

## Comparison of different techniques of cataract surgery in bacterial contamination of the anterior chamber in diabetic and non-diabetic population

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**Aim:** To compare the bacterial contamination of the anterior chamber (AC) between manual small incision cataract surgery (SICS) and phacoemulsification (Phaco). To study the conjunctival flora and bacterial contamination of AC between well-controlled diabetics and non-diabetics. **Materials and Methods:** Three hundred and sixty-eight patients were randomized to manual SICS and Phaco. Sixty-eight patients were excluded for not completing follow-up or for intraoperative complications like posterior capsule rupture. One hundred and fifty patients in each group were finally analyzed. Conjunctival swabs were taken on admission, after one day of topical ofloxacin and 15 min after 5% Povidone Iodine (PI) instillation. AC aspirate at the end of the surgery was also cultured. **Results:** Fifty-six (18.66%) patients had positive conjunctival swab on admission which was reduced to 19 (6.33%) with topical ofloxacin and to five (1.66%) with instillation of 5% PI. AC contamination in both manual SICS and Phaco was 0.66%. The conjunctival flora in diabetics was similar to non-diabetics. None of the diabetics had AC contamination. Statistical analysis was performed by Chi-Square test (with Yates' correction). **Conclusion:** Statistically significant reduction in conjunctival flora was achieved with topical ofloxacin and 5% PI instillation and AC contamination in both manual SICS and Phaco was minimal (0.66%). Well-controlled diabetics who underwent cataract surgery in this study had similar conjunctival flora and AC contamination as non-diabetics.

**Key words:** Anterior chamber contamination, cataract surgery, conjunctival flora, diabetics

Post-cataract surgery infectious endophthalmitis is a potentially disastrous complication of a usually successful outcome. Various studies are available in the literature regarding bacterial contamination of the anterior chamber (AC)<sup>[1-11]</sup> as well as about the use of antibiotics in irrigating fluid<sup>[12,13]</sup> or as intracameral bolus dose.<sup>[14-16]</sup> This points to the fact that many ophthalmic surgeons consider bacterial contamination of the AC to be a significant risk factor for postoperative endophthalmitis. This study was designed to see the difference in AC contamination between manual small incision cataract surgery (SICS) and phacoemulsification (Phaco) without the use of antibiotics in irrigating fluid/intracameral bolus antibiotics/systemic antibiotics. Also, the conjunctival bacterial profile and AC contamination in a diabetic population undergoing cataract surgery was compared with a non-diabetic population.

### Material and Methods

Three hundred and sixty-eight patients who underwent free cataract surgery at a medical college hospital in Puducherry, South India from September 2007 to September 2008 were included in the study. They were randomized to two groups—manual SICS group and Phaco group. Sixty-eight patients were excluded for not completing six weeks' follow-up or for surgical

complications like posterior capsule rupture. The patients were admitted for three days and on the second day of admission cataract surgeries were performed. Diabetics were taken up for surgery only if the postprandial blood sugar was < 140 mg/dl. Conjunctival swabs were taken on admission before instilling any antibiotics. All patients received preoperative antibiotic prophylaxis of 0.3% ofloxacin eye drops instilled every 4-6 h started one day before surgery and continued on the day of surgery. Before surgery conjunctival swab was taken and after that two drops of 5% Povidone Iodine (PI) were instilled at a 5-min interval. Fifteen minutes after instilling 5% PI, conjunctival swab was taken. Peribulbar block was used in all cases. Manual SICS was performed by phacosandwich technique.<sup>[17]</sup> Incision size varied from 6–8 mm. In all cases Polymethyl methacrylate (PMMA) intraocular lens was implanted. Phaco was performed with peristaltic machine by a scleral tunnel. The incision was extended in all cases to ~ 5 mm and all PMMA 5.25 mm optic diameter intraocular lens was implanted. For both the groups Ringer-Lactate without any additives was used as the irrigating fluid. After the viscoelastic (2% Hydroxypropyl methyl cellulose was used in all cases) was aspirated, thorough flushing of the AC with 10 ml of Ringer-Lactate was performed through the side port with depression of the posterior lip of the side port to allow for free irrigation. At the end of the surgery 0.1 ml of AC fluid was aspirated using a 26-gauge needle introduced through the side port. Topical antibiotic was instilled before patching the eye. Suturing of the incision was not done in any case.

