

## Endophthalmitis prophylaxis in cataract surgery

Three seminal publications have influenced our current thinking of cataract surgery endophthalmitis reduction or management. They are Speaker and Menikoff's study on povidone-iodine preparation of the eye,<sup>[1]</sup> the Endophthalmitis Vitrectomy Study (EVS) guidelines for the management of infective endophthalmitis,<sup>[2]</sup> and the ESCRS study on intracameral cefuroxime for the prevention of endophthalmitis.<sup>[3]</sup> These three publications are cited 516 times, 665 times, and 519 times since their publications (as of October 31, 2017), respectively. Central to the recommendations are either use of antiseptic or intraocular antibiotics.

Povidone-iodine is an antiseptic used for skin disinfection of patients and hands of the health-care providers. It came to commercial use in 1955 and it is on the World Health Organization list of essential medicines. It has minimal toxicity but produces powerful antimicrobial effect after one minute of skin contact. This effect is attributed to the release of free iodine and persists for at least one hour. It is believed that iodine penetrates the cell wall and reacts with amino acids and nucleotides, which ultimately, disrupts the cell's protein synthesis. It is contraindicated in people with iodine allergy and in people with hyperthyroid disease. Povidone-iodine is recommended for both skin (10% solution) and conjunctival (5% solution) application.<sup>[4]</sup> Ideally, it should dry after skin preparation and the conjunctival cul-de-sac should not be irrigated before one minute contact time.

The EVS recommended two intravitreal antibiotics in the treatment of post cataract surgery bacterial endophthalmitis: vancomycin (1.0 mg in 0.1 ml) that would act against Gram-positive cocci and ceftazidime (2.25 mg in 0.1 ml) that would act against Gram-negative bacilli. Vancomycin is a glycopeptide that inhibits the synthesis of the precursor units of bacterial cell wall and inhibits the RNA synthesis. It is also sensitive to methicillin-resistant *Staphylococcus aureus* (MRSA). Ceftazidime is a third-generation cephalosporin that inhibits peptide crosslinking of polysaccharide chains of peptidoglycan and affects the cell wall synthesis. It is sensitive to many Gram-negative organisms including *Pseudomonas aeruginosa*.

The ESCRS study suggested intracameral cefuroxime (1.0 mg in 0.1 ml) at the time of cataract surgery for prevention of postoperative endophthalmitis. Cefuroxime is a second-generation cephalosporin that is sensitive to Gram-positive cocci. Five years before the ESCRS study publication, we had reported a significantly reduced bacterial adherence of *Staphylococcus epidermidis* to polymethyl methacrylate intraocular lenses when treated with vancomycin.<sup>[5]</sup>

The ESCRS study has generated a lot of interests as it showed near 5-fold reduction of endophthalmitis. Despite several criticisms, the drug is now available for commercial use (Aprokam, Thea group, Clermont Ferrad, France) and it is increasingly used both in Europe (where the drug is approved) and in the USA (off-label use).<sup>[6]</sup>

There have been two important studies in India on the use of intracameral antibiotic. In a prospective randomized single-center study, Sharma *et al.* reevaluated the use of intracameral cefuroxime in cataract surgery.<sup>[7]</sup> Their study did not demonstrate statistically significant reduction of endophthalmitis with the use of intracameral cefuroxime; the odds of endophthalmitis occurrence in the absence of an intracameral cefuroxime was 1.42% (95% confidence interval 0.53–4.02;  $P=0.506$ ). In a multicenter trial, Haripriya *et al.* used intracameral moxifloxacin (0.5 mg in 0.1 ml) that is commercially available in India (Aurolab, Madurai, India) and showed 3-fold (for manual small incision cataract surgery) to 6-fold (for phacoemulsification) reduction in the occurrence of endophthalmitis.<sup>[8]</sup>

### Why Moxifloxacin?

Moxifloxacin is a fourth-generation fluoroquinolone that is sensitive to Gram-positive cocci including MRSA and selective Gram-negative bacilli. Others and we have shown that in more than a quarter instances, Gram-negative organisms, particularly *P. aeruginosa*, are the cause of infective endophthalmitis in India.<sup>[9]</sup> In that sense, moxifloxacin is superior to cefuroxime. An (unpublished) Indian survey suggests the following current pattern of antibiotic prophylaxis in cataract surgery in India: 90% use preoperative topical antibiotic (44% each 1 day or 3 days prior; 73% moxifloxacin), 40% use intracameral antibiotic (46% in high-risk patients only; 78% moxifloxacin), and 94% use postoperative topical antibiotic (78% moxifloxacin; 40% for 4 weeks; 32% for 1 week).

There are two concerns on routine use of intracameral antibiotic. The first concern is the changing infecting organism spectrum and sensitivity; hence, a periodic evaluation is mandatory. The second is the possibility of increasing resistance though one could argue that the possibility is rare as most eyes will receive only two intracameral antibiotic injections (one for each eye cataract surgery). All the same should one consider to using intracameral antibiotic injection only in high-risk patients, here is our suggestion-posterior capsule break, anterior vitrectomy, prolonged surgery (>40 min), difficult surgery (excessive iris manipulation), corneal surface disorders, elderly individuals (>80 years), and immunocompromised individuals. It will be interesting to watch if a routine use of intracameral antibiotic would reduce or eliminate routine use of postoperative topical antibiotic.<sup>[10]</sup> This will be very beneficial to people living in the developing countries where the cost and compliance are critical issues. In this issue, the rationale and the current evidences of antibiotic prophylaxis in cataract surgery are reviewed. This will surely guide in decision-making in this most common intraocular surgery.

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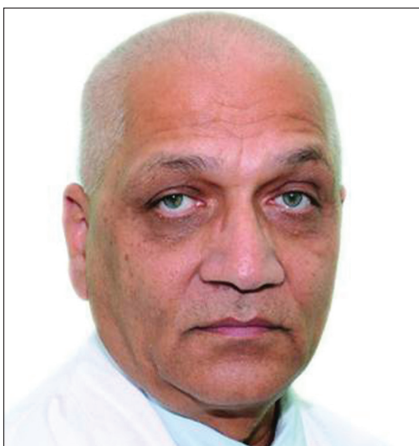
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Dr. Das has published 220 papers, 49 book chapters and has authored/edited 10 books. Published by Springer, his latest book is titled "Endophthalmitis - A Diagnosis and Management". He has received 18 grants and 26 national international awards, and has delivered 15 named lectures. He was conferred the Doctorate of Science (*Honaris Causa*) by the Ravenshaw University in year 2011. Government of India has recognized him with a high civilian honor (Padma Shri) in year 2013.