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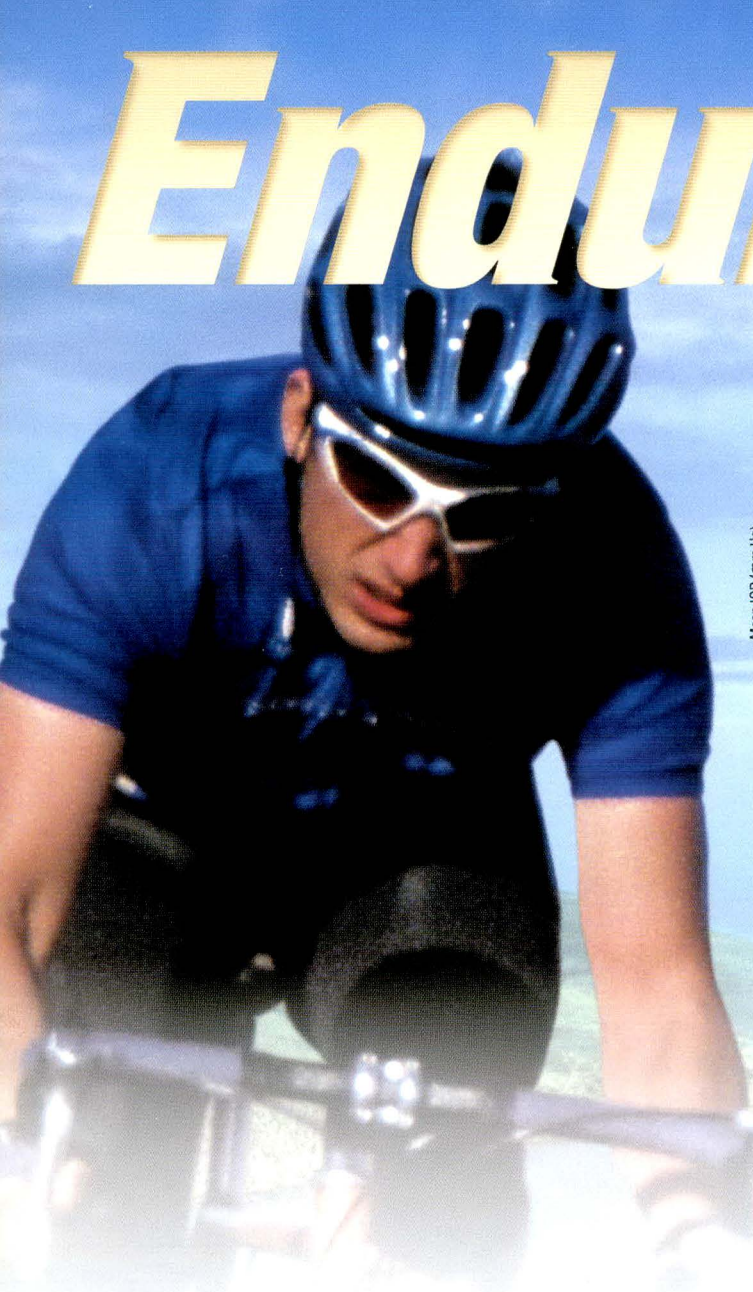

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TRAVATAN® (travoprost 0.004%) Ophthalmic Solution Sterile **DESCRIPTION** Travoprost is a highly selective, potent agonist for the FP prostanoid receptor. Its chemical name is isopropyl (Z)-7-[(1*R*,2*R*,3*R*,5*S*)-3,5-dihydroxy-2-[(1*E*,3*R*)-3-hydroxy-4-[(α,α,α-trifluoro-*m*-tolyl)oxy]-1-butenyl]cyclopentyl]-5-heptenoate. Its molecular formula is $C_{26}H_{35}F_3O_6$. Travoprost is a clear, colorless to pale yellow oil, which is very soluble in acetonitrile, methanol, octanol, and chloroform. It is practically insoluble in water. TRAVATAN® 0.004% Ophthalmic Solution is supplied as a sterile, buffered aqueous solution of travoprost with a pH of approximately 6.0 and an osmolality of approximately 290 mOsmol/kg. Each mL of **TRAVATAN® 0.004%** contains 40 µg travoprost. Preservative: benzalkonium chloride 0.015%. Inactive Ingredients: polyoxyl 40 hydrogenated castor oil, tromethamine, boric acid, mannitol, edetate disodium, sodium hydroxide and/or hydrochloric acid (to adjust pH) and purified water. **CLINICAL PHARMACOLOGY** Mechanism of Action Travoprost free acid is a highly selective, potent agonist for the FP prostanoid receptor. FP receptor agonists are reported to reduce intraocular pressure by increasing uveoscleral outflow. Pharmacokinetics/Pharmacodynamics Absorption: Travoprost is absorbed through the cornea. Studies in rabbits have shown peak concentrations in aqueous humor were reached one to two hours following topical administration. In humans, peak plasma concentrations of travoprost free acid were low (25 pg/mL or less) and occurred within 30 minutes following topical administration. Elimination from plasma was rapid resulting in concentrations below the limit of quantitation (< 10 pg/mL) by one hour. Metabolism: Travoprost, an isopropyl ester prodrug, is rapidly hydrolyzed by esterases in the cornea to the biologically active free acid. Systemically, travoprost free acid is rapidly and extensively metabolized to inactive metabolites. Biotransformations include beta-oxidation of the α(carboxylic acid) chain to give the 1,2-dinor and 1,2,3,4-tetranor analogs, oxidation of the 15-hydroxyl moiety, as well as reduction of the 13,14 double bond. Excretion: In rats, 95% of a subcutaneous radiolabeled dose was eliminated within 24 hours. The major route of elimination was via the bile (61%) with the remainder excreted by the kidneys. **INDICATIONS AND USAGE** TRAVATAN® Ophthalmic Solution is indicated for the reduction of intraocular pressure in patients with open-angle glaucoma or ocular hypertension. **CLINICAL STUDIES** TRAVATAN® 0.004% Ophthalmic Solution dosed once-daily in patients with open-angle glaucoma or ocular hypertension produced significant reductions in intraocular pressure (IOP) when used either as primary therapy or adjunctively to TIMOPTIC* (timolol maleate ophthalmic solution) 0.5% BID. As primary therapy, TRAVATAN® 0.004%, dosed QD, reduced IOP 7 to 9 mmHg. Stable diurnal IOP reductions were achieved as early as 2 weeks after initiation of therapy and were maintained over the 6 to 12 month treatment periods in three (3) well-controlled studies. The IOP reductions with TRAVATAN® (travoprost 0.004%) Ophthalmic Solution were superior to those obtained with TIMOPTIC* and equal or better than those obtained with XALATAN* (latanoprost ophthalmic solution) 0.005% QD. TRAVATAN® 0.004% demonstrated an earlier stabilization of IOP reduction and better IOP control throughout the day compared to XALATAN* 0.005%. TRAVATAN® 0.004% was significantly more effective (up to 1.4 mmHg) than XALATAN* 0.005% in reducing IOP in black patients. A responder analysis (IOP reduction ≥30% or mean IOP ≤17 mmHg) demonstrated that TRAVATAN® 0.004% had a significantly higher responder rate (56%) compared to XALATAN* 0.005% (50%) and which were both significantly greater than TIMOPTIC* (40%). In a 6-month well-controlled study, TRAVATAN® 0.004% dosed QD adjunctively to TIMOPTIC* 0.5% BID provided additional clinically significant IOP reductions (6 to 7 mmHg). **CONTRAINDICATIONS** Known hypersensitivity to travoprost, benzalkonium chloride or any other ingredients in this product. TRAVATAN® may interfere with the maintenance of pregnancy and should not be used by women during pregnancy or by women attempting to become pregnant. **WARNINGS** TRAVATAN® may gradually change eye color, increasing the amount of brown pigmentation in the iris by increasing the number of melanosomes (pigment granules) in melanocytes. The long term effects on the melanocytes and any consequences thereof are currently unknown. The change in iris color occurs slowly and may not be noticeable for months to years. These changes may be permanent. Periorbital and/or eyelid skin darkening has been reported in association with the use of TRAVATAN®. TRAVATAN® may gradually change eyelashes in the treated eye; these changes include: increased length, thickness, pigmentation, and/or number of lashes. Patients who receive treatment in only one eye may experience increased brown pigmentation of the iris, periorbital and/or eyelid tissue, and eyelashes in the treated eye. They may also experience disparity between the eyes in length, thickness, and/or number of eyelashes. These changes in pigmentation and lash growth may be permanent. **PRECAUTIONS** General There have been reports of bacterial keratitis associated with the use of multiple-dose containers of topical ophthalmic products. These containers had been inadvertently contaminated by patients who, in most cases, had a concurrent corneal disease or a disruption of the epithelial surface (see Information for Patients). Patients may slowly develop increased brown pigmentation of the iris. This change may not be noticeable for months to years (see Warnings). This change in eye color has predominantly been seen in patients with mixed colored irides, i.e., blue-brown, grey-brown, yellow-brown and green-brown; however, it has also been observed in patients with brown eyes. Based upon information from the literature, the color change is believed to be due to increased melanin content in the stromal melanocytes of the iris. Typically the brown pigmentation around the pupil spreads concentrically towards the periphery in affected eyes, but the entire iris or parts of it may become more brownish. No further increase in brown iris pigment has been observed after discontinuation of treatment, but the resultant color change may be permanent. TRAVATAN® should be used with caution in patients with active intraocular inflammation (iritis/uveitis). Macular edema, including cystoid macular edema, has been reported during treatment with prostaglandin $F_{2\alpha}$ analogues. These reports have mainly occurred in aphakic patients, pseudophakic patients with a torn posterior lens capsule, or in patients with known risk factors for macular edema. TRAVATAN® (travoprost 0.004%) Ophthalmic Solution should be used with caution in these patients. Patients should remove contact lenses prior to administration of the solution. Lenses may be reinserted 15 minutes following administration of TRAVATAN®. Information for Patients Patients should be advised concerning all the information contained in the Warnings and Precautions sections. Patients should also be instructed to avoid allowing the tip of the dispensing container to contact the eye or surrounding structures because this could cause the tip to become contaminated by common bacteria known to cause ocular infections. Serious damage to the eye and subsequent loss of vision may result from using contaminated solutions. Patients also should be advised that if they develop an intercurrent ocular condition (e.g., trauma, or infections) or have ocular surgery, they should immediately seek their physician's advice concerning the continued use of the multi-dose container. Patients should be advised that if they develop any ocular reactions, particularly conjunctivitis and lid reactions, they should immediately seek their physician's advice. Patients should also be advised that TRAVATAN® contains benzalkonium chloride which may be absorbed by contact lenses. Contact lenses should be removed prior to administration of the solution. Lenses may be reinserted 15 minutes following administration of TRAVATAN®. If more than one topical ophthalmic drug is being used, the drugs should be administered at least five (5) minutes apart. Carcinogenesis, Mutagenesis, Impairment of Fertility Travoprost was not mutagenic in bacteria, in one mouse lymphoma assay, in the mouse micronucleus tests and in the rat chromosome aberration assay. In another mouse lymphoma assay, higher concentrations of travoprost were slightly mutagenic only in the presence of activation enzymes. In life and early post-mortem evaluations of carcinogenicity studies in rats and mice suggest no evidence of a carcinogenic potential. Travoprost did not affect mating or fertility indices in male or female rats at subcutaneous doses up to 10 µg/kg/day (250 times the recommended human dose). The mean number of corpora lutea was slightly reduced at that dose, and the post-implantation losses were increased, but was not affected at 3 µg/kg/day (75 times the maximum recommended human dose). Pregnancy: Teratogenic Effects Pregnancy Category: C In reproduction studies conducted in pregnant rats and mice, travoprost reduced fetal viability when administered during gestation at doses as low as 1.0 µg/kg/day (25 times the maximum recommended human dose) with the lowest no effect level at 0.3 µg/kg/day (7.5 times the maximum recommended human dose). The incidence of skeletal malformations was increased in fetuses of rat dams receiving travoprost by subcutaneous injection at 10 µg/kg/day (250 times the maximum recommended human dose), but not at 3 µg/kg/day (75 times the maximum recommended human dose). No fetal abnormalities were observed in mice at 1.0 µg/kg/day (25 times the maximum recommended human dose). No adequate and well-controlled studies have been performed in pregnant women. TRAVATAN® may interfere with the maintenance of pregnancy and should not be used by women during pregnancy or by women attempting to become pregnant. Nursing Mothers A study in lactating rats demonstrated that radiolabeled travoprost and/or its metabolites were excreted in milk. It is not known whether this drug or its metabolites are excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when TRAVATAN® is administered to a nursing woman. Pediatric Use Safety and effectiveness in pediatric patients have not been established. Geriatric Use No overall differences in safety or effectiveness have been observed between elderly and other adult patients. **ADVERSE REACTIONS** (see Warnings and Precautions) The most common ocular adverse event observed in controlled clinical studies with TRAVATAN® (travoprost 0.004%) Ophthalmic Solution was ocular hyperemia which was reported in 35 to 50% of patients. 95% of the ocular hyperemia observed with TRAVATAN® (travoprost 0.004%) Ophthalmic Solution was mild in intensity and subsided over time without treatment. Approximately 3% of patients discontinued therapy due to conjunctival hyperemia. Ocular adverse events reported at an incidence of 5 to 10% included decreased visual acuity, eye discomfort, foreign body sensation, pain, and pruritus. Ocular adverse events reported at an incidence of 1 to 4% included, abnormal vision, blepharitis, blurred vision, cataract, cells, conjunctivitis, dry eye, eye disorder, flare, iris discoloration, keratitis, lid margin crusting, photophobia, subconjunctival hemorrhage, and tearing. Nonocular adverse events reported at a rate of 1 to 5% were accidental injury, angina pectoris, anxiety, arthritis, back pain, bradycardia, bronchitis, chest pain, cold syndrome, depression, dyspepsia, gastrointestinal disorder, headache, hypercholesterolemia, hypertension, hypotension, infection, pain, prostate disorder, sinusitis, urinary incontinence, and urinary tract infection. **OVERDOSAGE** A single dose intravenous study in rats was conducted to elucidate maximal acute hazard. The dose employed was 250,000-times the proposed daily clinical exposure and over 5000-times the possible exposure from the entire contents of one product container. No treatment related pharmacotoxic signs were present in the animals receiving Travoprost. If overdosage with TRAVATAN® occurs, treatment should be symptomatic. **DOSAGE AND ADMINISTRATION** The recommended dosage is one drop in the affected eye(s) once-daily in the evening. The dosage of TRAVATAN® should not exceed once-daily since it has been shown that more frequent administration may decrease the intraocular pressure lowering effect. Reduction of intraocular pressure starts approximately 2 hours after administration and the maximum effect is reached after 12 hours. TRAVATAN® may be used concomitantly with other topical ophthalmic drug products to lower intraocular pressure. If more than one topical ophthalmic drug is being used, the drugs should be administered at least five (5) minutes apart. **HOW SUPPLIED** TRAVATAN® (travoprost 0.004%) Ophthalmic Solution is a sterile, isotonic, buffered, preserved, aqueous solution supplied in Alcon's oval DROP-TAINER® package system inside a sealed foil pouch. This package system is comprised of a plastic oval shaped dispenser bottle, a dropper tip and tamper evident neck-band which shrinks to conform around the closure and neck area of the package. 0.004%: 2.5 mL fill **Storage** Store between 2° to 25°C (36° to 77°F). Refrigeration is not required. Rx Only (USA) **CAUTION: Federal (USA) law prohibits dispensing without prescription.**

*TIMOPTIC is a registered trademark of Merck & Co.Inc. *XALATAN is a registered trademark of Pharmacia Corp. U.S. Patent Nos. 5,631,287; 5,849,792; 5,889,052; 6,011,062 and 6,235,781.

* A washout period of 4 weeks was followed by 2 weeks of TRAVATAN® Soluton (n=16) or latanoprost monotherapy (n=18). At day 14, the final dose was administered at 8 pm and IOP measurements were taken. Baseline values for the two treatment groups were not significantly different. The standard deviations for the TRAVATAN® group were 3.9 mm Hg (12 hours), 2.9 mm Hg (16 hours), 3.2 mm Hg (20 hours), and 2.1 mm Hg (24 hours). For the latanoprost group, the standard deviations were 3.8 mm Hg (12 hours), 3.0 mm Hg (16 hours), 3.2 mm Hg (20 hours), and 3.1 mm Hg (24 hours). The difference between the two groups at 24 hours post dose was statistically significant (p=0.0117).

Reference 1. Dubiner HB, Sircy MD, Landry T, et al. Comparison of the diurnal ocular hypotensive efficacy of travoprost and latanoprost over a 44-hour period in patients with elevated intraocular pressure. Clin Ther. 2004;26:84-91.

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SEAGIG
South East Asia Glaucoma Interest Group

Asian Journal of OPHTHALMOLOGY is the official peer-reviewed journal of the South East Asia Glaucoma Interest Group (SEAGIG) and is indexed in EMBASE/Excerpta Medica. The website of *Asian Journal of OPHTHALMOLOGY* and SEAGIG membership details can be found at **www.seagig.org**.

As new technologies and therapeutic interventions are continually being developed, ophthalmology has become a field of rapid change, particularly in the Asia-Pacific region, where disease patterns and health care delivery differ greatly from those seen in the West. *Asian Journal of OPHTHALMOLOGY* was established in 1998 and became the official journal of SEAGIG in 2003, with the aim of disseminating information relevant to ophthalmology and glaucoma throughout Asia and to interested groups worldwide. The objectives of *Asian Journal of OPHTHALMOLOGY* are as follows:

- to provide a platform for the publication of information with a focus on ophthalmology in Asia
- to disseminate information that will improve the care of patients with all types of ophthalmological disorders, with a special focus on glaucoma
- to increase the understanding of such disorders through reporting of educational activities
- to publish the results of research programmes to expand knowledge about the causes, prevention, and treatment of ophthalmological disorders
- to work closely with Asian and international researchers to achieve these aims
- to provide a forum for young and relatively inexperienced researchers to present their research results as Original Articles via an international platform
- to maintain and promote relationships with any organisation with similar goals.

Although the focus of *Asian Journal of OPHTHALMOLOGY* is on glaucoma, other topics relevant to the region will not be ignored, and submissions on all aspects of ophthalmology are welcome.

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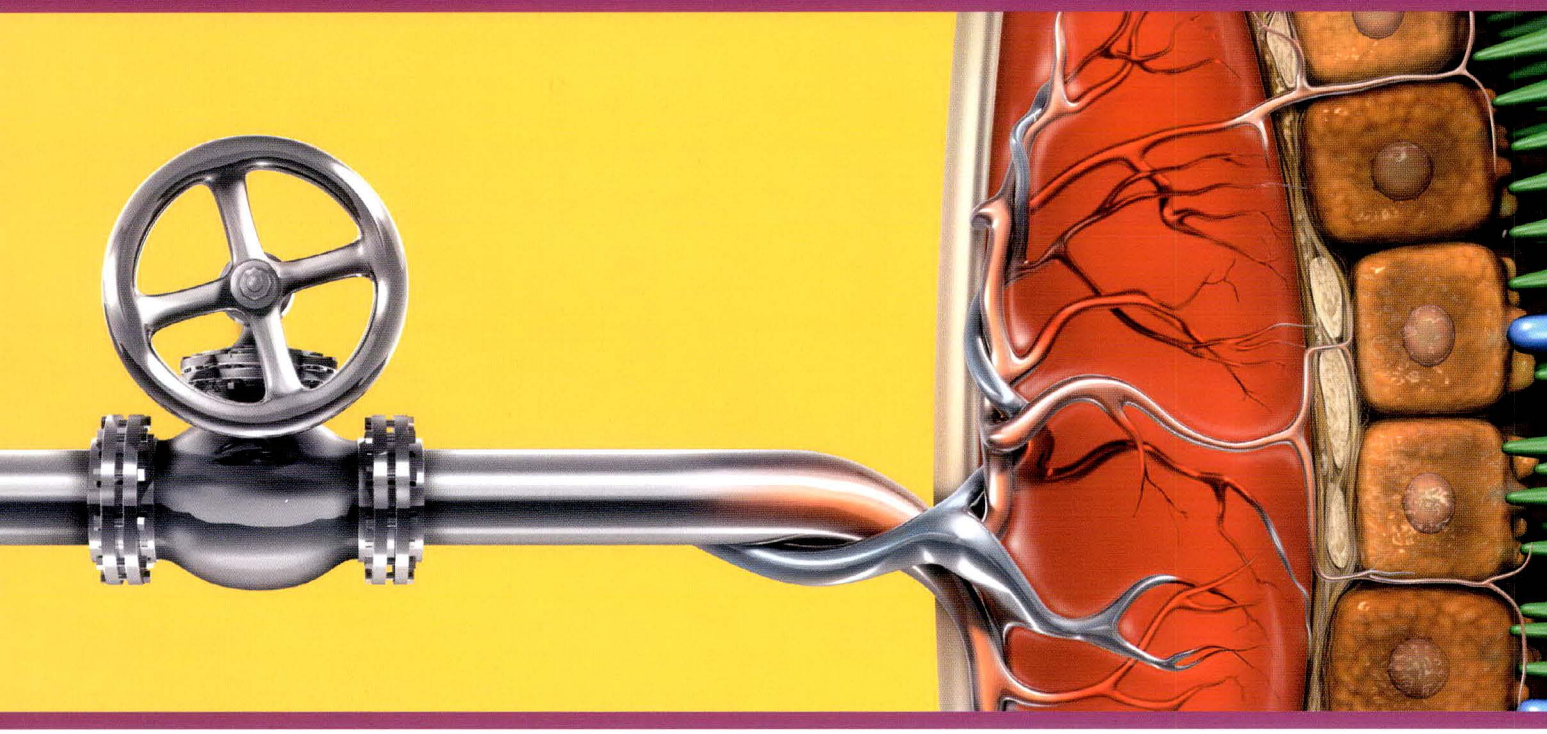

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* Age-related macular degeneration. † Vascular endothelial growth factor. ‡ Defined as <15 letters lost over 2 years.

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MACUGEN ABBREVIATED PACKAGE INSERT TRADE NAME: Macugen **PRESENTATION:** Macugen injection is supplied in a single use 1 mL glass syringe containing pegaptanib sodium 0.3 mg in a 90 µL deliverable volume. **INDICATIONS:** Treatment of neovascular (wet) age-related macular degeneration. **DOSAGE:** 0.3 mg administered once every six weeks by intravitreous injection into the eye to be treated. Macugen should be inspected visually for particulate matter and discoloration prior to administration. The injection procedure should be carried out under controlled aseptic conditions. Adequate anesthesia and a broad-spectrum microbicide should be given prior to the injection. **CONTRAINDICATIONS:** Patients with ocular or periocular infections. **WARNINGS & PRECAUTIONS:** FOR OPHTHALMIC INTRAVITREAL INJECTION ONLY. Intravitreous injections have been associated with endophthalmitis. Proper aseptic injection technique should always be utilized when administering Macugen. Patients should be monitored during the week following the injection to permit early treatment, should an infection occur. Intraocular pressure as well as the perfusion of the optic nerve head should be monitored and managed appropriately. **INTERACTIONS:** Pegaptanib is metabolized by nucleases and is generally not affected by the cytochrome P450 system. **PREGNANCY AND LACTATION:** Pregnancy Category B. Pegaptanib crosses the placenta in mice. There are no studies in pregnant women. The potential risk to humans is unknown. Macugen should be used during pregnancy only if the potential benefit to the mother justifies the potential risk to the fetus. It is not known whether pegaptanib is excreted in human milk, caution should be exercised when Macugen is administered to a nursing woman. **SIDE EFFECTS:** Anterior chamber inflammation, blurred vision, cataract, conjunctival hemorrhage, corneal edema, eye discharge, eye irritation, eye pain, hypertension, increased intraocular pressure (IOP), ocular discomfort, punctate keratitis, reduced visual acuity, visual disturbance, vitreous floaters, and vitreous opacities. Injection procedure related side effects include endophthalmitis, retinal detachment, iatrogenic traumatic cataract. **STORAGE:** Store in refrigerator at 2°C to 8°C. Do not freeze or shake vigorously. Reference: USPI (Dec 2004). **FULL PRESCRIBING INFORMATION IS AVAILABLE UPON REQUEST.**

MACD6003P

Primary Angle Closure Glaucoma in Asia

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The World Health Organization ranks glaucoma as the second leading cause of blindness worldwide after cataract.[1] It has been estimated that 3.9 million people with glaucoma will be blind due to primary angle closure glaucoma (PACG) by 2010, and the majority of those affected will be from Asia.[2] By 2020, the number is projected to increase to 5.3 million.[3] Eighty six percent of people with PACG will be in Asia, with approximately 48.0% in China, 23.9% in India, and 14.1% in Southeast Asia.[3] The growing concern about visual disability resulting from PACG has led investigators to determine the incidence and prevalence among at-risk racial/ethnic groups. Studies have shown that the prevalence of the disease differs among racial groups. In Mongolia, the prevalence was found to be 1.4%, which is approximately 3 times the rate for open angle glaucoma.[4] An island-wide survey of PACG in the heterogeneous population of Singapore showed that Chinese Singaporeans were at higher risk than the Malay and Indian ethnic groups.[5,6] Similarly, a survey aimed at finding the prevalence of occludable angles concluded that Vietnamese people have a much higher prevalence of narrow angle disease and a greater risk for angle closure than Caucasians.[7] Pooling data from epidemiological surveys of PACG conducted in China, the number of people with PACG in northern China was found to be higher than that in southern China, and prevalence rates differed among different Chinese groups.[8] Demographic characteristics such as older age, female sex, and Asian ethnicity, coupled with ocular risk factors of narrow drainage angles, shallow anterior chamber depth, and a thick or anteriorly positioned lens constitute significant predictors for disease occurrence.

It is encouraging to note that data for PACG in Asia have increased in recent years. However, the need for more information still exists owing to the numerous and varied population in Asia. In this issue of Asian Journal of Ophthalmology, Wong and Shah report on acute primary angle closure (APAC) and PACG in various ethnic groups from Sabah, Malaysia.[9] The 5-year retrospective study focuses mainly on 4 ethnic groups, namely Kadazan — comprising 35% of Sabah's population — Chinese, Malay, and Bajau. In general, the incidence of APAC and PACG in relation to age and sex were parallel to the observed trend reported in the literature. Women older than 60 years were 3 times more likely to have acute angle closure than were men. This is not surprising because women have shallower anterior chambers than men and older individuals have shallower anterior chambers than younger people.[10] This study also found that Chinese people had the highest incidence of APAC/PACG at 2.71 per 100,000 population, followed by Kadazan people at 1.33 per 100,000 population.[9] Malays were less likely to develop APAC/PACG, at only 0.28 per 100,000 population. This observation is consistent with several studies in Singapore.[5,8,10,11] However, the question arises as to whether the incidences depicted in this retrospective research translate into the actual incidence in the population because the results reflect a clinic/hospital-based study rather than a population study.

Prompt health care provision results in less morbidity and mortality. The time interval between the first presentation of symptoms and the institution of treatment is crucial in all disease conditions, especially PACG. Poor intraocular pressure control because of trabecular damage leads to treatment failure, and this is commonly associated with delay in seeking treatment. In Wong and Shah's cross-sectional study, patients with symptoms for less than 1 week were successfully treated with laser peripheral iridotomy (PI) alone.[9] When patients who presented within 1 week of symptom onset were compared with those who presented more than 1 week after the onset of symptoms, there was a statistically significant chance (8.7 times higher for presentation within 1 week of symptom onset) that a single PI treatment would be effective. Those people living closer to the hospital were more likely to present within 1 week of symptom onset than those who lived further away. Late presentation to an ophthalmologist remains a serious problem in Malaysia; similar to many parts of Asia. Effective educational programmes and improved accessibility of health services may diminish the medical and socioeconomic burden of glaucoma by encouraging adults to seek appropriate medical treatment early and thus lessen the complications and visual loss associated with severe glaucoma.[12]

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Primary Angle Closure Glaucoma in Sabah, Malaysia

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Aim: To determine the incidence rate and pattern of acute primary angle closure/primary angle closure glaucoma among the major ethnic groups in Sabah, Malaysia.
Methods: This was a retrospective study of 71 patients with acute primary angle closure who presented for the first time to the Eye Clinic at the Queen Elizabeth Hospital, Kota Kinabalu, Sabah, Malaysia, from 1 January 2001 to 31 December 2005. Patients were identified from the patient registry at the clinic. Information was obtained from review of the case notes and was entered into a data collection sheet in tabulated format for analysis. Pearson's chi-squared test and Fisher's exact test were used to determine any association between qualitative variables. Independent t test was used to determine the statistical significance when comparing between 2 means. One-way analysis of variance was used to test for differences among 3 or more independent groups. Confidence intervals for incidence and relative risk were calculated at the 95% level. A p value of <0.05 was taken as statistically significant.
Results: The incidence rate for primary angle closure glaucoma among Kadazan people was 1.33/100,000 (95% confidence interval, 0.23-2.44) and in Chinese people was 2.71/100,000 (95% confidence interval, 0.05-5.36). The mean age of patients with primary angle closure glaucoma was 59.9 years (SD, 9.13 years). The incidence was highest among people aged 60 years or older, with an incidence rate of 17.25/100,000 per year (95% confidence interval, 5.3-29.2). Patients with acute glaucoma who lived within 30 km of the hospital were 6.9 times more likely to present within 1 week of the symptoms than those who lived further away (95% confidence interval, 1.44-33.83; $p = 0.008$). Peripheral iridotomy was more effective for patients who presented within 1 week ($p = 0.035$); patients who presented within 1 week had an 8.7-fold better chance of the condition being controlled with peripheral iridotomy alone (95% confidence interval, 1.1-73.0).
Conclusions: Both Chinese and Kadazan people have a relatively high incidence of primary angle closure. The condition is associated with older age. Delay in presentation for treatment is associated with travel distance, and reduces the likelihood of a successful peripheral iridotomy.

Key words: Continental population groups, Glaucoma, angle closure, Incidence, Malaysia

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Introduction

Nearly half of the world's estimated 5.1 million people who are blind because of glaucoma live in East Asia.[1] In reports from China[2] and Singapore,[3] the majority of the patients described have primary angle closure glaucoma (PACG). Acute primary angle closure (APAC) is a relatively common eye emergency in Asian countries. However, data on APAC and the long-term visual outcome are lacking in some Asian countries, including Malaysia. To date, the only hospital-based Malaysian study detailed the race, age, and sex distribution of patients with primary open angle glaucoma and PACG in Kuala Lumpur General Hospital, Kuala Lumpur, Malaysia.[4]

Although there have been many studies from western countries, the extrapolation of data from Caucasian populations to the multi-ethnic Malaysian population is unreliable because of the large dissimilarity in glaucoma pattern between different ethnic groups. Likewise, although many studies have been done in Asian countries such as Thailand,[5] Hong Kong,[6] Singapore,[7] and Mongolia,[8] the racial mix in these countries is very different to that in Malaysia. In states such as Sabah and Sarawak, this problem is compounded by the fact that there are more than 30 different races in the population. Therefore, the incidence of glaucoma in East Malaysia is believed to be different to that of West Malaysia, although no studies have been conducted to date.

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The main ethnic group in Sabah is the Kadazan race, which comprises 35% of the population, followed by Chinese, Malay, and Bajau people. This is in contrast to West Malaysia, where Malay people make up the predominant race, followed by Chinese and Indian people. It is thought by ophthalmologists in Sabah that the Kadazan people and affiliated races are particularly susceptible to PACG — in much in the same way that Chinese people are susceptible — as the majority of people admitted to hospital for PACG are Kadazan people. As Sabah is populated by many racial groups, it may be useful to compare the incidence of PACG among these groups. Thus, one of the aims of this retrospective study was to document the epidemiology of PACG in the different ethnic groups living in Sabah, in particular the Kadazan population, to ascertain whether they are predisposed to PACG.

It is also thought that patients with APAC or PACG delay before presenting to a hospital after the onset of symptoms. As no hospital-based study of ACG has been performed in East Malaysia to date, this study was intended to determine the pattern of disease, identify problems for health care provision, and provide guidance for effective delivery of health care to patients with PACG in Sabah.

Methods

Patients

This was a hospital-based retrospective cross-sectional study. Patients were identified from the ophthalmology patient registry. Patients with ACG who presented for the first time to the Eye Clinic, Queen Elizabeth Hospital, Kota Kinabalu, Sabah, Malaysia, from 1 January 2001 to 31 December 2005 and who fulfilled the inclusion and exclusion criteria were enrolled in the study.

Patients diagnosed with PACG by an ophthalmologist were included, while patients with secondary ACG such as neovascular glaucoma, lens intumescence, or lens subluxation were excluded.

Design

Information was obtained from review of the case notes and was entered into a data collection sheet. The following definitions were used:[9]

- PAC suspect — an eye in which appositional contact between the peripheral iris and posterior trabecular meshwork was considered possible
- PAC non-ischaemic — an eye with an occludable drainage angle and features suggesting trabecular dysfunction such as peripheral anterior synechiae, elevated intraocular pressure (IOP), or excessive pigment deposition on the trabecular surface, with normal optic disc and visual field
- PAC ischaemic — the presence of iris whirling, stromal atrophy, or glaucomflecken signified previous 'acute' PAC, as these are areas of ischaemic necrosis; differentiating between non-ischaemic and ischaemic PAC is supported by experimental evidence that the iris and ciliary body are most sensitive to pressure-induced ischaemia, and damage to the optic nerve only occurs at higher IOPs — anterior segment ischaemic sequelae indicate that nerve ischaemia may have occurred, but do not confirm this
- PACG — glaucomatous optic atrophy, with a characteristic visual field defect in the presence of an occludable drainage angle or signs of PAC
- successful treatment — an IOP of ≤21 mm Hg after treatment.

Statistical Analysis

The data were tabulated and analysed using the Statistical Package for the Social Sciences Version 13. Age, sex, and race were based on census data from the 2004 Sabah Yearbook of Statistics for the hospital catchment area.[10] Pearson's chi-squared test and Fisher's exact test were used to determine any association between qualitative variables. Independent *t* test was used to determine statistical significance when comparing between 2 means. One-way analysis of variance was used to test for differences among 3 or more independent groups. Confidence intervals (CI) for incidence and relative risk (RR) data were calculated at the 95% level. A p value of <0.05 was considered statistically significant.

Results

Most of the patients with APAC were from the Kadazan race, followed by Chinese patients (Table 1). The mean age of patients with APAC or PACG was 59.9 years (SD, 9.13 years; range, 36 to 81 years) [Table 2]. There were 17 men (mean age, 61.3 years; SD, 7.13 years) and 54 women (mean age, 59.5 years; SD, 9.70 years), with a ratio of men to women of 1:3. The incidence of APAC or PACG was significantly higher among patients older than 60 years than

Table 1. Incidence of acute primary angle closure or primary angle closure glaucoma according to race.

	Number of patients (%)	Population in catchment area	Incidence/100,000 (95% confidence interval)
Chinese	20 (28.1)	147,706	2.71 (0.05-5.36)
Kadazan	28 (39.4)	420,024	1.33 (0.23-2.44)
Bajau	6 (8.5)	167,506	0.72 (0.0-2.00)
Malay	1 (1.4)	142,637	0.28 (0.0-1.15)
Others	16 (27.0)	309,756	1.03 (0.0-2.16)
Total	71 (100)	1,187,629	1.20 (0.57-1.82)

Table 2. Demographic characteristics of study population.

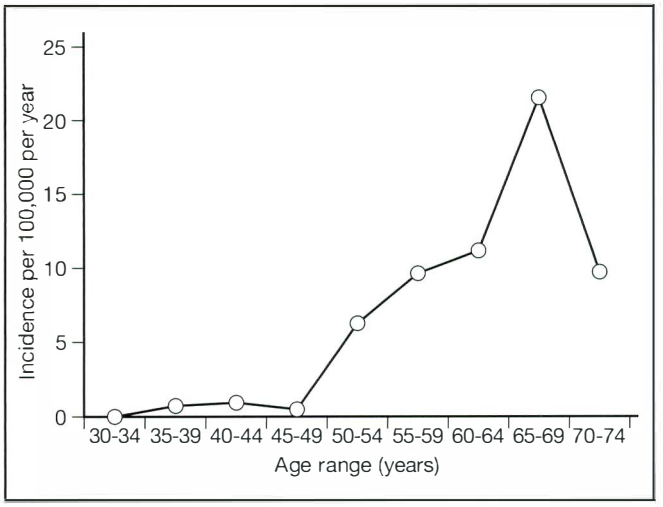
	Number of patients (%)	Overall mean (SD) or median	Overall range
Age group (years)		Mean, 59.9 (9.13)	36-81
30-39	3 (4.2)		
40-49	4 (5.6)		
50-59	24 (33.8)		
60-69	33 (46.5)		
70-79	5 (7.0)		
≥80	2 (2.8)		
Intraocular pressure at presentation (mm Hg)		Mean, 48.6 (12.9)	26-75
<30	2 (2.8)		
31-40	17 (23.9)		
41-50	22 (31.0)		
51-60	20 (28.2)		
>60	10 (14.1)		
Time from symptom onset (days)		Median, 7	1-30
1-3	21 (29.6)		
4-7	19 (26.8)		
8-13	6 (8.5)		
≥14	25 (35.2)		
Distance to travel (km)			
1-30	17 (23.9)	Mean, 88.9 (62.6)	3-205
31-50	9 (12.7)		
51-100	11 (15.5)		
101-150	24 (33.8)		
>150	10 (14.1)		

among those younger than 60 years (t = 15.4; p < 0.001). The incidence of APAC or PACG related to age and sex is shown in Figures 1 and 2.

The median time to presentation for APAC or PACG was 7 days (range, 1 to 30 days); 29.6% of patients presented within 3 days and 43.7% presented after 1 week (Table 2).

The mean distance to the Queen Elizabeth Hospital from the patients' residences was 88.9 km (SD, 62.6 km) [Table 2]. For patients with APAC, there was a statistically significant difference between those who lived within 30 km of the hospital and those who lived further than 30 km from the hospital (p = 0.008) [Figure 3]. Patients with APAC who lived within 30 km of the hospital were 6.9 times more likely to present within 1 week of the symptoms than those who lived further away (95% CI, 1.44-33.83).

Figure 1. Incidence of acute primary angle closure or primary angle closure glaucoma by age.



The mean IOP of the affected eye at presentation was 48.6 mm Hg (SD, 12.9 mm Hg) [Table 2]. The mean IOP of the affected eye at the last follow-up was 17.98 mm Hg (SD, 10.5 mm Hg).

Of the 71 patients with APAC or PACG, 10 achieved satisfactory IOPs after peripheral iridotomy (PI); 9 of these patients presented within 1 week of the onset of symptoms. There was a statistically significant difference in outcomes of PI for patients presenting within 1 week of symptom onset and those presenting more than 1 week after the onset of symptoms (p = 0.035), with PI being more effective when performed within 1 week. Patients who presented within 1 week of symptom onset had an 8.7-fold better chance of the condition being controlled with PI alone (95% CI, 1.1-73.0). Figure 4 shows the outcomes for patients according to the time to presentation.

Discussion

In this study, ACG was more prevalent among women and older people, which is a well-known trend. This study also found that Chinese people had the highest incidence of APAC or PACG at 2.71 per 100,000 population, followed by Kadazan people at 1.33 per 100,000 population.

The crude incidence of APAC and PACG in this study was 1.20 per 100,000 population per year, whereas the incidence in Singapore is reported to range from 11.1 to 12.2 per 100,000

Figure 2. Sex distribution of patients with acute primary angle closure or primary angle closure glaucoma by age.

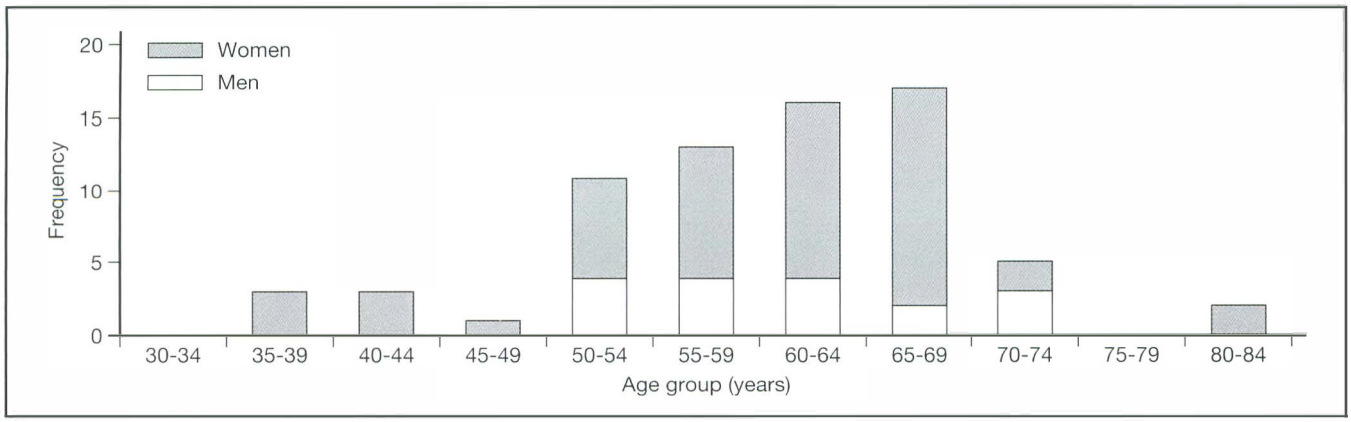


Figure 3. Association of travel distance and time to treatment.

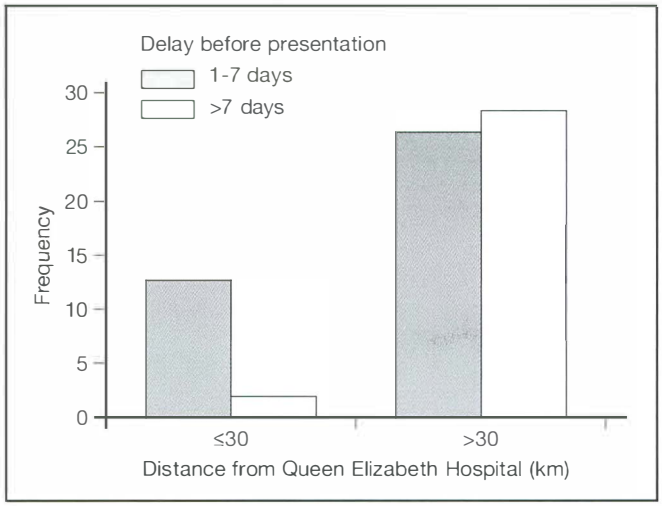
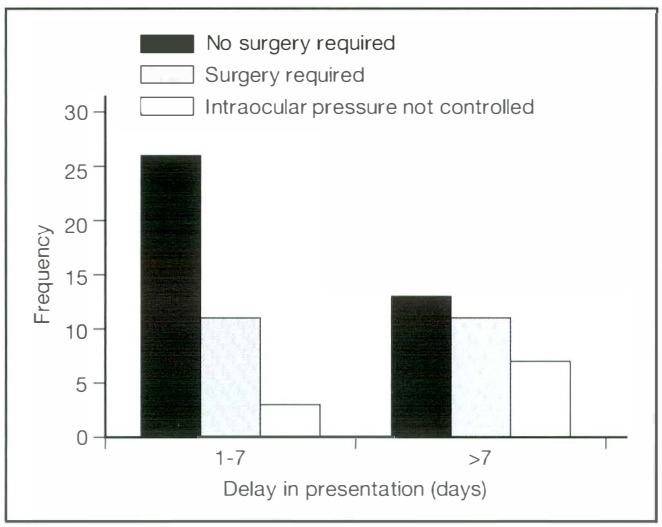


Figure 4. Treatment outcomes stratified according to the time to presentation.



population per year,[11,12] and that in Hong Kong is 10.4 per 100,000 population.[6] This disparity could arise for several reasons. Singapore and Hong Kong are predominantly inhabited by Chinese people (>80%), while in Sabah, only 12.4% of the population is Chinese. In addition, some patients in Sabah may have presented directly to private hospitals or clinics, and would therefore not be included in this study.