Conjunctival swab was inoculated on Thioglycollate broth and Brain Heart Infusion (BHI) broth. Subculture was done when the medium turned turbid. AC aspirate was inoculated

Access this article online

Website:

www.ijjo.in

DOI:

10.4103/0301-4738.90486

Quick Response Code:



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**Manuscript received:** 10.11.10; **Revision accepted:** 04.06.11

on Thioglycollate broth, BHI broth and Chocolate agar.

For all the patients the bandage was opened 6 h after surgery and topical antibiotic-steroid combination (0.3% ofloxacin and 0.1% dexamethasone) was commenced hourly during waking hours for the first 24 h and then tapered to four-hourly dosing for the first seven days, six-hourly for the second week, eight-hourly for the third week and once a day for the fourth week after which the topical antibiotic-steroid combination was stopped. The patients were followed up at Day 1, Day 7 and six weeks. Any postoperative inflammation was documented.

At the end of the study conjunctival flora and AC contamination between SICS and Phaco were studied. Out of the 300 patients who completed the study 76 were diabetics. Conjunctival flora and AC contamination between diabetics and non-diabetics were also analyzed.

## Results

Out of the 300 patients who completed the study and were included for analysis, 150 each had undergone manual SICS and Phaco. The mean age in the phacoemulsification group was 62.78 years (range 42–77 years) with 59 males and 91 females and in the manual SICS group the mean age was 60.76 years (range 41–77 years) with 68 males and 82 females. All cases of Phaco were performed by a single surgeon (first author) and manual SICS were performed by first (132 cases) and second (18 cases) authors. Average time taken (from the operation theater time-keeping registry) for Phaco was 25 min and for manual SICS was 20 min.

Conjunctival swab taken on admission was positive in 56 (18.66%) patients. Conjunctival swab taken after one day of topical ofloxacin and before instilling 5% PI was positive in 19 (6.33%) patients (11 in the manual SICS group and eight in the Phaco group). Conjunctival swab taken after instilling 5%

PI was positive in five (1.66%) out of 300 patients (two in the manual SICS group and three in the Phaco group).

Statistical analysis showed a statistically significant decrease in the conjunctival flora with only topical ofloxacin as well as with topical ofloxacin followed by preoperative 5% PI instillation [Table 1]. Comparison of reduction of ocular flora by only topical ofloxacin versus topical ofloxacin followed by preoperative 5% PI instillation showed that addition of 5% PI resulted in a statistically significant decrease in the conjunctival flora with a *P* value of 0.0068. The isolates were mainly *Staphylococcus epidermidis* and *diphtheroids* [Table 2]. Also, on admission the conjunctival swab in 18 patients showed growth of more than one type of bacteria but after instillation of ofloxacin multiple growths were not seen.

Anterior chamber aspirate was positive for viable bacteria in two (0.66%) out of 300 patients (one each in the manual SICS and Phaco groups). Both the isolates were *Staphylococcus epidermidis*. No patient was concurrently positive for conjunctival swab and AC aspirate.

In the diabetic subgroup 13 (17.1%) out of 76 patients had positive conjunctival swab on admission, four (5.26%) had positive conjunctival swab after one day of topical ofloxacin and one (1.31%) after PI instillation. In the non-diabetics 43 (19.19%) out of 224 patients had positive conjunctival swab on admission, 15 (6.69%) had positive conjunctival swab before PI and four (1.78%) after PI instillation. The AC aspirate was bacteriologically sterile in all diabetics [Table 3].

Both the patients who had positive AC contamination did not have significant postoperative inflammation. None of the patients developed endophthalmitis.

Statistical analysis was performed by Chi-square test using Smith's Statistical Package.

## Discussion

Anterior chamber contamination during Phaco in various studies ranges from 0–46.25% [Table 4].<sup>[1–11]</sup> Parmar *et al.*, compared manual SICS and Phaco and found a similar contamination rate.<sup>[6]</sup> Feys *et al.*, comparing Extracapsular Cataract Extraction with Phaco also found similar AC contamination rates in both surgeries.<sup>[8]</sup> Most of the studies had a preoperative prophylaxis of only topical PI or topical antibiotics for one to three days with topical PI. Eight out of these 11 non-interventional studies in the last 10 years report a

**Table 1: Conjunctival culture on admission, after one day of topical ofloxacin and after 5% Povidone Iodine instillation**

