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# Is zero incidence of postoperative endophthalmitis after cataract surgery achievable?

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***Abstract***

***Purpose:*** *For over 10 years, there have been zero cases of postoperative endophthalmitis (POE) after cataract surgery at Chatswood Private Hospital (CPH), Sydney, Australia.*

***Study design:*** *We conducted a retrospective audit study to evaluate the reasons for this, as well as the different preferences for route of antibiotic prophylaxis used.*

***Methods:*** *Deidentified data on cataract surgery cases for 2010–2020 were extracted and analyzed descriptively.*

***Results:*** *A total of 28,937 cataract surgery cases were performed at CPH from 2010-2020, for which no cases of POE were identified. The intracameral route for antibiotic prophylaxis was more commonly used compared to subconjunctival or both.*

***Conclusion:*** *Administration of prophylactic antibiotics, regardless of the route of administration, is beneficial and equally effective in preventing POE. Having operating theatres dedicated to ophthalmology helps maintain high standards of sterility of instrumentation and operating environments.*

***Keywords:*** *cataract surgery, endophthalmitis, prophylactic antibiotics*

## Introduction

Postoperative endophthalmitis (POE) is a rare but severe vision-threatening complication that can arise following cataract surgery.[1] The incidence has been reported to be between 0.13% and 0.7% in the literature.[2] More recent papers have quoted rates to be as low as 0.1%.[3]

There have been no cases of POE after cataract surgery for over 10 years at Chatswood Private Hospital (CPH) in Sydney, Australia and its predecessor facility, Ophthalmic Surgery Centre (North Shore). Electronic records data from 2010 to 2020 were analyzed.

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A retrospective audit study was performed to evaluate the reasons for the good results at CPH. As surgeons have different preferences for route of antibiotic prophylaxis, this was also analyzed.

## Methods

Cataract surgery cases were defined in this study as procedures with Australian Medicare item number 42702, under the description of cataract extraction and insertion of intraocular lens implant. Combined cases of cataract surgery with glaucoma surgery, corneal grafting, and vitreoretinal surgeries were excluded.

Deidentified data on cataract surgery cases was extracted from records of CPH via computer software for the years 2010–2020. This included data on the different routes of prophylactic antibiotic administration (intracameral, subconjunctival, or both) as well as the total number of cataract cases performed over the years. Descriptive statistics were used to analyze the data.

## Results

From 2010 to 2020 (11 years), a total of 28,937 cataract cases were performed at CPH, of which there were no cases of POE.

Data of the breakdown of the different routes of prophylactic antibiotic administration was only available for the year 2013 and from 2016–2020, as shown in Table 1. The various routes of antibiotic administration included intracameral, subconjunctival, or both. Cephazolin and cefuroxime (0.1 ml of 10 mg/ml) were the intracameral antibiotics used. Cephazolin and cephalothin (0.2 to 0.5 ml of 100 mg/ml) were the subconjunctival antibiotics used.

In 2013, intracameral antibiotics were more widely used, proportions being 60% for intracameral, 26% for subconjunctival, and 14% for both intracameral and subconjunctival antibiotics. This trend continued over the past 5 years (2016–2020), with intracameral antibiotics remaining the more common route of

**Table 1.** Routes of prophylactic antibiotic administration at Chastwood Private Hospital 2016–2020

| Year | Intracameral (%) | Subconjunctival (%) | Both subconjunctival / Intracameral (%) | Total |
|---|---|---|---|---|
| **2016** | 2,073 (85) | 269 (11) | 94 (4) | 2,436 |
| **2017** | 2,236 (82) | 355 (13) | 136 (5) | 2,727 |
| **2018** | 3,171 (88) | 379 (11) | 44 (1) | 3,594 |
| **2019** | 3,556 (84) | 624 (15) | 68 (2) | 4,248 |
| **2020** | 3,928 (86) | 456 (10) | 165 (4) | 4,549 |

antibiotic administration at an average proportion of 85%, followed by subconjunctival antibiotics (12%), and both (3%). Furthermore, the use of intracameral route for antibiotic prophylaxis after cataract surgery had increased over the years at CPH (Figs. 1–3).

There being no cases of POE after cataract surgery meant that besides the different routes of antibiotic administration, there may be other factors that contribute to lack of POE cases at CPH.