In this study, Malay people had the lowest rates of APAC or PACG, followed by the Bajau people. The low incidence of APAC or PACG in Malay people is consistent with several studies from Singapore that show that Malay people are significantly less likely to develop APAC or PACG than some other races.[3,7,11,12]

It was initially intended that the incidence rates would be based on new cases treated at the hospital on an annual basis. However, there were no statistics at the Queen Elizabeth Hospital to show the racial breakdown of new patients seen each year by the hospital. As such, it was not possible to use the hospital incidence rates to determine whether Kadazan people are equally vulnerable to APAC or PACG as Chinese people.

It is likely that racial representation at the hospital may not mirror the population breakdown. Disproportionately more Chinese patients attend the Eye Clinic annually (average, 20.2% of patients) than the number of Chinese people in the population warrants (12.4%). Likewise, Kadazan patients seem to be under-represented in the clinic (average, 18.8% of patients) when compared with the number of Kadazan people in the population (35.3%). This is likely to be because Chinese people generally live in urban areas and are more likely to access health care. Therefore, the APAC and PACG rates based on hospital or eye clinic data may not be accurate for the population of Sabah.

Relatively few patients in this study presented within 3 days of the onset of symptoms (29.6%). This is in contrast to a study from Singapore in which 32% of patients were seen on the day of symptom onset.[12] More than 40% of the patients in this study presented at least 1 week after the onset of symptoms. This is not an encouraging finding and may reflect a difficulty in obtaining health care or a reluctance to seek it for some patients. Less than

20 of the 71 patients lived within 30 km of the Queen Elizabeth Hospital, and this travel distance may have played a role in determining whether patients attended hospital.

This study has some limitations. Although Queen Elizabeth Hospital is the major referral hospital in Sabah, it serves a defined territory of the West coast and interior regions. Patients presenting to private doctors or other public hospitals were not recruited into this study. Thus, the data cannot be extrapolated to the whole state. Secondly, this was a retrospective study. The diagnosis and disease management were done by different doctors with varying experience. The data were not standardised as they were not intended for research purposes.

Chinese and Kadazan people in Sabah, Malaysia, have a relatively high incidence of APAC or PACG. Female sex and older age is associated with APAC or PACG. Patients do not present to the hospital as soon as they experience symptoms; this delay is associated with the distance of their home from the hospital. However, delay in treatment reduces the success of PI.

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Longitudinal Study of Sclerotomies in 25-G Transconjunctival Sutureless Vitrectomy using Ultrasound Biomicroscopy

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Aim: To study the longitudinal changes of sclerotomies using ultrasound biomicroscopy after primary pars plana vitrectomy with the 25-G transconjunctival sutureless vitrectomy system.
Methods: Seven eyes of 6 patients undergoing 25-G transconjunctival sutureless vitrectomy for various vitreoretinal conditions were prospectively recruited. Ultrasound biomicroscopy was performed preoperatively and monthly postoperatively until wound closure was evident. The main outcome measures included wound healing, rate of vitreous incarceration of sclerotomies based on ultrasound biomicroscopy, and sclerotomy-related complications.
Results: Twenty one sclerotomies were performed in 7 eyes. The mean period postoperatively to achieve wound closure and relief of vitreous incarceration was 1.8 and 2.4 months, respectively. Superonasal sclerotomies took longer to achieve wound closure than infusion sclerotomies ($p = 0.042$). Vitreous incarceration occurred in 27.8% of procedures, and sclerotomies with vitreous incarceration took significantly longer to heal ($p = 0.015$). No sclerotomy-related complications were encountered.
Conclusions: Good wound healing and a lower rate of vitreous incarceration were observed early after 25-G transconjunctival sutureless vitrectomy. These results suggest that transconjunctival sutureless vitrectomy potentially has less risk of sclerotomy-related complications than conventional 20-G vitrectomy.

Key words: Sclerotomy, Ultrasound biomicroscopy, Vitrectomy, Vitreous body

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Introduction

Sclerotomies of pars plana vitrectomy have been associated with problems of recurrent vitreous haemorrhage, fibrovascular ingrowth, and complications associated with traction leading to retinal detachment or phthisis bulbi.[1,2]

Recently, sutureless scleral tunnel sclerotomies and the 25-G transconjunctival sutureless vitrectomy (TSV) system have been introduced to try to minimise sclerotomy-related complications and hasten postoperative recovery.[3-5] Direct visualisation of sclerotomies was not possible prior to the introduction of ultrasound biomicroscopy (UBM).[6] UBM provides high-resolution in vivo imaging of the sclerotomies. This study examined the longitudinal changes of sclerotomies after the introduction of the 25-G TSV.

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Methods

This study was conducted in accordance with the Declaration of Helsinki. Patients undergoing primary pars plana vitrectomy (PPV) at the Prince of Wales Hospital, Hong Kong, using the 25-G TSV system were prospectively recruited. Informed consent was obtained from each patient. All surgeries were performed by 1 of 2 authors and the technique was as described previously.[4] The patient demographics, diagnoses, preoperative and postoperative visual acuities, and type of procedures performed were recorded. Intraoperative complications and duration of surgery were also recorded for each operation. Anatomical outcomes and postoperative complications, especially sclerotomy-related complications, were specifically looked for during the follow-up period.

UBM was performed preoperatively, and at monthly intervals postoperatively until closure of the wound was evident. The UBM examinations were all performed by 1 author using the Zeiss-Humphrey Ultrasound Biomicroscope Model 840 (Humphrey Instruments, Carl Zeiss, Inc, San Leandro, USA). All 3 sclerotomies

(superotemporal [ST], inferotemporal [IT], and superonasal [SN]) of each patient were examined.

Results

Seven eyes of 6 patients undergoing 25-G TSV were prospectively recruited into the study. There were 3 men and 3 women. The mean age was 57.4 years. Indications for surgery included proliferative diabetic retinopathy (2 eyes), Terson's syndrome (3 eyes), epiretinal membrane (1 eye), and branch retinal vein occlusion (1 eye). The mean follow-up was 19.6 months.

Three patients (patients 1, 5, and 7) underwent combined clear corneal phacoemulsification, intraocular lens implantation, and 25-G TSV. The overall mean duration of surgery was 60.8 minutes. No tamponade agent was used for all patients and no intraoperative complications were encountered. Suturing of the sclerotomies was required for 3 patients (patients 3, 6, and 7) because of persistent leakage after removal of the trocar. Suturing was only required at 1 site for each of the 3 patients (ST site for patients 3 and 6; and IT site for patient 7). These 3 sites were excluded from the analysis since the normal configuration and healing process of the sutureless sclerotomies might have been altered. All remaining 18 sclerotomies were analysed.

UBM revealed 3 distinct patterns of the sclerotomies, including wound gap (Figure 1a), healed sclerotomies (Figure 1b), and vitreous incarceration (Figure 2a). Vitreous incarceration was observed in 5 sclerotomies (27.8%; patient 3 at the SN site; patient 5 at the SN, ST, and IT site; and patient 6 at the SN site; Table 1) and graded.[7] The overall mean postoperative time to achieve complete wound closure was 1.8 months. When individual sclerotomies were considered, SN sclerotomies took significantly longer to achieve wound closure when compared with infusion sclerotomies (paired sample *t* test, $p = 0.042$). In sclerotomies with vitreous incarceration, there was relief of the vitreous incarceration (Figure 2b) and the mean period to achieve this, together with wound closure, was 2.4 months. Wound closure in sclerotomies without vitreous incarceration was achieved in a mean period of 1.6 months. Multiple regression analysis also showed that sclerotomies with vitreous incarceration took significantly longer to achieve wound closure ($p = 0.015$). No sclerotomy-related complication was encountered.

The mean preoperative vision ranged from 20/50 to hand movements. Visual improvement was observed in 5 of 7 eyes, with 57% achieving 20/40 or better vision. Only 2 patients lost vision. The first patient had reduction of vision to 20/200 due to recurrence of epiretinal membrane but he declined any further surgical intervention. His vision was maintained at 20/200 at the last follow-up. The second patient developed recurrent vitreous haemorrhage 1 month after TSV that failed to clear after 3 months of observation. He subsequently underwent vitreous washout. The mean intraocular pressure on postoperative day 1 was 12.5 mm Hg. No hypotony was encountered.

Discussion

Sclerotomies of conventional 20-G PPV have been extensively investigated with the use of UBM and a high rate of vitreous incarceration has been reported. Vitreous shaving around the sclerotomies has therefore been adopted by many vitreoretinal surgeons to try to avoid sclerotomy-related complications.[7] However, this technique

Figure 1. Ultrasound biomicroscopy findings of the superotemporal sclerotomy of patient 7. (a) Postoperatively at 1 month showing wound gaping of the sclerotomy (arrow); and (b) postoperatively at 2 months showing complete healing of the sclerotomy.

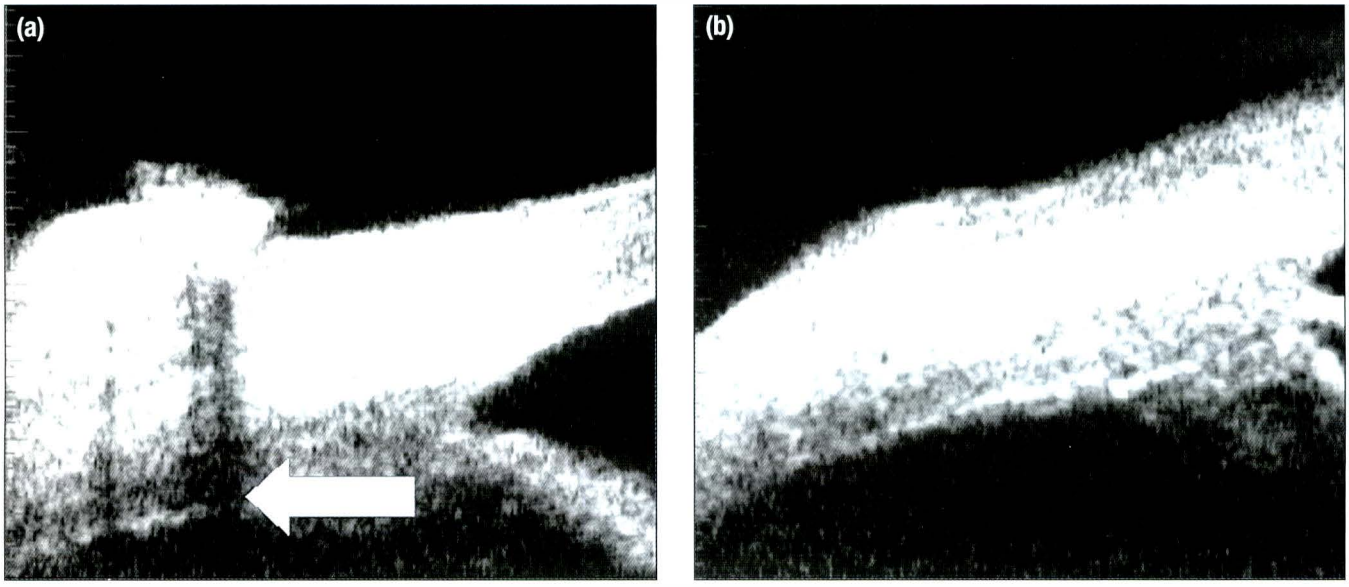
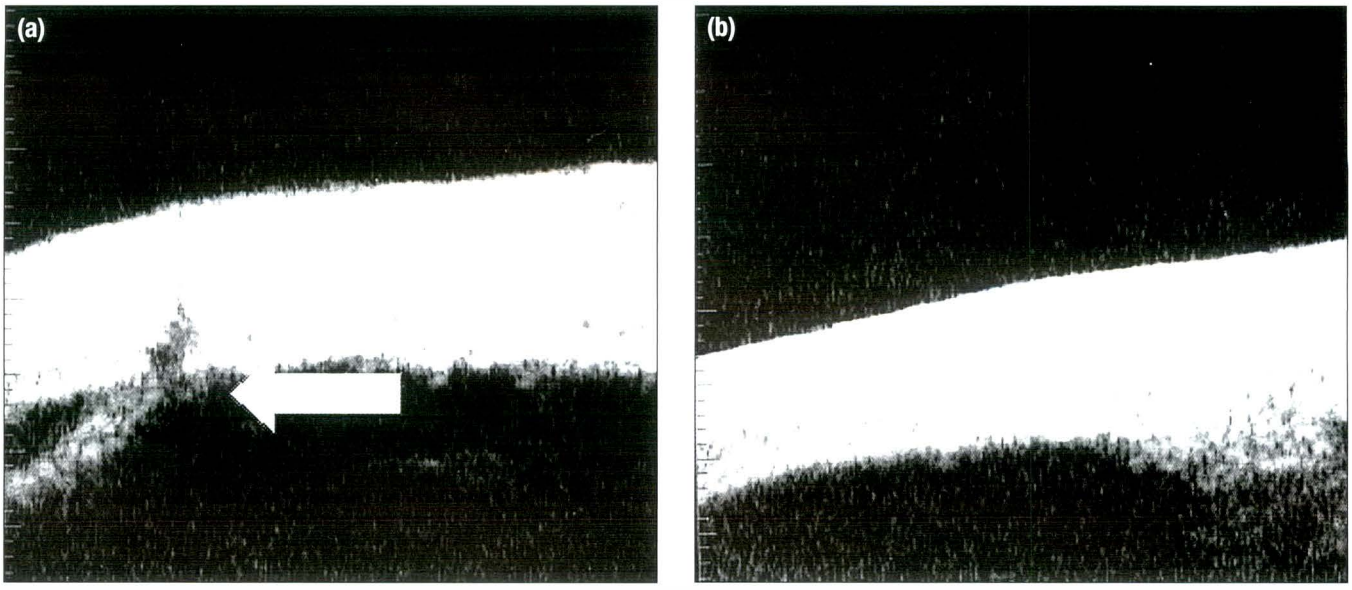


Figure 2. Ultrasound biomicroscopy findings of the superonasal sclerotomy of patient 3. (a) Postoperatively at 1 month showing the sclerotomy with vitreous incarceration (arrow); and (b) postoperatively at 3 months showing relief of vitreous incarceration and complete healing of the sclerotomy.



cannot be entirely applied to TSV, as our initial experience shows that meticulous vitreous base shaving may jeopardise the self-sealing nature of TSV. We speculate that the presence of peripheral vitreous may be required to plug the sclerotomies to avoid leakage. If this is true, TSV may increase the risk of sclerotomy-related complications. This study was therefore conducted to investigate the sclerotomy site changes after TSV.

Using UBM, vitreous incarceration was observed in only 5 of 18 sclerotomies (27.8%) 1 month after TSV. This vitreous incarceration rate is much lower than that of 85.4% to 90.9% for 20-G PPV reported previously.[5,7] Vitreous incarceration was observed up to 6 months after 20-G PPV.[5] However, vitreous incarceration after TSV behaved differently, with relief of the vitreous incarceration after a mean period of 2.4 months. The differences in the rate and behaviour of vitreous incarceration may be due to the differences in the size of the sclerotomies (0.5 mm vs. 0.89 mm) and the associated different wound healing process.

Table 1. Summary of the time required for the sclerotomies to heal (in months) by ultrasound biomicroscopy.

Patient number	Sclerotomy site		
	Superotemporal	Superonasal	Inferotemporal (infusion site)
1	1	2*	2*
2	1	3*	1
3	Suture required	3 (G2)	1
4	2*	2*	2*
5	2 (G1)	3 (G2)	2 (G1)
6	Suture required	2 (G1)	1
7	2*	1	Suture required

* Gaping of wound on initial ultrasound biomicroscopy.
Abbreviations: G1 = grade 1 vitreous incarceration; G2 = grade 2 vitreous incarceration.

The UBM findings of sclerotomy after 25-G TSV was recently described.[8] In the reported patient, wound gap was observed and wound closure was seen 2 weeks after surgery. Wound closure took slightly longer in the series reported here (1.8 months), but this might be because the first postoperative UBM was performed 1 month after surgery. UBM was performed at 1 month to reduce the risk of introducing bacteria to the eye that could lead to endophthalmitis. It was also observed that the SN sclerotomies took significantly longer to achieve closure than the infusion sclerotomies (IT).

One possible explanation was that more instrumentation and surgical manipulation occurred at the SN site than for the infusion sclerotomy, affecting wound healing. However, consideration of vitreous incarceration may affect this explanation. Three of the 7 SN sclerotomies had vitreous incarceration and this might explain why they took significantly longer to achieve wound closure, as it was observed that sclerotomies with vitreous incarceration took longer to heal.

From this study, it appears that sclerotomies of TSV behave differently from those of conventional 20-G PPV, with a lower rate of vitreous incarceration. However, these results are limited by the non-randomised nature of the study, the small sample size, and the lack of a control group for comparison. However, these results can help in the planning of future prospective randomised controlled trials by providing data for calculation of the sample size. A randomised controlled trial directly comparing sclerotomies after 20-G and 25-G vitrectomy with a masked evaluator will certainly increase the understanding of the differences in wound healing.

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Comparison of Red Colour Perimetry Chart and Humphrey Visual Field Assessments for Patients with Pituitary Tumours

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Aim: *To evaluate red dot perimetry as a simple and accurate perimetric assessment for patients with pituitary tumours.*
Methods: *This was a retrospective review of the visual fields of 15 patients with pituitary tumours using red dot perimetry or Humphrey visual field assessment. Eleven patients had some visual field defects and 4 had normal visual fields. The red dot perimetry and Humphrey visual field results were tabulated and compared. The sensitivity and specificity of red dot perimetry for detecting visual field defects were calculated.*
Results: *The sensitivity of red dot perimetry was 100% (11 of 11 patients) and the specificity was 100% (4 of 4 patients).*
Conclusion: *Red dot perimetry is a useful tool for detecting visual field defects in patients with pituitary tumours.*

Key words: *Perimetry, Pituitary neoplasms, Visual fields*

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Introduction

Visual field assessment is an essential component in the evaluation of all neuro-ophthalmic conditions and "should be performed on all patients regardless of their visual complaints".[1] This can be done by simple confrontation testing or using more sophisticated tools, for example the Humphrey visual field (HVF) analyser. HVF is a commonly used assessment because of its reproducibility for glaucoma patients. However, it is time-consuming, requiring approximately 20 minutes, and patients with neurological problems may have difficulty completing the test.

Red dot perimetry was first described in 1991.[2] The test is simple and quick, and has been found to be useful for the evaluation of visual fields in busy eye clinics.[3]

Methods

The case notes of all patients with pituitary tumour diagnosed from January 2002 to January 2006 at the Neuro-ophthalmic Service at the Singapore National Eye Centre, Singapore, were reviewed. Only patients who had both red dot perimetry and HVF performed before treatment was commenced were included in the study.

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The red dot perimetry chart employed was that described by Mutlukan and Cullen, consisting of 8 red disc targets arranged in a circle around a black dot.[2] The chart measured 19.0 x 29.5 cm, the red discs were 1.8 cm in diameter and were arranged around a black dot with a diameter of 0.5 cm in the middle of the chart; the distance between the red and black dots was 4.5 cm. The background was grey, creating a 75% contrast gradient (Figure 1). This was held 30 cm from, and parallel to, the patient's eyes in a well-illuminated room. The left eye was first occluded and the patient was asked to fixate on the central black dot with the right eye. The patient was then asked the following questions:

Figure 1. Red colour comparison perimetry.[2]

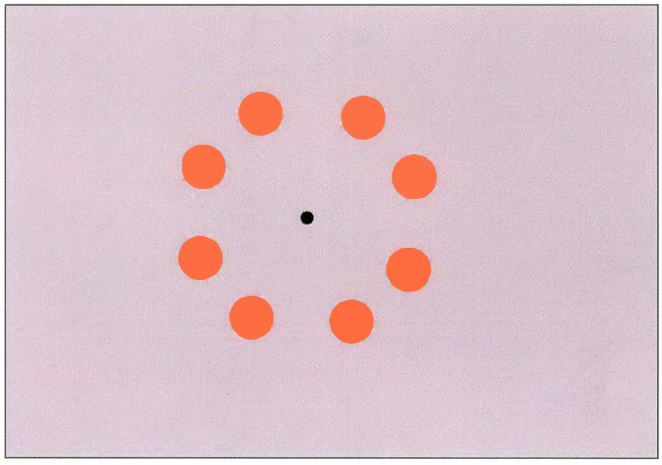

Figure 2. Template for recording a pictorial representation of the test.

- Are all the red dots present?
- If some are missing, which ones?
- Are bits of a red dot missing? Where?
- Do all the surrounding dots look equally red?
- If not, which look brighter or washed out?

This was repeated with the right eye occluded and the left eye fixating on the central black dot. The findings were recorded as a pictorial representation of what the patient could see (Figure 2 shows the template for recording the results).

An abnormal red dot perimetry result was noted when the patient reported partially or totally missing dots or when the dots had a reduction in colour saturation in either eye. The locations of the abnormal dots, for example, temporal, nasal, superior, or inferior, were noted. Each patient also underwent HVF assessment and the field defects of each eye were recorded.

Institutional Review Board/ethics committee approval was obtained.

Results

Sixty four patients were diagnosed with pituitary tumour by the Neuro-ophthalmic Service and their case notes were reviewed. Twenty seven patients underwent red dot perimetry assessment before commencement of treatment. Of the 27 patients, 2 had meningiomas with optic chiasmal type field defects and 1 was found to have an arachnoid cyst at operation; these patients were excluded. Of the remaining 24 patients, 15 underwent HVF assessment before treatment started and were enrolled in the trial; and 9 underwent Goldmann perimetry testing and were excluded.

Four patients (patients 1, 12, 13, and 15) had no visual field defect on HVF analysis and this was reflected by red dot perimetry assessment (Table 1). The other 11 patients had some form of temporal visual field defect on both HVF and the red dot perimetry assessment (Table 1). This translates to a sensitivity of 100% and a specificity of 100% (Table 2).

Three patients (patients 4, 5, and 9) had visual field defects on HVF that were not noted in the corresponding red dot perimetry of the same eye (Table 1). However, they were noted to have visual field defects in the fellow eye by both HVF and red dot perimetry.

Discussion

There are many forms of visual field testing available. These range from the simple confrontational visual fields to the more sophisticated HVF. Each type of perimetric testing has its own strengths and limitations.

The red dot perimetry test was introduced to provide a simple rapid visual field test to supplement confrontation testing when a neuro-ophthalmic problem is suspected. Red dot perimetry is particularly useful for testing bed-bound neurology patients in emergency rooms and hospital wards who may not be able to perform confrontation visual field testing. Johnson and Baloh noted that although confrontation visual field testing is good for detecting altitudinal defect, it gave poor results when used for the detection of bitemporal hemianopias.[4]

Controversy still exists regarding the use of colour perimetry, but it is well known that the use of red stimuli, in particular, can demonstrate visual field defects earlier than standard white-on-white perimetry. Bartolli and Liuzzi have shown that patients with pituitary adenomas have greater visual field defects when tested with red targets compared with white.[5] Thus, a red perimetric test was chosen for the study.

This study demonstrated that red dot perimetry may be useful for detecting visual field defects caused by pituitary tumours. There was good correspondence between HVF and red dot perimetry for detecting visual field defects in 27 of 30 eyes (90%). In the remaining 3 eyes of 3 patients, there was no correlation. However, the fellow eyes of these 3 patients had already shown change in visual fields. These temporal field defects should be taken as a warning sign of the underlying presence of a pituitary or a parapituitary lesion, prompting further investigations.

A limitation of this study was the small number of patients recruited. Although 64 patients were identified with pituitary adenoma, only 15 were eligible for the study. This was because red dot perimetry was not performed widely, and patients who only underwent Goldmann perimetry were excluded. A prospective study involving patients with other types of field defects would be useful for validating this perimetric test result.

In conclusion, this investigation shows that red dot perimetry is a simple, cheap, sensitive, and quick tool to elicit temporal and bitemporal visual field defects associated with pituitary adenomas.

Table 1. Visual acuity, colour vision, and visual field defects, recorded by red dot perimetry and Humphrey visual fields in 15 patients with pituitary tumours.

Patient number	Visual acuity		Colour vision		Red dot perimetry			Humphrey visual field		
	Right	Left	Right	Left	Right	Left	Visual field defect	Right	Left	Visual field defect
1	6/7.5	6/7.5	15/15	15/15	Nil	Nil	No	Nil	Nil	No
2	6/18	6/7.5	6/15	8/15	Temporal 4 dots	Temporal 4 dots	Yes	Temporal plus	Temporal	Yes
3	6/7.5	6/9	19/19	17/19	Temporal 4 dots	Temporal 4 dots	Yes	Temporal plus	Temporal	Yes
4	6/60	6/6	3/15	15/15	Temporal 4 dots	Nil	Yes	Temporal plus	Temporal plus	Yes
5	6/6	6/24	17/17	12/17	Nil	Temporal 4 dots	Yes	Superior temporal	Temporal	Yes
6	6/9	NPL	16/19	NPL	Temporal 4 dots	All 8 dots	Yes	Temporal plus	Not done	Yes
7	6/24	6/6	1/15	15/15	Temporal inferior 3 dots	Temporal 4 dots	Yes	Temporal plus	Temporal	Yes
8	6/9	6/7.5	16/17	15/17	Temporal inferior 2 dots	Temporal inferior 2 dots	Yes	Temporal	Inferior temporal	Yes
9	6/9	6/21	15/15	6/15	Nil	Temporal 4 dots	Yes	Superior arcuate	Temporal	Yes
10	6/15	6/120	15/15	8/15	Temporal 4 dots	Superior temporal 2 dots	Yes	Temporal	Temporal	Yes
11	6/7.5	6/21	15/15	9/15	Nil	Superior temporal 1 dot	Yes	Nil	Superior temporal	Yes
12	6/6	6/6	19/19	19/19	Nil	Nil	No	Nil	Nil	No
13	6/9	6/9	15/15	15/15	Nil	Nil	No	Nil	Nil	No
14	6/6	6/6	15/15	15/15	Temporal 4 dots	Temporal 4 dots	Yes	Temporal	Temporal	Yes
15	6/7.5	6/6	15/15	15/15	Nil	Nil	No	Nil	Nil	No

Abbreviations: NPL = no light perception; temporal plus = temporal field defect that crosses the midline.

Table 2. Summary of visual field defects by red dot perimetry or Humphrey visual fields (HVF) of 15 patients with pituitary tumours.

	Visual field defects on HVF	No visual field defects on HVF	Total
Visual field defects on red dot perimetry	11	0	11
No visual field defects on red dot perimetry	0	4	4
Total	11	4	15

The presence of visual field defects on red dot perimetry should prompt further investigations.

Acknowledgements

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Outcomes for Patients with Retinitis Sclopetaria following Blunt Ocular Trauma

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Aim: To investigate the outcomes of patients with retinitis sclopetaria following blunt ocular trauma.
Methods: Patients with retinal breaks associated with retinitis sclopetaria between February 2003 and January 2005 were traced from the surgeon's records. Demographic data, visual acuity at presentation, posterior segment findings, and presence of retinal detachment and associated posterior vitreous detachment were recorded. The treatment methods were analysed. All the examinations were done by 1 author, who also treated the patients.
Results: Six eyes of 6 patients were diagnosed with retinal breaks associated with retinitis sclopetaria. All patients were men. Two patients with retinal breaks associated with retinitis sclopetaria developed retinal detachment associated with posterior vitreous detachment; these patients were treated surgically. The retinas of 4 patients without posterior vitreous detachment remained flat.
Conclusion: Patients with retinal breaks associated with retinitis sclopetaria, in the presence of posterior vitreous detachment, may develop early retinal detachment.

Key words: Chorioretinitis, Retina, Surgical procedures, operative, Wounds and injuries

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Introduction

Blunt ocular trauma is defined as an application of force to the eye without penetration of the globe, but with resultant damage to the sclera, iris, ciliary body, choroid, vitreous, retina, and optic nerve.[1] Blunt ocular trauma may result in a variety of posterior segment injuries,[1,2] including vitreous haemorrhage, retinal breaks with or without retinal detachment, retinal dialysis, macular hole, choroidal rupture, chorioretinal scarring, commotio retinae, and optic neuropathy.[1-5] A rare manifestation is retinitis sclopetaria, a condition where there is a haemorrhagic retinal necrosis and atrophy with full thickness chorioretinal break (Figure 1). Retinitis sclopetaria is associated with a low risk of retinal detachment, due to chorioretinal scarring, and adhesion between the retina and underlying tissues, especially at the margin of the retinal atrophy.[4] As the risk is low, most authors recommend no treatment for this condition.[3,5] However, as retinal detachment can occur, a study was performed to investigate the outcomes of patients with retinitis sclopetaria following blunt ocular trauma.

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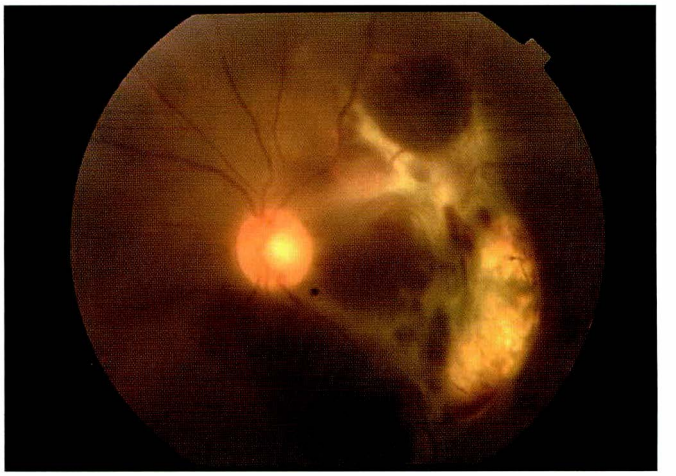
Figure 1. Fundus photograph of the eye of patient 1 showing multiple levels of haemorrhage with a full thickness chorioretinal tear.



Methods

Patients with retinitis sclopetaria following blunt ocular trauma treated between February 2003 and January 2005 were traced from the surgeon's records. Demographic data, visual acuity at presentation, posterior segment findings, and presence of retinal detachment and associated posterior vitreous detachment were recorded. The presence of retinal detachment and posterior

Table 1. Characteristics of and outcomes for patients with retinitis sclopetaria.

Patient number	Age (years)	Involved eye	Time to presentation (days)	Visual acuity		Retinal detachment	Posterior vitreous detachment
				Initial	Final		
1	25	Left	21	CF	CF	No	No
2	37	Left	12	CF	6/36	No	No
3	20	Right	5	6/36	6/24	Yes	Yes
4	11	Left	7	6/18	6/6	No	No
5	18	Left	60	2/60	CF*	Yes	Yes
6	22	Left	35	6/24	6/24	No	No

Abbreviation: CF = counting fingers at 1 ft.
* Counting fingers at 2 ft with +10.
† Grade C, anterior 3.

vitreous detachment was assessed by ultrasound and/or clinical examination, by observing the presence of Weiss Ring.

One author was responsible for the initial assessment and treatment. Since all the patients were referred from other hospitals, follow-up occurred at the referring hospitals upon completion of treatment. The treatment and outcomes were analysed after obtaining the patients' medical records from the referring hospitals. Date of the last follow-up, visual acuity and ocular findings, and retinal status were recorded.

Results

Six eyes of 6 patients with retinitis sclopetaria were referred to Selayang Hospital from February 2003 to January 2005. All patients with retinitis sclopetaria had associated retinal breaks of various sizes within the lesion. All patients were referred for further management of retinal tear or retinal dialysis with or without retinal detachment, except for 1 patient who was also referred for treatment of a macula hole.

All patients were men, with a mean age of 22 years (Table 1). In all patients except for patient 3, the injury involved the left eye. At presentation, 4 patients (patients 1, 2, 4, and 6) had flat retina with absence of posterior vitreous detachment. Patients 1 and 6 were treated conservatively. Patient 2 underwent vitrectomy for macula hole repair. Patient 4 was treated with cryotherapy as further follow-up was not possible due to the patient living in a remote area. Patients 3 and 5 had detached retinas and underwent surgery.

The presenting vision ranged from counting fingers at 1 ft to 6/18. After an average follow up of 13.5 months, the final visual acuity was 6/36 or better for 4 eyes. The final visual acuity was poor for patients 1 and 5 due to macula scar. Patient 6 had a peripapillary choroidal scar involving the macula; the final vision was 6/24. Patients 2, 3, 4, and 5 defaulted follow-up after several months. However, the retinas remained attached at the last follow-up for all patients.

Patient 3

Patient 3 was referred 5 days after the initial injury. Ocular examination revealed retinal detachment and posterior vitreous detachment. Cryotherapy, vitrectomy, and gas tamponade were performed. Intraoperatively, retinitis sclopetaria was present at 11 to 2 o'clock (anteriorly) with a retinal break within the lesion. This location corresponded to the extent of the retinal detachment.

Patient 5

Patient 5 presented with retinal detachment 60 days after the initial injury. Lensectomy, cryotherapy, vitrectomy, endolaser, and silicone oil tamponade were performed. Intraoperatively, there was retinal dialysis from 9 to 3 o'clock. There was also a large retinal break from 3 to 6 o'clock (within the area of retinitis sclopetaria). No other breaks were found. In this patient, the retinal detachment probably developed earlier due to the proliferative vitreoretinopathy changes with anterior circumferential contraction of the vitreous base (grade C, anterior 3).

Discussion

Retinitis sclopetaria was first described by Goldzieher in 1901.[6] Classification of this rare entity varies; some authors classify it as a form of blunt ocular trauma, while others classify it specifically as a result of missile injury.[1,2,5] The clinicopathological features of retinitis sclopetaria include direct traumatic chorioretinal rupture followed

Location of retinitis sclopetaria	Associated findings	Surgery	Follow-up (months)	Status at last follow-up
Posterior pole; temporal	Vitreous haemorrhage and secondary glaucoma	None	36	Retina attached Macula scar
1-3 o'clock; anterior	Stage III macula hole	Surgery for macula hole	7	Retina attached Mild posterior subcapsular cataract
11-2 o'clock; anterior	Retinal detachment at 11-2 o'clock Macula attached	Cryotherapy, vitrectomy, and gas tamponade	5	Retina attached
11-12 o'clock; involving vitreous base	Macula oedema	Cryotherapy	6	Retina attached
3-6 o'clock; anterior, with large retinal break within retinitis sclopetaria	Subluxated lens Vitreous haemorrhage Retinal dialysis 9-3 o'clock Macula attached Proliferative vitreoretinopathy†	Lensectomy, cryotherapy, vitrectomy, endolaser and silicone oil tamponade	3	Retina attached
11-1 o'clock; with corresponding vitreous base avulsion	Multiple choroidal rupture around the optic disc and temporal half of the macula	None	24	Retina attached

by marked fibrovascular proliferation with variable replacement of the choroid and retina with no retinal detachment.[4] The lesion is often obscured initially by intraretinal, subretinal, or vitreous haemorrhages. Bare sclera may be seen through the disrupted retina and choroid. Later, there is retinal pigment epithelium (RPE) and glial-cell proliferation leading to the formation of a fibrous membrane.[7] The occurrence of retinal detachment is rare due to the strong adhesion between the retina and the underlying tissue at the margin of the retinitis sclopetaria.

There are limited published case series in the literature.[3,5] Martin et al reported a series of 8 eyes of 7 patients with retinitis sclopetaria.[5] At presentation, no patients had retinal detachment and the posterior hyaloid was attached in 6 eyes. In the remaining 2 eyes, the status of posterior vitreous was not specified. However, the retina of all eyes remained attached for at least 6 months after the initial injury. Two patients in this series had retinal detachment after 1 year due to retinal breaks distant from the initial site of retinitis sclopetaria. Due to the low risk for retinal detachment associated with retinitis sclopetaria, most authors recommended non-surgical treatment for this condition.

In this case series, 2 patients presented with retinal detachment, both of which were associated with posterior vitreous detachment. It is postulated that the presence of posterior vitreous detachment facilitated recruitment of subretinal fluid through the retinal break, causing retinal detachment. A solid undetached vitreous body, in particular in young patients, may serve as effective internal tamponade prior to development of significant chorioretinal adhesion. It is likely that significant chorioretinal adhesion at the edge of the retinitis sclopetaria only developed 2 to 3 weeks after the injury.[1,3]

In conclusion, retinitis sclopetaria associated with posterior vitreous detachment may cause early retinal detachment. Prophylactic retinopexy is recommended for retinal breaks associated with retinitis sclopetaria in the presence of posterior vitreous detachment. Close monitoring is essential to exclude retinal detachment if the treatment decision is for conservative management.

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Phthirus pubis Infestation of the Eyelashes of a Child

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Phthirus pubis *is a pubic louse that can infest the eyelashes. This report is of a 9-year-old girl with* Phthirus pubis *infestation of the eyelashes.*

Key words: *Ectoparasitic infestations, Lice infestations,* Phthirus pubis

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Introduction

Phthirus pubis is a pubic louse that can infest the eyelashes. *Phthirus pubis* is usually spread through intimate human contact. This report is of a 9-year-old girl with *Phthirus pubis* infestation of the eyelashes.

Case Report

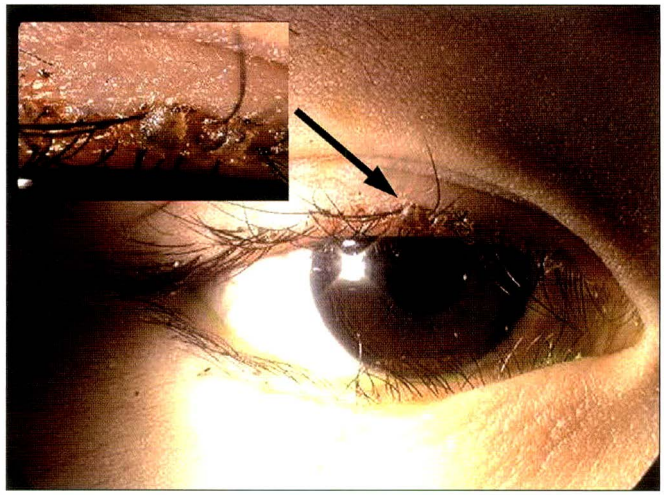
A 9-year-old girl presented to the Department of Ophthalmology, Caritas Medical Centre, Hong Kong, in 2002 with redness of the right eye for 4 days. At slit-lamp examination, 10 crab-like moving creatures with a characteristic shield shape and blood-engorged bodies were seen on the right upper eyelid (Figure 1). The girl was found to have *Phthirus pubis* infestation of the eyelashes, and the diagnosis was confirmed by a microbiologist. She made a complete recovery from the infestation after meticulous removal of the lice and nits with the application of permethrine 5% solution.

There was no other site of involvement of the lice. The child's social history and physical examination revealed no evidence of sexual abuse. The patient was followed up for 9 months at the Department of Ophthalmology, and no recurrence of the infestation was found.

Discussion

Phthirus pubis (pubic louse) is an ectoparasite of the *Pediculidae* family.[1] Three types of human lice can be involved in infestation of the eyelashes — *Pediculus humanus corporis*, *Pediculus humanus capitis*, and *Phthirus pubis*. *Phthirus pubis* (crab louse) is distinctly smaller (≤2 mm) than *Pediculus humanus corporis* or *Pediculus humanus capitis*. *Phthirus pubis* is the most common infestation in the eyelashes.[1] This might be due to the fact that the average space between adjacent eyelashes corresponds to the grasping span of *Phthirus pubis* (Figure 2), enabling the lice to firmly attach their 4 hindlegs.[3] *Phthirus pubis* infestation was once believed to be exclusive to Caucasian people,[4] but this is now known not to be the case.

Figure 1. Right eye of a young girl with *Phthirus pubis*.



Orkin suggested that *Phthirus pubis* is spread through intimate human contact.[3] However, the family members of this child did not have signs or symptoms of infestation, and there was no evidence that the child had been sexually abused. It may be that the spread of this organism is not via human-human contact. Alexander found that, during World War 2, a patient with such an infestation had shared his bed with his younger brother who was a serviceman on leave.[5] A similar route of transmission may have occurred for this patient. Therefore, suggestion that a patient with an infestation of *Phthirus pubis* of the eyelashes has a sexually transmitted disease might not be correct. However, physical examination and investigation for a sexually transmitted disease remains necessary. Extra care should be taken when treating paediatric patients, as issues other than medical care may be involved. It has been shown

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Figure 2. ***Phthirus pubis*** **grasps an eyelash.**

that 31.4% of patients who have *Phthirus pubis* infestation also have at least one other sexually transmitted disease.[6]

Treatment of *Phthirus pubis* involves mechanical removal of the lice and nits, and possible removal of the eyelashes, as well as medication to kill the ectoparasites.[7] Permethrine applied to the affected area interferes with sodium transport and causes depolarisation of the neuromembrane. This results in respiratory paralysis of the organism. Other options include pilocarpine gel and malathion; these are cholinergic agents that kill the organism by inducing respiratory paralysis. These drugs may irritate the skin, causing rash and numbness, and may also cause corneal epithelial damage. Thus, meticulous application around the eye is necessary. Another option is petroleum jelly, which is an occlusive agent that asphyxiates the organism. All hair-bearing parts of the body should be examined and treated accordingly. Family members or suspected sources of infestation should be screened and treated. Clothing and linens should be sterilised, and advice about proper hygiene is important.

This report of a patient with *Phthirus pubis* is intended to alert ophthalmologists to this rare condition. Meticulous slit-lamp examination is required for making the diagnosis. Most importantly, the diagnosis of *Phthirus pubis* has implications for patients as it is regarded as a sexually transmitted disease, although other routes of transmission are possible. Systemic evaluation, contact tracing, and education of patients and their family members are mandatory.

Acknowledgement

We would like to thank Dr MS Tsui, of the Department of Pathology, Caritas Medical Centre, Hong Kong, for his assistance.

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Massive Subretinal Haemorrhage 9 Months after Stabilisation of Choroidal Neovascularisation with Photodynamic Therapy

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Massive subretinal haemorrhage is an uncommon complication of age-related macular degeneration, although it has been previously reported in association with choroidal neovascularisation and disciform scar. There have not been any reported cases of this complication after the choroidal neovascularisation has been stabilised with photodynamic therapy. This report is of a patient who had a massive subretinal haemorrhage after stabilisation of choroidal neovascularisation with photodynamic therapy.

Key words: *Choroidal neovascularisation, Photochemotherapy, Retinal hemorrhage*

Asian J Ophthalmol. 2008;10:24-6

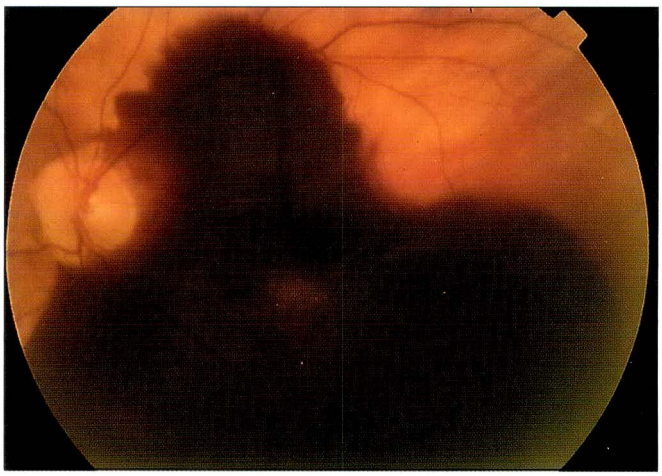
Introduction

Massive subretinal haemorrhage is an uncommon complication of age-related macular degeneration (AMD), although it has been previously reported in association with choroidal neovascularisation (CNV) and disciform scar.[1,2] Large submacular haemorrhage has also been reported shortly after photodynamic therapy (PDT).[3] However, there have not been any reported cases of this complication occurring in patients with CNV stabilised with PDT. This report is of a patient who had a massive subretinal haemorrhage after stabilisation of choroidal neovascularisation with photodynamic therapy.

