

# Is indiscriminate use of intracameral route for prophylactic antibiotics in cataract surgery appropriate?

As doctors, we do what we think is best for our patients. We make decisions to benefit our patients. It is preferable that these decisions were not influenced by costs, profit, or obedience to the medico-legal system.

The use of intracameral route for prophylactic antibiotics in cataract surgery was initially proposed for facilities with a high incidence of endophthalmitis. Subsequent studies in situations where there was a high incidence of endophthalmitis were interpreted to show that it was beneficial in reducing the incidence of endophthalmitis. It subsequently became the recommendation for everyone whether they experience a high incidence of endophthalmitis or not. Upon becoming a recommendation, its use became more widespread, even by those who felt it was not necessary. The medico-legal system then perpetuated the indiscriminate use of the intracameral route for prophylactic antibiotics by suggesting that not using it would be substandard care.

In this issue, "Incidence of post-cataract surgery endophthalmitis: a chronological review and intercontinental comparison" by Wen *et al.* reviews the historical aspect of endophthalmitis in cataract surgery. The review found that some studies which showed a marked improvement in incidence of endophthalmitis had a higher-than-average baseline endophthalmitis rate. The worldwide incidence of endophthalmitis has been lower in recent years. In some countries, such as Japan in which the use of intracameral antibiotics is estimated at 11.8%, the incidence of endophthalmitis is 0.025%, which is lower than in countries where intracameral antibiotics are used routinely.<sup>1</sup>

The volume of the anterior chamber is about 0.24 ml or 240  $\mu$ L. Given that aqueous inflow is approximately 2.4  $\mu$ L per minute, the total volume of aqueous in the anterior chamber is replaced every 100 minutes. In 100 minutes, the concentration of antibiotic would be half, and in 200 minutes, it would be a quarter. Hence, in 3.5 hours, the concentration of antibiotic would be a quarter, possibly falling below the minimal inhibitory concentration. Therefore, logically, prophylactic intracameral antibiotics would only be effective in preventing infections due to bacteria that entered the eye during cataract surgery.

By contrast, subconjunctival or topical antibiotics should maintain the ocular surface and adnexa sterile, thus inhibiting bacterial entry postoperatively. Subconjunctival antibiotics often ooze through the needle injection site and so would function to bathe the ocular surface with antibiotics.

In a surgical facility with high standards of sterility, there is little chance of bacteria being introduced intraoperatively. However, when cataract surgery is done in makeshift camps or settings with lower standards of sterility, bacterial inoculation is possible; these are the contexts where intracameral antibiotics may be needed. On the other hand, if the eye and eyelids have been prepped with povidone-iodine, the lids have been excluded from the incisions, and the instruments are sterile, it is likely that no bacteria would enter the eye.

Intracameral antibiotics can be useful when wounds are compromised or surgery is prolonged due to complications. In cases of wound compromise, bacteria can enter the eye for 24 hours or more, so the risk of endophthalmitis can persist for 24 hours postoperatively. Therefore, in these cases subconjunctival and topical antibiotics would be more useful.

In general, routine uncomplicated cataract surgery done by an experienced surgeon on a healthy patient with good hygiene in a surgical facility with high standards of sterility should carry negligible risk of endophthalmitis. In such cases, it would be adequate to use subconjunctival or topical antibiotics and not expose the patient to the risk of intracameral antibiotics. However, if a surgical facility has suboptimal standards of sterilization, the surgeon lacks experience, there are surgical complications, or the patient has poor hygiene with associated inflammation of ocular adnexa, the use of intracameral antibiotics is warranted.

Is there a significant difference in postoperative endophthalmitis rates between intracameral and subconjunctival antibiotics when cataract surgery is performed by experienced surgeons in facilities with high standards of sterility? This is the question posed by Lim *et al.* in a brief report titled, "Is zero incidence of endophthalmitis after cataract surgery achievable?"; also included in this issue.

Ironically, many of the proponents of intracameral antibiotics are experienced surgeons and would realize that their low rates of endophthalmitis are actually due to their sound surgical skills and settings should they audit their own results. Instead, their good results are automatically attributed to the routine use of intracameral antibiotics based on previously published studies and medico-legal recommendations.

The risk of significant adverse reaction to prophylactic antibiotics is greater with the intracameral route than subconjunctival and topical routes. "Subconjunctival antibiotics: an alternative to intracameral antibiotics for endophthalmitis prophylaxis in cataract surgery" by Xuan *et al.* evaluates subconjunctival and intracameral antibiotics in this issue. Subconjunctival antibiotics can maintain bactericidal levels in the anterior chamber for up to 12 hours compared to intracameral antibiotics, which have a four-fold reduction in concentration within an hour.

Serious complications associated with intracameral antibiotics, which can be even more devastating than postoperative endophthalmitis, include retinal

detachment, retinal infarction, vancomycin related hemorrhagic occlusive retinal vasculitis, cefazolin-associated retinal toxicity, and toxic anterior segment syndrome. There are no significant adverse effects associated with subconjunctival cephalosporins; the only theoretical risk could be inadvertent penetration of the eye by the hypodermic needle during injection.

Hence, in low-risk settings, it may be preferable to consider the subconjunctival and topical routes, which have a higher safety margin. In the reprint article "Intracameral antibiotics debate" originally published in *Eurotimes* in the May 2020 issue, Professor Antoine Brézin indicated that his use of intracameral antibiotics in cataract surgery is not due to scientific reasons, but rather because of official recommendation and medico-legal concerns.

There is understandable concern around legal liability for not using intracameral antibiotics if a patient develops endophthalmitis after cataract surgery. However, equally concerning is the possibility of legal liability if a patient suffers an adverse reaction to intracamerally administered prophylactic antibiotics when safer subconjunctival and topical routes are available.

Surgeons should be wise in their choice of route for prophylactic antibiotics and consider the risks and benefits in different situations. With the improvement of cataract surgery techniques and instrumentation to date as well as attention to wound construction and closure, indiscriminate routine use of the intracameral route for prophylactic antibiotics in cataract surgery, which is largely encouraged by the medico-legal system, may not be appropriate if risks outweigh the benefits.

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### **References**

1. Inoue T, Uno T, Usui N, et al. Incidence of endophthalmitis and the perioperative practices of cataract surgery in Japan: Japanese Prospective Multicenter Study for Postoperative Endophthalmitis after Cataract Surgery. *Jpn J Ophthalmol*. 2018;62(1):24-30. <https://doi.org/10.1007/s10384-017-0545-6>. Epub 2017 Nov 1. PMID: 29094328.