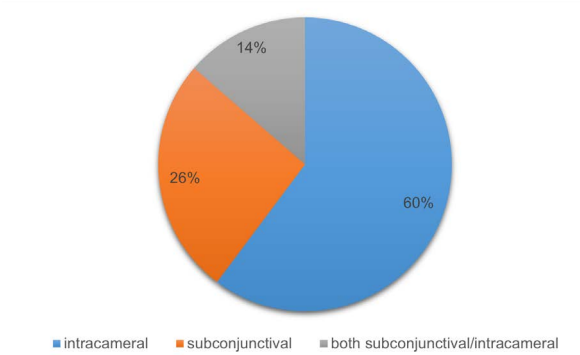


**Fig.1. Route of prophylactic antibiotic administration at Chastwood Private Hospital in 2013.**

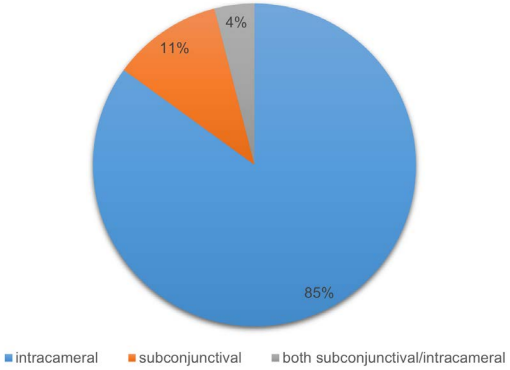


**Fig. 2. Route of prophylactic antibiotic administration at Chastwood Private Hospital in 2016.**

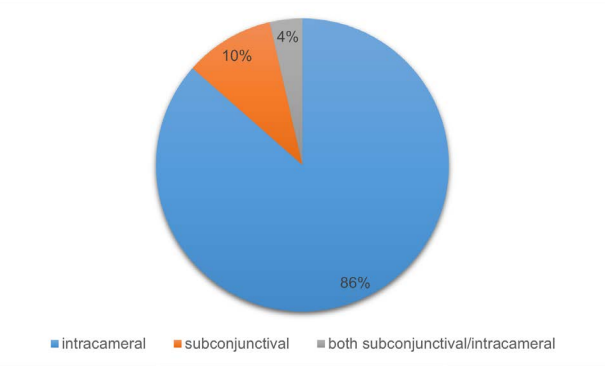


**Fig. 3. Route of prophylactic antibiotic administration at Chastwood Private Hospital in 2020.**

## Discussion

A total of 28,937 routine cataract surgery cases were performed at CPH from 2010 to 2020, of which no cases of POE were recorded. The lowest rate of POE in the literature was quoted to be 0.01%, which would have equated to 2.89 cases at this facility. It would be useful to discuss possible reasons behind the low incidence of POE at CPH.

The causes of POE are manifold and can be divided into endogenous, intraoperative, and postoperative factors. Bacteria from the patient's own ocular surface or adnexa is most often the primary source of infection, with gram-positive, coagulase-negative cocci (*Staphylococcus epidermidis*) accounting for most culture positive cases.[4] Endogenous causes include debilitated or immunocompromised patients with bacteremia or fungemia, which is unlikely in the scenario of elective cataract surgery. Intraoperative inoculation of bacteria can occur as a result of suboptimal operating environments and sterility of instrumentation, as well as inadequate preparation of surgical sites with antiseptic or surgical drapes. Infected eyelid adnexa can lead to endophthalmitis both intra and postoperatively. On the other hand, suboptimal wound closure can result in leakage of aqueous and tear entry into the eye postoperatively.[4] This presents a route for bacteria present in the tear film or eyelid adnexa to enter the eye, resulting in POE.

One of the reasons that may contribute to the low incidence of endophthalmitis at CPH is having operating theatres dedicated to ophthalmology, with high levels of sterility that prevent intraoperative inoculation of bacteria. Meticulous preparation of the patient with application of topical povidone-iodine also significantly reduces the likelihood of infection.[1,4,5]

Furthermore, the results obtained from the retrospective audit study suggest that prophylactic antibiotics, whether administered through an intracameral or subconjunctival route are equally effective in preventing POE. Theoretically, intracameral antibiotics would be more useful in settings where there is intraoperative inoculation of bacteria, for example, in resource-poor settings where high levels of sterility in operating theatres is less feasible. On the other hand, subconjunctival antibiotics, which often ooze through the needle injection site, would function to bathe the ocular surface with antibiotics.[6] This might prove more useful in keeping the ocular surface and adnexa sterile, hence preventing bacteria from entering the eye postoperatively.

Other preventive strategies would involve identifying and managing the suboptimal conditions that could potentially lead to POE, as discussed above. From a surgical perspective, wounds with a long intracorneal track are more secure and conducive for wound apposition. Suturing wounds that are insecure would add another layer of protection and security. Should any concerns regarding intra- and postoperative inoculation of bacteria arise, consideration should be given for use of both intracameral and subconjunctival antibiotics for synergistic effect. Finally, elective cataract surgery should be postponed if concerns of infected adnexa are present.

## Conclusion

This study shows that a low or zero incidence of POE after cataract surgery is achievable. Meticulous wound construction, attention to detail pre-, intra-, and postoperatively, and taking appropriate measures as necessary contribute to the prevention of POE. Having operating theatres dedicated to ophthalmology helps maintain high standards of sterility of instrumentation and operating environments. This study also provides evidence that administration of prophylactic antibiotics, regardless of the route of administration, is beneficial and equally effective in preventing POE.

## Declarations

### Ethics approval and consent to participate

Not required.

### Consent for publication

Not required

### Competing interests

None to disclose.

## Funding
None to disclose.

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