Case Report

A 65-year-old woman presented to the macular clinic at the Wolverhampton and Midland Counties Eye Infirmary, Wolverhampton, UK, in 2006 with sudden loss of vision in her left eye after a sneezing attack. Her visual acuity was reduced to counting fingers close to the face. Ocular examination revealed a massive subretinal haemorrhage involving the macular area, extending from the superior arcade to the inferior equator area (Figure 1). The patient was not taking anticoagulant therapy and her coagulation profile was normal. She underwent submacular surgery with autologous retinal pigment epithelium patch graft. Examination after 1 year showed a flat vascularised healthy patch graft and visual acuity of 6/18 (Figure 2).

Figure 1. Massive subretinal haemorrhage 9 months after the choroidal neovascularisation had been stabilised with photodynamic therapy.



Almost 2 years previously, she had been diagnosed with a subfoveal classic/no occult choroidal neovascular membrane secondary to AMD in the left eye (Figure 3). She had received 3 sessions of PDT over 1 year, which stabilised the CNV with no worsening of leakage from the lesion (Figures 4a and 4b). Although the CNV was still present, it did not progress during the next 9 months and her visual acuity was 6/12, indicating clinical stability.

Discussion

Massive subretinal haemorrhage may complicate AMD.[1,2] Various risk factors have been described, including use of anticoagulants

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Figure 2. Fundus photograph after 1 year showing a flat healthy autologous retinal pigment epithelium patch graft.

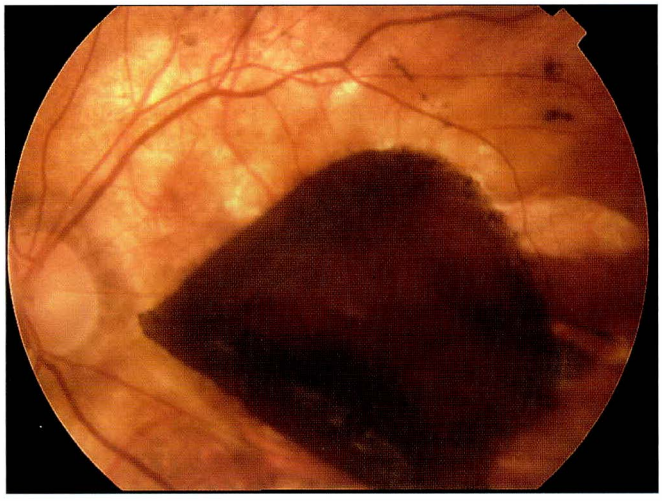
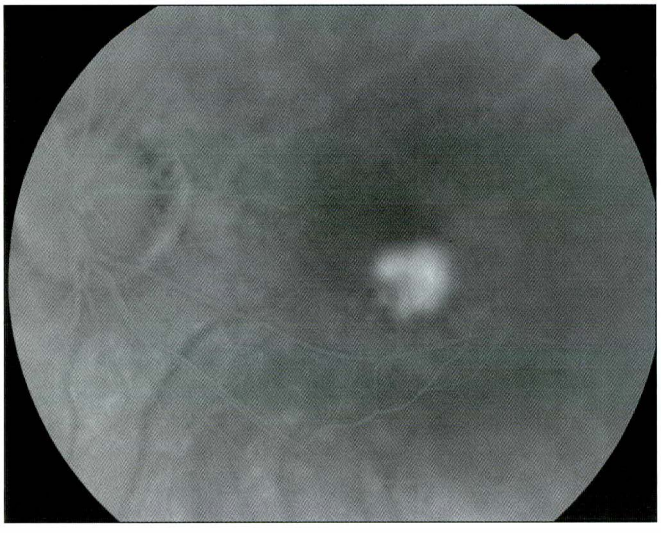


Figure 3. Late-phase fundus fluorescein angiography of the subfoveal choroidal neovascular membrane before photodynamic therapy.

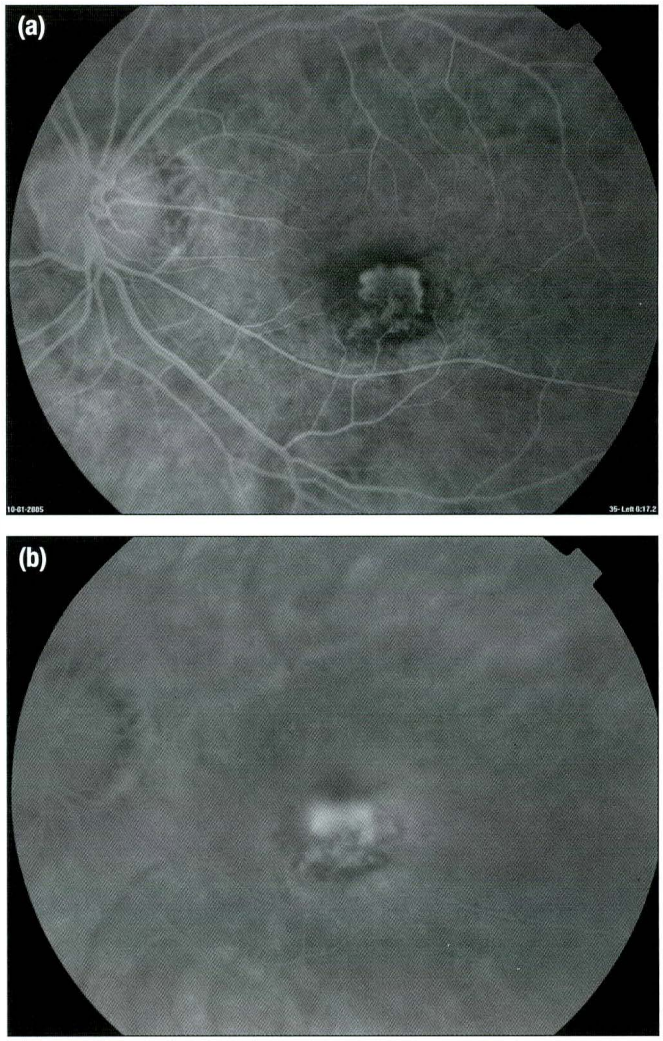


such as warfarin and aspirin and systemic hypertension.[1,4] In a series of 15 patients with massive haemorrhage complicating AMD, El Baba et al reported that 19% of patients had been taking anticoagulants and 40% had systemic hypertension or cardiovascular disease.[1] There has also been 1 report of massive subretinal haemorrhage complicating AMD in a patient with idiopathic thrombocytopenic purpura.[2]

El Baba et al also studied the clinicopathologic correlation of subretinal haemorrhage in AMD and found that the haemorrhage originated from rupture of the large choroidal vessels that extend into the disciform scar.[1] The haemorrhage may extend through all the layers of the retina, and even into the vitreous.

Chaudhry et al recently reported 3 patients with large submacular haemorrhage shortly after PDT treatment.[3] All 3 patients were taking warfarin as long-term anticoagulative therapy.

Figure 4. Fundus fluorescein angiography of the subfoveal choroidal neovascular membrane after photodynamic therapy showing no worsening of leakage. (a) Early phase; and (b) late phase.



All 3 haemorrhages were documented within 2 weeks of the procedure.

The patient described in this report was not taking any anticoagulant therapy and her coagulation profile was normal. Also, her presentation was different from that described in the above-mentioned reports, as the CNV had been stable for 9 months after PDT. This is the first reported case of massive subretinal haemorrhage after stabilisation of CNV with PDT. Ultrasound biomicroscopy had shown stable vision for the 9 months since the last PDT treatment, and the patient reported stable vision. The patient reported sudden loss of vision after a sneezing attack. The Valsalva manoeuvre is a recognised cause of preretinal subinternal limiting membrane haemorrhage due to rupture of the superficial retinal capillaries, but the condition usually has a good prognosis.[5] Action similar to the Valsalva manoeuvre may have also contributed to the massive haemorrhage in this patient.

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Horner's Syndrome Secondary to Chest Tube Insertion for Pneumothorax

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A 24-year-old man presented to the Emergency Department, Soroka University Medical Center, Beer-Sheva, Israel, with dyspnoea and left-sided chest pain. Examination of the chest showed signs of left pneumothorax and chest radiography confirmed the diagnosis. The patient was treated with thoracostomy on the left side. On the third postoperative day, a slight left upper lid ptosis was noticed. Two days later, the chest tube was removed but ptosis did not resolve. Horner's syndrome occurring in patients who have undergone chest tube insertion is a rare complication. Ophthalmologists and cardiothoracic surgeons need to be aware of this condition.

Key words: *Drainage, Horner syndrome, Pneumothorax*

Asian J Ophthalmol. 2008;10:27-9

Introduction

Horner's syndrome consists of ipsilateral pupillary miosis, eyelid ptosis, endophthalmos, and facial anhidrosis. This syndrome is a well-recognised complication of many disorders and procedures that interrupt the neuronal pathways from the hypothalamus to the eye.[1] The second neurone of the oculosympathetic pathway can be injured as a complication of some thoracic surgical procedures for trauma.[2] Only a few cases of Horner's syndrome occurring as a complication of chest tube insertion for the treatment of pneumothorax (traumatic, spontaneous, and iatrogenic) have been reported.[1-4] This report presents a rare case of Horner's syndrome occurring in a young man as a complication of chest tube insertion for the management of spontaneous pneumothorax.

Case Report

A 24-year-old man presented to the Emergency Department, Soroka University Medical Center, Beer-Sheva, Israel, in 2006 with cyanosis, dyspnoea, and left-sided chest pain for 1 day. Three days previously, he had started treatment with penicillin VK 500 mg twice daily for pharyngitis and cough. The patient had no other complaints. There was no history of trauma or previous cervical-thoracic surgery. His vital signs were in the normal range, with a heart rate of 84 bpm, blood pressure of 134/76 mm Hg, breathing rate of 16 respirations per minute, and blood oxygen saturation of 99%. Clinical examination revealed decreased breath sounds in the left side of chest. Chest radiography confirmed the presence of left pneumothorax. Thoracostomy with a 28-French chest tube was performed via a standard approach and the patient was admitted to the cardiothoracic surgery department. Post-thoracostomy chest radiography showed the tip of the chest drain pointing upward and overlapping the posterior part of the space between the left third and forth ribs (Figure 1).

Figure 1. Post-thoracostomy chest radiograph showing the tip of the chest drain pointing upwards and overlapping the posterior part of the space between the left third and fourth ribs.

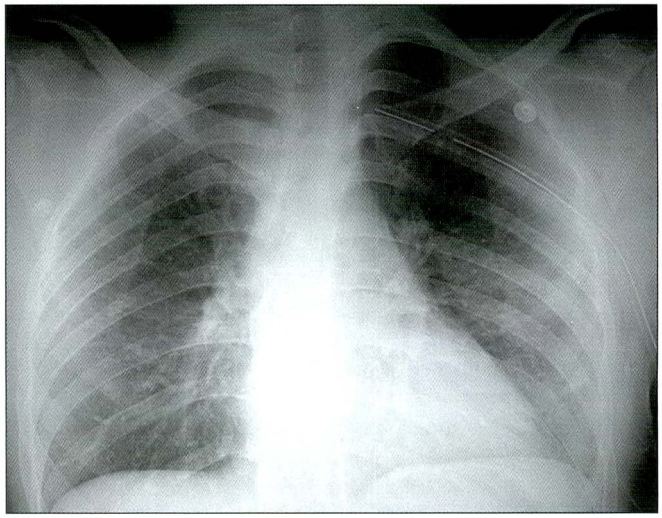

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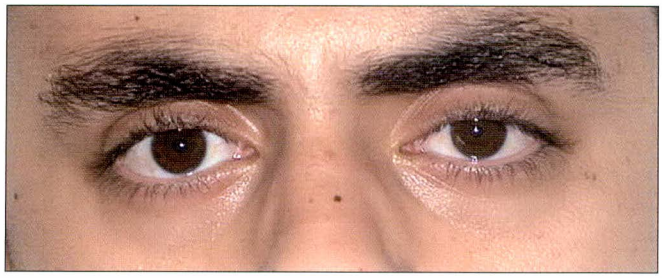
Figure 2. Slight left eye ptosis after 3 months.



In the morning of the third postoperative day, the patient noticed a slight left upper lid ptosis. Ophthalmic examination was unremarkable. The chest drain was removed on day 5 with complete resolution of the pneumothorax. The patient was discharged on day 6 with a recommendation for ophthalmological follow-up. Two weeks after discharge, ophthalmic examination revealed left upper eyelid ptosis of 2.0 mm and anisocoria (the right pupil was 3.5 mm and the left pupil was 2.0 mm in diameter), without anhydrosis or enophthalmos on the left side. Ocular movements were normal and the intraocular pressures were 13 mm Hg in the right eye and 14 mm Hg in the left eye. The posterior segment was unremarkable in both eyes. Examination of the upper limb and cranial nerves were normal. Instillation of freshly prepared cocaine 4% confirmed left Horner's syndrome (the right pupil dilated to 5 mm and the left pupil dilated to 3 mm). At 3 months' follow-up, slight left eye ptosis persisted, but the anisocoria had resolved (Figure 2).

Discussion

Horner's syndrome or oculosympathetic paresis consists of miosis, ptosis, enophthalmos, anhidrosis, and vascular dilatation ipsilateral to the lesion. This oculosympathetic palsy is caused by injury to the sympathetic pathway. The sympathetic pathway is a 3-neurone pathway in its course from the posterior-lateral nuclei of the hypothalamus through the spinal cord to the eye. Horner's syndrome can be caused by several conditions. Neoplasia is the most common cause, representing 35% to 60% of cases.[3] Trauma, including birth injuries, represents 4% to 13% of cases and iatrogenic injuries are responsible for another 10.0% to 18.5%. Between the 3 levels of the sympathetic pathway, second-order neurone injury is involved in 84% of iatrogenic lesions.[1-3]

Horner's syndrome has been reported in up to 1.3% of thoracic surgical procedures.[2] Only a few patients with Horner's syndrome associated with tube thoracostomy for the management of spontaneous pneumothorax have been reported. The duration to onset of Horner's syndrome after tube thoracostomy varies considerably from 12 hours to 12 days after the removal of the thoracostomy tube.[1,2,4] This finding can be explained by the anatomical features of the upper chest cage. The first thoracic (or stellate) ganglion lies close to the parietal pleura of the lung apex, and only a thin layer of connective tissue, the endothoracic fascia, separates these 2 structures. Therefore, the tip of the chest tube inserted high into the apex of the pleura can place direct pressure on the stellate ganglion, leading to local ischaemia and neuropraxia of the second neuronal pathway. Several hypothetical processes have been described to clarify the mechanism of tube thoracostomy injury leading to Horner's syndrome. Most investigators suggest that neuropraxia of the second neuronal pathway is multifactorial and includes factors such as direct pressure of the chest tube, inflammation, scarification, local haematoma, and stretching of the nerve fibres from the underlying pneumothorax.[4]

The natural course of this complication is not predictable. When direct chest tube pressure on the sympathetic chain or upward migration of the tube are recognised, repositioning of the tube within 1 day facilitates full recovery of Horner's signs in up to 66% of patients.[5] Although no association between the time of onset and reversibility has been reported, Kaya et al reported full recovery after chest tube repositioning for 4 patients when the diagnosis of Horner's syndrome was made during the first 2 days after the chest tube insertion.[2] However, up to 57% of patients showed no signs of reversibility after a follow-up period ranging from 3 months to 1 year, despite removal of the chest drain.[2] In a series of 9 patients with Horner's syndrome caused by tube thoracostomy in patients with traumatic pneumothorax or in patients who underwent thoracic surgery and were treated with insertion of an intercostal chest tube, 33% had full resolution, 33% had incomplete resolution, and 33% had no change in the initial symptoms after 5 years.[6]

For this patient, it was assumed that the second-order preganglionic neurone was injured by the chest drain. Although immediate post-thoracostomy chest radiograph did not show direct pressure of the tip of the chest tube on the sympathetic chain in the medial portion of apex and the tip of the chest drain was inferior to the posterior second rib, upward migration of the tube could not be ruled out or the injury may have occurred during the chest tube insertion.

Despite the incompletely understood mechanisms of Horner's syndrome as a complication of thoracostomy, prompt recognition of this entity and immediate repositioning of the chest drain can prevent irreversible iatrogenic Horner's syndrome. These authors recommend tight fixation of the chest drain and a daily check for pupil size and the presence of ptosis in patients undergoing chest tube insertion to reduce Horner's syndrome being misdiagnosed.

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RetCam — a Useful Adjunctive Tool to Evaluate and Manage Paediatric Glaucomas

Dear Editor,

Paediatric glaucoma is a challenging disorder to manage. The difficulty often lies in the evaluation of a child, for whom cooperation may be compromised. Although examination under anaesthesia may be an obvious solution, documentation of the angle and disc status is cumbersome and often subjective. In addition, changes in intraocular pressure considerably change disc morphology. Digital documentation of the angle and disc is possible using the RetCam. This procedure may be useful for more accurate assessment and follow-up of the clinical status of paediatric patients at risk for or with glaucoma.

The RetCam is a wide-field digital imaging system mainly used for the diagnosis and management of paediatric posterior segment diseases such as retinoblastoma and retinopathy of prematurity. The 30° lens is used for high-magnification images, mainly of the disc. The 120° and130° wide-field lenses are also useful for obtaining high-resolution anterior segment imaging, especially of the iris and anterior chamber angle (Figure 1).[1] Optic disc images (Figure 2) can be captured and the images used for documentation and to monitor progression. Imaging can be compromised if corneal haze is present. However, this can be overcome after initial successful surgery.

RetCam imaging is adjunctive to standard protocols for measuring the corneal diameter, intraocular pressure, axial length, and refractive

Figure 1. Anterior chamber angle photograph, taken with the RetCam, showing (a) anterior iris insertion; and (b) dense iris strands.

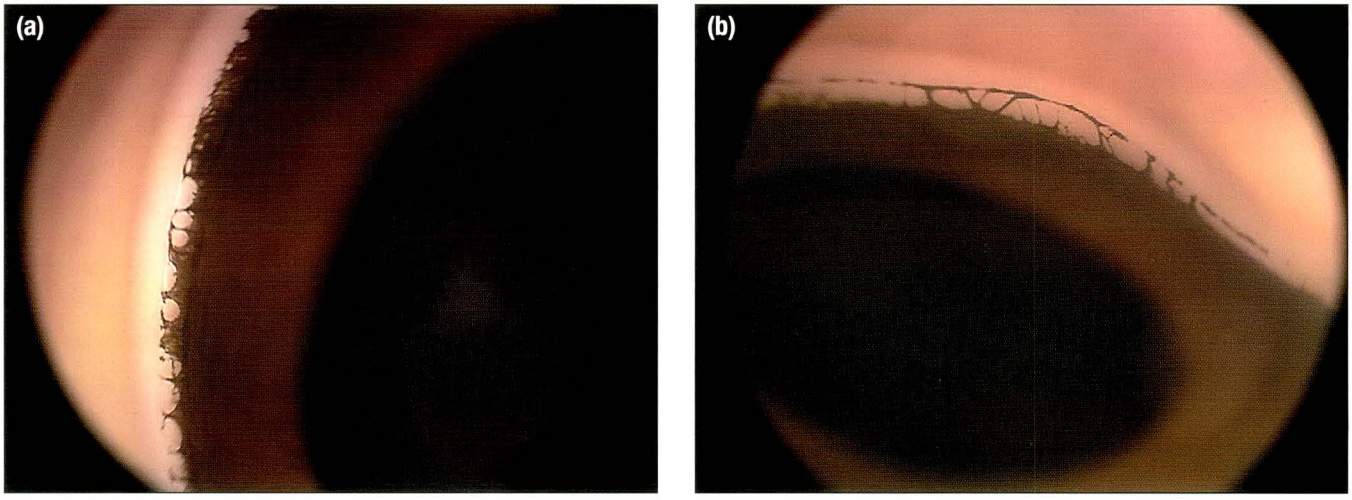
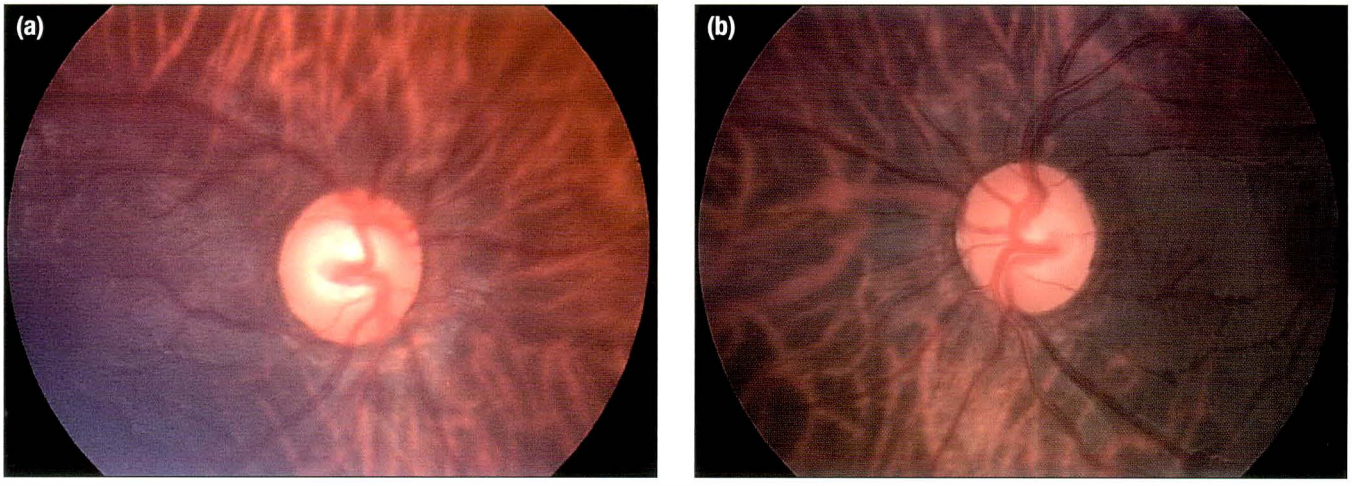


Figure 2. RetCam II disc photographs of a child with asymmetric cupping in both eyes. (a) Right eye; and (b) left eye.



error. Erraguntla et al have used RetCam 120 for optic nerve assessment in paediatric glaucoma; these authors observed that it is a useful tool for documenting disc damage, but may not be a reliable indicator of cupping change, as there is high inter-observer variation.[2] The technical parameters of illumination, contrast, magnification, and pixelation should be made constant for each examination to provide consistently good-quality and comparable images.

RetCam is a useful tool for obtaining gonioscopic and optic disc pictures, which can otherwise be technically demanding and often not of the desired quality. RetCam could serve as a useful adjunctive tool for management and follow-up of paediatric patients with glaucoma.

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The 5th Congress of the South East Asia Glaucoma Interest Group (SEAGIG 2008) and the 6th Meeting of the Asian Angle-Closure Glaucoma Club (AACGC) will take place in Seoul, Korea, from 25-27 September 2008. SEAGIG was established to facilitate contact between glaucoma specialists in the region, to encourage collaborative research and service projects, to increase the opportunities for exchange of skills and knowledge in this rapidly advancing field, and to assist comprehensive ophthalmological colleagues and other eye care workers (whether medically trained or not) to keep up to date with advances in all aspects of glaucoma diagnosis and management. The aim of the AACGC is to establish a scientific network for Asian glaucomatologists who are interested in exchange of knowledge about angle closure glaucoma.

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Asian Journal of OPHTHALMOLOGY

SUPPLEMENT 1

Volume 10 Number 1 February 2008

Inaugural Asia Cornea Society Scientific Meeting
Shangri-La's Rasa Sentosa, Singapore, 13-14 March 2008

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ABSTRACT BOOK

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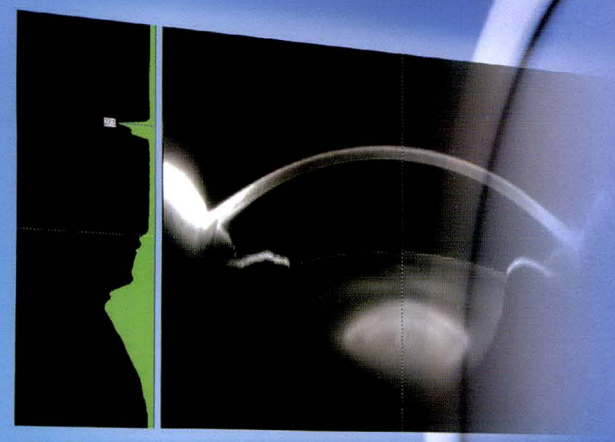

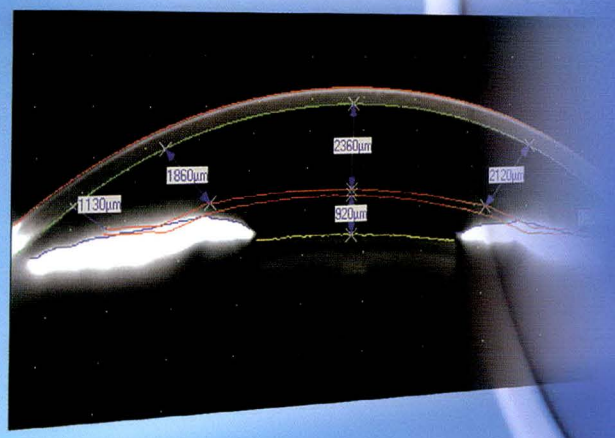

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ABSTRACT BOOK

Table of Contents

TIPS ON USAGE

The Abstract Book is divided into 4 sections. Each section is labelled by a prefix (letter) and a number series. Each Abstract is identified by a unique Abstract Number (numbers are not repeated).

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(1) Named Lectures	NL1-NL2
(2) Plenary Lectures	P1-P4
(3) Symposia	S1.1-S7.10
(4) Posters	B1-B89

(Example: Abstract NL1 denotes the abstract of Named Lecture Paper, No. 1)

Welcome

Recent global estimates from the World Health Organization suggest that cornea and ocular surface diseases account for more than 12 million of the 45 million people blind today, constituting the second commonest cause of world blindness. At a time of great advances in our field, it is timely that corneal surgeons in Asia have grouped together to initiate the Asian Cornea Society (ACS), a professional society dedicated to networking and promoting education and research in the fields of cornea and the ocular surface, corneal transplantation and keratoprosthesis surgery, eye banking, corneal refractive surgery, and contact lenses. The ACS has evolved from the Asia-Pacific Society of Cornea and Refractive Surgery (APSCRS), and the current ACS Council now comprises 13 leading academics and clinicians in the specialty from throughout Asia. Affiliations with the USA Cornea Society and many of the national corneal societies within Asia have also been established.

The primary goal of the ACS is to foster the exchange of knowledge and information on clinical, educational, and research aspects in corneal and related fields. The organisation of a dedicated biennial meeting for the corneal subspecialty in Asia, to be held in different Asian countries every 2 years, provides an ideal platform for interaction of corneal specialists, ophthalmologists, vision scientists, and eye care practitioners. In addition, the ACS will host other satellite meetings or symposia in conjunction with ophthalmic meetings in the region.

The Inaugural Scientific Meeting of the Asia Cornea Society is held in Singapore on 13th and 14th of March 2008. The theme of the meeting, *At the Forefront of the Eye!* reflects pivotal developments in our field that are transforming how we diagnose and treat anterior segment diseases today. Scientific symposia featuring invited key speakers from many countries cover the topics of keratoplasty, eye banking, ocular surface disease, corneal infections, keratoprosthesis surgery, corneal refractive surgery, and medical contact lenses, in addition to 4 plenary lectures and 2 special lectures — the *Singapore Eye Foundation Lecture* and the *Asia Cornea Foundation Lecture*. In addition, more than 80 scientific posters have been selected for presentation at the meeting. This special supplementary issue of Asian Journal of Ophthalmology provides scientific abstracts covering the special lectures, scientific symposia, and posters, and heralds the onset of a new era in the development of the corneal subspecialty in Asia.

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President, Asia Cornea Society
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Day 1 – 13 March 2008, Thursday

Time	Sessions
8.00 am – 8.30 am	**Plenary Lecture 1** Corneal Transplantation
8.30 am – 9.00 am	**Opening Ceremony**
9.00 am – 9.30 am	**Asia Cornea Foundation Lecture**
9.30 am – 10.30 am	**Symposium 1** Eye Banking
10.30 am – 11.00 am	**Tea Break/Poster Session**
11.00 am – 12.00 noon	**Symposium 2** Penetrating Keratoplasty/Anterior Lamellar Keratoplasty
12.00 noon – 1.30 pm	**Allergan Lunch Symposium**
1.30 pm – 2.00 pm	**Plenary Lecture 2** Endothelial Keratoplasty
2.00 pm – 3.00 pm	**Symposium 3** Endothelial Keratoplasty
3.00 pm – 3.30 pm	**Tea Break/Poster Session**
3.30 pm – 4.30 pm	**Symposium 4** Femtosecond Laser Surgery
7.30 pm – 9.00 pm	**Beach Party**

Day 2 – 14 March 2008, Friday

Time	Sessions
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8.30 am – 9.30 am	**Symposium 5 (I)** Ocular Surface Disease/Keratoprosthesis
9.30 am – 10.00 am	**Tea Break/Poster Session**
10.00 am – 10.50 am	**Symposium 5 (II)** Ocular Surface Disease/Keratoprosthesis
10.50 am – 12 noon	**Symposium 6** Refractive Surgery
12.00 pm – 1.30 pm	**AMO Lunch Symposium**
1.30 pm – 2.00 pm	**Singapore Eye Foundation Lecture**
2.00 pm – 2.30 pm	**Plenary Lecture 4** Infection
2.30 pm – 3.30 pm	**Symposium 7 (I)** Corneal Infection
3.30 pm – 4.00 pm	**Tea Break/Poster Session**
4.00 pm – 5.00 pm	**Symposium 7 (II)** Corneal Infection
5.00 pm – 5.30 pm	**Closing Remarks**

Clinical Investigators Needed for Innovative Presbyopic Procedure

Growing consumer demand in the Asia-Pacific region has created a near future opportunity to expand the number of investigators participating in the **AcuFocus ACI 7000™ Corneal Inlay** clinical trial.

AcuFocus, Inc. has developed an innovative corneal implant technology that is fully compatible with LASIK. This unique implant provides functional near vision for presbyopic patients. The ACI 7000 device, based on the small aperture optics principle, provides a complete, simple, yet elegant solution for presbyopia.

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MK-311 Rev A

Inaugural Asia Cornea Society Scientific Meeting
Shangri-La's Rasa Sentosa, Singapore, 13-14 March 2008

NAMED LECTURES

Asia Cornea Foundation Lecture

13 March 2008, 9.00 am – 9.30 am

NL1
CORNEAL BLINDNESS IN ASIA — SIGHT IS AT HAND

Donald TH Tan[1,2,3]

[1]Singapore National Eye Centre, Singapore, Singapore, [2]Singapore Eye Research Institute, Singapore, Singapore, [3]Department of Ophthalmology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

Estimates from WHO suggest that diseases of the cornea collectively account for the second commonest cause of world blindness, with up to 12 million cases globally, mostly occurring in Asia and Africa. However, only 100,000 corneal transplants are performed globally, largely due to lack of corneal donors, and most of these are performed in the western world, and while the major indications for transplantation in the west are pseudophakic bullous keratopathy and keratoconus, corneal ulceration as the "silent epidemic" remains the major indication for transplantation in many Asian countries, with far poorer outcomes. Assess to high quality corneal tissue remains a major impediment to alleviating corneal blindness in Asia, and eye donation and eye banking standards are pressing issues which need to be addressed now.

At the same time, working in major academic institutions throughout Asia, Asian corneal surgeons and clinician scientists are providing pivotal contributions to the field of cornea and external disease. Asian clinician researchers are at the forefront of ocular surface and stem cell epithelial transplantation research, while institutions here are paving the way for the emerging transition from conventional penetrating keratoplasty to novel methods of anterior lamellar keratoplasty and endothelial keratoplasty. In addition, clinical trials on new forms of artificial cornea and keratoprosthesis devices are being actively pursued, and the future to alleviation of corneal blindness may lie in these pivotal new developments in the field.

In our endeavor to make a significant impact on the alleviation of corneal blindness, major corneal leaders in Asia have now formed the Asia Cornea Society (ACS), dedicated to providing a forum for regional interaction so as to advance the development of the corneal subspecialty in Asia, and to contribute to international development in this arena. Working with regional Asian corneal groups, and in affiliation with the US Cornea Society, ACS will initiate strategic educational and research programs in the field of corneal and external disease, with an immediate focus on determining the epidemiology of infectious keratitis in Asia, developing a clinical strategy with an Asian approach, and novel eye banking initiatives to enable better tissue utilization and Asian eye donation strategies. In order to achieve our goals, the Asia Cornea Foundation (ACF) has also now been established, to provide philanthropic support and advocacy for the various activities of ACS. Through all this, sight is at hand.

Singapore Eye Foundation Lecture

14 March 2008, 1.30 pm – 2.00 pm

NL2
THE EVOLUTION OF SURGERY FOR KERATOCONUS

Mark J Mannis, Jay C Bradley

USA

Keratoconus remains a disease with a great many unanswered questions as to ultimate cause and pathogenesis. Its management surgically has developed over the last two centuries based on the effort to render the conical cornea either more spherical or more stable. Surgical therapies have evolved based on the curvature abnormalities without a clear understanding of disease pathogenesis. In initial efforts at surgical management included central corneal cauterization with or without perforation, employed primarily to flatten the central cornea through scarification. Optical iridectomy was also employed to redirect the entrance of light around central corneas that were severely distorted or scarred from the disease centrally. Both lamellar and penetrating keratoplasty were used for keratoconus in the early 20th century. The square graft, developed by Ramon Castroviejo, was an answer to the persistent problems in keratoconus surgery in the absence of direct appositional suturing. Penetrating keratoplasty remained the treatment of choice for more than half a century. In this paper, we evaluate the clinical literature on the last 25 years of development of surgery for keratoconus and the progression through newer methods with varying degrees of efficacy including epikeratophakia, intracorneal rings, deep anterior lamellar keratoplasty, and collagen cross linking.

Inaugural Asia Cornea Society Scientific Meeting
Shangri-La's Rasa Sentosa, Singapore, 13-14 March 2008

PLENARY LECTURES

Corneal Transplantation

13 March 2008, 8.00 am – 8.30 am

P1
BOSTON KERATOPROSTHESIS — AN ALTERNATIVE TO REPEAT PENETRATING KERATOPLASTY

Michael W Belin
Albany, New York, USA

In 1974 Claes Dohlman initially reported on the Dohlman-Doane Keratoprosthesis (later revised and named the Boston Keratoprosthesis) in a series of 36 patients. In 1992 the Boston Type 1 Keratoprostheis received FDA clearance for marketing in the United States and has since gained worldwide acceptance. The purpose of this study is to report preoperative, intraoperative, and postoperative variables, as well as outcomes, on a large number of patients from multiple surgical sites throughout North America.

The current Multicenter Boston Keratoprosthesis Study is a noncomparative, interventional, case series consisting of 210 eyes/218 procedures from 1/1/03 - 7/1/007. Common preoperative diagnoses were graft failure in 103 eyes (avg prior grafts 2.0), bullous keratopathy (34), chemical injury (26), infectious keratitis (16) and HSV keratitis (12). Preoperative BCVA were <20/400 in 87%. Postoperative BCVA improved to ≥20/400 in 70%. Eyes ≥1 year postoperative (39) obtained BCVA ≥20/400 in 68%, ≥20/100 in 47% and ≥20/50 in 29%. Graft retention was 96.3%. Severe visual loss was typically secondary to co-morbidity (retina & glaucoma). The Boston KPro represents a viable alternative for patients with a poor prognosis for standard PK due to repeat immunologic rejection.

Disclosure: The Author has no financial interest in the topics discussed.

Endothelial Keratoplasty

13 March 2008, 1.30 pm – 2.00 pm

P2
ENDOTHELIAL KERATOPLASTY

Francis W Price Jr
USA

Endothelial keratoplasty (EK) is undergoing rapid adoption around the world because it provides fast visual recovery with minimal refractive change and essentially preserves the structural integrity of the eye. It can be performed without any sutures and virtually eliminates graft failure from ocular surface complications, which are a leading cause of early failure with standard penetrating keratoplasty (PK). Key EK challenges are ensuring graft adherence and minimizing endothelial cell trauma. Specific surgical technique modifications and refinements of insertion and applanation methods continue to be developed to address these concerns. Eyes with a glaucoma shunt, a shallow anterior chamber, a failed penetrating graft, or those without an iris or lens provide unique challenges and require specific modifications in the basic technique to help achieve success.

EK is sufficiently refractive-neutral that patients with both corneal decompensation and cataracts typically have the cataracts removed first or at the same time as the EK, in contrast to the sequence typically employed with standard PK. New donor graft preparation methods, currently being optimized, may help further increase refractive reproducibility and further improve visual outcomes. Looking to the future, EK is a technique that can be readily adapted for use with tissue engineering.

Disclosure: Dr Price receives travel grants from Moria (France).

Ocular Surface Transplantation

14 March 2008, 8.00 am – 8.30 am

P3
THE STATE-OF-THE-ART THERAPEUTIC MODALITIES FOR SEVERE OCULAR SURFACE DISORDERS

Shigeru Kinoshita
Kyoto, Japan

The purpose of this presentation is to better appreciate the state-of-the-art bioengineering technology and future directions for ocular surface reconstruction. Briefly stated, two types of transplantable cultivated mucosal epithelial sheets can be obtained. One is an allogeneic/autologous corneal epithelial stem cell sheet, and the other is an autologous oral mucosal epithelial sheet.

These cultivated mucosal epithelial sheets can be applied for either corneal surface reconstruction or fornical conjunctival reconstruction. Although there have been biological and/or immunological epithelial troubles in various degrees postoperatively, the ocular surface can be well restored in general. Several improvements are still necessary in the future.

Infection

14 March 2008, 2.00 pm – 2.30 pm

P4

NATIONAL AND INTERNATIONAL OPHTHALMIC MICROBIOLOGY LABORATORIES — THE BENEFIT OF COLLABORATION

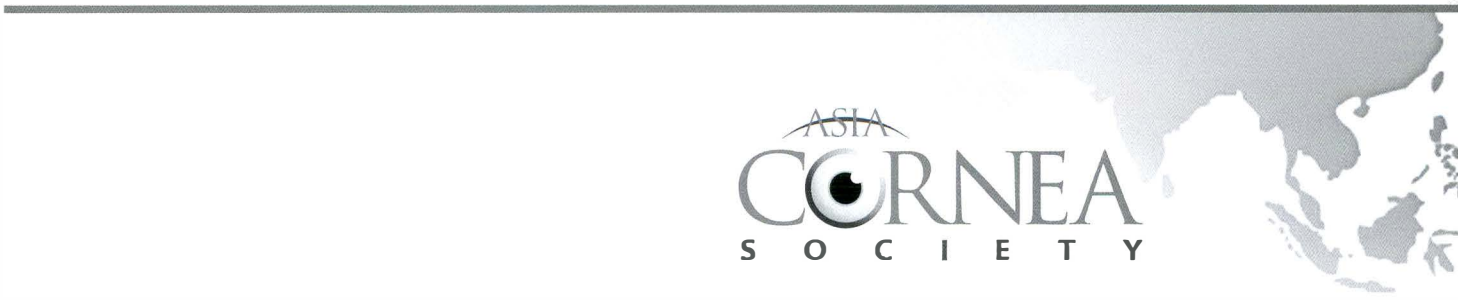
Francis S Mah

USA

Ocular infections have devastated lives for centuries. Although research and technology usually occur at a rapid rate, the spread of the knowledge and the implementation of the methodologies may be adopted slowly. Infections and epidemics may be prevented with better collaboration.

The Charles T. Campbell Ophthalmic Microbiologic Laboratory at the University of Pittsburgh has been at the forefront of diagnostic testing, educating and researching potential therapeutics. This presentation will discuss the benefits and challenges of building the infrastructure for a network of microbiology laboratories. The presentation will also discuss some of the advancements in diagnostic testing and new therapeutics.

Inaugural Asia Cornea Society Scientific Meeting
Shangri-La's Rasa Sentosa, Singapore, 13-14 March 2008



SYMPOSIA

Symposium 1 — Eye Banking

13 March 2008, 9.30 am – 10.30 am

Chairmen: Michael Belin, USA; Ma Dominga B Padilla, The Philippines

S1.1
STRATEGIES FOR SUCCESSFUL EYE BANKING AND CORNEAL TRANSPLANTATION

Paul J Dubord
Vancouver, Canada

Eye banking in the developing world presents obstacles that if not overcome will hamper the development of local self-sustainable corneal transplantation services. The reality that the overwhelming majority of the world's corneal blind, live in the developing world, demands that we aggressively pursue solutions.

Evaluation and discussion of the basic foundations of successful developing world programs is a starting point. Transferrable concepts that can serve as building blocks for eye bank development success will be discussed. Initiatives to assist in resolution of these challenges will be presented.

The input of the newest World Health Organization initiatives in the area of Cell, Tissue and Organ Transplantation and its positive input on donation and eye banking development will be reviewed.

S1.2
US EYE BANKING TRENDS: PAST, PRESENT AND FUTURE — THE DRAMATIC CHANGES IN US EYE BANKING AND THE AFFECTS IT HAS ON CORNEA TRANSPLANTATION

Jason Woody
USA

This presentation examines the impacts of U.S. eye bank movements through a multi-layered overview of the trend in eye bank procurement in the United States. We will look at procurement trends from last decade including its peak in the early 1990s through the 2007. By examining this historically data, I illustrate the process by which external movements transform and alter the procurement cycles. The time period studied in this presentation includes the expansion of governmental oversight, increased recovery costs and trends in surgical procedures. I use two major research strategies: (1) A analysis of Eye Bank Association of America (EBAA) Statistical report and (2) Data that has been collected from colleagues, interviews, and published reports. This presentation supports the argument these changes are consequential to the international eye banking community. Indeed, some view religious beliefs, government oversight, economic conditions, or personal behaviors the agents driving these changes. Typically these factors have been present throughout the history of eye banking, but varied in the actual impact they posed on the outcomes. The U.S. Eye Banking movement has attempted to forge independent structures for sustaining eye bank challenges. By propelling change in an array of multi-facetted approaches, movement infrastructures had found ways to ensure the supply meets the demand for U.S. patients and surgeons.

S1.3
ASIAN EYE BANKING — CHANGING TRENDS AND CHALLENGES

Ma Dominga B Padilla
The Philippines

The changing trends in corneal transplantation, particularly in the last three years, have brought about new challenges for eye banks around the world. Asian eye banking is no exception. While some of the old challenges and problems still remain, foremost among them being the shortage of transplantable eye tissue as well as the many obstacles certain Asian cultures pose towards the realization of functional eye banking in many Asian countries, the recent trend towards a return to lamellar keratoplasty has brought new challenges as well as opportunities for many eye banks. Lamellar keratoplasty can provide a means to increase eye bank tissue utilization as well as optimize the use of corneal tissue. This trend has also made it necessary however for eye banks to invest in new technology and training, shift paradigms in how they interact with surgeons, and change the ways by which tissue is prepared. This talk will discuss the changing face and challenges of eye banking in relation to the evolving trends in corneal surgery.

S1.4
THE RAMAYAMMA INTERNATIONAL EYE BANK — A SUCCESS MODEL FOR INDIA AND OTHER DEVELOPING COUNTRIES

Usha Gopinathan
LV Prasad Eye Institute, Hyderabad, India

Safety and viability of human donor cornea is an essential prerequisite for the successful outcome of corneal transplantation. Meeting the requirements of infrastructure, human resource, quality practices, cornea distribution, and community participation has a significant bearing on the success of eye banking programs. The Ramayamma International eye bank (RIEB) of LV Prasad Eye Institute, Hyderabad, India, has emerged as one of the leading eye banks in south east Asia, and globally. It has been able to set standards of excellence and become a model eye bank for the developing countries through fulfilling of the demands of donor corneas both in terms of quantity and quality. Ongoing public awareness programs, and replication of a unique program initiated by the RIEB namely the Hospital Cornea Retrieval Program (HCRP) have paved way for significant enhancement of donor cornea procurement across the country. RIEB serves as the leading center in the country imparting training to different cadres of eye bank professionals in India and its neighboring countries. In addition to setting forth quality systems and monitoring programs, the RIEB has been responsible for developing educational materials and a structured curriculum for its varied training programs. Currently, RIEB functions as a community eye bank serving the corneal blind across India. A community eye bank model has been proposed to the Government of India to address the needs of the millions of blind in the developing countries.

S1.5
TOWARDS EFFICIENT CORNEAL TISSUE UTILIZATION — THE SINGAPORE EYE BANK CORNEA GRADING SYSTEM (CGS)

Donald TH Tan[1,2,3]
[1]Singapore National Eye Centre, Singapore, Singapore, [2]Singapore Eye Research Institute, Singapore, Singapore, [3]Department of Ophthalmology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

The Singapore Eye Bank was founded in 1991, and since then, has provided corneal tissue for over 2,800 transplants in Singapore. The Singapore Corneal Transplant Study (SCTS), is the single largest, long-term, prospective corneal transplant database on corneal transplantation in Asian eyes today, and SCTS has now revealed that with the advent of a wide variety of corneal transplantation procedures existing today, such as penetrating keratoplasty, anterior lamellar keratoplasty, endothelial keratoplasty, limbal transplantation, peripheral corneal patch grafts, and tectonic and therapeutic grafts, the emerging trend is clearly towards new forms of lamellar keratoplasty. In the early 90s, lamellar keratoplasty only accounted for 3% of all grafts performed at the Singapore National Eye Centre; in contrast, in 2007, lamellar procedures accounted for 57.3% of keraplasties performed, consisting of various forms of anterior lamellar keratoplasty (ALK) (36.7%), and endothelial keratoplasty (EK)(20.6%).

With this pivotal change in our corneal surgeons' approach, SEB has devised a pragmatic and objective Cornea Grading System (CGS) for donor corneas to ensure highly efficient and effective utilization of corneal tissue. Grade A corneas are optically clear corneas with endothelial cell densities of 2,250 cells/mm^2 and are used primarily for optical penetrating grafts, or for endothelial keratoplasty. All other corneas (Grades B and C) with unacceptable endothelial cell quality, are utilized for lamellar surgery, which constitute the bulk of our transplants. Grade B corneas have acceptable optical clarity with good stromal status, but either have endothelial cell counts < 2,250 cells/mm^2 or are >7 days from date of death, and are reserved for all forms of optical anterior lamellar keratoplasty, and may also be cryopreserved. Grade C corneas have poor optical clarity and are reserved for tectonic procedures, patch grafts, or for emergency grafts when no other tissue is available, with a view of rapid surgical replacement once better tissue is available. Finally, residual annular corneoscleral rims (after central corneal trephination) may be used for peripheral corneal melts and limbal transplants. In all cases, negative serology and other safety parameters of donor tissue requirements are respected.

This grading system has greatly enhanced our ability to utilize corneas which ordinarily would have been discarded, and with no compromise with regards to safety standards. The Singapore Eye Bank Cornea Grading System provides a rational approach to efficient efficient and maximal utilization of a limited supply of donor corneas which may be universally adopted by eye banks in Asia. This system has been instrumental in the ability of our Eye Bank to respond resourcefully to the increasing demands of new emerging corneal surgical procedures to reduce the impact of corneal blindness.

Symposium 2 — Penetrating Keratoplasty/ Anterior Lamellar Keratoplasty

13 March 2008, 11.00 am – 12.00 noon

Chairmen: Donald Tan, Singapore; Xie Lixin, China

S2.1
ANTERIOR LAMELLAR KERATOPLASTY FOR CORNEAL ECTASIA

Rajesh Fogla
India

Lamellar corneal surgery has witnessed resurgence in the past decade. Anterior lamellar corneal surgical procedures help retain the healthy host endothelium. Hence there is no risk of endothelial rejection & long term usage of corticosteroids and it potential complications can be avoided. Donor tissues with poor endothelial cell counts can be used for these procedures thereby improving tissue utilization in the eye-bank.

Ectatic corneal conditions comprising of Keratoconus, Keratoglobus and Pellucid marginal corneal degeneration, are a group of non inflammatory corneal disorders affecting young adults. Surgical intervention is often necessary in advanced stage of disease to restore corneal anatomy & improve visual function. Various techniques of anterior lamellar keratoplasty have evolved for managing corneal ectasia. Results of anterior lamellar keratoplasty are comparable to full thickness penetrating keratoplasty. However it is likely that anterior lamellar keratoplasty may become the standard of care for corneal ectatc disorders.

S2.2
MANAGEMENT OF MICRO AND MACRO PERFORATIONS IN BIG-BUBBLE

Vincenzo Sarnicola
Primary of Ophthalmology Department of Misericordia Hospital, Grosseto, Italy

Deep anterior lamellar keratoplasty (DALK) is a surgical method that selectively removes pathologic corneal stromal tissue down to the Descemet membrane, followed by transplantation of a donor graft and thus retains the healthy endothelium.

DALK has the advantage of avoiding most complications associated with "open sky" surgery, providing easier postoperative management and prevention of long-term endothelial loss.

The most common intraoperative complications of DALK are micro and macroperforations of Descemet membrane (0 to 39% described on literature). These can be verified from the trephination period to the suture time on the procedure, different from the usual thought and it is even more frequently searching Descemet's exposure. The occurrence of descemet membrane rupture is less relevant than it seems and does not preclude completing a successful dissection by other means.

In our experience (236 cases underwent DALK) we evidenced 25 (10.5%) ruptures: 7 (2.9%) macroperforations, while the remaining 18 (7.62%) were microperforations. We were able to accomplish DALK procedure in 22 out of 25 cases (82,35 %) of ruptures, repairing the perforation by air injection in the AC and keeping the patient on supine position for a couple of hours after surgery, with strictly postoperative care regarding pupillary block.

Different surgical approaches have been proposed, focused on simplifying the identification of the DM and/or the predescemetic plane in order to obtain a smooth deep surface with uniform thickness which allows better visual results compared to classical PK.

S2.3
DALK COMBINED WITH OCULAR SURFACE TRANSPLANTATION

Shigeto Shimmura
Japan

Ocular surface disease such as chemical/thermal burns, autoimmune disease and hereditary dystrophies often involve the corneal stroma in addition to depletion of corneal stem cells. Conjunctivalization of the ocular surface can be treated by limbal tissue transplantation, and more recently, by cultivated epithelial sheets. However, stromal opacification still requires the use of donor tissue to restore useful vision. Unfortunately, PKP has had limited success due to the high rate of endothelial rejection as well as secondary glaucoma. On the other hand, LKP is safe in terms of rejection, but still has complications in the long term such as intra-lamellar neovascularization and lipid deposition. DALK removes all of the stromal tissue, and attaches the donor cornea directly to the host Descemet's membrane. Safer techniques to perform successful DALK procedures should make the technique the preferred method to replace damaged tissue in ocular surface disease.

S2.4
LONG TERM OUTCOME OF EX-VIVO CULTIVATED LIMBAL STEM CELL TRANSPLANTATION (CLSCT) FOR LIMBAL STEM CELL DEFICIENCY (LSCD)

Virender S Sangwan,[1] Rishi Swarup,[1] Virender Sachdeva,[1] Geeta Kvemuganti,[2] Anees Fatima[2]

[1]*Cornea and Anterior Segment Services, LV Prasad Eye Institute, Hyderabad. India.*

[2]*Sudhakar & Sreekanth Ravi Stem Cell Biology Laboratory, India*

Purpose: Chemical injuries of the eye frequently result in lid changes, ocular surface damage and corneal scarring with an attendant loss of visual activity. Rehabilitation of these patients usually requires a multidimensional approach focusing on correction of lid abnormailities, stabilization of the tear film, and achieving stable ocular surface using limbal stem cell transplantation and penetrating keratoplasty.[1,3] Limbal stem cell transplantation using cultivation of limbal stem cells on the amniotic membrane and subsequent transplantation is a relatively newer technique.[4] In this paper we attempt to describe the long term outcomes of the patients with chemical injuries who underwent limbal stem cell transplantation. To describe the long term outcome of ex vivo CLSCT for patients with chemical injuries.

Methods: Study design: retrospective chart analyses. We retrospectively analysed the medical records of patients with limbal stem cell deficiency due to chemical burns who underwent cultivated limbal epithelium transplantation between May and December 2001 for demographics, primary etiology, type of limbal stem cell transplantation, ocular surface stability, visual acuity, and complications. These patients underwent limbal biopsy from the opposite eye followed by the culture of the same on the Amniotic membrane and the transplantation of the same onto the affected eye along with pannus resection, symblepharon release wherever required and were observed for the stabilization of the ocular surface, followed by a repeat Limbal Stem Cell Transplantation in cases wherever required . Penetrating Keratoplasty was performed in the cases where a stable epithelium had been achieved.

Results: There were in total 19 patients with mean age of the patient being 16.9 years (range = 4 to 32 years). Mean follow was 42.8 months (range 12 months to 57 months). The demographic characteristics are shown in Table 1:

Table 1.

Age	Mean: 16.89 yrs	Range: 4 to 32 yrs
M:F	13:6	
Right eye:left eye	7:12	

Pre-operative visual acuity was noted to range from light perception to 20/200 in 15/19 (78.9%) and better than 20/200 in 4/19 (21.1%). Pre-operative conjunctivalisation was noted in all but one patients spanning 3 to 4 quadrants in all the patients, mean 3.68 ± 1.8 quadrant.

Following surgical procedures had been performed (Table 2):

Table 2.

Amniotic membrane transplantation (AMT)	9 (1 patient had a repeat transplantation)
CLAG	1
Symblepharon release	2
Fornix reformation	1
Superficial keratectomy	1
Entropion surgery	1
Conjunctival granuloma excision	1
Tissue adhesive + bandage contact lens	1

Additional surgery was performed in 6 cases at the time of initial limbal stem cell transplantation in the form of Symblepharon release in 4 cases and CLAG in 2 cases. 8 cases required a repeat limbal stem cell transplantation either for a primary failed LSCT or a recurrence of epithelial defect after an initial period of stabilization. A penetrating keratoplasty was performed in 9 out of 19 cases.

Post-operative results are summarised in the Table 3 below:

Table 3.

Visual acuity	
No PL	1 eye
PL + to 20/200	9 eyes
20/200 to 20/100	1 eye
≥20/100	8 eyes
Conjunctivalisation	
Nil	10 eyes
1 clock hour	2 eyes
2 clock hours	2 eyes
3 clock hours	1 eye
4 clock hours	4 eyes

Significant conjunctivalisation extending onto central cornea was noted only in 3 eyes rest had only peripheral conjunctivalisation.

The mean reduction in conjunctivalisation was 2.36 quadrants.10 patients eventually had no evident conjunctivalisation. 6 cases had no recurrence of conjunctivalisation. 3 patients had partial success with peripheral recurrence of conjunctivalisation. 10 patients had a failed CLSCT but 7 of these had a repeat CLSCT with favourable outcome. Final visual acuity ranged from PL negative to 20/25 p. improvement of visual acuity of ≥2 lines was noted in 8/19 patients (42.1%) of patients. However 15 out of 19 cases (78.9%) had a subjective improvement while 4 (21.1%) patients did not achieve a satisfactory improvement in the symptoms. Complications were noted in the form of failed LSCT (2 cases), Corneal perforation (1 case), Partial recurrence in 2 cases, microbial keratitis in 1 case

and anterior staphyloma formation in 1 case.

Conclusion: Patients with chemical injuries require a multi-dimensional approach towards a structural and visual rehabilitation of the patient.[1] Autologus or allogenic limbal stem cell transplantation for the stabilization of the ocular surface is in sync with the physiologic conditions of the eye , thereby providing a niche for the restoration of stem cell milieu for the epithelial cell survival of the graft.[1,2,3] We found that stabilization of the ocular surface noted as a reduction in conjunctivalization, healing of the epithelial defect and symptomatic improvement in the majority of the patients undergoing CLSCT (78.9%), however repeat transplantation was required in 8/19 (42.1%) of the patients. Stable ocular surface was maintained in these patients. however visual acuity outcomes were limited by the development of stromal scars and the need for keratoplasty which were not performed in all the patients. CLSCT from the other eye in cases of unilateral/assymteric chemical injury may help in the Restoration of ocular surface, however, multiple procedures may be required and further penetrating keratoplasty may be required to optimize the visual potential in these cases.

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S2.5
CYCLOSPORINE A DRUG DELIVERY SYSTEM FOR PREVENTION OF IMMUNE REJECTION AFTER PENETRATING KERATOPLASTY

Xie Lixin
China

Immunological rejection has always been an issue after penetrating keratoplasty. Cyclosporine A has been found to be an effective immunosuppressant widely used in organ and tissue transplantation in humans. However, the side effects of systematic administration are against the use of cyclosporine A in corneal transplantation, as well as the failure to achieve and sustain high drug levels in eyes by topical administration. With a series of studies, we have developed an intraocular cyclosporine A delivery system which can realize sustained drug delivery in eyes and effectively prevent immune rejection after penetrating keratoplasty.

Symposium 3 — Endothelial Keratoplasty

13 March 2008, 2.00 pm – 3.00 pm

Chairmen: Francis Price, USA; Kohji Nishida, Japan

S3.1
ENDOTHELIAL CELL SURVIVAL AFTER DSEK

Marianne O Price
USA

Rapid adoption of Descemet's stripping with endothelial keratoplasty (DSEK) has raised questions about how long-term graft survival will compare with that of standard penetrating keratoplasty (PK), particularly because DSEK requires more donor tissue manipulation. Outcomes from a large consecutive series of DSEK procedures shows that devices and techniques used for graft insertion have a significant influence on early cell loss. For example, the donor tissue is often grasped with a forceps for insertion into the eye. Different forceps designs are associated with significantly different levels of cell loss 6-months after DSEK. Early cell loss is also influenced by use of a funnel to curl the graft for insertion.

Although the mean 6-month cell loss in this large DSEK series was somewhat higher than that reported in some recent PK series, including a same-center series, the rate of cell loss subsequently moderated. Mean cell loss at 2, 3 and 4 years after DSEK was well within the range reported after PK. These findings may help alleviate some concerns about the prognosis for long-term graft survival and the potential impact on the donor tissue supply.

Disclosure: Dr Price receives travel grants from Moria (France).

S3.2
COMPARATIVE STUDY EXAMINING THE EFFECTS OF DIFFERENT DONOR INSERTION TECHNIQUES ON ENDOTHELIAL CELL DAMAGE IN HUMAN EYES

Jodhbir Mehta
Singapore

Purpose: DSAEK currently requires folding of the donor for insertion. We evaluated endothelial cell loss by this method, and compared this to a new insertion technique.

Methods: A DSAEK model using 30 human eye bank corneas with SEM and Trypan blue/Alizarian red vital dye staining evaluation of endothelium was created. A new donor insertion technique was devised, in which a viscoelastic-protected donor is placed on an IOL sheet glide. The glide is inserted through the corneal wound, and the donor pulled through the corneal wound with intraocular forceps. An AC infusion is running throughout the insertion.

Results: SEM and vital dye staining showed that on average, folding of the donor tissue causes 34% endothelial cell damage as compared to the glide technique (9.3%, p=0.003). Two patterns of damage were seen by the two techniques; folding showed damage along the compression arms of the forceps, glide insertion showed damage only at the peripheral circumference of the donor posterior lamellae button. The glide technique has been successfully performed clinically in 36 DSAEK cases, without donor dislocation and only one case of primary graft failure (PGF)(2.7%) compared to 20% PGF following fold insertion.

Conclusion: Folding of the donor in DSAEK damages endothelium. The glide technique reduces the endothelial damage following donor lamellae insertion.

S3.3
DSAEK FOR JAPANESE PATIENTS

Kohji Nishida
Japan

DSAEK is a partial-thickness corneal transplant that replaces only the endothelial layer. There are many advantages to the DSAEK compared to PKP, including very little postoperative astigmatism and possible low risk of the incidence of rejection. But postoperative endothelial cell loss is crucial problem that needs to be solved. In the original method, many surgeons make a "taco" fold of the donor graft tissue and pull it through an incision. However, unfolding the graft with forceps kills a large number of endothelial cells. To overcome the disadvantage, "sliding" donor graft insertion technique has been recently developed.

DSAEK is often performed in patients with Fuchs endothelial corneal dystrophy in US. Most of the cases have average eye size with deep anterior chamber. In Japan, there are many patients with postoperative bullous keratopathy which may be candidates for DSAEK. But, the eye is small with shallow anterior chamber in most of the cases. Under the condition, it is difficult to perform DSAEK procedure, especially insertion of graft into the anterior chamber. In this presentation, how to deal with unfavorable terms for DSAEK will be discussed.

S3.4
DSAEK IN NON-FUCHS BULLOUS KERATOPATHY

Shigeto Shimmura
Japan

DSAEK has developed to become the first choice of surgery for bullous keratopathy. Reports have shown that the procedure is especially effective in patients with Fuch's endothelial dystrophy. However, a subset of patients in Japan suffers from bullous keratopathy following laser iridectomy procedures. These patients have shallow anterior chambers with dense cataracts, and are more challenging cases to perform DSAEK. Institutional results of a case series in post PI bullous keratopathy cases will be presented.

S3.5
PERSONAL EXPERIENCE OF DSAEK SURGERY IN THAI PATIENTS

Anun Vongthongsri
Thailand

Descemet's stripping automated endothelial keratoplasty (DSAEK) is rapidly replacing penetrating keratoplasty (PKP) in cases where the indication for intervention is limited to corneal endothelial dysfunction such as Fuchs' endothelial dystrophy and pseudophakic bullous keratopathy. The descemet's membrane with diseased endothelial layer is manually stripped from the recipient bed through a small, tunneled scleral-limbal incision. A lamellar endothelial donor graft prepared by using an automated microkeratome is then inserted into the anterior chamber and attached to the posterior stromal bed of the host cornea without sutures. DSAEK provides several benefits over standard PKP, including a more stable wound, faster visual recovery, less suture-related complications, less refractive error and irregular astigmatism and simpler postoperative care. There have been many modifications both in the surgical technique and instrumentation to improve graft survival. The "pull through" donor graft insertion technique recently developed by Busin and colleagues simplifies the DSAEK procedure and involves less graft manipulation which may reduce rates of postoperative endothelial cell loss. Using this technique, the donor automatically unfolds with minimal trauma and cell loss, enhancing the success of transplantation. The overall success rate of DSAEK in Thailand is satisfactory, with 1-year graft survival of 80%. However, long-term results have yet to be determined.

Symposium 4 — Femtosecond Laser Surgery

13 March 2008, 3.30 pm – 4.30 pm

Chairmen: Mark Mannis, USA; Donald Tan, Singapore

S4.1
INTRALASE — FROM LASIK TO PENETRATING KERATOPLASTY

Francis W Price Jr
USA

Femtosecond lasers are increasingly being used to reproducibly create the flap for LASIK, and to minimize flap-related complications. For instance, the incidence of epithelial in-growth after LASIK enhancements is less if IntraLase was used to create the original flap compared with a microkeratome. Femtosecond laser precision is also helping revolutionize corneal transplantation. Outcomes obtained over the last 2 years indicate that IntraLase can successfully create a variety of interlocking corneal transplant incisions and suggest that different incision profiles may offer advantages in treating different corneal problems. In particular, the "tophat" configuration can help normalize the corneal surface in eyes with thinned and scarred corneas, and the "zigzag" configuration facilitates wound closure and suture placement.

In many cases, the femtosecond laser may not be located in the facility where the transplant will be performed. Specific techniques can help ensure the integrity of the eye as the patient is moved from the facility where the laser incisions are made to the facility where the graft is completed. The reproducibility of IntraLase incisions also makes it feasible to pre-cut the donor tissue at a separate eye bank facility.

Disclosure: Dr Price is a consultant for IntraLase (American Medical Optics, USA)

S4.2
FEMTOSECOND LASER KERATOPLASTY

Yong-Ming Por
Singapore

Corneal transplantation has evolved in many ways since its introduction more than a century ago. Although bladed instruments have been associated with excellent operative results, shortcomings

exist such as the potential for irregularities and disparities between donor and host dissection, which affect post-operative astigmatism and interface opacity. The femtosecond (fs) laser now enables potentially smoother and more precise automated corneal dissection in any plane than manual dissection.

We successfully used the Femtec laser (20/10 Perfect Vision, Heidelberg, Germany) to perform penetrating keratoplasty (PK), and established a laboratory model for performing deep lamellar dissections. In eight cases of fs-PK using a straight perpendicular trephination pattern, patients with no co-morbidity achieved best corrected vision ranging from 20/20 to 20/80. Mean post-operative astigmatism was 2.56D (range 0.50-4.00D). Our laboratory study in 30 cadaver corneoscleral rims established that double and triple pass laser deep lamellar dissections provided smoother surfaces and greater ease of peeling of resected tissue than single pass dissections. No improvement above single pass rim dissections was seen when multiple passes were performed. Recently we have also established that deep fs laser lamellar dissection causes no significant endothelial damage and precisely dissects to within 50µm of the intended depth.

S4.3
A NEW NON-INVASIVE APPROACH TO REFRACTIVE SURGERY — INTRASTROMAL CORRECTION WITH THE FEMTEC

Luis Antonio Ruiz
Bogota

We present approaches for intrastromal refractive correction procedures using the FEMTEC femtosecond laser system (20/10 Perfect Vision, Germany) with the goal of a completely intrastromal refractive laser procedure, which leaves the anterior and posterior side of the cornea intact. The 1 micron infrared laser light with pulse durations of around 600 fs is tightly focused at the desired location inside the cornea, resulting in well localized plasma-mediated ablation of stromal tissue. Refractive changes of the cornea are achieved by the combination of ablation and biomechanical effects from different intrastromal ablation patterns. Patients are selected according to the defined protocol and visual acuity is evaluated pre-op and post-op.

Preliminary results of the ongoing clinical study for the intrastromal correction of presbyopia using the FEMTEC laser show very promising results with currently more than 1 month follow-up. The noninvasive technique improved near vision nearly instantaneously with an average gain of 5.9 ± 2.7 Jaeger lines in Near UCVA after 1 month post op (n = 52), showing good stability over time. The safety profile was also found to be excellent with a minimal change in Distance BSCVA of +0.1 ± 0.5 Snellen lines after 1 month. Further long-term follow-up will be collected.

Disclosure: 20/10 Perfect Vision, L, S.

S4.4
FEMTOSECOND LENTICULE EXTRACTION (FLEX) — UPDATE ON A NEW ALL-FEMTOLASER REFRACTIVE PROCEDURE WITH THE ZEISS VISUMAX LASER SYSTEM

Marcus Blum
Germany

Purpose: The aim of this prospective study was to assess the safety, efficacy and refractive outcome of a new method of refractive correction, the femtosecond lenticule extraction (FLEx).
Methods: This prospective study comprised 108 myopic eyes with and without astigmatism undergoing the new type of refractive treatment FLEx, where both, a flap and a lenticule of intrastromal corneal tissue were simultaneously cut using the Carl Zeiss Meditec VisuMax femtosecond system in an integrated procedure. Thereafter, the lenticule was manually removed and the flap repositioned. 3 and 6 months follow-up data of refractive outcome, uncorrected visual acuity (UCVA), change in best spectacle corrected visual acuity (BSCVA), wavefront and topography data will be available.
Results: At 3 months post-OP 78 % of eyes treated were within ±0.5 D and 97 % within ±1.0 D of intended correction. Refractive outcome is acceptable for all patients when the manifest refractive spherical equivalent was almost stable already after 1 month post-op. Visual recovery, however, seems to be slower compared to standard LASIK. Nearly 78% of eyes (or 36 eyes with full correction) show up with UCVA 20/20 or better demonstrating the efficacy of the method. Safety: 84% of 106 eyes gained or retained preoperative best spectacle corrected visual acuity at the 3 months follow-up. Corneal topography revealed large and prolate optical zones. Aberrometry showed no significant induction of higher orders aberrations. No adverse events or complications were observed.
Conclusion: FLEx is shown to be a new promising corneal refractive method providing a safe and effective single step procedure to correct myopia including astigmatism using the Carl Zeiss Meditec VisuMax femtosecond system. Compared to standard excimer laser refractive surgery the all-femtolaser method FLEx turns out to induce less variation in ocular aberrations.

S4.5
ADVANCES IN CORNEAL IMAGING WITH THE FEMTOSECOND LASER

Josef F Bille
Medical Faculty Mannheim, University of Heidelberg, Germany

The advances in microscopic imaging have continuously paved the way of ophthalmic imaging techniques. Most recently, nonlinear multiphoton laser scanning microscopy has received attention for living cell imaging, due to its unique advantages of large sensing depth, minimized photon damage and sub-micron resolution. Collagen, as the most abundant protein in the human body, determines the unique physiological and optical properties of the connective tissues, including cornea and sclera. The fine structure of collagen fibrils in the ocular tissue, which conventionally can only be resolved by light or electron microscopy after complicated tissue preparation, now can be probed by Second-Harmonic-Generation(SHG)-imaging due to the non-centrosymmetric structure of collagen fibrils. The untreated cornea/sclera tissue can be imaged with high resolution, strong contrast and large sensing depth, without requiring staining, fixation or slicing.

Symposium 5 (I) — Ocular Surface Disease/Keratoprosthesis

14 March 2008, 8.30 am – 9.30 am

Chairmen: Shigeru Kinoshita, Japan; Ray Tsai, Taiwan

S5.1
STEVENS-JOHNSON SYNDROME

Panida Goseyarakwong
Thailand

Stevens Johnson Syndrome (SJS) and Toxic epidermal necrolysis (TEN) are most often related to adverse drug reactions characterized by an acute widespread destruction of the epithelium of skin with blisters and erosions and mucous membrane of oral and eyes that can be fatal. These ocular involvements lead to symblepharon, keratinization, dry eye, corneal damage and threaten vision. History taking and physical examination were assessed severity by internal medicines, dermatologists, and ophthalmologists for proper management. Guideline of management in these patients with corticosteroid is still controversial or unproven beneficial, because of increase in morbidity and mortality with half of the deaths due to septicemia. Topical corticosteroid is still controversial for conjunctivitis, regarding increase the risk of infection, impair or delay wound healing, steroid-induced glaucoma for prolong usage over 2 weeks.

Total severity score change in topical methyl prednisolone 1% group and normal saline 0.5% group at one month was approximately the same. The tear production in Schirmer I without anesthesia in group without systemic corticosteroid were significantly more than in group with systemic corticosteroid. Prevent infection, remove debris and pseudomembrane, lid hygiene and lubrication with artificial tears preservative free should be recommended for decreasing fibrous formation, and preventing severe visual loss.

S5.2
AMNIOTIC MEMBRANE EXTRACTION SOLUTION FOR THE TREATMENT OF SEVERE DRY EYE

Zuguo Liu
China

The treatment of severe dry eye is a big challenge for ophthalmologists. The autologous serum eye drops has been used to this

disorders. However, it is complicated to make this kind of eye drops and it can not be preserved for long time. We make the amniotic membrane extraction (AME) from amniotic membrane by ourselves. The effects of AME were evaluated in vivo and in vitro. The patients with severe dry eye were treated with AME for 1-6 months. The beneficial clinical effect was observed in these patients. The AME solution may be a alternative treatment for patients with severe dry eyes.

S5.3
THE LONG-TERM RESULT OF EX VIVO EXPANSION OF ALLOGRAFT LIMBAL STEM CELLS TRANSPLANTATION

Ray Jui-Fang Tsai
Taipei Eye Center, Taipei, Taiwan

The successful clinical application of ex vivo expansion of limbal Stem Cells has been documented for more than 10 years. The limbal stem cells harvested in this way are effective for ocular surface reconstruction, especially in autologous transplantation, in which limbal stem cells are taken from normal fellow eye of the patient and cultured in vitro for two weeks, then transplanted to the diseased eye to restore patient's vision. However, for those patients whose both eyes were damaged, the allograft limbal stem cells transplantation will be the way to performed.

I reviewed 54 cases which the allograft limbal stem cells had been performed during 1998 to 2000. 19 cases have followed for more than 18 months were studied. There were 6 cases of chemical burn, 7 cases of OCP, 3 cases of SJ syndrome, and 3 cases with chronic inflammation. The success rate was 9/46 (47.4%), including chemical burn 4/6 (66.7%), OCP 3/7 (42.9%), SJ syndrome 0/3 (0%), and inflammation 2/3 (66.7%). The vision improvement was 65%.
From 2001, I changed the immunosuppression regimen: prednisone 0.5mg/kg/d, cyclosporine A 2.5 mg/kg/d BID, cellcept 2g/d BID. 15 patients were included for studied. The success rate improved to 11/15 (73.3%), including Chemical burn: 4/7 (57.1%), OCP: 4/5 (80%), SJ Syndrome 2/2 (100%), inflammation 1/1 (100%).

In conclusion, in our culture system, limbal explanted culture on amniotic membrane provides a practical method for ex vivo expansion of limbal stem cells. The stem cells harvested can be transplanted to human diseased cornea and they can reserve their stem cell function for more than 10 years in autograft, but the survival rate for allograft is 50% to 70 %, depend on the immunosuppression regimen were used.

S5.4
CELL THERAPY FOR SEVERE OCULAR SURFACE DISEASE — CLINICAL OUTCOME

Virender S Sangwan, Geeta K Vemuganti, Anees Fatima, Soundarya Lakshmi M, Ghazala Iftekhar, Himanshu Matalia
Sudhakar and Srikant Ravi Stem Cell Biology Laboratory, Prof Brien Holden Eye Research Centre, LV Prasad Eye Institute, Hyderabad, India

Purpose: To report the technique of cultivation and clinical application of limbal and conjunctival epithelium in patients with severe ocular surface disorders.
Methods: Salient features of cultivation included: use of 2.5 x 4cms of human amniotic membrane (HAM) as carrier, 2 mm of limbal/conjunctival tissue, autologous serum, feeder cell-free method, submerged technique, characterization by morphology & immunohistochemistry, generated within 10-12 days of cultivation. Successful out come measures included: re-epithelization of ocular surface, absence of recurrence, status of pre & post-op vision, in-vivo stratification of epithelium by confocal microscopy; histologic evidence of in-vivo survival, stratification and corneal phenotype of transplanted cells in patients who subsequently underwent penetrating keratoplasty.
Results: Adequate sheet (75% of HAM surface) of 1-2 cell layered epithelium was generated in all cases. In the first 100 cases (with minimum follow-up- 6 months), the cumulative probability of survival of transplanted epithelium was 79% at 6 months; 73% at 1 year; 69% 2 years.
Conclusion: This largest clinical trial using cultivated limbal and conjunctival epithelium in patients with severe ocular surface disease demonstrates ocular surface stability and visual improvement in significant proportion of cases.

S5.5
CULTIVATED EPITHELIAL TRANSPLANTATION FOR THE TREATMENT OF SEVERE CORNEA AND OCULAR SURFACE DISEASE

Leonard PK Ang[1,2]
[1]Singapore National Eye Centre, Singapore, [2]Department of Ophthalmology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

The destruction of the ocular surface (comprising the cornea and conjunctiva) is a major cause of blindness in the world. Severe ocular surface disease arising from conditions such as Stevens-Johnson syndrome and chemical injury are devastating conditions

that may result in limbal stem cell deficiency, corneal scarring and severe visual loss. Management of these complex cases remains a major clinical challenge.

Using tissue-engineering techniques, the ex vivo expansion of ocular surface stem cells aims to harness the regenerative potential of stem cells to repopulate and rejuvenate the ocular surface. Cultivated limbal stem cell transplantation has been shown to be a promising treatment modality in the management of severe limbal stem cell deficiency.

Damage to the conjunctiva may also arise from various diseases, such as pterygia and conjunctival tumors. Treatment of these disorders involves surgical excision of the diseased area, which results in an epithelial defect. The use of bioengineered conjunctival equivalents represents a novel approach to reconstruct the ocular surface, without causing iatrogenic injury from harvesting large autografts. It is particularly useful in situations where the normal conjunctiva is deficient either from disease or scarring.

Another promising new treatment modality is the use of autologous cultivated oral epithelial transplantation for the treatment of severe cornea and ocular surface disease. Utilizing the patient's own oral tissue overcomes the problems related to allogeneic transplantation, and is particularly useful for treating severe bilateral conditions. These new treatment modalities may offer new hope to patients afflicted with severe cornea and ocular surface disease that are currently not amenable to conventional treatment.

Symposium 5 (II) — Ocular Surface Disease/Keratoprosthesis

14 March 2008, 10.00 am – 10.50 am

Chairmen: Virender Sangwan, India; Hu Fung-Rong, Taiwan

S5.6
CULTIVATED CORNEAL ENDOTHELIAL TRANSPLANTATION

Shigeru Kinoshita
Kyoto, Japan

Recently, we have performed Descemet's stripping automated endothelial keratoplasty (DSAEK) procedure using internationally shipped, pre-cut donor corneas in 10 cases of bullous keratopathy with Busin's glide. The endothelial cell density (ECD) of the donor peripheral remaining cornea using Alizarin red staining, and specular microscopy were performed to monitor the ECD. Early postoperative corneas showed an ECD of 2,300cells/mm^2, resulting in corneal transparency.

A similar surgical modality using cultivated corneal endothelial sheet was also investigated, having some success in monkey.

S5.7
CHALLENGES TO SEVERE CASES

Kohji Nishida
Japan

Patients with limbal stem cell deficiencies can be treated with allogeneic limbal transplantation, but in severe cases such as Stevens-Johnson syndrome and ocular cicatricial pemphigoid, long-term results of limbal transplantation is not satisfactory due to high risk of rejection. Since late 1990's, amniotic membrane transplantation has been introduced, which allow us to perform allogeneic limbal transplantation in severe cases. However, some reports show that long-term results of limbal transplantation are not satisfactory even if amniotic membrane transplantation is used simultaneously.

To overcome the high incidence of rejection in severe cases, recent attempts have been made to fabricate corneal epithelial grafts *ex vivo* by expansion of autologous limbal stem cells. We also have developed a replacement strategy for damaged corneal epithelium involving a tissue-engineered epithelial cell sheet comprising only the patient's autologous oral mucosal epithelial

cells. In this presentation, case reports will be shown for ocular surface reconstruction in patients with severe cases such as Stevens-Johnson syndrome and ocular cicatricial pemphigoid

S5.8
KERATOPROSTHESES — CURRENT DEVELOPMENTS IN INTERNATIONAL RESEARCH

Debbie Sweeney
Australia

Keratoprosthesis surgery, or KPro, is a rapidly growing field. The development of new biomaterials and surgical techniques are driving the emergence of new methods to correct vision and repair ocular damage.

The development of the corneal inlay/onlay, for example, is bringing novel polymers to the permanent yet reversible correction of vision, offering an alternative to laser refractive surgery.

The KPro Study Group was established in 1990 to foster clinical and basic research on keratoprosthesis, synthetic corneas and artificial corneal implants. This International Group aims to foster the development and improvement of keratoprosthesis worldwide for the benefit of eyecare and our patients. The Group is comprised of researchers and surgeons involved in this specialized field, and regular conferences are held to facilitate communication and research development.

This talk will examine the latest developments in KPro, and the role of the KPro Study Group in international research.

S5.9
END-STAGE CORNEAL BLINDNESS — THE SINGAPORE OOKP STUDY

Donald TH Tan[1,2,3]
[1]Singapore National Eye Centre, Singapore, Singapore, [2]Singapore Eye Research Institute, Singapore, Singapore, [3]Department of Ophthalmology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

Corneal transplantation is the mainstay for the visual rehabilitation for corneal blindness, currently estimated at 12 million by WHO, but only 100,000 corneal transplants are performed globally, primarily due to lack of corneal donors. The only alternative to corneal transplantation is keratoprosthesis (KPro) surgery, but currently, only a few keratoprosthetic designs have proven to be both safe, and effective in the long-term. The osteo-odonto-keratoprosthesis (OOKP) procedure is arguably the current "gold standard" for end-stage corneal and ocular surface disease in which conventional corneal transplantation is usually contra-indicated due to high failure rates in these most severe forms of corneal and ocular surface destruction.

In Singapore we established a multidisciplinary surgical program for osteo-odonto-keratoprosthesis (OOKP) surgery in 2004, the Singapore OOKP Study (SOS), and evaluated efficacy and preliminary safety of this keratoprosthesis in end-stage corneal and ocular surface disease. Twenty-two adults of Asian ethnic origin, bilaterally blind with severe corneal and ocular surface blindness from Stevens-Johnson Syndrome and chemical or thermal burns underwent OOKP surgery in a 2-stage procedure. In stage 1, an autologous canine tooth is removed, modified to receive an optical polymethyl methacrylate cylinder, and implanted into the cheek. The ocular surface is denuded and replaced with full-thickness buccal mucosa. Stage 2 surgery, performed 2 to 4 months later, involves retrieval of the tooth–cylinder complex and implanting it into the cornea, after reflection of the buccal mucosal flap, corneal trephination, iris and lens removal, and anterior vitrectomy. Concurrent glaucoma and vitreoretinal procedures are also performed at either stage, as required.

Our results have been extremely encouraging to date. Twenty-one of the 22 patients (10 men and 11 women; mean age 32.8 months, range, 22-61 years), all referred from neighbouring Asian countries, and Australia, completed both stages of the surgery, between 2004 and 2007. The mean follow-up period was 17.1 months (range, 1-36 months). Intraoperative complications included expulsive haemorrhage (n=1), tooth fracture (n=1), oronasal fistula (n=1), mild inferior optic tilt (n=1) and a choroidal haemorrhage. Anatomical stability and keratoprosthesis retention has been maintained in all eyes, with no dislocation, extrusion, retroprosthetic membrane formation or keratoprosthesis-related infection. Others complications not directly related to device insertion included retinal detachment (RD) related to silicone oil removal (n=1) and endophthalmitis related to endoscopic cyclophotocoagulation performed 1 year after OOKP surgery (n=1). Twelve patients (57.1%) attained a stable best spectacle-corrected VA of at least 20/40 or better, whereas 8 patients (38.1%) attained stable 20/20 vision.

Our results suggest that implementation of a multidisciplinary team of clinicians and surgeons to perform OOKP surgery has the potential to restore good vision to the most severe cases of corneal blindness in an Asian setting, with minimal device-related complications. Longer follow-up of these cases is currently underway, but it appears clear that OOKP surgery is an important and viable option for patients with the most severe cases of end-stage corneal and ocular surface disease in Asia.

Symposium 6 — Refractive Surgery

14 March 2008, 10.50 am – 12.00 noon

Chairmen: Daniel Durrie, USA; Joo Choun-Ki, Korea

S6.1
COMPARISON OF THE CLINICAL OUTCOMES OF EPI-LASIK AND EPI-LASIK WITH FLAP REMOVAL

Choun-Ki Joo,[1,2] Kyung-Min Lee,[1] Hyun-Soo Lee,[1] Shin-Hae Park[1]

[1]Department of Ophthalmology and Visual Science, Kangnam St. Mary's Hospital, College of Medicine, The Catholic University of Korea[1], Seoul, Korea, [2]Laboratory of Ophthalmology and Visual Science, Korean Eye Tissue and Gene Bank Related to Blindness, College of Medicine, The Catholic University of Korea, Seoul, Korea

The purpose of this study was to compare clinical results according to the achievement of an intact epithelial flap in patients that underwent epi-LASIK for the correction of mild to moderate myopia.

Group I comprised 46 eyes with an intact epithelial flap after epi-LASIK, whereas Group II comprised 30 eyes that were converted to PRK because of incomplete flap separation or free cap formation. Uncorrected visual acuity (UCVA), best corrected visual acuity (BCVA), spherical equivalent (SE) refraction, higher order aberrations, postoperative pain, corneal aberration and corneal haze were examined for 6 months after surgery in both groups.

Flap-removed (group II) eyes had a better UCVA at 4 days postoperatively (p=0.002) and a better BCVA at 7 days postoperatively (p=0.036) than epi-LASIK (group I) eyes. No significant differences were observed between the two groups in terms of UCVA, BCVA, or SE efraction at 1, 2, and 6 months. Group I had lower postoperative pain scores than group II for 2 days postoperatively. The corneal haze levels and higher order aberrations were no different in the two groups.

In this study, inevitable flap removal during epi-LASIK had advantages in terms of more rapid re-epithelialization and visual recovery during the early postoperative period, but it caused more discomfort during the first 2 postoperative days. Flap removal did not cause any differences in visual acuity, spherical equivalent, or corneal haze level.

S6.2
IN VIVO CONFOCAL MICROSCOPIC EVALUATION OF CORNEAL WOUND HEALING AFTER EPI-LASIK

Fung-Rong Hu

Taiwan

Although LASIK is the most popular surgical procedure for treating refractive errors, Epi-LASIK has certain advantages over LASIK including reduced depth of treatment, less severity of dry eye and no flap-related complications. Epi-LASIK is reported to preserve a viable epithelial sheet after replacement within at least 24 hours after treatment. However, the long term survival and wound healing of epikeratome-created epithelial flaps is still unknown. We conducted a study to investigate the healing of corneal wounds after Epi-LASIK by in vivo confocal microscopy. Twenty-seven patients who had undergone Epi-LASIK for the treatment of myopia or myopic astigmatism in a total of forty-six eyes were enrolled. Eyes were examined by in vivo confocal microscopy at 1, 3, and 7 days after surgery. The eyes were then examined weekly during the first month, and once each at 3 and 6 months. Our study showed that the corneal epithelial flaps after Epi-LASIK were not as healthy as previously thought, as cells underwent severe pathologic changes within or after 24 hours. At least several weeks were required for the epithelial cells to return to their normal morphology, and apical surface cells needed more time than basal cells.

S6.3
SUB-BOWMAN'S KERATOMILEUSIS VS PRK — 1 YEAR VISUAL RESULTS

Daniel S Durrie, Jason E Stahl, Stephen Slade

USA

Purpose: To evaluate and compare the safety, efficacy, and stability of SBK and PRK for myopia with or without astigmatism.

Methods: In this prospective, randomized, contralateral study, 50 patients underwent Intralase assisted SBK (100 μm flap setting) in one eye and PRK in fellow eye with Alcon CustomCornea to treat myopia with or without astigmatism. Visual outcomes evaluated include: UCVA, BCVA, refraction, contrast sensitivity, retinal image quality (OQAS) and patient questionnaire.

Results: 6 month follow-up data: SBK eyes with statistically better UCVA until 3 months post-op when no difference between SBK and PRK observed. UCVA — SBK 90% 20/20, 72% 20/16; PRK 92% 20/20, 70% 20/16. MRSE for SBK -0.17D and PRK +0.08D.

Statistically better contrast sensitivity for SBK eyes until 6 months when no difference seen. Better OQAS MTF and contrast values for SBK eyes during 6 month follow-up. Patients preferred vision in SBK eyes until 3 month postop when no difference reported. No loss of BSCA in either group. 1-year results will be included in presentation.

Conclusion: Both SBK and PRK provide safe, effective, and stabile refractive results. SBK eyes experienced better UCVA, contract sensitivity, retinal image quality and patient preference during the early postoperative period.

S6.4
OUTCOMES OF THE VISIAN IMPLANTABLE COLLAMER

Marian Macsai, Jigna Joshi
Northwestern University, Chicago, Illinois, USA

Purpose: To present the outcomes of the Visian Implantable Collamer Lens in patients with moderate and high myopia.

Methods: A retrospective review of consecutive patients implanted with a phakic intraocular lens by one experienced surgeon, after FDA approval.

Results: Twenty Two Eyes of 11 patients with bilaterally implanted phakic intraocular lenses were evaluated with the Visian implantable collamer. The average patient age was 43 (28-56) years with an average pre-operative spherical equivalent of -11.75D (-6.75 to -18.00). Non-contact endothelial cell counts at 6-12 months demonstrated an average loss of 2.58% in the Visian. Two eyes required postoperative Lasik and no ICL's were replaced. Two eyes developed mild peripheral anterior subcapsular opacities that were not visually significant.

Conclusions: The Visian ICL appears to be safe alternatives for the treatment of high myopia. Endothelial cell counts, lens changes and intraocular pressure all require long term evaluation to demonstrate long term safety in these patients.

S6.5
CORRECTION OF COMPOUND MYOPIC ASTIGMATISM AFTER DEEP LAMELLAR KERATOPLASTY USING TORIC POSTERIOR CHAMBER PHAKIC LENSES. 1 YEAR RESULTS

Alaa El-Danasoury
Saudi Arabia

Purpose: To evaluate toric posterior chamber phakic lenses (T-ICL) in correcting compound myopic astigmatism after deep anterior lamellar keratoplasty (DALKP).

Methods: Twenty-eight eyes (28 patients) with previous DALKP received T-ICL. All eyes had stable refraction for 6 months after removal of corneal sutures, spherical equivalent refraction (SE) between -5.0 and -16.0 D, spectacle-corrected visual acuity (SCVA) of 20/40 or better and endothelial cell count more than 2200 cells/mm^2.

Results: At baseline; mean SE was -9.4 ± 2.6D, 50% eyes saw 20/20 with correction. At 1 year (follow-up, 86%); SE was -0.3 ± 0.5D, 58.3% eyes saw 20/20 uncorrected; 25% eyes gained 2 lines of SCVA.

Conclusion: T-ICL is effective, predictable and relatively safe for correcting compound myopic astigmatism after DALKP.

S6.6
THE ACUFOCUS CORNEAL INLAY FOR THE CORRECTION OF PRESBYOPIA

Wing-Kwong Chan, Donald Tan, Tze-Lin Wee, Wei-Han Chua
Singapore

Emmetropic presbyopic patients were implanted with an AcuFocus corneal inlay (ACI 7000, AcuFocus Inc., USA) to assess the efficacy and safety of the device for the correction of presbyopia under a 3 year US FDA multi-centre, prospective, non-randomised interventional study.

The corneal inlay was implanted in the non-dominant eye, centered over the entrance pupil, under a 160μ thick corneal flap created with a microkeratome (Zyoptix XP microkeratome, Bausch & Lomb, USA).

Twenty-four eyes of 24 patients had reached 3 months post-operative follow-up. The mean age of the patients was 49 years old. Two of the eyes had undergone previous LASIK and 1 eye had previous PRK for the correction of myopia. Pre-operative mean unaided distance visual acuity was 20/16 (53.7 ETDRS letters) and

mean unaided near acuity was J7/8 (27.1 ETDRS letters). Three months post-operatively, the mean unaided distance visual acuity was 20/25 (47.2 ETDRS letters) and mean unaided near visual acuity was J2 (44.8 ETDRS letters) in the implanted eye. No corneal melting, clinically significant corneal haze or scarring was observed 3 months post-operatively.

The AcuFocus corneal inlay appears to be effective and safe for the correction of presbyopia in emmetropic eyes.

Symposium 7 (I) — Corneal Infection

14 March 2008, 2.30 pm – 3.30 pm

Chairmen: Francis Mah, USA; Venkatesh Prajna, India

S7.1
CHARACTERIZATION OF CONJUNCTIVAL BACTERIAL FLORA AND ITS SUSCEPTIBILITY

Choun-Ki Joo,[1,2] Jun-Sub Choi,[2] Shin-Hae Park[1]

[1]Department of Ophthalmology and Visual Science, Kangnam St Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, Korea, [2]Laboratory of Ophthalmology and Visual Science, Korean Eye Tissue and Gene Bank related to blindness, College of Medicine, The Catholic University of Korea, Seoul, Korea

To evaluate their in vitro susceptibility to ciprofloxacin, levofloxacin, gatifloxacin, and moxifloxacin in the normal ocular bacterial flora isolated from patients undergoing anterior segment surgery, we studied.

We conducted this study over a period of 12 months from January 2006 to December 2006 at Kangnam St Mary's Hospital, Seoul, Korea. The isolated bacteria were classified by analysis of 16s rDNA sequencing. The resistance patterns were evaluated by the disk diffusion test according to the NCCLS.

Gram-positive species predominated (89.3%) and *Staphylococcus epidermidis* was the most frequently isolated organism accounting for 60.3% in normal conjunctival flora. For the Gram-positive isolates, the resistance rates to ciprofloxacin, levofloxacin, gatifloxacin and moxifloxacin were 19.9%, 10.4%, 2.5%, and 4.6%, respectively. Of the 62 ciprofloxacin-resistant isolates, 32 organisms showed co-resistance to levofloxacin. Some organisms were resistant to all fluoroquinolones.

In conclusion, the fourth generation fluoroquinolones provide higher activity against normal ocular flora, especially Gram-positive species, and cover many second and third generation fluoroquinolone resistant *Staphylococci*.

S7.2
CHARACTERIZATION OF OCULAR ISOLATES FROM INDIA AND THE US

David W Stroman

Alcon Labs, Ft Worth, Texas, USA

More than 2500 recent isolates from conjunctivitis, blepharitis, corneal ulcers and endophthalmitis in India and the US have

been characterized by definitive species-level identification. The susceptibility to over 20 antibiotics was determined using end-point broth dilution MIC methods. A variety of DNA-based methods have been used to further study the genomes of selected *Staphylococcus aureus* and *Pseudomonas aeruginosa* isolates. These methods have revealed significant differences in the genome size as well as the presence and absence of several virulence factors.

The specific findings with ocular isolates from India and the US will be presented. The importance and impact of these findings on clinical practice will be discussed.

S7.3
UPDATE ON FUNGAL KERATITIS

Shi Weiyun
China

Fungal keratitis has been a very important corneal problem. Early diagnosis and choosing right surgical indications are vital to the prognosis of the problem. Lab tests such as 10% potassium hydroxide wet mount of corneal scrapings, fungal culture and confocal microscopy are very useful for early diagnosis. Gene/protein diagnosing methods have been studied, but have not yet come with any mature products. Natamycin and amphotericin B have been proved to be the most effective antifungal agents. They work very well together with necessary remove of superficial infected tissues. Different from systemic fungal infections, we found phospholipase B is not important in corneal fungal infections. So this may not lead to a cure of fungal keratitis. When medications appear to be ineffective and the infection has not yet reached the endothelium, lamellar keratoplasty could be very safe and effective. And penetrating keratoplasty should still be done in cases with infections going through the cornea.

S7.4
ACANTHAMOEBA KERATITIS

Panida Goseyarakwong
Thailand

Acanthamoeba keratitis is often initially problematic in diagnosis, difficult to treat from encyst many years, and intermittently recur in treated – eyes. Its association with contact lens wearers is noted in poor personal hygiene, but trauma in noncontact lens wearers can be associated. Fine epithelial and subepithelial infiltration, course opaque streaks and dendritiform epithliopathy are early findings to misdiagnose as herpes simplex keratitis. The stromal infiltration as ring opacity is often differentiated from bacterial or fungal infection. However, radial perineuritis is a helpful sign and pain out of proportion to corneal findings is typical. Delayed diagnosis can worsen prognosis. Good visual outcome in those treated early is still varied and long term follow up is crucial to prevent blindness.

S7.5
COMPARISON OF FLUOROQUINOLONES – CYTOTOXICITY ON HUMAN CORNEAL EPITHELIAL CELLS

Fung-Rong Hu
Taiwan

Fluoroquinolones have gained popularity for the treatment of ocular infections because they have been shown to be as effective as combination therapy. Recently, new generations of fluoroquinolones eye drops have been introduced to the market that believe to have stronger antibacterial potency, better drug delivery and less bacterial resistance. However, there are controversial results on the cytotoxicity of fluoroquinolones to human cornea epithelium. We conducted a study to compare the cytotoxicity of different fluoroquinolones and benzalkonium chloride (BAC) to human corneal epithelial cells by MTS assay and measurement of transepithelial electrical resistance (TER). Our results showed that the cytotoxicity observed with fluoroquinolone eye drops seems to be caused mainly by the preservative, which induced a significant decrease in membrane integrity and increase in paracellular permeability. Ofloxacin and Levofloxacin, both contain no preservatives, showed the least cytotoxicity to human corneal epithelial cells than other commercial fluoroquinolone eye drops. The new generation fluoroquinolones (Moxifloxacin and Gatifloxacin) were not less cytotoxic than the old generation fluoroquinolones.

Symposium 7 (II) — Corneal Infection

14 March 2008, 4.00 pm – 5.00 pm

Chairmen: Francis Mah, USA; Venkatesh Prajna, India

S7.6
CONTACT LENS-RELATED MICROBIAL KERATITIS — MECHANISMS AND NEW STRATEGIES FOR PREVENTION AND TREATMENT

H Dwight Cavanagh
USA

Purpose: To integrate the biological effects of contact lens wear on corneal epithelium, at the cell and clinical level, and correlate these effects with risk for lens-related infectious keratitis.

Methods: In vivo rabbit lens wear model, human studies; assessing apoptosis, basal cell proliferation, cell migration/differentiation, surface cell toxicity, tear LDH levels, central epithelial thickness, pseudomonas binding, and internalization (PA) stratified by lens O_2, wearing time, lens type, and associated lens care solution formulation.

Results/Conclusion: Contact lens wear in rabbit or man: (1) suppresses surface cell exfoliation (DW or EW); (2) decreases central epithelial thickness; (3) slows basal mitosis and vertical migration, collectively producing a stagnant epithelium. These effects are: (1) only partially affected by lens O_2; and (2) less in DW vs EW for all lens types. At identical lens O_2 levels, SCTL produce less surface cell damage but induce greater PA binding per unit surface area than do RGP lenses. Lens O_2 regulates PA binding independent of lens type. Unexpectedly, conjunctival and limbal epithelial cells do not bind or internalize PA with or without CTL use. PA internalization requires lens wear and is a central/para central event mediated by membrane lipid rafts and blocked by topical statins. The latter offer the hope of a new strategy to treat/prevent PA infections, the commonest microbial pathogen associated with CTL wear.

Support: EY-10738, and grants from the Pearle Vision Foundation Dallas, TX, Research to Prevent Blindness NY, NY; and direct institution research support from B & L, CibaVision, and Menicon Ltd.

Disclosure: The author is a consultant to Menicon Ltd.

S7.7
ROLE OF PMNS IN CORNEAL ULCER

Teruo Nishida
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Corneal infections could be calmed down by the administration of antimicrobials, such as antibiotics, anti-fungal or anti-viral agents. However, once the corneal stromal cells are activated by the factors released from microbial, biological responses may last and lead to the ulceration of the stroma, the excess destruction of stromal collagen. It has been believed that infiltrated polymorphonuclear Leukocytes (PMNs) are responsible for the collagen destruction. Recently, we reported that the resident corneal stromal cells are the effecter cells for collagen degradation, but infiltrated PMNs are modulating cells in vitro. Based on these laboratory results, I would like to discuss the basic concepts for the successful treatment of the infectious corneal ulcer.

S7.8
PATHOGENESIS OF FUNGAL KERATITIS — ITS IMPLICATION IN MANAGEMENT

Prashant Garg
India

Mycotic keratitis is an important cause of ocular morbidity in developing countries. It accounts of nearly 40% of all cases of keratitis in tertiary eye care centers in India. Although such a common entity it poses a therapeutic challenge because of delayed presentation, lack of effective fungicidal agents and lack of understanding of the pathogenesis. At LV Prasad eye institute we carried out several studies to understand various aspects of pathogenesis of fungal keratitis. We found that the progression of fungal keratitis in the early phases is agent dependant while in the late phase is host related. The cases presenting with deep infiltrate have fungal filaments penetrating descement membrane and even extend into anterior chamber. In contrast, in the cases presenting as raised plaque fungal filaments grow on surface of cornea with minimal stromal inflammation and tissue necrosis. The tissue damage in fungal keratitis is by matrix metalloproteases and the enzyme levels are dependant on the degree of tissue reaction.

Thus the management of mycotic keratitis should not only aim at rapid elimination of the pathogens but also control of inflammation and tissue damage. The patients presenting as raised

plaque can be benefited by superficial keratectomy. Lamellar keratoplasty including deep anterior lamellar keratoplasty may not be the best choice in deep keratitis.

S7.9
BIOENGINEERED PEPTIDES — THE FUTURE FOR ANTIMICROBIAL THERAPY

RW Beuerman

Singapore Eye Research Institute, Department of Ophthalmology, Yong Loo Lin School of Medicine, NUS, Singapore

Purpose: Ocular infections in Asia account for a large part of the corneal blindness, and at the same time multi-drug resistance is hampering the development of successful new antibiotics. Bioengineering naturally occurring peptides may be one route to overcoming this problem. We have developed analogues of a natural human peptide, beta defensins 3 (hBD3) with enhanced pathogen killing ability and safety to ocular epithelial cells.

Methods: Two series of peptide analogues were synthesized by solid-phase techniques, purified and checked by mass spectrometry. Tests of absolute pathogen killing were carried out with ATCC strains of Pseudomonas aeruginosa, Staphylococcus aureus, Bacillus cereus, and E. coli, comparisons were made with the wild-type peptide and gentamicin. Cytotoxicity was determined by dose response studies of human conjunctival cells (HCC) to each analogue and wild-type hBD3 over the concentration range of 10-200 microg/ml.

Results: Linear analogues of 45 aa were found not to be cytotoxic to HCC at concentrations of up to 100 microg/ml compared to the wild-type which was cytotoxic at 20 microg/ml. Their killing ability was equal to the wild type hBD3. Another series of C-terminus, 10 aa analogues were safe to HCC at concentrations up to 200 microg/ml and displayed outstanding killing ability to Pseudomonas at 50 microg/ml at 2 hours exposure, were secondarily effective for B.cereus but not to E.coli.

Conclusions: Molecular improvements to the design of these analogues could further enhance the properties of these analogues. Benefits from this approach are that resistance is less likely to occur due to their mechanism of action and they can be readily applied in saline at high concentrations.

Support: NMRC IBG, 10808/2003, CPG/007/2003, CPG/007/2004.

S7.10
BACTERIAL KERATITIS — THINKING OUTSIDE THE SQUARE

Minas T Coroneo

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There are few places in the body where bacterial infection can have such devastating consequences as in the cornea. Bacterial keratitis is a major cause of world blindness and the risk of infection remains of concern, particularly in the setting of increasing elective corneal surgery and the continued high prevalence of contact lens wear.

Whereas bacteria and epithelial surfaces can exist in balanced co-existence, the demands of modern medicine and the development of new antibiotics has progressed the arms race between bacteria and designers of new antibiotics. The traditional cellular targets of antibiotics, causes of antibiotic failure, virulence mechanisms at the ocular surface and counter strategies to these mechanisms will be reviewed, particularly in relation to developing new treatments. The contribution of prophylactic use of topical ocular antibiotics to the development of bacterial resistance will be discussed. The potential for ultraviolet corneal treatments to increase the risk of corneal infection will be examined.

Several new interventions in the management of bacterial keratitis will be reviewed. As examples of such tactics, our experience with the use of hyperbaric oxygen in the management of pseudomonas keratitis as well as the management of corneal biofilms in crystalline keratopathy with YAG laser will be discussed.

Inaugural Asia Cornea Society Scientific Meeting
Shangri-La's Rasa Sentosa, Singapore, 13-14 March 2008

ASIA CORNEA SOCIETY

POSTERS

B01
INTRACAMERAL VORICONAZOLE FOR FUNGAL ENDOEXUDATES – CASE REPORT

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Purpose: To report successful treatment of fungal endoexudates with intracameral voriconazole.
Methods: 50 years old male presented with pain, redness, watering of 20 days duration. He was on topical natamycin, gatifloxacin, fortified cephazolin eye drops on presentation. Patient had 2 mm x 2 mm full thickness infiltrate, endoexudates in 6 mm x 7 mm area and 1mm hypopyon along with less than 1 mm corneal perforation. Patient underwent application of cynoacrylate glue and therapeutic bandage contact lens. Corneal scrapings and AC tap was positive for fungal filaments. He was given topical 1% voriconazole eye drops and 3 intracameral voriconazole (50 microns/0.1 ml) injections.
Results: Endoexudates resolved completely leaving a scar at deep stromal and descemets level. Total time taken for resolution of keratitis was 1.5 months and there was no recurrence over a period of 7 months. Increased AC reaction was not noticed after any intracameral voriconazole injection.
Conclusion: Fungal keratitis especially deep infiltrates are refractory to most of the present antifungal medications and may require therapeutic transplants. Present case highlights the role of voricanazole in such cases which can be used before deciding for penetrating keratoplasty.

B02
A RARE CASE OF STROMAL MICROSPORIDIAL KERATITIS SUCCESSFULLY TREATED WITH DEEP LAMELLAR GRAFT

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[1]Singapore National Eye Centre, Singapore, [2]Singapore Eye Research Institute, Singapore

Purpose: To describe a case of microsporidial stromal keratitis in an immunocompetent patient. Diagnosis was confirmed by corneal biopsy. This is the first case reported to be treated successfully with a deep lamellar keratoplasty.
Methods: Descriptive case report. A 42 Year-old Pakistani Female had an eight-year history of symptoms in the left eye (LE). She had been previously diagnosed as having HSK and Thygeson's keratitis. At presentation, she had blurring of vision in the LE. BCVA RE 6/6, LE 6/60. On examination, there was irregular deep stromal opacity with keratitic precipitates and occasional cells in the anterior chamber. Investigations for TB, syphyllis and tetraplex tests were normal; and all other hematological/biochemistry/virology investigations were normal – she was not found to be immunocompromised
Results: A corneal biopsy revealed microsporidial infiltration of the stroma. After prolonged intensive medical treatment with fumagillin and oral albendazole, she opted for a deep lamellar keratoplasty using the big bubble technique for complete stromal replacement. One month post-op her BCVA is 6/30 in the LE.
Conclusion: Stromal Microsporidia keratitis is a rare entity. Conventional treatment for such a condition has been penetrating keratoplasty. This is the first case of microsporidia keratitis that is successfully treated with deep lamellar graft.

B03
MICROSPORIDIAL KERATOCONJUNCTIVITIS IN OTHERWISE HEALTHY INDIVIDUALS

S Sanjay, SM George, KG Au Eong
Alexandra Hospital, Singapore

Purpose: To describe three cases of microbiologically confirmed and three cases of presumed microsporidial keratoconjunctivitis in otherwise healthy individuals.
Methods: Retrospective case series.
Results: Six male patients aged 16 - 47 (mean 36.3) years presented with complaints of unilateral eye redness, foreign body sensation and blurring of vision for 3 days – 3 weeks. All patients had been treated by their general practitioner with topical antibiotics and 2 had also used topical steroids. There was no history of ocular trauma or contact lens use. Three patients had their eyes exposed to muddy water while playing football in the rain prior to the onset of symptoms. Their presenting visual acuity ranged from 6/6 to 6/9. Slit-lamp biomicroscopy revealed coarse, multifocal, punctate epithelial keratitis and accompanying conjunctivitis in all cases and anterior stromal infiltrates in 4 cases. Corneal scrapings were performed in 5 cases and modified trichrome staining revealed pinkish to red spores characteristic of microsporidia in 3 cases. Four patients were treated with topical gatifloxacin and two cases with topical chloramphenicol and hourly lubricant eye drops. Two patients who were using topical steroids had this discontinued. All six patients showed resolution of epithelial keratitis but with residual visually inconsequential subepithelial scars after 2 weeks of treatment.

Conclusions: Microsporidial keratoconjunctivitis can occur in otherwise healthy individuals without any loss of visual acuity. Microsporidial spores may not be isolated in all cases and only presumptive diagnosis based on clinical signs can be made.

B04
VISANTE™ OCT IS USEFUL FOR TREATMENT OF CORNEAL INFECTIOUS DISEASE

Shunji Yokokura, Toru Nakazawa, Kohji Nishida
Tohoku University Hospital, Japan

Introduction: Corneal edema is very important to estimate activity of infection because of corneal edema is yield to some inflammatory condition and disappears gradually when original lesion is eliminated. However, objective quantitative analysis of corneal thickness by old instrument is very difficult and limited. Anterior segment OCT (Visante OCT™) provides anterior segment scans, high-resolution corneal scans, and pachymetry maps. In pachymetry map, corneal thickness at 25 segments is displayed as colored map, therefore it is easy to analyse quantitatively change of corneal thickness at each segment with recovery or deterioration of some corneal diseases, especially corneal infectious disease. In this study, we observed changes of corneal thickness in 3 cases with corneal infectious diseases by Visante™ OCT, and investigated effectiveness of this instrument for analysis of these disease.
Cases: Case 1 was 72-year-old man with fungal keratitis. Average of corneal thickness was 644 ± 13 μm. We treated him by 1% voriconazole eyedrop, etc, and measured corneal thickness in infiltrated area and whole cornea by a week. After 2 weeks, the average thickness of the whole cornea decreased to 585 ± 25 μm ($p<0.05$), therefore we continued the same medication and corneal lesion was cured. Case 2 was 72-year-old man with fungal keratitis. Case 3 was 17-year-old man with acanthoamebal keratitis. In both cases, we measured corneal thickness in the same manner.
Conclusion: Visante™ OCT is very useful to estimate effectiveness of some drugs for corneal infectious disease by quantitative measuring of changes of corneal thickness.

B05
EFFICACY OF FLUCONAZOLE SUBCONJUNCTIVAL INJECTION AS ADJUNCTIVE THERAPY FOR SEVERE FUNGAL CORNEAL ULCER

Saichin Isipradit
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Purpose: To assess the efficacy of 2% Fluconazole subconjunctival injection as an adjunctive treatment in severe recalcitrant fungal corneal ulcer.
Methods: Retrospective, non-comparative interventional case series. This study included six eyes of six patients with severe fungal corneal ulcer that did not respond to therapy with topical antifungal drugs, oral Itraconazole (200 mg) twice a day and 10 μg intracameral Amphotericin B. All patients were treated with 0.5 ml of 2% Fluconazole subconjunctival injection twice a day as adjunctive therapy for 5 days then once a day till 14 days.
Results: Three patients were successfully treated within 14 days. Two patients were partially responded, and one of them underwent evisceration. Last patient did not respond to treatment and enucleation was done. Severe local and systemic side effects were not found.
Conclusion: 0.5 ml of 2% Fluconazole subconjunctival injection can be a very useful treatment as adjunctive therapy by increasing success rate of medical treatment and delay progression of infection in severe recalcitrant fungal corneal ulcer instead of early surgical interventions such as penetrating keratoplasty, evisceration and enucleation.

B06
THE EFFECT OF AZITHROMYCIN IN THE TREATMENT OF CHLAMYDIAL CONJUNCTIVITIS

Yan-Ming Chen, Yu-Chih Hou, Fung-Rong Hu
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Purpose: To access the efficacy of azithromycin in the treatment of chlamydial conjunctivitis.
Methods: Sixty-seven patients with clinically suspected chlamydial conjunctivitis visiting our out patient clinic in 2006 were enrolled to receive conjunctival swabs for chlamydial direct fluorescent antibody (DFA) tests. Patients with positive results were treated with a single dose azithromycin (1000 mg) once a week for consecutive two weeks. Repeated DFA examinations were performed 4 to

6 weeks later. If the DFA examinations still showed positive results, repeated single dose of azithromycin once a week for one week was given again till the DFA showed negative results. The occurrence and frequency of adverse events were analyzed.

Results: sixty-seven percent of the patients (45/67) showed positive DFA results. Among them, 28 completed the treatment course. Eradication of C. trachomatis was achieved in 27 of 28 (96.4%) patients treated with azithromycin.19 (67.9%) patients were cured by biweekly single dose azithromycin and 8 (28.5%) patients by augmented single dose azithromycin. Among the 8 patients receiving augmented treatments, 4 (50%) patients was treated by single augmented dose while the other 4 (50%) patients need two augmented single dose azithromycin treatments before the DFA showed negative results. The oral azithromycin in this study was well tolerated.

Conclusion: Oral azithromycin was effective and well tolerated in the treatment of chlamydial conjunctivitis. However, augmented single dose azithromycin treatments may be necessary to eradicate the C. trachomatis.

B07
GENOTYPE IDENTIFICATION OF ACANTHAMOEBA IN VIETNAMESE PATIENT WITH KERATITIS

Le Quang Huan, Pham Thu Lan, Hoang Minh Chau, Vu Bich Huong
Vietnam National Institute of Ophthalmology, Vietnam, Vietnam National Biological Institute, Vietnam

Purpose: To determine variable regions in restrict length of 18S-rRNA to identify species of Acanthamoeba in Vietnamese patient suffered from Keratitis.

Methods: In this report we use specific primers NS1F and NS8R for amplying 18S rRNA by PCR. Phylogeny construct was obtained by using MEGA 3.1 with the Kimura two-parameter correction for multiple substitutions. Tree were rooted with Balamuthia Mandrillaris sequence.

Results: The PCR products for genus Acanthamoeba with genotype T1- T12 when using primer pair Aca F/Aca R will be obtained with 580 bp to 610 bp in length (from location 19 th to 604 th) and phylogenic tree has the shape similar to that obtained by using intire sequences 18S-r RNA.

Conclusion: Acanthamoeba was isolated in our study is Acanthamoeba Castellanii with genotype T4. The interstrain genotypes of Acanthamoeba should be determined with the analysis of variable regions of 5'-half of the 18S-rRNA molecule.

B08
AN EXPERIMENTAL STUDY ON INTRASTROMAL INJECTION AMPHOTERICIN B IN *FUSARIUM SOLANI* KERATITIS IN RABBITS

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Purpose: To compare the effectiveness between intrastromal injection of amphotericin B 0.15% (50 mg) and intrastromal injection of amphotericin B 0.0005% (5 μg) and the safety of intrastromal injection Amphotericin B 0.0005% in *Fusarium solani* keratitis in rabbits.

Methods: Fungal keratitis was induced with a standardized inoculum of *Fusarium salani* placed on the debrided cornea into the right eye of 18 New Zealand white rabbits. Rabbits in Group A (n=6) was treated with topical 0.15% amphotericin B hourly for 12 hours daily (control), while rabbits in Group B (n=6) was treated with intrastromal injection 0.15% (50 mg/ml) amphotericin B and Group C rabbits (n=6) were treated with intrastromal injection 0.0005% (5 μg/ml). The intrastromal injection was given at day 3, 6, 9 and 11. Serial clinical examination was conducted at day 3, 6, 9, 11 and 14 to look at the changes in the size of the epithelial defect, the depth of the ulcer, stromal infiltration, hypopyon and the presence of satellite lesion. The infected eyes were enucleated on the day 14 and sent for histopathology evaluation.

Results: The intrastromal amphotericin B 0.0005% injection (group C) was found to be effective compared to intrastromal 0.15% amphotericin B injection ($p<0.001$) in treating *Fusarium* keratitis in rabbits. There was statistical significant difference in the size of epithelial defect ($p=0.02$) and satellite lesion ($p=0.02$) for the rabbits treated with intrastromal injection amphotericin B 0.0005% compared to the other two groups. Histopathological examination also revealed absence of fungal load, the depth of ulcer limited to anterior two third, moderate inflammatory responses and mild granulation tissue in the group treated with intrastromal 0.0005% amphotericin B injection. These histopathological findings were consistent with serial clinical observation. There was no evidence of corneal decompensation, severe punctate keratopathy and or corneal melting in the group treated with intrstromal 0.0005% amphotericin B injection.

Conclusion: Intrastromal 0.0005% (5 μg) amphotericin B injection was found to be effective and safe in treating *Fusarium solani* keratitis. Thus, it can be applied to the patient whose refractory to conventional therapy and can reduce the cost and shorten the hospital stay.

B09
EFFECT OF SOFT CONTACT LENS MODULUS ON OCULAR SURFACE TEMPERATURE

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Purpose: To study the effect of soft contact lens modulus on ocular surface temperature (OST).
Methods: 24 subjects were recruited. Subjects were non contact lens wearer, no ocular pathology/corneal inflammatory signs nor general ill-health. Subjects were wearing well-fitting soft contact lenses being right and left eye with different modulus. 5 types of contact lenses (Omafilcon A, HEMA, Senofilcon A, Balafilcon A and Lotrafilcon A) with 5 different modulus were studied (MPa 0.2, 0.29, 0.72, 1.1 and 1.4). OST was measured continuously 5 times, for 8s after a blink, first prior lens wear, then following 2 hours lens wear and immediately following lens removal, at a specific time of the day to eliminate diurnal variation. OST was measured at four different areas (corneal geometrical centre (GCC), mid peripheral, limbal and conjunctiva). Only one examiner was taking the measurement to eliminate inter-examiner variation. To control the environment, a room with standard room temperature and humidity was used. Subjects adapted to the room conditions for 20 min before measurement (Morgan PB, 1994). The ocular temperature was measured using infrared thermo-imaging (Thermo-Tracer TH9100MV, NEC San-ei), in a non-invasive manner. Type/choice of lenses worn was randomised and masked and subjects were asked to refrain from rubbing their eyes prior to and during the session. Human ethics approval was granted from the SERI ethics committee and informed consent obtained from every subject.
Results: OST during contact lens wear was found to decrease, highest at the corneal GCC (average, 0.55 ± 0.12°C), followed by mid peripheral (average, 0.45 ± 0.14°C) and limbal (average, 0.19 ± 0.08°C) compared to a bare cornea. OST was found to increase slightly at conjunctiva during contact lens wear (average, -0.04 ± 0.02). The changes was more prominant in lenses with higher modulus. However, no significant changes in OST were found on both corneal and conjunctiva upon lens removal, compared to a bare corneal, in all modulus studied.
Conclusion: Contact lenses triggered a decrease in OST on cornea during lens wear. The effect was highest at corneal GCC compared to other areas and more prominant in lenses with higher modulus. On the other hand, contact lenses triggered slight increase in OST on conjunctiva. This was believed to be due to more ocular blood flow triggered at the conjunctiva and physiologic responses of the tear film during contact lens wear.

B10
A REVIEW ON EPIDEMIOLOGICAL FINDINGS OF EYE CANCERS IN IRAN IN 2004

Fatemeh Heidary, Reza Gharebaghi, Hasan Ghasemi
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Purpose: To describe the epidemiological characterizations of patients with eye cancers seen in Iran in 2004 according published data through Annual Cancer Registration Report.
Methods: Epidemiological data of all cancers diagnosed in Iran are collected by Center for Disease Control and Prevention from all pathologic centers. The data of all eye cancers were retrieved for assessment.
Results: Of 47217 new cases in cancer, there were 187 eye cancers (0.39%) of which 116 (62%) were male and 71 (38%) were female. The most common cancer was Squamous Cell Carcinoma (18.72%), followed by Squamous Cell Carcinoma In-situ (17.11%), retinoblastoma (15.51%) and Carcinoma In-situ (10.16%). The most common histology in those younger than 10 years old was retinoblastoma which was more predominant in male. There was a clear incidence peak in early childhood carcinomas for both sexes and a particular zenith between 70-79 years (17.65%).
Conclusion: Statistical analysis indicated that retinoblastoma is more common than melanoma in Iran. These expanded epidemiological characterizations serve to provide epidemiologists, ophthalmologists and health-care professionals to monitor future disease trends and provide foundations for comparison findings with other countries.

B11
USE OF FIBRIN GLUE IN PTERYGIUM SURGERY — AN EVIDENCE-BASED ANALYSIS

Sachin Mathew George, Kah-Guan Au Eong
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Purpose: To perform an evidence-based analysis on the efficacy of fibrin glue for securing the conjunctival autograft in pterygium surgery.
Methods: A systematic search of the electronic database MEDLINE was performed to identify all English language articles pertaining

to the use of fibrin glue in pterygium surgery. The primary outcome evaluated was evidence supporting the efficacy of the fibrin glue in pterygium surgery.

Results: Of the ten relevant articles, 3 randomised clinical trials (RCTs) and 3 case series were identified. The 3 RCTs compared different brands of fibrin glue with different types of sutures (Beriplast P® vs 10-0 Nylon®, Quixil® vs 8-0 Vicryl® and Tisseel Duo Quick® vs 7-0 Vicryl®). The total number of patients varied from 22 to 65 and the mean follow up time ranged from 3 weeks to 6 months in the RCTs. The transplant success rate was 100% in both study groups in all 3 RCTs. All 3 RCTs showed a statistically significant reduction in the average operating time ($p<0.05$) and improvement in the postoperative comfort ($p<0.05$) on using fibrin glue. In the largest case series, which was non-randomised, the recurrence rate was 5.3% with fibrin glue and 13.5% with suture ($p=0.31$). No side effects of fibrin glue were reported.

Conclusion: Current available evidence in published literature suggests that the use of fibrin glue in pterygium surgery is as efficacious as sutures in anchoring the conjunctival autograft and has the added advantage of reducing the operating time and postoperative pain compared to using sutures.

B12
TISSUE ADHESIVE — AN EYE SAVING PROCEDURE IN CORNEAL PERFORATIONS

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Nagpur, Maharashtra, India

Purpose: Many eyes lose useful vision in corneal perforations. A majority can be saved by sealing the perforations by tissue adhesive. To evaluate safety and efficacy of tissue adhesive.

Methods: Retrospective case series of 51 eyes between 2001-2004. N-butyl cyanoacrylate was applied under topical anaesthesia and bandage lens was placed .All eyes followed up for 120 days, adhesive removed after complete loosening. Parameters analyzed were – Age, Sex, Vision, Injury, Associated infection, Site and size of perforation, status of anterior chamber, site and number of applications, air injection, adhesive loosening time, structural and visual outcome.

Results: Age 1-78 yrs, M:F 3:1, 33%had injury, 68%had associated infection, 74.50% had perforation, 25.50% had Descemetocoele. 58.2% were <2 mm, 88.23% were central –mid peripheral. AC was flat in 54.9%. Adhesive application sites averaged 3.9, air injection required in 41.7%. Average adhesive loosening time was 5.3 weeks. 82.35% developed corneal scar, 7.84% adherent leukoma, 3.92% ,anterior staphyloma and 5.88% developed phthisis. Vision improved beyond 6/60 in 27.44%. Only 3 eyes lost all useful vision. Complications – Corneal vascularisation 7.65%, bacterial infection 0.51%, secondary glaucoma 0.51%, cataract 2.55%.

Conclusion: Tissue adhesive was effective in sealing all perforations in majority of eyes only by single application. It was found to be safe. Most common outcome was corneal scar and most frequent complication was vascularisation. The vision improved in some patients significantly.

B13
MEDICAL MANAGEMENT OF OSSN WITH MITOMYCIN C (MMC)

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Purpose: To report dramatic regression of large Ocular Sqamous surface neoplasia with topical Mitomycin C.

Methods: 92 years old male presented with 7 mm x 8 mm fleshy mass on temporal limbus. Mass had cork screw vessels and surface keratin consistent with ocular surface sqamous neoplasia. Impression cytology using Millipore filter confirmed the clinical diagnosis of OSSN. Considering the age and large mass, patient was given only topical Mitomycin C (0.4 mg/ml, 4 times/day, 4 days a week; 3 weeks chemotherapy and 1 week off; 3 such cycles).

Results: Mass had resolved 80% after 2 cycles and almost completely after 3 cycles. Ocular surface was healthy and no side effect was perceived by the patient. Patient was followed up for 8 months and no recurrence was noticed.

Conclusion: Present case confirms the safety and efficacy of topical MMC in OSSN which can be first line of management in large lesions.

B14
UNUSAL CASE OF CORNEAL EPITHELIAL DYSMATURATION

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Chosun University Hospital, Korea

Purpose: We experienced a case of unilateral central corneal epithelial dysmaturation treated successfully with amniotic membrane transplantation and mitomycin C.

Methods: Case report of a 67-year-old man visited the ophthalmology department for whitish corneal opacity, which was developed 1 year ago and gradually increased in size. Slit lamp examination showed an individual island of opalescent corneal epithelial lesion, 2 x 2.4 mm in size located at the central cornea without neoplastic fibrovascular corneal pannus.
Results: The unilateral central corneal epithelial dysmaturation was carefully removed by superficial excision. Amniotic membrane transplantation and topical 0.02% mitomycin C were used for treatment success and recurrence prevention.
Conclusion: Three years after treatment, the lesion had completely regressed and did not recur under slit lamp examination. Amniotic membrane transplantation and topical 0.02% mitomycin C were useful treatment for corneal epithelial dysmaturation.

B15
TREATING RECURRENT CORNEAL EPITHELIAL EROSION SECONDARY TO SEVERE DRY EYE WITH A PMMA RING-AMNIOTIC MEMBRANE CONTACT LENS

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Purpose: To introduce and evaluate a therapeutic PMMA ring–amniotic membrane (AM) contact lens in promotion re-epithelization in patients suffer from recurrent corneal epithelial erosion secondary to severe dry eye.
Methods: The patients suffer from recurrent corneal epithelial erosion secondary to severe dry eye were enrolled in this study after treating with medicine and/or the bandage contact lens long time. In experimental group, the PMMA ring –AM contact lens was inserted in one eye of each patient, and the bandage contact lens was inserted in another eye as control. The patients were followed with slit-lamp examination and fluorescein staining for 3 weeks. Best corrected visual acuities (BCVA) and the scores of the questionnaire on the symptoms caused by dry eye and the inserted lens were compared before and after insertion. The complications were recorded.
Results: BCVA and the corneal re-epithelization regained within 7 days in experimental group were more rapidly then control group. Questionnaire indicated the symptoms of dry eye were relieved obviously after the application of the PMMA ring -AM Contact lens compared with pre-treatment and the control eyes. Among symptoms, total scores for foreign body sensation (15 and 20 Scores) and blurred vision (20 and 20 Scores) were high. There was no severe complication occurred. There were 2 times that the amniotic membrane slipped off the ring within 3 days after the insertion.
Conclusion: Our findings demonstrated that this new approach of PMMA ring –AM contact lens were useful in promotion re-epithelization in patients suffer from recurrent corneal epithelial erosion secondary to severe dry eye. The advantages includes its efficacy, non-traumatic sutureless, safely and simplicity.

B16
ANTERIOR STROMAL PUNCTURE WITH ND-YAG LASER FOR THE TREATMENT OF RECURRENT CORNEAL EROSIONS

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Purpose: To evaluate the clinical outcomes in patients with recurrent corneal erosions who received anterior stromal puncture by use of neodymium-aluminum-garnet (Nd:YAG) laser.
Methods: A total of 33 patients with recurrent macroform corneal erosions who showed poor response to conservative managements were treated with Nd-YAG laser. The cause and frequency of corneal erosions, refraction, intensity of pain, slit-lamp biomicroscopic examination and corneal surface regularity were recorded before and after operation.
Results: Sixteen patients were completely symptom-free after operation. Twelve patients suffered eye pain without evidence of macroform erosion, and the residual 5 patients developed corneal epithelial defect again. Patients with a traumatic etiology responded better to Nd-YAG therapy than those with an unknown cause. In patients with macroform and symptom-only recurrence, the frequency of corneal erosions and the severity of pain improved significantly after operation. No patient revealed significant refraction change, and corneal surface regularity improved with marginal significance post-operatively.
Conclusion: Anterior stromal puncture by Nd: YAG laser is an effective, simple and safe procedure to treat recurrent corneal erosion. It can ameliorate the symptoms both in terms of the attack frequency and the pain intensity, and the corneal surface become smoother without change of refraction.

B17
EXPERIENCE OF AMNIOTIC MEMBRANE TRANSPLANT IN CORNEAL DISEASES AT AL-SHIFA TRUST EYE HOSPITAL

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Purpose: Human amniotic membrane transplant (AMT) is a useful surgical technique for the treatment of damaged ocular surface. Here we report the experience of AMT in different corneal diseases operated at Al-Shifa Trust Eye Hospital, Rawalpindi, from May 2006 to August 2007.

Methods: Frozen human amniotic membrane taken from a sero-negative donor and stored at -80°C in DMEM and glycerol was used for transplant. The study consisted of 102 (72 males and 30 females) patients. The indications of the use were; symptomatic bullous keratopathy (N=25); chemical burns (N=16); Stevens Johnson Syndrome (N=15); corneal opacity with vascularization (N=13); stromal thinning with descemetocoele or descemetocoele with microperforation (N=9); corneal perforation with complications (N=6); spheroidal degeneration (N=5); pterygium (N=5); vernal keratoconjunctivitis (N=4); non-chemical trauma (N=2) and gelatinous dystrophy (N=2). The average age of the patients was 37.38 years (4.5-90 years) and the average follow up period was 131.86 days.

Results: Over all 74.5% patients showed clinical improvement while 85.3% patients improved subjectively. Visual acuity improved in a total of 49% patients. AMT was repeated in 8 patients.

Conclusion: Our study concludes that AMT is a useful treatment option in a variety of ocular surface pathologies. However, its efficacy varies in different diseases.

B18
SURGICAL MANAGEMENT AND IMMUNOHISTOCHEMICAL STUDY OF CORNEAL PLAQUES IN VERNAL KERATOCONJUNCTIVITIS

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Purpose: To report the surgical management and histopathological and immunohistochemical analysis of the corneal plaques in vernal keratoconjunctivitis (VKC).

Methods: Case report.

Results: Case 1. A 12-year-old boy had the history of atopic diseases. VKC was diagnosed at the age of 7 years. Corneal epithelial defect which was unresponsive to conservative systemic and topical medical treatment persisted for 3 months. Corneal plaques complicated and the best-corrected visual acuity (BCVA) was 0.05 in both eyes. **Case 2.** A 7-year-old boy presented with itching and photophobia for 1 year. Shield ulcer persisted for 4 months and was followed by corneal plaques in spite of medical treatment in both eyes. Under general anesthesia, lamellar keratectomy with amniotic membrane transplantation (AMT) was performed for both cases. Hematoxylin & eosin staining of the excised corneal specimen revealed a thick layer of eosinophilic material attached to the Bowman's layer in both cases. These dense laminated deposits were positive for eosinophil granule major basic protein (MBP), confirmed by immunohistochemical study. The shield ulcer healed after the amniotic membrane was removed 6 weeks postoperatively in case 2. The BCVA improved from 20/100 preoperatively to 20/50 three months after the surgery. In case 1, the symptoms of itching and tearing were so intense that the amniotic membrane dislodged in postoperative 3 weeks before complete re-epithelialization. Repeated surgeries of lamellar keratectomy with AMT were needed. The post-operative BCVA was 0.05 in the right eye and 0.15 in the left eye. No recurrent corneal plaque developed though corneal opacity complicated in both cases.

Conclusion: MBP plaque on the Bowman's layer may hinder the epithelialization in shield ulcer. Lamellar keratectomy with AMT offers an effective management by removing the cytotoxic plaques and protecting the denuded stroma from deposition of inflammatory debris.

B19
THE EFFECT OF BEVACIZUMAB IN INHIBITING CORNEAL NEOVASCULIZATION

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Purpose: Our animal study demonstrated the effectiveness of subconjunctival injection of bevacizumab in inhibiting corneal neovasculization formation. The purpose of this study is to report the treatment outcome of subconjunctival injection of bevacizumab in patients with corneal neovascularization.

Methods: Sixteen patients with unilateral clinically significant corneal neovascularization were included. Subconjunctival injection of bevacizumab was performed once per month for 3 times. Resolution of corneal neovasculization, reduction of lipid infiltrate,

and improved visual acuity were used as the parameters to evaluate the treatment results.

Results: In the 16 patients enrolled, 4 patients have neovascularization after penetrating keratoplasty, 8 patients had neovascularization with lipid keratopathy due to a variety of etiologies, 4 patients had neovascularization without lipid keratopathy due to a variety of etiologies. Four patients had partial resolution of neovascularization, reduction of lipid infiltrate and increased visual acuity after serial subconjunctival injection of bevacizumab. Ten patients had no response after treatment. Two patients were found to have progression of neovasculization after treatment.

Conclusion: Although our animal study demonstrated the effectiveness of subconjunctival injection of bevacizumab in inhibiting corneal neovasculization, the effects on clinical application was not as good as animal study. The frequency of injection, the duration of neovasculization formation, and the etiologies leading to neovasculizition may all contribute to the results.

B20
FORMALDEHYDE TOXICITY ON THE OCULAR SURFACE

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Purpose: The surgical spear used during the refractive surgery was found with high concentration of formaldehyde. To evaluate the toxicity of formaldehyde on the corneal epithelium ex vivo and in vivo.

Methods: Formaldehyde concentration was detected within different surgical spears. Human corneal epithelium was cultured ex vivo and cell viability test was done to evaluate the toxicity from different concentration of formaldehyde. Refractive surgery was done on rabbit cornea except laser photoablation by using different surgical spears during the surgery. Corneal epithelium healing was evaluated by slit-lamp biomicroscopy. Tear film stability was evaluated by tear interference images.

Results: The cultured human corneal epithelium may tolerate the concentration of formaldehyde no more than 250 ppm. The concentration of formaldehyde and the exposure duration are highly correlated with the survival rate of human corneal epithelium.

Conclusion: Formaldehyde is a human carcinogen and leads local irritation directly. The ocular surface that immersed in the high concentration of formaldehyde during refractive surgery will delay the wound healing process and prolong the complications such as dry eye syndromes after operation. Ophthalmologists who perform refractive surgery should use a safer product during the surgery to prevent complications.

B21
EXPRESSION OF MEMBRANE-ASSOCIATED MUCINS IN THE HUMAN OCULAR SURFACE AND ORAL MUCOSAL EPITHELIUM

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Purpose: Cultivated oral mucosal epithelial sheet transplantation has been reported to be effective for the reconstruction of the ocular surface of severe ocular surface diseases. We investigated the expression of membrane-associated mucins in human oral mucosal epithelial cells.

Methods: Specimens of oral mucosal tissue were harvested from healthy volunteers. The oral mucosal and corneal epithelial cells were cultured on temperature-responsive culture dishes to produce stratified cell sheets. RT-PCR was used to determine the expression of membrane-associated mucins (MUC1, -3, -4, -12, -13, -15, -16, and -17) in these cell sheets. Sections were subjected to immunohistochemical examination using MUC16 antibody (OC125) to determine the distribution of MUC16 protein in the cultivated oral mucosal epithelial sheets.

Results: Cultivated oral mucosal epithelial cells formed 3- to 5-cell stratified sheets for about 2 weeks. MUC1, -4, and -16, but not -3, -12, -13, -15, or -17 mRNA was detected in the oral mucosal epithelial as well as in the corneal epithelial sheet. MUC16 protein was localized in the apical cell layers of the cultivated oral mucosal and corneal epithelial sheets, but the human oral mucosal epithelium did not express MUC16 proteins in any cell layers.

Conclusion: The membrane-associated mucins, MUC1, -4, and -16, are expressed in the human oral mucosal epithelial cell sheet as well as human ocular surface epithelial cells. These membrane-associated mucins may thus contribute to the ocular surface reconstruction after oral mucosal epithelial sheet transplantation for patients with severe ocular surface disorders.

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B22
THE EFFECT OF BEVACIZUMAB ON CORNEAL NEOVASCULARIZATION IN RABBITS

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Purpose: To determine the efficacy of topical and subconjunctival bevacizumab injection in the treatment of corneal neovascularization.

Methods: Corneal neovascularization was induced with a slik suture of the corneal stroma in 12 rabbits (24 eyes). One week after suturing, 4 rabbits were treated with topical bevacizumab 5 mg/ml (A group) and another 4 rabbits were treated with topical bevacizumab 10 mg/ml (B group) in the right eyes twice a day. Bevacizumab 1.25 mg/ml were injected subconjunctivally in the right eyes of 4 rabbits(C group). The left eyes were used as the control. The area of corneal neovascularization was measured and evaluated histologically using light microscopy. The concentration of vascular endothelial growth factor (VEGF) in corneal tissue was measured.

Results: The neovascularized area was smaller in A, B and C groups than control group (p=0.001). The histologic examination revealed fewer corneal vessels and the concentration of VEGF was also lower (p=0.01) in the treated group.

Conclusion: Topical and subconjuctival bevacizumab may be useful in treatment of the corneal neovascularization and a further study will be necessary.

B23
EFFECT OF CONTACT LENS WEARING ON LOCALIZATION OF ZO-1 IN THE RABBIT CORNEAL EPITHELIUM

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Purpose: The barrier function of the corneal epithelium depends primarily on tight junctions, of which zonula occludens (ZO)-1 is a major component. The corneal epithelium requires ambient (atmospheric) oxygen, with hypoxia induced by the wearing of contact lenses having been found to result in a reduction in epithelial barrier function. We have now investigated the effect of contact lens wearing on ZO-1 localization in rabbit corneal epithelial cells in vivo.

Methods: Rigid gas-permeable (RGP) or polymethylmethacrylate (PMMA) lenses were worn by albino rabbits in one eye for 24 h. The structure of the corneal epithelium was then examined by in vivo confocal microscopy. The corneas were removed and the integrity of tight junctions between epithelial cells was evaluated by immunofluorescence analysis of ZO-1.

Results: Immunofluorescence staining revealed continuous ZO-1 immunoreactivity around the perimeter of superficial cells of the corneal epithelium in both control eyes and eyes that received RGP lenses. In contrast, ZO-1 staining was disrupted, patchy, and generally weaker in eyes that received PMMA lenses than in control eyes. The wearing of PMMA lenses, but not that of RGP lenses, also induced a significant decrease in epithelial cell size compared with that in control eyes.

Conclusion: Corneal epithelial integrity and tight junction organization were maintained after wearing of RGP lenses for 24 h. In contrast, the wearing of nonpermeable lenses disrupted tight conjunctions between superficial epithelial cells as well as induced a decrease in epithelial cell size, likely as a result of hypoxia at the ocular surface.

B24
HUMAN DEFENSINS STIMULATE SPECIFIC CYTOKINE PRODUCTION IN CONJUNCTIVAL EPITHELIAL CELLS

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Purpose: Neutrophil defensins (HNPs) and beta defensins (HBDs) are expressed on the ocular surface. The role of defensins in inflammation modulation has been suggested from studies of lung epithelial cells. The purpose of this study was to examine the effect of HNP1, HBD2 and HBD3 on cytokine secretion of conjunctival epithelial cells.

Methods: Human conjunctival cells were stimulated with defensins at concentrations between 1-20 μg/mL for 6-24 hrs. Antibody-based cytokine arrays and multiplexed microbead analysis were used to measure cytokine concentrations in culture medium. Western blot analysis was used to detect the activation of specific protein kinases.

Results: HBD3 caused more than 50% cell death at the concentration of 10 μg/mL and higher. No cell death was observed with HNP1 or HBD2 at concentrations up to 20 μg/mL. Only IL-6, IL-8

and RANTES were detected in the culture medium in the absence of defensins stimulation, and the levels increased in the presence of HNP1, HBD2 and HBD3. HBD2 and HBD3 also stimulated the secretion of IL-1 and MIP-1α. The cytokine response was first observed 2-8 hrs after the stimulation, and accumulated over 24 hrs. Five μg/mL of defensins was sufficient to cause significant increase of the cytokines. The increase in cytokine levels was preceded by the activation of p42/44 MAP kianse, Akt and STAT3.

Conclusion: HNP and HBD target the secretion of specific cytokines in conjunctival epithelial cells in a time- and concentration-dependent manner that may cause inflammation and further increase local defensin concentration.

B25
EXPRESSION OF TRANSGLUTAMINASES IN MOUSE AND PRIMATE EYE

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Purpose: Transglutaminase (TGM) is a class of enzymes involved in the regulation of endocytosis, cell migration, apoptosis and autophagy. Purpose of our study was to investigate the differential expression of TGM in mouse eye and eyelid.

Methods: Mouse eye, monkey and mouse eyelids were embedded in OCT (frozen tissue matrix) compound at -20°C for 2 hours. Prepared tissue blocks were sectioned with cryostat at 5 microns and collected on the clean polysine™ glass slides. Immunostainig analysis for TGM1, 2, 3 and 5 were performed on eye and eyelid sections. Mouse and monkey sclera was immediately frozen as individual tissue in liquid nitrogen for protein extraction and TGM expression was confirmed by Western blot analysis.

Results: The expression of TGM2 was found in corneal stroma, RPE, choroid, sclera, epithelial basal layers of cornea, limbus and conjunctiva while TGM1, 3 and 5 was found in RPE, choroid, sclera, epithelium and endothelium of conjunctiva, cornea and limbus. Immunohistochemistry showed the presence of TGM1, 2, 3 and 5 in the normal mouse and monkey sclera, which was confirmed by Western blot. The pattern of TGM1, 3 and 5 expression was slightly different from TGM2.

Conclusion: Our results confirmed the expression of TGM1, 2, 3 and 5 in cellular level as well as the protein level in both mouse and monkey eye tissues. Taking advantage of the understanding of TGM in critical processes such as wound healing and modulation of inflammation, translational research in ocular diseases will be greatly enhanced.

CR: None
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B26
TOLL-LIKE RECEPTOR EXPRESSION INCREASED IN STRATIFIED HUMAN CONJUNCTIVA EPITHELIAL CELLS

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Purpose: Previously we have reported that Toll-like receptor (TLR) mRNA expression decreased during cell culture for human conjunctival epithelial cells. This study is designed to explore the changes of TLR expression during the stratification of conjunctival epithelial cells.

Methods: IOBA-NHC cells were plated on 6-well insert at 0.2 x 10^6 cells/well and allowed to grow to confluence. The culture medium was then lowered to promote cell stratification at the air-liquid interface. The stratified NHC cells were collected at 4, 7 and 10 days after air-lifting. Total RNA and/or protein was extracted for the determination of TLR mRNA and protein levels. The stratification of NHC cells was examined by H&E and immunofluorescent staining.

Results: TLR1, 2, 3, 4, 5, 6, and 9 were found expressed in stratified NHC cells. Except for TLR9, increased mRNA expression was detected by real time PCR analysis for all other TLRs in the stratified cells compared to cells in submerged culture. Among those, TLR2 and TLR5 showed the most increase of averaged 6-7 folds at 7 days after air-lifting. Western blot analysis also revealed increased TLR2 and TLR5 protein expression in stratified cells. TLR1, TLR3, TLR4 and TLR6 showed less than 3 fold increase at the mRNA level. However, we were not able to detect the increase of the respective proteins by western blot analysis. Interestingly, we observed an averaged 3.5 fold increase of CD14 mRNA in the stratified NHC cells compared to those in submerged culture.

Conclusion: Air-liquid interface promoted cell stratification stimulate the expression of TLRs in conjunctival epithelial cells.

B27
UBIQUITINYLATION IN PTERYGIUM — INSIGHTS INTO DISEASE MECHANISM AND THERAPY

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Purpose: The treatment for pterygium, an ocular surface disease with uncertain etiology, is surgical, with no effective medical therapy. The ubiquitin proteosome system is the primary method of protein degradation in cells. In this study, we evaluated the role of the ubiquitin-proteasome system in pterygium.

Methods: Global gene expression in pterygium was evaluated by an Affymetrix Gene chip microarray technique, using samples from 9 primary pterygium and 4 un-involved conjunctivae as controls. Immunofluorescent staining and western blots for representative members of the ubiquitinylation enzymes were performed.

Results: Sixteen genes in the ubiquitin-proteasomal system were found to be differentially regulated in pterygium ($p<0.05$) in the microarray experiment. In the immunofluroscent staining experiments, ubiquitin activase (E1) and ubiquitin conjugase (E2) were not differentially regulated in pterygium compared to un-involved conjunctiva. Ubiquitin ligases (E3) members UBE3B and UBE3C, present in pterygium epithelial cytoplasm, were down-regulated compared to conjunctival epithelium. Western blot experiments supported these findings. Tissue expression of UBE4B, a member of the recently discovered E4 polyubiquitinylation ligases, showed presence of this protein in the nuclei of all layers of pterygium epithelium, but predominantly in the superficial layers of the un-involved conjunctival epithelium.

Conclusion: Aberrant protein degradation in conjunctiva tissue may result in pterygium formation. Regulation of cell proliferation or apoptosis via dysregulation of specific E3 and E4 ligases may be important for disease progression. Known inhibitors of this pathway may be considered for non-surgical management of pterygium, or as an adjunctive treatment to prevent recurrence after surgery.

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B28
IMMUNOHISTOCHEMICAL ANALYSIS OF EPITHELIAL CELL MARKERS AND TRANSGLUTAMINASES AT THE EYELID MARGIN OF MOUSE

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Purpose: Conjunctival epithelium is a dynamic tissue with the capacity to replace and wound-heal the ocular surface. However, the origin of the stem cells for the conjunctival epithelium is unclear. This study is designed to analyze the putative progenitor cells at the mucocutaneous junction (MCJ) by evaluating the distribution of epithelial cell markers and transglutaminases in the eyelid of mouse.

Methods: Cryosections of eyelid tissue from normal albino and black mouse were subjected to immunohistochemistry by staining the sections with cytokeratins (CKs): CK1, CK4, CK5/8, CK13, CK14, and CK19; filaggrin; involucrin; connexin 43; and transglutaminases (TGases): TGase 1 and TGase 2.

Results: The expression pattern varied across the MCJ. Skin epidermis expressed CK1, filaggrin and connexin 43, but did not express CK4, CK5/8 and CK13. Conjunctival epithelium expressed CK4, CK5/8, CK13, and little of connexin 43, but not CK1 and filaggrin. CK14 was consistently expressed in the full-thickness of skin, MCJ, and conjunctiva, as well as in the meibomian gland ducts and acini. CK19 and TGase 1 were consistently expressed basally in skin and conjunctival epithelium, while involucrin-positive cells were expressed superficially in both epithelium. TGase 2 expression was seen at the basal lamina of palpebral and fornical conjunctiva.

Conclusion: The findings suggest that the MCJ and meibomian gland may serve as the reservoir of progenitor cells for conjunctival and skin epidemis. The presence of TGase 1 may be related to the distribution of progenitor cells and TGase 2 may be essential to maintain the integrity of the conjunctival epithelium.

Support: NMRC grants IBG, and 1066/2004.

B29
THE DEVELOPMENT OF A BIOENGINEERED CORNEAL EPITHELIAL EQUIVALENT USING AN ULTRA-THIN POLYCAPROLACTONE MEMBRANE SUBSTRATE

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Purpose: To evaluate the use of an ultra-thin polycaprolactone (PCL) membrane as a substrate for the development of a bioengineered corneal tissue-equivalent.

Methods: Ultra-thin PCL membranes of 5 μm in thickness were prepared by solvent casting and biaxial stretching. One group of membranes was treated with argon plasma and membranes were analysed by atomic force microscopy (AFM). Rabbit corneal epithelial cells were cultivated on plasma-treated PCL membranes and untreated PCL membranes using serum-free media. Bromodeoxyuridine (BrdU) ELISA proliferation assays of the corneal cells were performed. The morphology and growth characteristics of the cells were monitored, and immunostaining with pancytokeratin, keratin 3 and keratin 4 was performed. *In-vivo* biocompatibility test was done by implanting PCL membranes into rabbits'corneal stroma. Rabbits were followed up with slit-lamp examination and analysed at 6 weeks by histology.

Results: AFM showed that plasma treatment increased the surface roughness of membranes. Moreover, treatment of membranes with argon plasma resulted in greater cell attachment and proliferation of corneal epithelial cells compared to untreated membranes. The mean BrdU absorbance of corneal epithelial cells cultivated on plama-treated PCL and untreated PCL, was 2.3 ± 0.23 and 1.4 ± 0.13, respectively. The cells expressed keratin 3, and not the conjunctival-associated keratin 4, which was consistent with the *in-vivo* corneal phenotype. *In-vivo* biocompatibility test showed no gross or histological reaction to PCL during 6-week follow-up.

Conclusion: An ultra-thin PCL membrane was biocompatible and shown to support the proliferation of corneal epithelial cells. This may potentially be used as a scaffold matrix in tissue-engineered corneal ingredients.

B30
CULTIVATED HUMAN CONJUNCTIVAL EPITHELIAL TRANSPLANTATION FOR TOTAL LIMBAL STEM CELL DEFICIENCY

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Purpose: To evaluate the clinical results of cultivated human conjunctival epithelial (HCjE) transplantation for total limbal stem cell (LSC) deficiency, and to compare it with cultivated human corneal epithelial (HCE) transplantation.

Methods: HCjE and HCE were cultivated on human amniotic membrane (HAM). Rabbits with surgically-induced LSC deficiency were divided into 3 treatment groups: Group 1- cultivated HCjE transplantation (n=6), group 2- cultivated HCE transplantation (n=6) and group 3- plain AM transplantation (n=6). Rabbits were followed-up with slit lamp examination and the corneas were excised and analyzed at 2 weeks by histology and immunohistochemistry.

Results: Cultivated HCjE and HCE transplantation achieved immediate epithelialization of the corneal surface. HCjE and HCE transplanted corneas remained clear and smooth. The engrafted epithelium remained intact during the follow-up period. In contrast, plain HAM transplanted eyes had persistent epithelial defects with greater inflammation and vascularization. Engrafted HCjE and HCE were morphologically similar, with 5-6 layers stratified epithelial cells.

Conclusion: Cultivated HCjE transplantation may be used to re-epithelialize and stabilize the corneal surface in eyes with total limbal stem cell deficiency.

B31
DIFFERENTIATION OF RABBIT BONE MARROW MESENCHYMAL STEM CELLS INTO CORNEAL EPITHELIAL CELLS IN VIVO AND EX VIVO

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Purpose: In order to examine whether bone marrow mesenchymal stem cells (MSCs) could be differentiated into corneal epithelial cells in vivo and ex vivo.

Methods: Rabbit MSCs (Rb-MSCs) labeled by BrdU were

suspended in fibrin gel and transplanted onto the surface of a damaged rabbit cornea. Histology and molecular phenotype were studied on postoperative day 28. Labeled Rb-MSCs were cultured in four different systems in vitro.We used immunofluorescence, flow cytometric analysis, and western blotting to examine the expression of cytokeratin 3 (CK3) in differentiated Rb-MSCs of the different groups.

Results: The data showed that transplantation of Rb-MSCs successfully reconstructed the rabbit's damaged corneal surface, and found some Rb-MSCs participated in the healing of injured corneal epithelium and expressed CK3 in vivo. In vitro, the data showed that Rb-MSCs rapidly differentiated into cells with the morphological and of corneal epithelial cells in all group. The differentiated Rb-MSCs of all groups were positive for corneal epithelial-specific marker CK3 in two hours and remained unchanged within three days. Analysis of flow cytometry showed that The differentiated Rb-MSCs cells expressed CK3 at day 1, and was increased at day 2, and was slightly increased at day 3. By western blotting we showed that expression of CK3 in all group.

Conclusion: MSCs could differentiate into corneal epithelial cells in vivo and ex vivo. EGF was one of the important factors in this process.

B32
CORNEAL SENSITIVITY AND THE TEAR FILM CHANGES CAUSED BY INCISION IN MANUAL-SMALL INCISION CATARACT SURGERY AND PHACOEMULSIFICATION

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Purpose: To describe corneal sensitivity changes caused by different incision method in manual-small incision cataract surgery (manual-SICS) and phacoemulsification (phaco) and its influence to the tear film quantity and quality.

Methods: Thirthy subjects who planned to underwent cataract surgery with manual SICS or phaco methods with *polymethyl-methacrylate* intraocular lens concequitively followed the study. The examination were prior to the surgery, first, seventh and the fifteenth day after surgery, including the five sites of the corneal sensitivity using *Cochet-Bonnet* aesthesiometry, tear meniscus, nonivasive break up time (NIBUT), lipid pattern using Tearscope plus™ and Schirmer. The subjective complains were reviewed based on questionaire by *Ocular Surface Disease Index* (OSDI).

Results: Corneal sensitivity decreased in phaco group since the first day after surgery until the fifteenth day, while in the manual-SICS group the decreasing only at first day after surgery. The decreasing in phaco group not only at the incision site, but also on the other sites of the cornea, the difference between two groups was significant ($p<0.05$). The aquous production decreased in phaco group on the seventh and fifteen day after surgery. The tear film quality decreased in both groups on the first day and much lower in manual-SICS group but it recovered until the fifteenth day. The increasing subjective complains on phaco group correlated to the changes of the corneal sensitivity.

Conclusion: Temporal-side incision on phacoemulsification caused decreasing corneal sensitivity in the incision site and the other sites up till the 15 day. Decreasing corneal sensitivity caused changes of the tear film quality and also the complains.

B33
EFFICACY OF CYCLOSPORINE 0.05% EMULSION IN THE TREATMENT OF DYSFUNCTIONAL TEAR SYNDROME

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Purpose: To evaluate clinical efficacy of cyclosporine (CsA) 0.05% emulsion in the treatment of dysfunctional tear syndrome (DTS).

Methods: This was a randomized, parallel, prospective clinical trial enrolling patients diagnosed with DTS without lid margin. Patients received unpreserved artificial tear (Cellufresh®; Allergan, Inc.; Irvine, CA) in both eyes and were randomized to adjunctively receive CsA 0.05% (Restasis®; Allergan, Inc.; Irvine, CA) twice a day for 6 months in the other eye. Patients were evaluated for signs and symptoms of dry eye at their first visit (baseline) and after receiving the study treatments at week 1 and months 1, 3, and 6, utilizing Schirmer I and II tests, tear breakup time (TBUT), ocular surface staining (fluorescein and rose bengal), conjunctival injection severity scores, and a modified Ocular Surface Disease Index (MOSDI).

Results: Twenty-two of 26 enrolled patients completed the study. Most patients were female (73%), and the median (range) age was 49 (31-73) years. Compared to artificial tear, CsA 0.05% treatment resulted in significantly greater improvements in Schirmer I test scores, TBUT, rose Bengal staining scores, conjunctival injection severity scores, and MOSDI scores at months 3 and 6 ($p<0.05$). Schirmer II test scores and fluorescein staining scores were significantly more improved in the eyes treated with CsA 0.05%

than those treated with artificial tear at month 3 ($p<0.05$).
Conclusion: Concurrent treatment with CsA 0.05% emulsion was effective in alleviating the signs and symptoms of DTS.

B34
THE EFFECT OF SYSTEMIC STEROID THERAPY ON DRY EYE IN HEMATOPOIETIC STEM CELL TRANSPLANTATION

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Purpose: To evaluate the effect of systemic steroid therapy on the development of dry eye syndrome (DES) in graft-versus-host disease (GVHD) by hematopoietic stem cell transplantation (HSCT) of hematologic malignancy (HM) patients.
Methods: We analyzed 108 HSCT patients. We examined tear film break-up time (BUT), basal tear secretion and the presence of corneal lesion. We compared clinical characteristics of dry eye with or without GVHD, and also compared clinical aspects of dry eye with GVHD before and after systemic steroid therapy.
Results: The patients diagnosed as DES were 51 persons (91.1%) in GVHD group and 31 persons (59.6%) in non-GVHD group. BUT, basal tear secretion, patients with corneal lesion were 4.08 ± 1.76 sec, 6.05 ± 2.57 mm, 32 persons (57.1%) in GVHD group and 5.37 ± 1.83 sec, 7.08 ± 1.54 mm, 13 persons (25%) in non-GVHD group, so DES was statistically significantly severe in GVHD group. In GVHD group, BUT and basal tear secretion were 4.08 ± 1.76 sec, 6.05 ± 2.57 mm before systemic steroid therapy and 5.20 ± 2.91 sec, 6.73 ± 1.80 mm after the therapy. The difference was statistically significant ($p<0.05$). Before and after steroid therapy, there was no difference in corneal lesion ($p>0.05$).
Conclusion: Severity and incidence of DES were higher in GVHD group. Meanwhile, systemic steroid therapy could relieve DES in GVHD patients. So proper medical treatment and ocular examination should be performed for HSCT patients.

B35
RESEARCH ON THE CHANGE OF TEAR SECRETION AND OCULAR SURFACE AMONG COMPUTER USERS

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Purpose: to evaluate the changes of tear secretion (Schirmer tests), tear film break-up time (TBUT), eye-blink rate, integrity of conjunctiva and cornea epithelial cells of computer users and relation between this parameters.
Methods: 448 peoples (896 eyes) age from 22 to 55 (28.06 + 5.74) have taken Schirmer test I and II, TBUT, eye-blink rate, Rose bengal and fluorescein tests and asked about subjective symptoms.
Results: Tear secretion is at normal physiological level (12.74 + 8.92 mm and 8.82 + 6.01 mm). TBUT is at under normal level (7.90 + 3.50 seconds). Eye-blink rate is 8.2 + 5.7 times/minutes. The integrity of epithelial cells is also changed in 16.8-16.9% of all objects. Among all objects, 80.80% reported symptoms of ocular fatigue, 50.15% complained of decrease of visual acuity, 51.34% complained of pain in the eye. 28.1% of objects diagnosed dry eye.
Conclusion: it is necessary to have periodical examination for computer users and put forward working rules to protect eyes in order to prevent "dry eye" syndrome and symptoms of others eye diseases.

B36
DRY EYE PREVALENCE AND VISUAL FUNCTION IN SINGAPORE MALAYS

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Purpose: We aimed to study the prevalence of dry eye symptoms and its effect on visual function related activities in an Asian population.
Methods: A population-based survey was conducted among 3,280 (78.7% response rate) Malay adults aged 40-79 from southwestern Singapore. Participants answered a standardized questionnaire and had systemic and ocular examinations. Dry eye symptoms are considered present if one or more self-reported symptoms were

present often or all the time. Questions on visual function were adapted from the VF-14 questionnaire.

Results: The prevalence of symptomatic dry eyes was 6.5% (95% confidence interval [CI] 5.7, 7.4). After adjusting for age, gender, nature of work (outdoor/indoor), and housing types, factors associated with symptomatic dry eyes were cigarette smoking (odds ratio [OR] 1.77, 95% CI: 1.17-2.66), thyroid diseases (OR 2.58; 95% CI 1.29-5.18) and higher incomes (OR 1.74; 95% CI 1.13-2.68). After adjustment for age, gender and visual acuity, symptomatic dry eye was associated with difficulty in navigating stairs (OR 2.43, 95% CI 1.49, 3.98), reading road signs (OR 2.10, 95% CI 1.44, 3.06), recognizing friends (OR 2.62, 95% CI 1.82, 3.76), watching television (OR 2.04, 95% CI 1.24, 3.34) and driving at night (OR 3.22, 95% CI 1.96, 5.29).

Conclusion: Symptomatic dry eyes are present in 6.5% of Singapore Malay adults and are associated with lower visual functioning scores and difficulty performing visual function dependent tasks, independent of visual acuity and other factors.

B37
INTEGRATING TRANSCRIPTOMICS AND PROTEOMICS OF HUMAN LACRIMAL GLAND AND TEAR FLUID

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Purpose: The aim of this study is to integrate transcriptomics and proteomics for the profiling of lacrimal gland and tear fluid. This approach was applied to assess the biochemical changes in tear fluids and lacrimal gland tissues from lacrimal gland adenoid cystic carcinoma patients.

Methods: Tear fluid was collected using Schirmer strip from lacrimal gland adenoid cystic carcinoma patients before surgery. Tear protein profiles were quantitively compared with those from normal tears by two dimensional nanoLC-MS/MS. For comparison, gene expression of lacrimal gland tumor tissue was examined using cDNA microarray (Affymetrix Gene 1.0 ST array). Proteomic analysis was also performed on lacrimal gland tumor tissue using shotgun two dimensional nanoLC-MS/MS. Transmission electron microscopy (TEM) was used to confirm the presence of acinar cells in the lacrimal gland tumor tissue.

Results: Quantitative proteomic analysis showed that among more than 100 tear proteins, the levels of 29 tear proteins increased and the levels of 22 tear proteins decreased in lacrimal gland tumor patients compared with normal controls. Tear proteomics revealed the presence of a high level of matrix metalloproteinase-9 (MMP-9) in tear fluid of the affected eye which was confirmed using ELISA. Microarray data correlated well with the proteomic data of lacromal gland tumor tissue where MMP-9 was also seem to be upregulated.

Conclusion: We have demonstrated that tear fluid may be useful for diagnosing and monitoring lacrimal gland diseases. A comprehensive genomic and proteomic profiling may lead to develop novel diagnostics and therapeutics.

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B38
OCULAR SURFACE ANTIGENICITY IN A MOUSE MODEL OF DRY EYE DISEASE

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Purpose: To determine if $CD4^+$ T cell pathogenicity, induced by immunization of cornea epithelial cells from a dry eye mouse, can be enhanced by compromising the ocular surface immunosuppressive milieu. This was evaluated in an adoptive transfer model of dry eye.

Methods: C57BL/6 wild type female mice were exposed to a dry desiccating environment (DS) (scopolamine injections TID, humidity <40%, air flow) for 5 days. C57BL/6 WT mice treated with 500 μg anti-CD25 antibody were immunized by hind footpad injection in the presence of CFA with control or DS cornea epithelial cells and were left non-stressed or treated with DS for 5 days. $CD4^+$ T cells from immunized mice were administered IP into an athymic recipient.

Results: Four days after adoptive transfer of $CD4^+$ cells from mice immunized with DS cornea epithelial cells, IL-12, IL-1β and TNF-α tear levels and infiltration of both mononuclear cells (*P=0.014) and neutrophils (*P=0.001) into the conjunctiva of athymic recipient mice significantly increased. DS treatment of the immunized mouse further increased the pathogenicity of $CD4^+$ T cells when adoptively transferred to athymic T cell deficient nude mice as indicated by significant fold increases in tear cytokine levels and cellular infiltration into the conjunctiva as compared to the non-stressed DS immunized CD4+ T cell adoptive transfer.

Conclusion: Exposure of DS cornea epithelial cell immunized mice to DS treatment compromises the ocular surface immunosuppressive reserve and increases the pathogenicity of $CD4^+$ T cells from the immunized mouse to adoptively transfer disease to an athymic, T cell deficient mouse.

B39
PREOPERATIVE ENDOTHELIAL DISC PREPERATION AFFECTING ON DESCEMETS STRIPPING ENDOTHELIAL KERATOPLASTY RESULTS

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Purpose: Endothelial cell density, corneal thickness and endothelial disc thickness comparison endothelial keratoplasty (DSEK), in pre-cutting donor's disc preparation and simultaneous to keratoplasty.

Methods: Retrospective study two groups of patient's after endothelial keratoplasty. For the study 26 patients with psedophakic bullous keratopathy were selected. The subjects were divided into two groups. First group with donor's pre cutting disc preparation consisted of 13patients, BCVA before keratoplasty ranged from 0.01 to 0.06 (mean 0.03). Second group with donor's disc preparation simultaneously to keratoplasty, consisted of 13 patients, BCVA 0.01 to 0.1 (mean 0.03). In first group, the day before surgery deep stromal dissection via corneoscleral tunnel and dissected botton left in storage medium till keratoplasty. In case of second group endothelial disc prepared simultaneously to keratoplasty. 3000/mm^2 considered borderline donor's endothelial cell density. Endothelial cell density and corneal thickness was measured using.

Results: BCVA 6 months postoperatively in first group ranged from 0.01 to 0.6 (mean 0.4 ± 0.23), in second group ranged from 0.01 to 0.5 (mean 0.3 ± 0.10). Donor's endothelial cell density 6 months after surgery in first group equaled 2130.37 ± 1230.2 cells/mm^2, in second equaled 2293.55 ± 260.12 cells/mm^2. Corneal thickness ranged in first group from 920 μm do 520 μm (mean 653.6 μm ± 126.41) in second group ranged from 840 μm do 570 μm (mean 730.2 μm ± 83.12), endothelial disc thickness ranged from 190μ do 40μ (mean 113.6 μm ± 45.7) in second group ranged from 259 μm to 61 μm mean 150.8 μm ± 73.7).

Conclusion: Pre-cutting procedure appears to be a useful way of disc preparation in eye banks.

B40
SCATTERED LIGHT AND RECOVERY OF VISION AFTER ENDOTHELIAL KERATOPLASTY

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Purpose: To compare changes in backscattered light and vision after Descemet-stripping with endothelial keratoplasty (DSEK) and deep lamellar endothelial keratoplasty (DLEK).

Methods: Eyes with endothelial dysfunction were prospectively examined before and at 1, 3 and 6 months after DSEK (donor prepared by microkeratome) or DLEK. Backscattered light was measured with a custom scatterometer, and best spectacle-corrected visual acuity (BSCVA) was measured by the electronic ETDRS protocol.

Results: Before surgery, backscatter in the anterior third of corneas that would receive DSEK (n=17) was 22% higher than in corneas that would receive DLEK (n=13, $p<0.001$), whereas backscatter from the remainder of the cornea did not differ. Backscatter from the anterior third of the cornea was 25% higher after DLEK than after DSEK ($p=0.03$) at 6 months. Peak backscatter from the posterior cornea (lamellar interface) was 57% higher after DLEK than after DSEK ($p<0.001$) at 1 month, but was only 31% higher after DLEK than after DSEK ($p=0.04$) at 6 months. BSCVA at 6 months after DLEK (0.41 ± 0.18 logMAR) did not differ from preoperative (0.57 ± 0.20 logMAR; $p=0.33$), whereas BSCVA improved by 6 months after DSEK (0.27 ± 0.16 logMAR) compared to preoperative (0.46 ± 0.27 logMAR, $p<0.001$).

Conclusion: The ratio of backscatter from the lamellar interface after DLEK and DSEK diminished during the first 6 months, while the ratio of backscatter from the anterior cornea remained constant. Slower visual recovery after endothelial keratoplasty might not only be related to scatter from the lamellar interface, but also to scatter from the anterior cornea.

B41
CLINICAL OUTCOMES OF ENDOTHELIAL KERATOPLASTY USING MANUAL TECHNIQUE FOR DESCEMETS MEMBRANE PREPARATION

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Purpose: To analyze results of endothelial keratoplasty using manual technique for separating Descemet's membrane (DSEK).
Methods: Retrospective case control study of following endothelial keratoplasties. For the study 20 eyes with psedophakic bullous keratopathy were selected. The subjects were 14 women and 6 men. The follow-up was from 12 to 28 months (mean 18.5 months). Via corneoscleral tunnel Descemetorhexis was performed with diameter marked on the external corneal surface. The endothelial discs were prepared from whole eye globes. The disc was rolled and inserted into recipient's stromal pocket, afterwards unrolled using air bubble in the anterior chamber. Visual acuity, corneal transparency, endothelial density, central corneal thickness, disc thickness and complications were analyzed.
Results: BCVA 12 months postoperatively ranged from 0.1 to 0.9 (mean 0.48 ± 0.23). Average astigmatism value equaled 1.5 ± 0.52. Donors endothelial cell density was 3022,31 ± 286,33 cells/mm^2, 9 months postop 2212,84 ± 407,27 cells/mm^2, 12 months postop1905,73 ± 439,99 cells/mm^2 and 24 months postop 715.9 ± 117.16 cells/mm^2. Corneal thickness before surgery equaled 760.4 ± 90.49 μm, 9 months postop 841.9 ± 125.76 μm, 12 months postop 726.8 ± 118.32 μm and 24 months postop 715.9 ± 117.16 μm. Disc thickness 9 months after surgery ranged from 92 μm to 180 μm (mean 129 μm ± 116.2), 12 months postop ranged from 80 μm to 142 μm (mean 103 μm ± 114.6) 24 months postop ranged from 84 μm to 127 μm (mean 93 μm ± 119.3). Corneal transparency achieved in 19 cases. In four recipients poor graft adhesion and required additional air tamponade.
Conclusion: DSEK is an effective procedure in corneal edema management, which restores good vision quality.

B42
Descemet's Stripping Endothelial Keratoplasty (DSEK), clinical experience and initial results from Western India

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Purpose: To describe our clinical experience and early results from western India with Descemet's Stripping Endothelial Keratoplasty (DSEK).
Methods: Retrospective, noncomparative, interventional case series of 24 eyes of 22 patients who underwent DSEK for pseudophakic corneal edema and Fuch's dystrophy. The surgical technique consisted of stripping Descemet's membrane and endothelium from the recipient's central cornea and transplanting an 8.0 to 8.5 mm disc of donor endothelium and posterior stroma through a 5.0 mm incision, with sutures used only to close the incision. 5 eyes underwent combined surgery which included DSEK along with phacoemulsification with IOL (Intra Ocular Lens) implant or IOL exchange.
Results: Mean age was 65.43 years (range, 21-78 years), and minimum follow-up was 3 months (range, 3-13months). Visual rehabilitation was rapid with graft dislocation, partial or total occurred in 5 eyes and was managed with rebubbling in 3 eyes, but, 2 eyes (8%) had recurrent dislocation and underwent penetrating keratoplasty. 2 eyes (8%) had to undergo reDSEK for graft failure and 1 eye developed endophthalmitis and was successfully salvaged by therapeutic keratoplasty with temporary keratoprosthesis and parsplana vitrectomy.
Conclusion: The DSEK technique provided significant advantages over penetrating keratoplasty, including more rapid healing and visual rehabilitation and better maintenance of corneal strength and globe integrity. Graft dislocation was prevented by strict supine positioning and venting incisions. The 2 early graft failures could be attributed to endothelial damage associated with the initial steep learning curve of the procedure.

B43
COMPLEX STAGED DESCEMET'S STRIPPING AUTOMATED ENDOTHELIAL KERATOPLASTY — A CASE REPORT

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Purpose: An 86 year old Chinese lady developed graft failure after a left penetrating keratoplasty was done for pseudophakic bullous keratopathy. She was managed with a staged endothelial keratoplasty. The final result was an optically clear graft.

Methods: Superficial keratectomy was done first to remove sub-epithelial scarring in the corneal graft. A bandage contact lens was then placed to promote re-epithelialization. 3 weeks later, after the corneal epithelial defect was healed, descemet's stripping automated endothelial keratoplasty (DSAEK) was performed using a 9 mm corneal lenticule.

Discussion: A staged procedure as such offers several important advantages to the patient compared to a full thickness re-graft. The likelihood of rejection is lower and visual rehabilitation is faster. This is an important consideration as the patient is a high risk candidate for graft rejection. In addition, follow-up care is less intensive and the reduced number of clinic visits has practical significance for an elderly patient. In summary, endothelial keratoplasty combined with superficial keratectomy to selectively remove and replace the layers of pathology for the cornea in a staged procedure represents an alternative method of corneal transplantation in a high-risk patient with good visual outcome achieved.

B44
A PIG EYE MODEL OF ENDOTHELIAL LOSS ASSOCIATED WITH DONOR INSERTION IN ENDOTHELIAL KERATOPLASTY

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Purpose: To compare endothelial loss associated with 2 different donor insertion techniques in Descemet's stripping endothelial keratoplasty (DSEK).

Methods: EK lenticules were prepared from cadaveric pig corneal material, folded, and inserted in a recipient cadaveric pig eye through a 5mm corneoscleral pocket using a "push through" (n=6) or "pull through" (n=6) technique. Specimen lenticules were retrieved atraumatically through a large corneal incision, fixed, processed and examined as whole mounts by scanning electron microscopy. 4 control specimens, fixed without insertion, were also examined. 2 observers, masked to the insertion technique used, independently estimated the percentage area of endothelial damage in each specimen using image analysis software.

Results: Push through and pull through techniques produced similar levels of endothelial damage (push through mean 40.5%, SD 27.5, range 12-81%; pull through mean 57.2%, SD 18.9, range 34-83%: Mann Whitney *U* test, p=0.31). Over 20% of the endothelial area was damaged in three quarters of the specimens inserted. None of the control specimens, either folded or unfolded, had over 20% of the endothelial area damaged.

Conclusion: Both the donor insertion techniques examined are associated with significant endothelial damage. The simple pig eye model described here may be useful in evaluating new donor insertion techniques in DSEK.

B45
PRIMARY GRAFT FAILURE FOLLOWING DESCEMET'S STRIPPING AUTOMATED ENDOTHELIAL KERATOPLASTY (DSAEK) — AN ULTRASTRUCTURE STUDY

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Purpose: Descemet's stripping automated endothelial keratoplasty (DSAEK) is a selective tissue corneal transplantation procedure in which only the diseased endothelium and descemet's membrane is replaced. Refractive and visual results have been encouraging with this procedure but higher rates of primary graft failure have been noted. We herein report histopathological and ultra-structural changes in two cases of primary graft failure following DSAEK. We are not aware of these features following DSAEK being reported before.

Methods: Two cases of primary graft failure following DSAEK. One patient underwent DSAEK for Fuch's Endothelial Dystrophy the other for pseudophakic bullous keratopathy. Both DSAEK procedures were uneventful. Post-operatively there was no graft dislocation but one patient had a nasal descemet's detachment that was re-apposed with intracameral air. One month post-operatively there was no improvement in the vision and both patients had

pronounced swelling of recipient and donor cornea. Both patients underwent graft exchange. Both recipient and donor corneal edema resolved.

Results: Histopathological evaluation showed marked corneal edema and loss of endothelial cells with no anterior stromal haze. Ultrastructural evaluation showed only remnant cell membranes present in one sample devoid of any intracellular contents. TEM showed the presence of extensively damaged keratocytes in the deep posterior stroma and also in the interface between at the graft host junction.

Conclusion: These cases illustrate widespread and irrecoverable endothelial and keratocyte damage in patients with primary graft failure following DSAEK, implying early graft exchange as the treatment of choice.

B46
HEMI-AUTOMATED LAMELLAR THERAPEUTIC KERATOPLASTY

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Purpose: To describe a technique for performing anterior lamellar keratoplasty for treatment of corneal scars with high topographical irregularities or asymmetric thin corneas.

Methods: A standard ALTK procedure was modified to combine manual lamellar dissection of the recipient bed with an automated donor preparation using an ALTK unit (Hemi-Automated Lamellar Keratoplasty (HALK)). Parameters evaluated were pre and postop-BSCVA, pre and post op donor thickness, postoperative refractive astigmatism, intra-operative complications and graft clarity.

Results: 5 eyes of five patients, who were intolerant of gas permeable contact lens wear, underwent a HALK procedure. Diagnosis included, post-infectious keratitis scars, traumatic penetrating injury, congenital scar and keratoconus. Mean Preop LogMar FVA was 0.84 ± 0.347, Mean postop Log MAR BSCVA was 0.652 ± 0.321 at mean 3 months. Mean (SD) preoperative donor thickness was 637 ± 130 microns. Mean intra-operative donor thickness was 398 ± 45 microns. Mean postoperative donor thickness at 3 months was 377.2 ± 62 microns. There was no significant difference in the intra-operative and postoperative donor thickness p=0.3. There were no intraoperative or postoperative complications, all graft remained clear.

Conclusion: HALK is an effective surgical procedure in the treatment of corneas with irregular topographic profiles. It combines the benefits of smooth microkeratome lamellar dissection of the donor and customized donor lenticule thickness with a manual lamellar dissection technique.

B47
COMPARISON OF OUTCOME OF LAMELLAR KERATOPLASTY AND PENETRATING KERATOPLASTY IN KERATOCONUS

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Purpose: To compare the treatment outcomes after penetrating keratoplasty (PK) and anterior lamellar keratoplasty (ALK) in Asian patients with keratoconus.

Methods: Retrospective cohort study. Of the 136 corneal transplants for keratoconus at the Singapore National Eye Centre from April 1992 to December 2006 reviewed, 104 were PK and 32 ALK. ALK was performed with the modified Anwar technique in 11 eyes and predescematic lamellar keratoplasty (LK) techniques in 15 eyes. PK was performed with a standard technique using a Hanna vacuum trephine system. In all techniques a single continuous or 12 interrupted sutures were placed. Best-corrected visual acuity (BCVA), refractive results (spherical equivalent and astigmatism), complication rates and percentage endothelial cell loss were analyzed.

Results: Post-operative BCVA of the PKs and ALKs were similar, but modified Anwars achieved significantly better post-operative BCVA at 12 months than predescematic LKs at levels of better than 6/9 and better than 6/12. Mean spherical equivalent and astigmatism were comparable between the PKs and ALKs and between modified Anwars and predescematic ALKs. Rates of complications were comparable between PKs and ALKs, although ALKs had lower incidence of allograft rejection and glaucoma requiring surgery. Percentage endothelial cell loss may be lower in the ALKs.

Conclusion: Treatment outcomes of ALKs are at least comparable to and may be better than PKs for keratoconus. The modified Anwar technique is emerging as a promising technique for better optical outcome. Further studies are required to provide long term analysis of these results.

B48
DEEP ANTERIOR LAMELLAR KERATOPLASTY FOR FUNGAL KERATITIS USING CRYOPRESERVED DONOR CORNEAS

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Purpose: To investigate whether deep anterior lamellar keratoplasty (DALK) with cryopreserved donor corneas could be used to eradicate the infection, obviate complications, and restore vision in the treatment of fungal keratitis not curable by antifungal chemotherapy.
Methods: DALK was performed in fifteen eyes of 15 patients with fungal keratitis confirmed by laser confocal microscopy, and not cured by antifungal chemotherapy. Surgical procedures included deep removal of corneal stroma with the use of a very fine forceps tip and a fine blunt spatula, exposing Descemet membrane in the entire stromal bed, and grafting a cryopreserved donor corneal button. After surgery, topical antifungal treatment was continued for 2 weeks with gradual tapering of the drugs. Visual acuity, corneal clarity, and endothelium cell density were assessed at different time points.
Results: No case occurred intraoperative perforation of Descemet membrane. Full corneal epithelialization was achieved in 8 eyes within 7 days and in 13 eyes within 10 days after surgery. Delayed epithelial healing occurred in one eye. Patient follow–up ranged from 7 to 20 months. Among these 15 eyes, only one eye occurred recurrence of the fungal infection within 2 weeks. The resulting BCVA ranged from 20/60 to 20/20. Overall, mean post–operative endothelium cell density was 2367 cells/mm^2. Immune reactions to the lamellar grafts were not observed and the donor lamellae remained clear for the duration of follow–up.
Conclusion: Our findings suggest that DALK by using cryopreserved donor corneas for the treatment of fungal keratitis is a safe and effective method of restoring visual acuity, but recurrence remains a risk.

B49
CORNEA PATCH GRAFT REPAIR OF EXPOSED GLAUCOMA DRAINAGE IMPLANTS

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Purpose: To describe a novel method of repair for exposed glaucoma drainage implants (GDIs) using cornea patch grafts.
Methods: This was a retrospective review of patients who underwent cornea patch graft repair of exposed GDIs at two tertiary ophthalmic centres in Singapore from November 1, 2000 to January 31, 2006. Surgical outcome was assessed in terms of tectonic integrity of the graft over the period of follow-up. Endpoints assessed were epithelialization of graft and absence of re-exposure of GDI, scleral thinning and infection.
Results: Eight eyes of 7 patients were analyzed with a mean follow-up of 36.3 ± 28.4 months (range 11 – 83 months). The mean age of patients was 57.0 ± 20.8 years. The mean interval between GDI implantation and first occurrence of tube exposure was 22.1 ± 26.3 months (range 1-78 months). Six eyes (75.0%) had undergone one or more procedures for surgical repair of tube exposure prior to corneal patch graft surgery, including direct closure of conjunctival defect overlying the GDI tube or repair using conjunctival autograft, donor pericardium or sclera. After corneal patch graft surgery, seven eyes (87.5%) had stable conjunctival coverage with no epithelial breakdown over the corneal patch graft, and with no re-exposure of the GDI, scleral thinning or ocular infection during follow-up.
Conclusion: Corneal patch graft repair of exposed GDIs is an effective method to provide stable GDI coverage following exposure.

B50
THE SINGAPORE EYE BANK CORNEA GRADING SYSTEM – TOWARDS EFFICIENT TISSUE UTILIZATION

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Purpose: With the advent of a wide variety of corneal transplantation procedures, including penetrating keratoplasty, anterior lamellar keratoplasty, microkeratome or femtosecond-assisted keratoplasty, limbal transplantation, peripheral corneal patch grafts, and emergency need for tectonic and therapeutic grafts, we

propose an objective method of grading donor corneas to ensure efficient and pragmatic utilization of a limited supply of tissue.

Methods: A retrospective review of local corneas procured by the Singapore Eye Bank from 2001 to 2007 using the following grading system: Grade A corneas are optically clear corneas with endothelial cell densities of 2,250 cells/mm^2 and are ≤7 days from date of death. These are used primarily for optical penetrating grafts. Additionally, corneas in this category with cell counts >2,500 cells/mm^2 and with a rim diameter >16 mm are suitable for endothelial keratoplasty. Grade B corneas have acceptable optical clarity with good stromal status but either have endothelial cell counts <2,250 cells/mm^2 or are >7 days from date of death and are reserved for all forms of optical anterior lamellar keratoplasty. These may be cryopreserved for future use if they have not been utilized by day 14. Grade C corneas have poor optical clarity and are reserved for tectonic procedures, patch grafts or for emergency grafts when no other tissue is available, wih a view of rapid surgical replacement once better tissue is available. These can also be cryopreserved. In addition, residual annular corneoscleral rims (after central corneal trephination) may be used for peripheral corneal melts and limbal transplants. In all cases, negative serology and other safety parameters of donor tissue requirements are respected.

Results: Our review shows that 68 Grade B and 30 Grade C local corneas were utilized from 2001 to 2007. These corneas would otherwise have been discarded or wasted if the modified grading system was not used.

Conclusion: The Singapore Eye Bank cornea grading system provides a rational approach to efficient and maximal utilization of a limited supply of donor corneas which may be universally adopted by eye banks in Asia. This system has been instrumental in the ability of our Eye Bank to respond resourcefully to the increasing demands of new emerging corneal surgical procedures to reduce the impact of corneal blindness.

B51
ROTATIONAL AUTOKERATOPLASTY WITH PUPILLOPLASTY IN PEDIATRIC POST-TRAUMATIC CORNEO-IRIDIC SCARS

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Purpose: To report the outcome of rotational autokeratoplasty for pediatric post-traumatic corneo-iridic scars.

Methods: A retrospective analysis of five consecutive patients with post-traumatic corneo-iridic scars who underwent ipsilateral rotational keratoplasty with pupilloplasty. The pre-operative visual acuity, size of the trephines used, intra-operative procedures, postoperative complications, visual outcome and astigmatism at final follow-up were noted.

Results: Four male and one female patient of mean age 9.1 ± 5.22 (3 to 15 years) had undergone ipsilateral rotational keratoplasty with pupilloplasty with a mean follow-up of 11.8 ± 4.14 (5 -16 months). The graft size was 7 mm (2 cases) and 7.5 mm (3 cases). Release of iris adhesions with pupilloplasty was performed in all cases. Pre-operative visual acuity was poor for all cases. Postoperative best corrected visual acuity improved by 3 – 6 lines. Postoperative problems included suture replacement (1), early suture loosening with mucus aggregations (2). Postoperative astigmatism ranged from – 1.5 D to – 6.0 D. Visual outcome was good in all cases except one due to dense amblyopia.

Conclusion: Rotational autokeratoplasty with pupilloplasty has a role to play in pediatric cases of central corneo-iridic scars, when the central scarring can be rotated to the periphery provided sufficient undamaged peripheral cornea remains and interference with angle structures is minimal.

B52
PEDIATRIC PENETRATING KERATOPLASTY

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Purpose: To report the results of penetrating keratoplasty in children.

Methods: Retrospective analysis of keratoplasty follow-up records of 51 children who underwent penetrating keratoplasty in the period of December 2003 to September 2007 was done.

Results: Of 51 children (male – 29, female 22) with age range 3 months – 15 years who underwent PK, 5 were for CHED (9.8%), 4 for non-CHED congenital opacification (7.8%), 6 were for congenital glaucoma 11.8%), 23 were for acquired non-traumatic (45.1%)and 1 for traumatic (1.9%), while 12 were for perforated corneal ulcers (23.5%). The mean timing of surgery in congenital corneal opacification was 4.8 yrs (7.8 yrs for CHED and 1.1yr for non-CHED) eyes. The causative micro-organisms for the perforated corneal ulcers were Staphylococcus albus – 4, Pseudomonas – 1, Aspergillus niger – 1 and no organisms isolated in 6 eyes. Over a mean follow-up of 12.8 months, 28 grafts (54.9%) were clear. Complications included graft infection – 4, immune rejection – 5, primary graft failure – 1, glaucoma – 3 and post-traumatic graft

dehiscence – 3. Final visual acuity in assessable cases at the end of the follow-up period was ≤3/60 in 21 eyes, 3/60 - ≤6/60 in 4 eyes, 6/60 – ≤6/18 in 5 eyes and >6/18 in one eye.

Conclusion: Acquired non-traumatic corneal opacities (post-infectious keratitis) and perforated corneal opacities constitute a major part of the etiology for penetrating keratoplasty in pediatric age group in developing countries. Visual outcome remains poor in pediatric keratoplasty despite good anatomical results.

B53
EVALUATION OF CORNEAL DONOR FACTORS IN EPITHELIAL HEALING

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Purpose: To study the correlation of epithelial healing in graft with corneal donor factors.

Methods: Retrospective review of follow-up records of 34 patients of penetrating keratoplasty for different indications. The parameters noted included tear break up time (TBUT), schirmer's value, epithelial healing time, death enucleation time, age of the donor and host, and size of the host and donor cut.

Results: There were 19 males and 15 females with mean age of 53.29 ± 16.04. 7 yrs (range 46.7 to 69.6 yrs) who underwent penetrating keratoplasty. The mean age of the donor was 47.78 ± 19.72 yrs (range 28.06 to 67.40 yrs). The indications for PK were PBK (10), ABK (3), corneo-iridic/corneal scar (6), healed keratitis (9), failed graft (4) and trachomatous keratopathy (2). The host-donor cut 7.0/7.5 mm in 21 patients, 7.0/ 8.0 mm in 6 patients, 7.5/ 8.0 mm in 6 patients and 6.5/7.0 mm in 1 patient. The mean TBUT was 4.38 ± 4.90 sec. The mean schirmer value was 10.70 ± 7.52 mm. The mean death enucleation time was 3.45 ± 2.71 hours. The mean epithelial defect healing time was 4.81 ± 4.26 days. The negative correlation between donor age and epithelial defect healing time, death enucleation time and epithelial defect healing time was not statically significant.

Conclusion: The epithelial healing time after penetrating keratoplasty does not seem to be largely affected by corneal donor factors such as donor age and death enucleation time.

B54
Long Term Outcomes of Glaucoma Surgery for Post-keratoplasty Glaucoma in Asian Eyes

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Purpose: To compare the intraocular pressure (IOP) outcome and cornea graft survival in patients with post-keratoplasty glaucoma who had undergone trabeculectomy, glaucoma drainage device surgery or diode transscleral cyclophotocoagulation.

Methods: A retrospective review of clinical records of patients with refractory post-keratoplasty glaucoma that required glaucoma surgery was conducted. The patients underwent surgery at the Singapore National Eye Centre from July 1991 to September 2004. Two primary outcomes were evaluated: IOP control and graft status. In terms of IOP control, success was defined as IOP of between 6 to 21 mm Hg with and without medication and failure was defined as IOP >21 mm Hg or <6 mm Hg, loss of light perception or further glaucoma surgery. Graft failure was defined as loss of graft clarity due to persistent stromal edema or scarring.

Results: 70 eyes of 68 patients were analysed. The mean age was 53.5 years. There were 52 males and 16 females. Mean follow-up time was 66.1 months. The number of eyes with trabeculectomy, glaucoma drainage device and diode transscleral cyclophotocoagulation were 42, 15 and 13 respectively. There were no differences between the 3 groups in terms of age, gender, race or pre-existing glaucoma. Kaplan Maier analysis showed that trabeculectomy had both better IOP outcome (p=0.042) and graft survival (p=0.022) than glaucoma drainage device and diode transscleral cyclophotocoagulation.

Conclusion: Trabeculectomy was found to be superior to glaucoma drainage device and diode transscleral cyclophotocoagulation in terms of both IOP control and graft survival for the surgical management of refractory post-keratoplasty glaucoma.

B55
TISSUE UTILISATION AT THE SINGAPORE EYE BANK

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Purpose: To review the trends in tissue utilization for corneal grafting at the Singapore Eye Bank.
Methods: Retrospective comparative case series on the types of graft surgery performed using corneas supplied by the Singapore Eye bank between 2003 and 2007.
Results: The number of grafts performed and type of graft procedure performed are summarized in table 1.

Table 1. Type of graft procedure performed.

Year	Total number of grafts performed	Penetrating keratoplasty (%)	Lamellar keratoplasty (%)
2003	176	149 (84.7%)	27 (15.3%)
2004	260	201 (77.3%)	59 (22.7%)
2005	221	175 (79.1%)	46 (20.9%)
2006	238	152 (63.9%)	86 (36.1%)
2007	253	127 (50.2%)	126 (49.8%)

There has been a slight increase in the total number of corneal graft procedures performed over the 5 years. The proportion of lamellar keratoplasties among the graft procedures has increased significantly from 15.3% in 2003 to 49.8% in 2007 ($p<0.001$).
The indications for penetrating keratoplasty or lamellar keratoplasty are summarized in Table 2.

Table 2. Indications for penetrating keratoplasty or lamellar keratoplasty.

Year	Penetrating keratoplasty	Lamellar keratoplasty		
	Optical/ therapeutic/ tectonic	Patch lamellar	Anterior lamellar	Posterior
2003	149	6 (22.2%)	21 (77.8%)	0 (0%)
2004	201	18 (30.5%)	41 (69.5%)	0 (0%)
2005	175	14 (30.4%)	32 (69.6%)	0 (0%)
2006	152	14 (16.3%)	56 (65.1%)	16 (18.6%)
2007	127	11 (8.7%)	73 (57.9%)	42 (33.3%)

The proportion of posterior lamellar keratoplasties increased significantly from 2006 to 2007 (18.6% vs 33.3%, p=0.03).
Conclusion: There has been an increasing trend towards performing lamellar keratoplasty over penetrating keratoplasty. Amongst lamellar keratoplasties, the proportion of posterior lamellar replacement procedures has been increasing steadily over the last three years.

B56
DONOR CORNEAS WITH SEVERE JAUNDICE — A CASE REPORT

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Purpose: Jaundiced corneal tissue is often erroneously rejected by corneal surgeons for transplantation. We report on the successful and safe use of corneal tissue from a severely jaundiced donor for corneal transplantation.
Methods: The Singapore Eye Bank procured corneas from a 64-year-old Chinese donor who died of metastasic duodenal carcinoma. The patient also suffered from severe obstructive jaundice. Serology results for HIV, Hepatitis B and C, and Syphilis were negative. On slit lamp examination, both corneas had intact epithelium, clear and compact stroma. Endothelial counts were 3571 and 3623 for the right and left corneas respectively. Both corneas were rated as "Good" and suitable for transplantation. The corneas were initially offered to several surgeons who declined primarily because of the jaundice. Two surgeons from Singapore National Eye Centre eventually accepted the corneas for optical grafts.
Results: The right cornea was used for a 15-year-old keratoconus patient who underwent Deep Lamellar Keratoplasty (DLK). The left cornea was used for a 70-year-old failed graft patient who underwent Descemets Stripping Automated Endothelial Keratoplasty (DSAEK). The corneas were still jaundiced at the time of surgery but the yellowish pigmentation cleared within a week for both cases. Both grafts remained clear at three months post-op and best-corrected visual acuity for both is 6/15.
Conclusion: Jaundice in the absence of sepsis or infective hepatitis is not considered an exclusion criteria for corneal transplantation.

B57
ALTERATIONS IN CORNEAL DONOR TISSUE PREPARATION FOR NEW EMERGING FORMS OF CORNEAL TRANSPLANTATION

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Purpose: With the advent of new procedures in corneal transplantation such as anterior lamellar keratoplasty, endothelial keratoplasty and limbal transplantation, alterations in corneal donor

procurement and preparation must be implemented by eye banks. We describe modifications in procurement surgery to match these needs.

Methods: We reviewed donor and recipient records of the Singapore Eye Bank (SEB) over the last 5 years in relation to requests for donor cornea tissue for a variety of corneal transplantation procedures. We reviewed surgical modifications in corneal procurement techniques over this period as determined by the medical directors of SEB (who are all active corneal surgeons), to match surgical and tissue requirements for the appropriate form of corneal transplantation, and formulated new standardized surgical procedures in donor procurement.

Results: Alternatives to conventional PK include sclerokeratoplasty (SKP), limbal transplants, anterior lamellar keratoplasty (ALK), endothelial keratoplasty (EK), donors for microkeratome or femtosecond laser-assisted donor lamellar surgery, and cryopreserved corneas for tectonic and therapeutic grafts. SKP requires a large corneoscleral rim for inclusion of scleral tissue in the graft. Limbal transplantation requires an adequate rim of sclera with intact adjacent conjunctival tissue. ALK procedures require optical grade corneal tissue with minimal endothelial requirements. Microkeratome or femtosecond laser-assisted lamellar dissection procedures (e.g. EK and automated lamellar therapeutic keratoplasty (ALTK) require large, centralized scleral rims exceeding 16 mm and minimal conjunctival tissue. Cryopreserved corneas are required for therapeutic grafts for infectious keratitis (of optical grade), or for tectonic patch grafts (non-optical quality), while discarded annular corneoscleral rims (after central corneal tissue utilization) are required for peripheral tectonic melts and limbal transplants.

Conclusion: Eye banks must today keep pace with advances in corneal transplantation and develop standardized surgical alterations in donor procurement to match the needs of emerging forms of corneal transplantation.

B58
EFFECTS OF CHANGING LEGISLATION ON EYE DONATION IN SINGAPORE — THE SINGAPORE EYE BANK EXPERIENCE

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Purpose: Changes in national legislation on organ and tissue donation affect corneal donation in Singapore. We evaluate and present the proactive evolving responses of the Singapore Eye Bank to effect maximal corneal donation rates in Singapore.

Methods: We conducted a retrospective review of Singapore Eye Bank historical documents and statistical records in relation to changing statutory legislation on organ and tissue donation in Singapore over 16 years period. The Singapore Eye Bank (SEB) was founded in 1991 at the Singapore National Eye Centre (SNEC). Prior to 1995, the SEB sourced the majority of its corneas from international eye banks as no local dedicated eye donation programs were in existence. Local corneas during this period were exclusively from multi-organ donations under the Medical (Therapy, Education and Research) Act. In 1996, SEB initiated the Hospital Eye Donation Program (HEDP) with the Singapore General Hospital. This was a collaborative effort to counsel bereaved relatives of potential hospital donors about eye donation and obtain consent for corneal donation. The program was a success on its first year and a similar arrangement was launched in TTSH in 2002. Since then, the corneas donated through HEDP have been steadily increasing. In July 2004, the revised Human Organ Transplant Act (HOTA) came into effect. This "opting out" law assumes national consent with a voluntary "opt-out" clause, enabling kidney, liver, heart and cornea donation from all non-Muslim Singaporeans and Permanent Residents with confirmed brain death, between the ages of 21 and 60 years.

Results: To date, the amended HOTA has accounted for an additional 145 corneas in our local pool. Our data reveals that HOTA supplements local donor tissue, but our HEDP still remains the major source of local corneas today. The total number of HEDP cornea is 637 since its inception. However, foreign corneas are still needed to match our needs in Singapore.

Conclusion: Changing organ donation legislation in Singapore has been successful in enhancing local cornea donor rates, but voluntary hospital eye donation with an appropriate family counseling program (HEDP) remains the major factor for successful local corneal donation in Singapore.

B59
POST-OPERATIVE RISK FACTORS PREDICTIVE OF CORNEAL GRAFT SURVIVAL — THE SINGAPORE CORNEAL TRANSPLANT STUDY

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Purpose: To quantify post-operative risk factors that influence long-term graft survival in patients with penetrating keratoplasty (PKP).

Methods: Prospective cohort study of 901 patients who under-went PKP for optical, tectonic or therapeutic indications. Data was obtained

from the Singapore Corneal Transplant Study (SCTS) database — A prospective database of all corneal transplants (2100) performed between January 1991 and November 2006 at the Singapore National Eye Centre. 17 post-operative risk factors (complications and post-PK surgical procedures) were subjected to univariate and multivariate analysis to determine effect on graft survival. The main outcome measure was graft failure, defined as an irreversible loss of optical clarity.

Results: Glaucoma was the commonest post-operative complication (23.8%) followed by allograft rejection (20.9%), epithelial problems (17.9%), late graft failure (10.83%) and microbial keratitis (6.11%). Glaucoma surgery accounted for 21.78% of all surgeries done after PKP followed by repeat corneal graft (20.3%), graft resuturing (15.6%), graft refractive surgery (11.04%) and cataract surgery (10.43%).

Kaplan-Meier survival curve showed that patients with post-operative complications had a significantly lower graft survival ($p<0.000$). Univariate analysis revealed that the presence of allograft rejection ($p<0.000$), epithelial problems ($p<0.024$), late graft failure ($p<0.000$) and microbial keratitis ($p<0.000$) reduced graft survival significantly. Of the various surgical procedures, glaucoma surgery reduced graft survival significantly ($p<0.001$) and glaucoma drainage devices were more likely to be associated with decreased graft survival than trabeculectomy ($p<0.000$). Patients who needed a repeat corneal graft also had a significantly lower graft survival rate ($p<0.000$).

Conclusion: Presence of post-operative risk factors has a significant negative impact on long-term graft survival. Prevention of post-operative complications and their aggressive management may improve survival rates.

B60
THERAPEUTIC KERATOPLASTY NEED & OUTCOME — A RESTROSPECTIVE STUDY

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Purpose: To retrospectively evaluate the indications and outcome of Therapeutic Keratoplasty.

Methods: Total 97 patients underwent therapeutic grafts between 1/1/04 to 31/12/05 at our centre. The charts were reviewed and analyzed in retrospect. All the surgeries were performed by one surgeon. Demographics included gender, age distribution, urban or rural background and eye of the patients. Ulcer was graded as mild, moderate & severe based on the size at presentation. Clinical presentation, predisposing factors and indications of the surgery noted. The surgical procedure involved main procedure and other subsequent procedures.

Results: Therapeutic success was achieved in 91 cases [93.81%] how ever, re-infection occurred in 9.27% [9] cases of which 3 could be completely treated medically. Optical success was observed in 33 cases [34.02%]. Out of which 25 were small [<8.5 mm or patch grafts], where as 8 were large grafts [>8.5 mm]. The longest follow up was 45 months with BCVA of 6/9. Optical success was higher in non-infective cases compared to infective ones.

Conclusion: Therapeutic keratoplsty is a valuable tool for non responding microbial keratitis. It helps maintain the architecture & integrity of otherwise non salvageable eye. Therapeutic success [93.81%] depends on micro work-up, timing of surgery, total removal of infective material, per and post-op antimicrobial treatment and follow-up. The optical outcome 34.02% was quite encouraging despite poor donor tissue quality and an inflamed eye.

B61
THE SURVEY OF XENOTRANSPLANTATION ACCEPTABILITY IN CORNEAL BLINDNESS PATIENTS IN CHINA

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Purpose: To get the information of acceptability to xenotransplantation in the corneal blindness patients in China.

Methods: Total 203 patients were involved in the study. Among the patients, 103 were those that registered in Beijing Tongren Eye Bank waiting for donor corneas and 100 were those that received keratoplasty in Beijing Tongren Eye Center in 2006. A questionaire was designed to investigate the patients' attitude to corneal xenotransplantation which included the general information of the patients and some important questions such as: 1) whether the patients are willing to accept animal corneas when there is no human corneas available; 2) whether there is a request for special animal species; 3) what do you care most if you could accept the animal cornea.

Results: The total acceptability of the patients to xenotransplantation was 68.4% and significantly lower in patients before keratoplasty (58.7%) than those after surgery (80.6%). Patients after surgery were more willing to accept xenotransplantation and had less requests for animal species than patients before surgery. The acceptance percentage in patients with corneal perforation was higher than any other corneal diseases, in male patients higher than

female patients and in urban patients higher than rural patients. What the patients cared most was the therapeutic efficiacy and if the result was satisfactory, 98.20% patients were willing to have the animal corneas for ever.

Conclusion: In China, corneal blindness patients had fairly good acceptance of xenotransplantation.

B62
ESTABLISHMENT OF MURINE MODEL OF CHRONIC CORNEAL ALLOGRAFT DYSFUNCTION

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Purpose: To establish a murine model of chronic corneal allograft dysfunction (CCAD) that permits molecular evaluation of chronic allograft dysfunction after corneal transplantation.

Methods: C57BL/6 (allogenic), CB6F1 (semiallogeneic) and BALB/c (syngeneic) corneal grafts were transplanted orthotopically to BALB/c recipients respectively, and BALB/c mice as a control group. The follow-up time was more than 100 days. Graft survival time and corneal opacity score were monitored, and corneal endothelium were examined by alizarin red and PI/Hoechst stain. $CD4^+$ and $CD8^+$ T lymphocytes were examined by immunohistochemistry. Ultrastructure changes of the grafts were examined by electromicroscopy.

Results: Median graft survival times were 17d, 85.5d, >100d, >100d in allogenic, semiallogeneic, syngeneic and control groups, respectively. Acute rejection episode was found only in allogenic group clinically. A large amount of $CD4^+$ and $CD8^+$ T lymphocyte infiltration was present only in allogenic group, and few $CD4^+$ and $CD8^+$ T lymphocytes were observed in other groups. Large amount of apoptotic and necrotic endothelial cells can be seen in allogenic group, and endothelial cell density decreased and few apoptosis cells can be detected in semi-allogenic and syngeneic groups. No apoptotic and necrotic endothelial cells were found in control group. Ultrastructural characteristic changes mainly include fibrosis formation and endothelium atrophy and degeneration in failed grafts in allogenic, semi-allogenic and syngeneic groups by electron microscopy examination.

Conclusion: Semiallogeneic and syngeneic transplantation groups present the changes similar to CCAD in clinical study, and both can be regarded as the model that permits molecular evaluation of CCAD.

Support: The National Natural Science Foundation of China (30700923) and the Natural Science Foundation of Shandong Province.

B63
GLAUCOMA MANAGEMENT IN PATIENTS WITH OSTEO-ODONTO KERATOPROSTHESIS (OOKP) — THE SINGAPORE OOKP STUDY

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Purpose: To report diagnostic modalities and treatment options for glaucoma in a sample of eyes with OOKP (osteo-odonto-keratoprosthesis).

Methods: Eyes that underwent OOKP were evaluated for glaucoma. All eyes underwent optic nerve head (ONH) assessment, kinetic (Goldmann) and automated static visual field testing (24-2 SITA-Standard), stereo disc photography, imaging using the Heidelberg Retina Tomogram (HRT II), Scanning Laser Polarimeter (GDx VCC) and Optical Coherence Tomogram (OCT3) at 1 and 3 months after the procedure and thereafter at every 6 months.

Results: 16 eyes of 16 patients (9 males and 7 females) underwent OOKP; 5 of these eyes had pre-existing glaucoma. Average follow-up period was 19.1 (range 5-31) months. ONH photography and visual field testing were the most reliable methods to assess disease status, while HRT and OCT could be performed with reasonable reproducibility; GDx performed poorly due to problems with fixation. The approximate field of vision assessed by Goldmann perimetry in glaucoma patients was 40° to 70°; 3/5 glaucoma patients were able to perform reliable and repeatable visual fields. All patients with glaucoma were treated with oral acetazolamide 500 mg twice a day on a long-term basis. Trans-cyclophotocoagulation was performed in 3 eyes at stage 2 of OOKP surgery. Progression was noted in 2 eyes based on disc photographs and automated perimetry; both underwent endocyclophotocoagulation.

Conclusion: Visual field testing and stereo disc photos appear to be effective methods to monitor eyes with OOKP that have glaucoma, as intraocular pressure (IOP) cannot be measured. Treatment strategies include oral medications to lower IOP and cyclophotocoagulation.

B64
KERATOPROSTHESIS SURGERY FOR END-STAGE CORNEAL BLINDNESS IN ASIAN EYES — THE SINGAPORE OOKP STUDY

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Purpose: To establish a multidisciplinary surgical program for osteo-odonto-keratoprosthesis (OOKP) surgery in Asia and to evaluate efficacy and preliminary safety of this keratoprosthesis in end-stage corneal and ocular surface disease.

Methods: Prospective noncomparative case series. Twenty-two adults of Asian ethnic origin, bilaterally blind with end-stage corneal blindness from Stevens-Johnson Syndrome and severe chemical and thermal burns. Osteo-odonto-keratoprosthesis surgery involves 2 procedures—in stage 1, an autologous canine tooth is removed, modified to receive an optical polymethyl methacrylate cylinder, and implanted into the cheek. The ocular surface is denuded and replaced with full-thickness buccal mucosa. Stage 2 surgery, performed 2 to 4 months later, involves retrieval of the tooth–cylinder complex and implanting it into the cornea, after reflection of the buccal mucosal flap, corneal trephination, iris and lens removal, and anterior vitrectomy. Concurrent glaucoma and vitreoretinal procedures are also performed at either stage, as required. Main Outcome Measures: Visual acuity (VA), field of vision, anatomical integrity and stability, and ocular and oral complications related or unrelated to the OOKP device.

Results: 21 of the 22 patients completed both stages of the surgery, with a mean follow-up period of 17.1 months (range, 1 to 36). Intraoperative complications included expulsive haemorrhage, tooth fracture (n=1), oronasal fistula (n=1), mild inferior optic tilt (n=1) and a choroidal haemorrhage (after iris removal). Anatomical stability and keratoprosthesis retention has been maintained in all eyes, with no dislocation, extrusion, retroprosthetic membrane formation, or keratoproshesis-related infection. Other complications not directly related to device insertion included retinal detachment (RD) related to silicone oil removal (n=1) and endophthalmitis related to endoscopic cyclophotocoagulation performed 1 year after OOKP surgery (n =1). Fourteen patients (63.6%) attained a stable best spectacle-corrected VA of at least 20/40 or better, whereas 8 (36.4%) attained stable 20/20 vision.

Conclusion: Establishment of our OOKP program suggests that OOKP surgery has the potential to restore good vision to the most severe cases of corneal blindness in an Asian setting, with minimal device-related complications. Longer follow-up of these cases is currently underway.

B65
EVALUATION ON THE CORNEA FLAP IN DIFFERENT THICKNESS AFTER LASIK BY CONFOCAL MICROCOPY

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Purpose: To investigate morphologically the different changes of cornea tissue between thick and thin cornea flap with confocal microscope.

Methods: 50 cases (100 eyes) who had received LASIK were divided into the thin cornea flap group (48 eyes, group A)and the thick cornea flap group (52 eyes, group B). The age was 23 ± 4.5 years old. Spherical equivalent diaopter (SE) were -4.76 ± 2.3DS and -3.03 ± 2.2DS. Inspection items included visual acuity (VA), refraction, wave-front analysis, contrast sensitivity during pre-and post-lasik, at the same time, all eyes were examined by confocal microcopy. Using Moria 90 um and 130 um keratome with Allegretto Excimer laser machine.

Results: The comparison results of confocal microscope: The thickness of cornea flap: group A 107.37 ± 20.5 μm; group B 149 ± 25.2 μm ($p<0.05$). The thickness of wrinkle: group A 63.71 ± 15.8 μm; group B 48.16 ± 20.7 μm ($p<0.05$). The thickness of acellular area: group A 69.93 ± 15.8 um; group B 55.63 ± 23.7 μm ($p<0.05$). The thickness of activation cornea cells: group A 60.15 ± 30.9 μm; group B 51.86 ± 27.9 μm ($p<0.05$). The density of anterior stromal: group A 825.14 ± 156.9 μm^2; group B 853.54 ± 126.8 μm^2 ($p<0.05$). There were significant differences on the thickness of cornea flap. Wave-front analysis: There was no difference between two groups ($p>0.05$). Contrast sensitivity: There was also no difference between two groups ($p>0.05$).

Conclusion: From the point of confocal microscope view, morphologic changes of cornea was significant with different thick flap. It is not cicatrical healing between the cornea flap and stromal. The injury of cornea tissue in the thin cornea flap was server than that of in the thick cornea flap even though there was no significant difference between thin and thick cornea flap group in clinical refraction correction, wavefront and contrast sensitivity.

B66
FACTORS ASSOCIATED WITH THE SUCCESSFUL SEPARATION OF CORNEAL EPITHELIUM IN EPI-LASIK WITH AMADEUS II MICROKERATOME

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Purpose: To determine the incidence of the flap-related complications of Epi-LASIK and the factors related perioperatively AMADEUS II microkeratome.
Methods: 131 eyes of 67 patients who had Epi-LASIK using AMADEUS II microkeratome (AMO, USA) were enrolled in this study. Group 1 (41 eyes) is patients with free flap and incomplete flap (epitheial nest, button hole, large hinge, flap tearing) Group 2 (60 eyes) is normal control group. Associations of pre-operative corneal curvature, white-to-white distance, central corneal thickness, refractive error, dry eye, punctate corneal erosion, pannus, and history of wearing contact lenses with flap-related complications were investigated. To decrease the flap-related complications, pressing the lids with speculum during epithelial separation and corneal wetting was tried and its effect was verified.
Results: Vaccum pressure (p=0.078), astigmatism (p=0.552), thin cornea (p=0.041), a history of wearing contact lenses (p=0.117) and the period of using contact lenses (p=0.125) are not relatively to with free flap and incomplete flap development. Only small hinge width is significantly decreased the incidence of the successful epithelial separation (p=0.048). Pressing down the lids with speculum during separating epithelial sheet increased complete separation from 50.6% to 83.8% (p=0.003).
Conclusion: Flap-related complications of Epi-LASIK may increase in the contact lens users and in people who has thin cornea, and they can be reduced by pressing the lids with speculum during epithelial separation and corneal wetting.

B67
BILATERAL INADVERTENT STROMAL DISSECTION DURING MECHANICAL SEPARATION OF THE CORNEAL EPITHELIUM USING AN EPIKERATOME

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Purpose: To report the bilateral inadvertent stromal cuts during mechanical separation of the corneal epithelium by epikeratome in one patient.
Methods: Observational case report. A 25-year-old female underwent epi-laser in situ keratomileusis (epi-LASIK) with Centurion SES epikeratome (Norwood Eye Care) to separate corneal epithelium. Preoperative slitlamp examination and corneal topography showed no remarkable findings. After the completion of epithelial flap creation, a linear superficial stromal cut adjacent to the upper flap edge was found on her right eye. An oval superficial stromal cut involving central cornea was found on her left eye. Excimer laser ablation was continued in both eyes and epithelial flaps were repositioned after the laser ablation.
Results: Six months after operation, the best corrective visual acuity was 20/20 in the right eye and 20/40 in the left eye. Slit lamp biomicroscopy revealed irregular corneal surface with faint corneal opacity corresponding to the previous stromal cut area in the left eye. Topographic examination revealed irregularities in the left cornea.
Conclusion: Stromal dissection during mechanical separation of the corneal epithelium with an epikeratome is a potential complication of the epi-LASIK procedure. Severe visual impairment can be found in such complications.

B68
WOUND HEAING AFTER EPI-LAISK WITH OR WITHOUT REPLACED EPITEHLIAL FLAPS

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Purpose: To compare the corneal wound healing process after Epi-LASIK with or without corneal epithelial flaps remained on corneal surface after surgery.
Methods: Forty six eyes of 27 patients underwent Epi-LASIK with epithelial flaps remained on surface, and 28 eyes of 15 patients underwent Epi-LASIK without epithelial flaps remained on surface were compared. Slit-lamp biomicroscopy, in vivo confocal microscopy, visual acuity and refractive status were recorded before, weekly in the first month and at 3 and 6 months after surgery. By in vivo confocal microscopy, cellular morphology of selected images of the corneal basal/apical surface epithelium was evaluated. Internal light reflectivity on Z scan profile was used to evaluate postoperative stromal reaction.
Results: There was no significant difference of corneal epithelial healing time (p>0.05), final visual acuity (p>0.05) and refractive errors between these two groups (p>0.05). By in vivo confocal microscopy, different healing procesess of corneal epithelial layer

between these 2 groups were found. There was no difference of stromal reaction between two groups. No major complications were found in all cases presented in this study.

Conclusion: The surgical outcome of Epi-LASIK with or without epithelial flaps remained on corneal surface was compatible. Both methods were safe and effective for refractive surgery. However, different corneal epithelial healing process was found by in vivo confocal microscopy.

B69
COMPARISON BETWEEN CORNEAL AND OCULAR ABERRATION IN LASER REFRACTIVE SURGERY

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Purpose: To evaluate change of anterior corneal aberration (Pentacam®) and ocular aberration (aberrometer, LADARWave®), and to examine their correlation in laser refractive surgery.

Methods: Sixty-six eyes of 33 patients who underwent laser refractive surgery were retrospectively reviewed. Anterior corneal and ocular aberrations were measured by Pentacam® and aberrometer (LADARWave®) respectively – before and 1 and 3 months after operation. We compared changes of RMS (root mean square) values of coma, spherical aberration, and total high order aberration (HOA).

Results: Preoperative ocular aberration measured low level, but as a result of laser refractive surgery, anterior corneal aberration and ocular aberration were increased by similar degree. There were no statistically significant differences of internal optics aberration values-ocular aberration minus anterior corneal aberration - in coma, spherical aberration, and total HOA. Anterior corneal and ocular aberrations showed statistically significant correlations at 1 and 3 months after operation.

Conclusion: Before operation, internal optics aberration compensated anterior corneal aberration effectively. However, the increase of anterior corneal aberration by laser refractive surgery exceeded compensation of internal optics, and anterior corneal and ocular aberrations were increased by similar degree. After operation, correlation between anterior corneal and ocular aberrations became statistically significant because of increased proportion of anterior corneal aberration in ocular aberration.

B70
EX-VIVO MULTIPHOTON ANALYSIS OF RABBIT CORNEAL WOUND HEALING FOLLOWING CONDUCTIVE KERATOPLASTY

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Purpose: To characterize the rabbit corneal wound healing after conductive keratoplasty (CK) procedures by the use of multiphoton microscopy.

Methods: CK was performed on 24 eyes of 12 New Zealand albino rabbits. CK tips were inserted onto the cornea in a circular pattern with 8 spots at 7.0 mm optic zone. The right eye received CK with a controlled delivery of radio-frequency energy and the left eye was punctured by keratoplast tip without energy application. Rabbits were humanely killed 1 day, 1, 2, 4, 8 and 12 weeks after the CK procedure and the eyes were enucleated and placed in an eye imaging chamber for structural analysis by multiphoton imaging.

Results: The damage from the CK procedure to corneal epithelium and stroma along with the subsequent wound healing process can be followed without histological procedures. In the CK corneas, autofluorescence imaging showed re-epithelialization occurred in the damaged region. However, epithelial hyperplasia was observed to accompany re-epithelialization. The corneal stroma damage, characterized by the absence of SHG signal, still exists 12 weeks following the CK procedure. On the contrary, within the control group, the epithelium restores to the original layers and arrangement, and the stromal damage was minimal.

Conclusion: Without histological processing, multiphoton microscopy is able to characterize corneal damage and wound healing from CK. Our results show that this technique has potential in the clinical evaluation of corneal damage due to refractive surgery and may be used to study and help to reduce the unwanted side effects of these procedures.

B71
INFLUENCE OF DIABETES MELLITUS ON BIOMECHANICAL PROPERTIES OF THE CORNEA

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Purpose: To compare biomechanical properties of human cornea measured as corneal hysteresis (CH) and corneal resistance factor (CRF) in patients with diabetes mellitus and healthy subjects.

Methods: Diabetic patients and healthy subjects were prospectively recruited. In the right eye of each participant we measured CH and CRF with the Ocular Response Analyser (ORA), central corneal thickness (CCT) with an ultrasonic pachymeter, and intraocular pressure (IOP) with Goldman applanation tonometer (GAT). Findings were compared between the two groups using multivariate analysis to adjust for age and sex.

Results: Thirty healthy subjects (10 F, 20 M) and thirty diabetic patients (13 F, 17 M) were enrolled. The respective age in the two groups was (mean ± SD) 63 ± 9.2 and 58 ± 11.2 years (p=0.06). CH was 9.56±1.40 mm Hg (range 6.9-13.4) and 10.30 ± 1.54 mm Hg (range 7.0-13.5) in healthy subjects and in diabetic patients, respectively (p=0.031). CRF was 9.80 ± 1.70 mm Hg (range, 6.8-14.6) and 10.78 ± 1.38 mm Hg (range, 8.2-14.2), respectively (p=0.008). CCT was 533.7 ± 38.8 µm (range, 459-620) vs 544.9 ± 28.4 µm (range, 491-612) in healthy and diabetics, respectively (p=0.048). There was no statistically significant difference between the two groups in GAT IOP (13.83 ± 3.21 vs 14.97 ± 3.31 mm Hg, p=0.26).

Conclusion: Diabetes mellitus may affect the biomechanical properties of human cornea as measured by the ORA parameters CH and CRF. Our findings suggest increased stiffness of the diabetic cornea, and thus may explain previously reported observations such as higher IOP measurements in diabetic patients in large epidemiologic studies as well as the protective role of diabetes against the progression of keratoconus.

B72
INFLUENCE OF UVA-RIBOFLAVIN CORNEAL COLLAGEN CROSS LINKING ON BIOMECHANICAL PROPERTIES OF KERATOCONIC EYES

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Purpose: To assess changes in biomechanical properties of human corneas following treatment of progressive keratoconus with ultraviolet A (UVA)-Riboflavin corneal collagen cross-linking.

Methods: Seven eyes of seven patients aged 27.7 ± 6.9 (mean ± SD) years with progressive bilateral keratoconus were treated with UVA-Riboflavin collagen cross linking and assessed with the Ocular Response Analyzer (ORA) that measured corneal hysteresis (CH), corneal resistance factor (CRF), Goldmann-correlated intraocular pressure (IOPg) and corneal-compensated intraocular pressure (IOPcc). Treatment included 6-mm diameter corneal deepithelization, instillation of 0.1% Riboflavin in 20% Dextran solution every 5 minutes for 40 minutes and corneal irradiation with UVA 3 mW/cm^2 for 30 minutes at 5 cm from cornea. Patients were assessed by ORA before, 1 week, 1 month and 3 months after treatment. Comparison of postoperative to preoperative measurements was done.

Results: CH was 8.56 ± 1.94 mm Hg (range, 6.7-12), 9.07 ± 1.6 mm Hg (6.9-11.6), 8.54 ± 1.51 mm Hg (6.8-10.7) and 8.13 ± 1.57 mm Hg (6.1-10.7) before, at first week (p=0.62), first month (p=0.99) and third month (p=0.66) after treatment, respectively. CRF was 7.19 ± 2.03 mm Hg (range, 5.1-11), 8.78 ± 1.63 mm Hg (6.2-10.9), 8.26 ± 1.48 mm Hg (5.8-10.5) and 7.17 ± 1.51 mm Hg (6.2-10.5) before, at first week (p=0.15), first month (p=0.28) and third month (p=0.99) after treatment, respectively. IOPg was 10.0 ± 1.7 mm Hg (range, 7.9-12.7), 13.9 ± 2.05 mm Hg (11.5-14.7), 13.5 ± 3.7 mm Hg (8.8-19.7) and 11.1 ± 3.17 mm Hg (7.3-14.9) before, at first week (p<0.001), first month (p=0.04) and third month (p=0.46) after treatment, respectively. IOPcc was 13.3 ± 1.61 mm Hg (range, 11.8-15.5), 16.1 ± 2.16 mm Hg (13.2-18.3), 16.3 ± 3.93 mm Hg (11.4-22.9) and 14.6 ± 3.48 mm Hg (10.5-18.9) before, at first week (p=0.02), first month (p=0.09) and third month (p=0.38) after treatment, respectively.

Conclusion: Our results show transient elevation of all ORA measured parameters, with statistically significant IOP rising, one week after cross linking treatment, but no statistically significant change in biomechanical corneal properties presented by CH and CRF.

B73
CLINICAL CHANGES OF THE CORNEA IN KERATOCONUS AFTER CXL TREATMENT

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Purpose: To assess the Visual and Clinical Improvement and Stability of the Cornea after 12 months Treatment with Collagen Cross Linking (CXL)

Methods: The corneas were infused with Riboflavin Dextran solution . The more affected eye (higher K) was treated using the UV-CXL treatment technique developed by Prof. Theo Seiler. The better eye serves as the control. Postoperative treatment with topical antibiotic and FML drops, together with a steroidal ointment.. was done for one month . Visual acuity, Slit-Lamp examinations, Topography, Pachymetry Refractive status were done at the 1st, 3rd, 6th, 9th, 12th Month periods. RGP contact lenses were fitted at the 2nd week after treatment.

Results: Visual Acuity was improved in all cases and Log mar notation showed visual impairment was reduced to below 0.3. Topography revealed there was a general flattening of the central cornea by about 2 dioptres of Astigmatism. In contrast the control eyes indicated a slight increase of 1-2.00DS. The centre of the Keratoconus cone became more centred resulting in the RGP lenses centering better too. (T.Koller "Optical Regularisation"). Preliminary observations indicate there seems to be initial thinning of the cornea (T. Kollor et al). Patient's Improved Visual Quality also resulted in not only better vision , but better quality of life, and better coping Efficacy Related benefits such as becoming more focused, less depressed and more hope for success in the future.

Conclusion: The results indicate some similarities with other researchers, but longterm , longitudinal studies will help to standardize and prove the efficacy of this CXL treatment and perhaps eventually make it a proactive treatment in early Keratoconus management.

B74
MECHANICAL CHARACTERISATION OF UVA-RIBOFLAVIN CROSSLINKED COLLAGEN HYDROGELS

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Purpose: A UVA-riboflavin technique has been developed recently to crosslink collagen fibers in the cornea, which causes little damage to corneal cells. We propose that this same technique can be modified to improve the mechanical strength of collagen hydrogels for use in tissue engineering applications.

Methods: Rat-tail collagen was used to make collagen hydrogels. Hydrogels submerged in riboflavin photosensitizing solution were placed under a UVA light source for 30 minutes. The mechanical properties of the collagen hydrogels were obtained using a novel indentation system consisting of a sample holder and an image acquisition system. A ball of known weight and size was placed on top of the hydrogel causing it to deform. A theoretical model was derived to calculate the mechanical properties of the hydrogels from their deformation profiles.

Results: Our initial results demonstrate that the UVA-riboflavin crosslinking technique improved the mechanical strength of collagen hydrogels. The Young's modulus of the collagen hydrogels was measured before and after UVA-riboflavin crosslinking. Student T-test was used to verify that there was a significant increase in the modulus of the hydrogels after crosslinking.

Conclusion: This experimental technique potentially has many applications in tissue engineering, as collagen hydrogels are much weaker than the native tissues. In addition to demonstrating a method of improving the mechanical strength of collagen hydrogels, this work also demonstrates the capabilities of the long focal indentation system for measuring the mechanical properties of hydrogels nondestructively.

B75
OBSERVATION OF UNILATERAL LATTICE CORNEAL DYSTROPHY WITH IN VIVO LASER CONFOCAL MICROSCOPY

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Purpose: In order to examine the detail histology of unilateral lattice corneal dystrophy, in vivo laser confocal microscopy (HRT2-RCM®) was used.
Methods: A 50-year-old female with unilateral lattice corneal dystrophy was examined using the slit-lamp biomicroscope and in vivo laser confocal microscope.
Results: On slit-lamp biomicroscopy, the opacity of lattice degeneration was observed at wide area of the right cornea and the diffuse opacity like 'frosted glass' was detected in some part of the right cornea. In contrst, there were no abnormal findings on the left eye. The examination with HRT2-RCM® showed hyper-reflective round deposits (350 micron) with the radial needle-shape shadow at the center of the right cornea. There were no inflammatory responses, such as inflammatory cell infiltration, close to the deposits. In addition, hyper-reflective dot deposits (less than 5 micron) were observed in the epithelial basal layer and the anterior stromal layer. In the left cornea, there were no hyper-reflective round deposits; the hyper-reflective dot deposits were observed between the epithelial basal layer and posterior stromal layer.
Conclusion: Using a HRT2-RCM®, the microstructural changes were described in both eyes in a case who was diagnosed as unilateral lattice corneal dystrophy by a slit-lamp biomicroscopy.

B76
USE OF ANTERIOR SEGMENT OCT TO ASSESS SECONDARY GLAUCOMA FOLLOWING PENETRATING KERATOPLASTY

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We describe the use of anterior segment optical coherence tomography in the evaluation of a patient with raised intraocular pressures following corneal transplantation with synechiolysis. The demonstration of the blocked glaucoma drainage device and exact siting of the tube opening beneath the iris enabled us to confirm the cause of raised intraocular pressure, and guide us in exact placement of a surgical iridectomy to relieve the blockage.

B77
CORNEAL IMAGING WITH ANTERIOR SEGMENT OPTICAL COHERENCE TOMOGRAPHY FOR LAMELLAR KERATOPLASTY PROCEDURES

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Purpose: To assess and describe the uses of anterior segment optical coherence tomography (ASOCT) in the evaluation of the cornea prior to and following lamellar corneal transplantation procedures.
Methods: Prospective, non-comparative observational case series. 7 eyes of 7 patients undergoing anterior and posterior lamellar corneal transplantation procedures at the Singapore National Eye Centre were included in the study. High resolution ASOCT scans of the cornea and anterior segment were performed both prior to and following lamellar transplantation procedures on the cornea with the Visante ASOCT system (Visante OCT, Carl Zeiss Meditec Inc, Dublin, CA) and the imaging findings were correlated with the clinical picture. Measurements of lamella thickness were performed with the software provided.
Results: ASOCT images were able to provide information on donor apposition, Descemets detachment after DALK, and posterior lamellar dislocation, primary graft failure and anterior chamber crowding with consequent chamber angle encroachment and pupillary block following DSAEK.
Conclusion: ASOCT is a valuable imaging tool for assessing the feasibility of lamellar transplantation surgery in the diseased cornea and in the management of surgical complications following such procedures.

B78
INTRACAMERAL SF6 INJECTION FOR TREATMENT OF ACUTE HYDROPS IN PELLUCID MARGINAL CORNEAL DEGENERATION

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Purpose: To report a case of acute hydrops in pellucid marginal corneal degeneration (PMCD) successfully treated with SF6 intracameral injection.

Methods: A 47 year-old female patient presented with spontaneous onset of pain, redness and decreased vision in her left eye. Clinical evaluation revealed a bilateral PMCD with evidence of acute hydrops in the left eye. Anterior segment optical coherence tomography examination revealed intrastromal clefts with Descemet's membrane detachment in the left eye. She was managed with descemetopexy with 0.2 ml injection of iso-expansile SF6 (18%) intracamerally.

Results: The patient showed excellent early resolution of the stromal edema with reattachment of the Descemet's membrane.

Conclusion: Prompt intervention in acute hydrops in PMCD cases helps in achieving early good visual results and prevents potentially serious complications such as perforation.

B79
THE INFLUENCE OF WOUND SIZE ON SURGICAL INDUCED ASTIGMATISM AFTER PHACOEMULSIFICATION

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Purpose: To compare intraindividually the surgical induced astigmatism (SIA) after phacoemulsification and foldable intraocular lens (IOL) implantation through a 2.5 mm and a 3.5 mm unsutured temporal clear corneal incisions over postoperative 12 weeks.

Methods: This study comprised 18 consecutive patients who underwent cataract surgery by a single surgeon at National Taiwan University Hospital. All the patients were randomly assigned to receive a 1-piece IOL (Acrysof SA60AT) through a 2.5 mm incision in one eye, and a 3-piece IOL (Tecnis Z9000) through a 3.5 mm incision in the contralateral eye. Corneal topography was performed preoperatively and at 3, 6, and 12 weeks. Surgical induced astigmatism (SIA) was calculated by vector analyses using the Alpins' method.

Results: Mean SIA was lower in the 2.5 mm incision group than in the 3.5 mm group during whole follow-up period. The difference in SIA between the 2 incision groups was statistically significant at postoperative 3 weeks (0.57 diopter versus 0.86 diopter, $p<0.05$), but no significant difference was noted at 6 or 12 weeks postoperatively. Mean SIA reduced with time in both groups, and more than 90% were less than 1.0 diopter at postoperative 12 weeks.

Conclusion: A 2.5 mm corneal incision in cataract surgery induced less astigmatism than a 3.5 mm cornea incision in the early postoperative 3 weeks. Over the long term, there was no significant difference in SIA between these two groups of different wound sizes.

B80
THE EFFECT OF SOFT CONTACT LENSES ON THE MEASUREMENTS OF INTRAOCULAR PRESSURE WITH NON-CONTACT TONOMETER

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Purpose: to assess the accuracy of the non-contact tonometer (NCT) in measurement of intraocular pressure (IOP) through a soft contact lens with different refractive power.

Methods: Sixteen healthy volunteers participated in this study. Three different diopters (-3.0D, -6.0D and -9.0D) of soft contact lenses (Bausch and Lomb daily disposable soft lenses) were sequentially placed on the eyes and repeat measurements were taken. The readings obtained for each contact lens were compared to the baseline readings taken without a lens in place in order to assess the effect that each contact lens had on the accuracy of IOP measurements.

Results: We found statistical difference between IOPs measured with and without soft contact lens. IOPs decreased 1.03 ± 2.34, 1.63 ± 2.10 and 2.61 ± 2.10 mm Hg in -3.0D, -6.0D and -9.0D soft contact lens respectively. The linear regression showed the decreased IOP related with refractive power of soft contact lens by IOP = -0.173 + 0.264 x diopter.

Conclusion: IOP measurement by NCT over myopic soft contact lenses may be inaccurate and tend to be an underestimation, especially in high myopic lens.

B81
TRANSSCLERAL FIXATION OF POSTERIOR CHAMBER INTRAOCULAR LENSES — VISUAL OUTCOME AND COMPLICATIONS

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Purpose: To describe the epidemiology, visual outcome and complications of transscleral suture fixation of intraocular lenses, as well as to compare the visual outcomes and complication rates of an anterior vitrectomy and posterior vitrectomy.
Methods: The medical records of 23 eyes of 22 patients who underwent scleral fixation in Tan Tock Seng Hospital were retrospectively reviewed and analysed. Main outcome measures: Post op visual acuity, determined as good (visual acuity 6/6-6/12), and poor (visual acuity 6/15 or worse) and complication rates in both groups.
Results: After a mean follow-up of 7.28 months, 11 patients (47.8%) were able to achieve a good visual outcome. The significant determinants of good visual outcome were that of male gender and an uncomplicated procedure. Males are noted to be more likely to experience a complicated procedure which was statistically significant. The posterior vitrectomy approach was 1.98 times more likely to achieve a good visual outcome as compared to anterior vitrectomy, although this result was not statistically significant. The posterior vitrectomy group was 2.70 times more likely to run into complications compared to the anterior vitrectomy group although this was not statistically significant.
Conclusion: Transscleral fixation of posterior chamber lenses is a good alternative in selected patients. Although the posterior vitrectomy approach may encounter more complications, these were not sight threatening and thus did not affect visual outcome. The posterior approach is thus preferred. A larger study could be further conducted to validate this data.

B82
A NON-TOUCH 'CORNEAL-ANESTHESIOMETER'

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Purpose: Corneal sensitivity is an important test in everyday ophthalmic practice. The present method of testing corneal sensations with a cotton wick appears very primitive, apart from having many other shortcomings.The purpose of the study is to design a device capable of assessing the sensitivity of the cornea without having to touch it.
Methods: Controlled and calibrated pressure air jets were used to test corneal sensations. The simple device was mounted onto a conventional slit-lamp. A 26 gauge needle was attached through a regulator and pressure gauge to a cylinder containing pressurized air. Air jets were directed onto the cornea, and the pressure of the jet just enough to initiate a lid closure reflex was recorded. Recordings were made in 50 normal eyes to calibrate the device and determine the range of readings one could expect in normal corneas. 62 eyes having diminished corneal sensitivity due to various causes were then studied.
Results: It was possible to make an objective record of the corneal sensitivity, based on the minimum pressure required to initiate a lid closure reflex.
Conclusion: The corneal anesthesiometer is an excellent device to test for corneal sensitivity without having to actually touch the cornea.

B83
THE USEFUL TECHNIQUE TO REDUCE A VITREOUS PRESSURE BY 25-GAUGE VITRECTOMY SYSTEM IN PENETRATING KERATOPLASTY COMBINED WITH A CATARACT SURGERY

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Purpose: To report a technique to reduce vitreous pressure by 25-gauge vitrectomy system in penetrating keratoplasty combined with a cataract surgery.
Methods: Before cutting a recipient's cornea by a trephine, 25-gauge trocar canula was transconjunctivally inserted at 3.5mm from the limbus. 25-gauge cutter was inserted until 8mm from the end of the cutter and cutted vitreous without reflux until vitreous came to 20cm point of tube from the end of cutter.
Results: In 4 eyes (4 patients), the mean time from setting trocar canula to removal was 215.5 ± 98.0 sec. There was no complication such as hypotony, retinal detachment or disapproval of intraocular lens insertion.
Conclusion: The reduction of vitreous pressure by 25-gauge vitrectomy system could be done for a short time and is very useful in penetrating keratoplasty combined with a cataract surgery under a local anesthesia.

B84
MICROARRAY FOR GENES ASSOCIATED WITH ANGIOGENESIS IN DIABETIC OLETF KERATOCYTES

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Purpose: The purpose of this study was to identify differences in angiogenesis gene expression between normal and diabetic keratocytes stimulated with interleukin-1α (IL-1α) and tumor necrosis factor-α (TNF-α).
Methods: Normal and diabetic keratocytes(OLETE) were primarily cultured and treated with 20 ng/ml IL-1α and TNF-α for 6 h. cDNA was hybridized to an oligonucleotide microarray. Genes identified by the microarray were further evaluated by real-time PCR.
Results: Diabetes showed down-regulated 20 genes and up-regulated 14 genes compared with normal keratocytes. IL-1α treated diabetic keratocyte expressed 20 down-regulated and 16 up-regulated genes. Compared with diabetic keratocytes, the up-regulated expressed genes in OLETF treated with TNF-α were as Angiotensin II type-I receptor, Integrin alpha 1, Dimethylarginine dimethylaminohydrolase 1, Pituitary tumor transforming 1. Tenomodulin. Real-time PCR showed a significant increase in the IL-6, Integrin alpha 1, and Angiotensin II type I receptor gene.
Conclusion: There were differentially expressed genes related with angiogenesis between normal and diabetic keratocytes of OLETF. Especially, Integrin alpha 1 gene expressed up-regulated in diabetes treated with IL-1α, and Angiotensin II type I receptor gene showed up-regulated in stimulated with TNF-α. Studies to analyze the apoptotic significance of the identified differences of diabetes are needed.

B85
IDENTIFICATION OF A NOVEL *UBIAD1* MUTATION IN A CHINESE FAMILY WITH SCHNYDER CRYSTALLINE CORNEAL DYSTROPHY (SCCD)

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Purpose: Schnyder crystalline corneal dystrophy (SCCD) is a rare autosomal dominant disease characterized by abnormal increase in cholesterol and phospholipid deposition in the cornea. A genome wide linkage analysis in Swede-Finn pedigrees, mapped the SCCD locus to chromosome 1p36 and *UBIAD1* gene identified in this locus caused SCCD. Our aim was to identify the molecular genetic basis of SCCD in a non-consanguineous four-generation Chinese Singaporean family with bilateral corneal abnormalities characteristic of SCCD.
Methods: Ophthalmic examination to check for arcus lipoides and crystalline deposits and genetic analysis of blood samples of the Chinese SCCD family was performed. Ten microsatellite markers from the SCCD locus were genotyped using an ABI 3100 Genetic Analyzer. Two-point and multipoint LOD scores were calculated using the MLINK option of the Cyrillic pedigree information package. The 2 coding exons of the *UBIAD1* gene were screened for mutations by direct sequencing.
Results: The Chinese SCCD family was confirmed to be linked to the known SCCD locus with a maximum two-point LOD score of 2.13 at theta=0.00 with marker D1S244. A novel heterozygous mutation was identified at position c.511T>C leading to substitution of serine by proline at codon 171 (p.Ser171Pro); which is a highly conserved region in mammalian, avian and insect homologs of *UBIAD1* protein. This mutation was absent in >180 Chinese normal controls indicating p.Ser171Pro to be the disease causative mutation in this family.
Conclusion: Identification of a novel UBIAD1 mutation in the first Chinese family with SCCD indicates that SCCD is likely to be genetically homogeneous.

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B86
Identification and characterization of SLC4A11 mutations in Fuchs Endothelial Corneal Dystrophy (FECD)

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Purpose: The endothelial (posterior) corneal dystrophies, which result from primary endothelial dysfunction, include Fuchs endothelial dystrophy (FECD), posterior polymorphism dystrophy (PPCD) and congenital hereditary endothelial dystrophy (CHED). As they share common features of disease it is possible that a proportion

of them could be clinical manifestations of different mutations of the same gene. The aim of our work was to determine whether mutations in the SLC4A11 gene, recently implicated in recessive CHED may also play a pathogenic role in the development of the more common FECD.

Method: SLC4A11 gene exons were screened in 89 FECD cases (64 Chinese and 25 Indian) by direct sequencing. 210 Chinese and 144 Indian samples were used as normal age matched controls. Wild type and mutant cDNA constructs were transfected into HEK293 cells and protein extracts used for immunoblot analysis, cell surface processing assays and Confocal immunolocalization.

Results: Four heterozygous mutations absent in ethnically matched controls were identified in the screen of 89 FECD patients. These were three missense mutations (E399K, G709E and T754M) and one deletion mutation (99-100delTC). All missense mutation sites also showed high interspecies conservation indicating that mutations at these sites would be deleterious. Accordingly, immunoblot analysis, assay of cell surface localization and confocal immunolocalization showed that missense mutants were defective in localization to the cell surface.

Conclusion: Our data suggests that SLC4A11 haploinsufficiency and gradual accumulation of the aberrant misfolded protein may play a role in FECD pathology and that reduced levels of SLC4A11 influence the long-term viability of corneal endothelial cells.

B87
2 YEARS FOLLOW-UP RESULTS OF VISUAL ACUITY AND CONTRAST SENSITIVITY ENHANCEMENT IN PATIENTS WITH LOW MYOPIA USING NEUROVISION'S NEURAL VISION CORRECTION™ (NVC™) TECHNOLOGY

KL Siow,[1,2] Donald TH Tan [1,2,3]
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Purpose: NeuroVision's NVC™ technology is a non-invasive, patient-specific, perceptual learning program based on visual stimulation and facilitation of neural connections at the cortical level, involving a computerized visual training regime using Gabor patches, to improve contrast sensitivity and visual acuity. We evaluated efficacy of treatment in enhancement of unaided visual acuity (UAVA) and unaided contrast sensitivity function (UCSF) in low myopes and monitored the persistence of the improvement for up to 24 months.

Methods: 119 low myopes (range 0D to -2.63D) underwent NVC treatment in Singapore National Eye Centre. 63 patients completed 6 months follow-up, 27 patients completed 12 months follow-up and 17 patients completed 24 months follow-up post treatment end.

Results: Mean Baseline LogMAR UAVA was 0.404, improving to 0.110 at the end of the treatment approximating 3 lines of improvement in acuity. 78% of this improvement was maintained after 6 months, 76% was maintained after 12 months and 74% was maintained after 24 months. Mean baseline UCSF at 1.5, 3, 6, 12, 18 cpd was: 39, 41, 23, 7, 2 improving to: 117, 145, 148, 61, 18. Average 82% of this improvement was maintained after 6 months, 79% was maintained for 12 months and 76% was maintained for 24 months. Mean refractive error in all groups remained unchanged.

Conclusion: Results suggest that NVC treatment improves UAVA and UCSF in low myopes. This improvement appears to be retained for 24 months after treatment.

B88
ENHANCEMENT OF UNDER-CORRECTED VISUAL ACUITY AND CONTRAST SENSITIVITY IN MYOPIC CHILDREN USING NEUROVISION'S NEURAL VISION CORRECTION™ (NVC™) TECHNOLOGY

Allan Fong, Chua Wei Han, Muhammad Nazarul, Donald TH Tan
Singapore National Eye Centre, Singapore

Purpose: To evaluate the efficacy of NeuroVision's NVC™ technology in the enhancement of under-corrected visual acuity (UC-VA) and contrast sensitivity function (UC-CSF) in Myopic children in Singapore.

Methods: NeuroVision's NVC™ technology is a non-invasive, patient-specific, perceptual learning program based on visual stimulation and facilitation of neural connections at the cortical level, involving an internet-based computer generated visual training exercise regime using stimuli based on Gabor patches, to sharpen contrast sensitivity and visual acuity. Children with highly progressive Myopia often use under-corrected eyeglasses. 33 children aged 7-9 having a myopia refraction of at least -1.0DS in both eyes (mean cycloplegic SE: -2.88D, range -1.0D to -6.00D) completed NVC treatment over a period of 4 months. During the course of treatment, subjects were prescribed with eyeglasses that are 0.5D under their full manifest refraction. Investigations included manifest and cycloplegic refraction, axial length, Under-Corrected (1.0DS) VA and CSF.

Results: Mean UC-VA before treatment was 0.47 logMar, improving

by 0.22 logMar to 0.25 post-treatment. UC-CSF at 1.5, 3, 6, 12, 18 cpd improved from 40, 43, 30, 8, 2.5 at baseline to 70, 110, 100, 35, 12 post-treatment. Changes in cycloplegic refraction (-0.47D) and Axial length (0.177 mm) were within the expected myopia progression for this age group.

Conclusion: Results of the NVC treatment suggest that this technology is able to improve under-corrected VA and CSF in Myopic Children.

B89
A RANDOMIZED CONTROLLED TRIAL EVALUATING THE EFFICACY OF NEUROVISION'S NEURAL VISION CORRECTION™ (NVC™) TECHNOLOGY IN ENHANCING UNAIDED VISUAL ACUITY IN ADULTS WITH LOW MYOPIA

Allan Fong, Donald TH Tan

Singapore National Eye Centre, Singapore

Purpose: To evaluate the efficacy of NeuroVision's Neural Vision Correction™ (NVC™) Technology in enhancing unaided visual acuity in adults with low myopia.

Methods: NeuroVision's NVC™ technology is a non-invasive, patient-specific, perceptual learning program based on visual stimulation and facilitation of neural connections at the cortical level, involving an internet-based computer generated visual training exercise regime using stimuli based on Gabor patches, to sharpen contrast sensitivity and visual acuity. A double masked randomized controlled trial was conducted to evaluate the efficacy of NVC™ technology in improving unaided vision of low myopic patients. 84 adult low myopic patients with SE≤-1.5D, (mean SE -1.29D), were randomly divided into 2 groups, one receiving NVC treatment and the other receiving placebo NVC treatment.

Results: Mean Unaided Visual Acuity (UAVA) improved in Group A by 0.186 logMar vs 0.023 logMar in Group B. 65.2% of the subjects in group A improved more than 0.2 logMar in at least one eye vs. 11.1% in Group B ($p<0.005$). Mean refractive error remained unchanged.

Conclusion: NVC treatment demonstrates statistical significant UAVA improvement in Low Myopic Patients between masked treatment groups.

ASIA CORNEA SOCIETY

AUTHOR INDEX

Vigamox®
(moxifloxacin HCl ophthalmic solution) 0.5% as base

VIGAMOX® (moxifloxacin hydrochloride ophthalmic solution) 0.5% as base

DESCRIPTION: VIGAMOX® (moxifloxacin HCl ophthalmic solution) 0.5% is a sterile topical ophthalmic solution. Moxifloxacin is a fourth-generation fluoroquinolone antibacterial agent active against a broad spectrum of Gram-positive and Gram-negative ocular pathogens, atypical microorganisms and anaerobes.

Contains: Active: Moxifloxacin 0.5% (5 mg/mL); **Preservative:** None. Product is self-preserved. **Inactives:** sodium chloride, boric acid and purified water. May also contain hydrochloric acid/sodium hydroxide to adjust pH. VIGAMOX® Solution is isotonic and formulated at pH 6.8 with an osmolality of approximately 290 mOsm/kg.

CLINICAL PHARMACOLOGY:

Microbiology: Moxifloxacin has in vitro activity against a wide range of Gram-positive and Gram-negative microorganisms. Moxifloxacin inhibits the topoisomerase II (DNA gyrase) and topoisomerase IV required for bacterial DNA replication, transcription, repair, and recombination. The C8-methoxy moiety of moxifloxacin also lessens the selection of resistant mutants of Gram-positive bacteria compared to the C8-H moiety found in older fluoroquinolones. Moxifloxacin's bulky C-7 substituent group interferes with the quinolone efflux pump mechanism of bacteria. In vitro resistance to moxifloxacin develops slowly via multiple-step mutations and occurs at a general frequency between 10-9 to 10-11 for Gram-positive bacteria. Moxifloxacin has been shown to be active in vitro against most strains of the following organisms; however, the clinical significance of these data is unknown.

Gram-positive bacteria:

Arthrobacter species, Bacillus cereus, Bacillus thuringensis, Corynebacterium accolens, Corynebacterium amycolatum, Corynebacterium bovis, Corynebacterium macginleyi, Corynebacterium propinquum, Corynebacterium pseudodiptheriticum, Enterococcus faecalis, Exiguobacterium species, Kocuria kristinae, Kocuria "lindaea", Kocuria rhizophila, Listeria monocytogenes, Microbacterium "harmaniae", Microbacterium "otitidis", Rothia mucilaginosus, Staphylococcus arlettae, Staphylococcus capitis, Staphylococcus caprae, Staphylococcus cohnii, Staphylococcus lugdunensis, Staphylococcus pasteuri, Staphylococcus saprophyticus, Staphylococcus sciuri, Streptococcus agalactiae, Streptococcus "conjunctiviae", Streptococcus cristatus, Streptococcus dysgalactiae, Streptococcus mitis, Streptococcus Groups C, G and F, Streptococcus "ocularis", Streptococcus oralis, Streptococcus parasanguinis, Streptococcus pyogenes, Streptococcus salivarius, Streptococcus sanguis, Streptococcus "schlechii"

Gram-negative bacteria:

Achromobacter xylosoxidans, Acinetobacter baumannii, Acinetobacter calcoaceticus, Acinetobacter johnsonii, Acinetobacter junii, Acinetobacter lwoffi, Acinetobacter "mumbaiae", Acinetobacter schindleri, Acinetobacter ursingii, Aeromonas caviae, Chryseobacterium indologenes, Chryseobacterium species, Citrobacter freundii, Citrobacter koseri, Enterobacter aerogenes, Enterobacter cloacae, Enterobacter hormaechei, Escherichia coli, Klebsiella oxytoca, Moraxella osloensis, Morganella morganii, Neisseria gonorrhoeae, Pantoea agglomerans, Proteus mirabilis, Proteus vulgaris, Pseudomonas orzyihabitans, Pseudomonas stutzeri, Serratia liquefaciens, Serratia marcescens, Stenotrophomonas maltophilia

Anaerobic microorganisms:

Clostridium perfringens, Fusobacterium species, Porphyromonas species, Prevotella species, Propionibacterium acnes

Other Organisms:

Atypical Mycobacterium, Chlamydia pneumoniae, Legionella pneumophila, Mycobacterium avium, Mycobacterium marinum, Mycoplasma pneumoniae

Clinical Studies: VIGAMOX® Solution has been studied in patients from newborns to adults, including geriatric patients.

In three randomized, double-masked, multicenter, controlled clinical trials in which patients were dosed 3 times a day for 4 days, VIGAMOX® Solution produced clinical cures in 80% to 94% of patients treated for bacterial conjunctivitis. Microbiological success rates for the eradication of the baseline pathogens ranged from 85% to 97%. In one of these trials in pediatric patients from birth to one month of age, VIGAMOX® Solution produced clinical cure in 80% of patients with bacterial conjunctivitis. The microbiological success rate for the eradication of the baseline pathogens was 92%.

INDICATIONS AND USAGE: VIGAMOX® Solution is indicated for the treatment of bacterial conjunctivitis caused by susceptible strains of the following organisms:

Gram-positive bacteria:

Corynebacterium species, Microbacterium species, Micrococcus luteus*, Staphylococcus aureus, Staphylococcus epidermidis, Staphylococcus haemolyticus, Staphylococcus hominis*, Staphylococcus warneri*, Streptococcus mitis*, Streptococcus pneumoniae, Streptococcus viridans*

Gram-negative bacteria:

Acinetobacter species, Haemophilus "alconae", Haemophilus influenzae, Klebsiella pneumoniae, Moraxella catarrhalis*, Pseudomonas aeruginosa**

Other microorganisms:

Chlamydia trachomatis

*Efficacy for this organism was studied in fewer than 10 infections

CONTRAINDICATIONS: VIGAMOX® Solution is contraindicated in patients with a history of hypersensitivity to moxifloxacin, to other quinolones, or to any of the components in this medication.

WARNINGS: In patients receiving systemically administered quinolones, serious and occasionally fatal hypersensitivity (anaphylactic) reactions have been reported, some following the first dose. Some reactions were accompanied by cardiovascular collapse, loss of consciousness, angioedema (including laryngeal, pharyngeal or facial edema), airway obstruction, dyspnea, urticaria, and itching. If an allergic reaction to moxifloxacin occurs, discontinue use of the drug. Serious acute hypersensitivity reactions may require immediate emergency treatment. Oxygen and airway management should be administered as clinically indicated.

PRECAUTIONS:

General: As with other anti-infectives, prolonged use may result in overgrowth of non-susceptible organisms, including fungi. If superinfection occurs, discontinue use and institute alternative therapy. Whenever clinical judgment dictates, the patient should be examined with the aid of magnification, such as slit-lamp biomicroscopy, and, where appropriate, fluorescein staining. Patients should be advised not to wear contact lenses if they have signs and symptoms of bacterial conjunctivitis.

Drug Interactions: While drug-drug interaction studies have not been conducted with VIGAMOX® Solution, they have been performed with the oral product at much higher systemic exposures than are achieved by the topical ocular route. Unlike some other fluoroquinolones, no clinically significant drug-drug interactions between systemically administered moxifloxacin and itraconazole, theophylline, warfarin, digoxin, oral contraceptives, probenicid, ranitidine or glyburide have been observed. In vitro studies indicate that moxifloxacin does not inhibit CYP3A4, CYP2D6, CYP2C9, CYP2C19 or CYP1A2 indicating that moxifloxacin is unlikely to alter the pharmacokinetics of drugs metabolized by these cytochrome P450 isozymes.

Carcinogenesis, Mutagenesis, Impairment of Fertility: Moxifloxacin was not mutagenic in four bacterial strains used in the Ames Salmonella reversion assay. As with other quinolones, the positive response observed with moxifloxacin in strain TA 102 using the same assay may be due to the inhibition of DNA gyrase. Moxifloxacin was not mutagenic in the CHO/HGPRT mammalian cell gene mutation assay. An equivocal result was obtained in the same assay when v79 cells were used. Moxifloxacin was clastogenic in the v79 chromosome aberration assay, but it did not induce unscheduled DNA synthesis in cultured rat hepatocytes. There was no evidence of genotoxicity in vivo in a micronucleus test or a dominant lethal test in mice. Moxifloxacin had no effect on fertility in male and female rats at oral doses as high as 500 mg/kg/day, approximately 21,700 times the highest recommended total daily human ophthalmic dose. Long term studies in animals to determine the carcinogenic potential of moxifloxacin have not been performed. However, in an accelerated study with initiators and promoters, moxifloxacin was not carcinogenic following up to 38 weeks of oral dosing at 500 mg/kg/day.

Pregnancy: Teratogenic Effects.

Pregnancy Category C: Moxifloxacin was not teratogenic when administered to pregnant rats during organogenesis at oral doses as high as 500 mg/kg/day (approximately 21,700 times the highest recommended total daily human ophthalmic dose); however, decreased fetal body weights and slightly delayed fetal skeletal development were observed. There was no evidence of teratogenicity when pregnant Cynomolgus monkeys were given oral doses as high as 100 mg/kg/day (approximately 4,300 times the highest recommended total daily human ophthalmic dose). An increased incidence of smaller fetuses was observed at 100 mg/kg/day. Since there are no adequate and well-controlled studies in pregnant women VIGAMOX® Solution should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Nursing Mothers: Moxifloxacin has not been measured in human milk, although it can be presumed to be excreted in human milk. Caution should be exercised when VIGAMOX® Solution is administered to a nursing mother. **Pediatric Use:** VIGAMOX® Solution has been shown to be safe and effective in pediatric patients including neonates. There is no evidence that the ophthalmic administration of VIGAMOX® Solution has any effect on weight bearing joints, even though oral administration of some quinolones has been shown to cause arthropathy in immature animals.

Geriatric Use: No overall differences in safety and effectiveness have been observed between elderly and other adult patients.

ADVERSE REACTIONS: No serious ophthalmic or systemic adverse reactions related to VIGAMOX® Solution were reported. Adverse reactions were generally mild and occurred at an incidence similar to placebo (vehicle). The most frequently reported event was transient ocular discomfort (burning/stinging) reported at an incidence of 2.9%. Other reported events included headache, keratitis, ocular pain, ocular pruritus, ocular hyperemia, pharyngitis and subconjunctival hemorrhage which were reported at an incidence of 0.5% to 1.0%.

DOSAGE AND ADMINISTRATION: Instill one drop in the affected eye 3 times a day for 4 days.

Rx Only CAUTION: Federal (USA) law prohibits dispensing without prescription.

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Alcon Laboratories, Inc.
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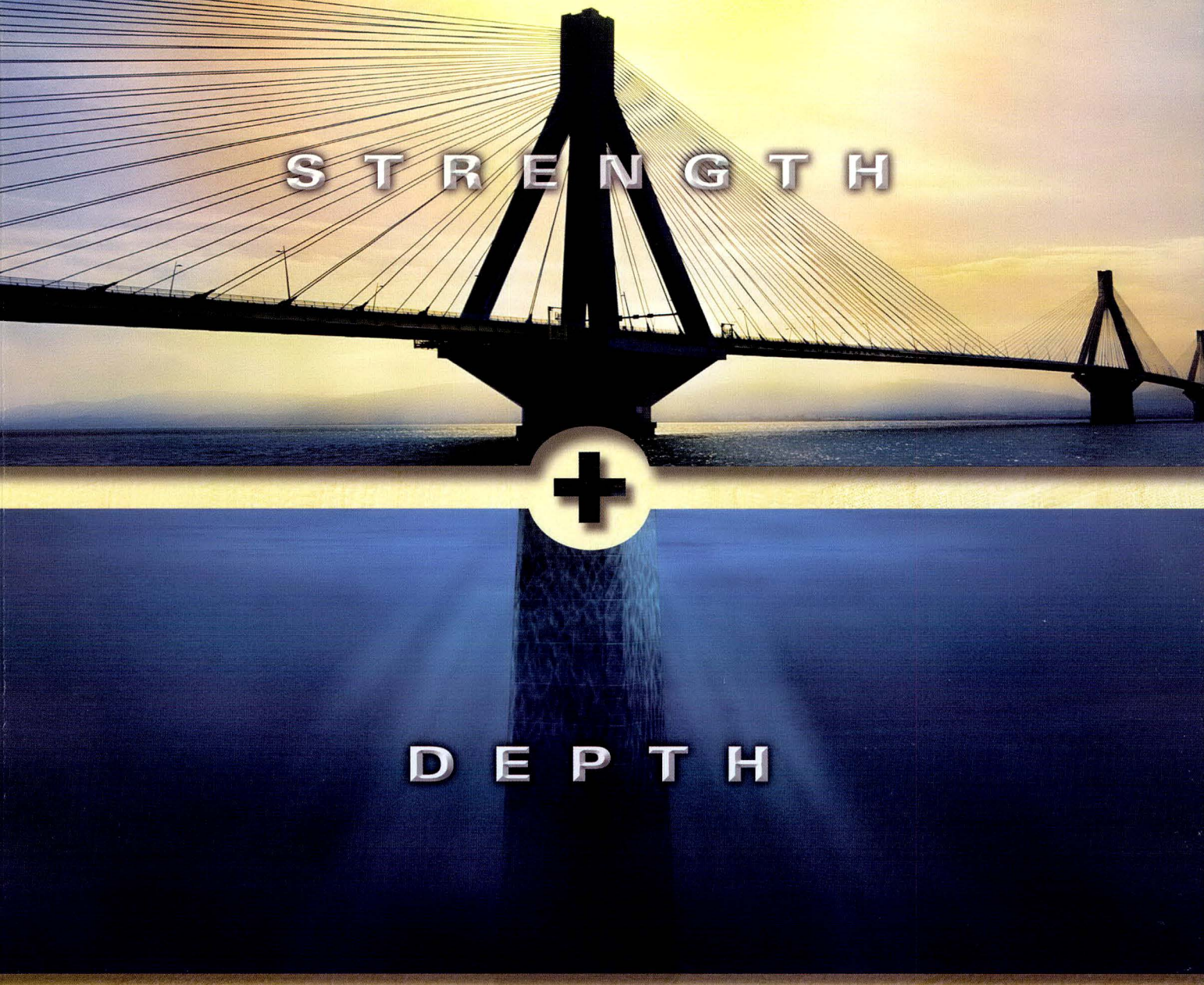

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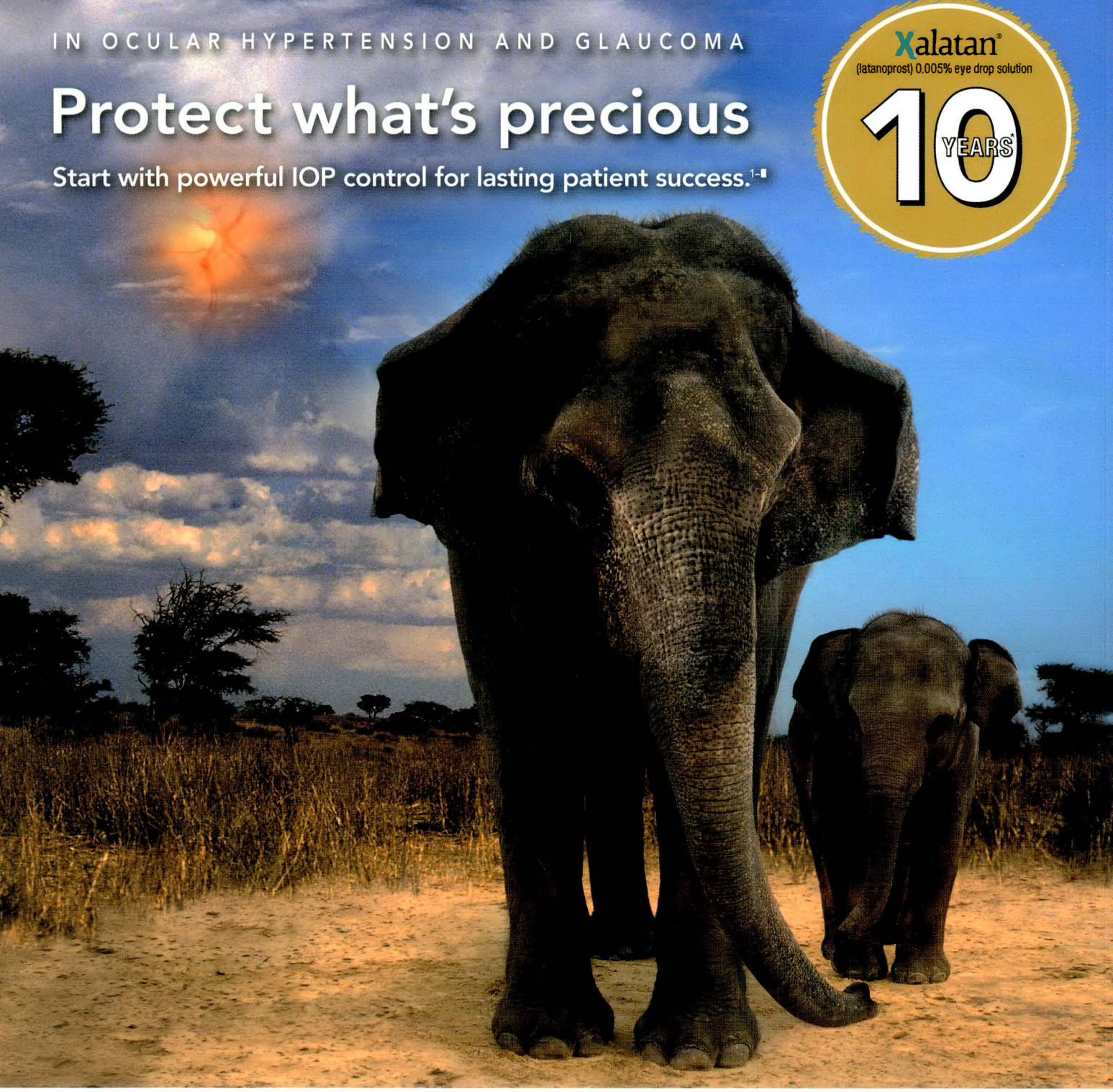

Xalatan® is indicated for the reduction of elevated intraocular pressure (IOP) in patients with open angle glaucoma (OAG) and ocular hypertension (OH). Prescribing Information. Please refer to the SmPC before prescribing Xalatan® 0.005% eye drops solution (latanoprost) **Presentation:** Plastic bottle containing 2.5ml eye drops. Each 1ml contains latanoprost 50 micrograms (0.005%) and benzalkonium chloride 0.20mg. Indication Reduction of elevated intraocular pressure in patients with OAG and ocular hypertension. **Dosage and Administration:** *Adults including the Elderly:* One eye drop into the affected eye(s) once daily in the evening. Contact lenses should be removed before instillation of the eye drops and may be reinserted after 15 minutes (see Precautions). *Children:* Not recommended. **Contra-indications:** Known hypersensitivity to any component. **Precautions:** Xalatan may increase brown pigment within the iris leading to a gradual change in eye colour usually within the first 8 months. This has predominantly been seen in patients with mixed coloured irides and may be permanent. Patients should be examined regularly and treatment discontinued if appropriate. Unilateral treatment can result in permanent heterochromia. Exercise caution in patients with severe or brittle asthma, inflammatory ocular conditions and other types of glaucoma, including OAG of pseudophakic patients, aphakic patients, pseudophakic patients with torn posterior lens capsule or anterior chamber lenses or patients with known risk factors for cystoid macular oedema. Xalatan contains the preservative benzalkonium chloride which has been reported to cause punctate keratopathy and/or toxic ulcerative keratopathy, may cause eye irritation and is known to discolour soft contact lenses. Close monitoring required with frequent or prolonged use of Xalatan in dry eye patients/conditions where the cornea is compromised. Contact lenses may absorb benzalkonium chloride. These should be removed before applying Xalatan but may be reinserted after 15 minutes (see Dosage and Administration). **Pregnancy:** Do not use. **Lactation:** Do not use or stop breast feeding. **Interactions:** Definitive data are not available. However, any other eye drops should be administered five minutes apart. **Side Effects:** Ocular side effects – Very common (>1/10): Increased iris pigmentation, eye irritation (including slight foreign body sensation), eyelash changes (darkening, thickening, lengthening, increased number); Common (>1/100 and <1/10): Mild to moderate conjunctival hyperaemia, transient punctate epithelial erosions (mostly without symptoms), blepharitis, eye pain. Please refer to SmPC for other ocular side-effects. Non-ocular side-effects – Uncommon (>1/1000 and <1/100): Skin rash; Rare (<1/1000): Asthma, asthma exacerbation and dyspnoea; Very rare (<1/10,000): Aggravation of angina in patients with pre-existing disease, chest pain. **Driving:** Vision may be blurred following eye drop instillation. **Overdosage:** Symptomatic treatment. **Pharmaceutical Precautions:** Store at +2°C – +8°C. Protect from light. Once opened, store at room temperature (≤25°C) and discard after 1 month. **Legal category:** POM. **Packaging Quantities and Basic NHS price:** 2.5 ml £13.14. **PL number:** PL 00032/0220. **PL Holder:** Pharmacia Limited, Ramsgate Road, Sandwich, Kent, CT13 9NJ, UK. **Date of preparation of PI:** September 2006. Further information is available on request from: Pfizer Limited, Walton Oaks, Dorking Road, Tadworth, Surrey, KT20 7NS, UK.

Adverse events should be reported to Pfizer Medical Information on 01304 616161 Information about adverse event reporting can also be found at www.yellowcard.gov.uk

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