	On admission	After topical ofloxacin	After 5% Povidone Iodine
Manual SICS (n=150)	29 (19.33)	11 (7.33) <i>P</i> value 0.0022	2 (1.33) <i>P</i> value 0.0000
Phacoemulsification (n=150)	27 (18)	8 (5.33) <i>P</i> value 0.0006	3 (2) <i>P</i> value 0.0000
Total (n=300)	56 (18.66)	19 (6.33) <i>P</i> value 0.0000	5 (1.66) <i>P</i> value 0.0000

All figures in parentheses are in percentage

**Table 2: Pattern of bacterial isolates from conjunctiva**

	On admission	After topical ofloxacin	After 5% Povidone Iodine
<i>Staphylococcus epidermidis</i>	49	14	5
<i>Propionibacterium acnes</i>	2	0	0
<i>Diphtheroids</i>	10	0	0
Others	0	0	0

**Table 3: Comparison between diabetics and non-diabetics**

	Conjunctival swab on admission	Conjunctival swab after topical ofloxacin	Conjunctival swab after 5% Povidone Iodine	AC aspirate
Diabetics (n=76)	13 (17.1)	4 (5.26)	1 (1.31)	0
Non-diabetics (n=224)	43 (19.19)	15 (6.69)	4 (1.78)	2
<i>P</i> value	0.6860	0.6576	0.7822	

All figures in parentheses are in percentage

**Table 4: Anterior chamber contamination in various non-interventions studies**

Study	Number of eyes studied	Phaco	Manual SICS	ECCE
Present study	300 (150 in each group)	0.66%	0.66%	ns
Cornut <i>et al.</i> <sup>[1]</sup>	30	0	ns	ns
Das <i>et al.</i> <sup>[2]</sup>	57	ns	14%	ns
Bucci <i>et al.</i> <sup>[3]</sup>	220	<1%	ns	ns
Ta <i>et al.</i> <sup>[4]</sup>	50	0	ns	ns
Bausz <i>et al.</i> <sup>[5]</sup>	97	2%	ns	ns
Parmar <i>et al.</i> <sup>[6]</sup>	150 (75 in each group)	2.7%	4%	ns
Baykara <i>et al.</i> <sup>[7]</sup>	132	1.5%	ns	ns
Feys <i>et al.</i> <sup>[8]</sup>	354 ECCE and 2270 Phaco	4.7%	ns	5.6%
Srinivasan <i>et al.</i> <sup>[9]</sup>	80	46.25%	ns	ns
Leong <i>et al.</i> <sup>[10]</sup>	98	0	ns	ns
John <i>et al.</i> <sup>[11]</sup>	53	7.5%	ns	ns

Phaco - Phacoemulsification, SICS - Small incision cataract surgery, ECCE - Extracapsular cataract extraction, ns - not studied

very low contamination rate of 0–5%. All these studies showed that there is no correlation of postoperative endophthalmitis with AC contamination. Leong *et al.*, showed that the bacterial contamination rate of the AC after Phaco was extremely low and the conjunctiva was shown to be the primary source of bacteria causing postoperative endophthalmitis.<sup>[11]</sup>

But interventional studies have used antibiotics like vancomycin and gentamicin in irrigating fluid<sup>[12,13]</sup> and systemic antibiotics (intravenous imipenem)<sup>[18]</sup> to show a significant decrease in AC contamination rates during Phaco. Srinivasan *et al.*, showed a decrease in the AC contamination rate from 21.1 to 7.7% by adding vancomycin to the irrigating fluid and one case of endophthalmitis occurred in their study in the group with no vancomycin in the irrigating fluid.<sup>[12]</sup> Sobaci *et al.*, showed a decrease from 21% to 6.8% using vancomycin and gentamicin added to the irrigating fluid and endophthalmitis occurred in two patients where only Balanced salt solution was used.<sup>[13]</sup> Intracameral bolus dose of antibiotics like vancomycin,<sup>[14]</sup> cefuroxime<sup>[15]</sup> and moxifloxacin<sup>[16]</sup> has also been proposed to prevent endophthalmitis.

Our study showed a very low AC contamination rate of 0.66% and the AC contamination did not differ between manual SICS and Phaco. We can assume that the architecture of the wound, amount of irrigating fluid and type of surgery do not play a significant role in AC contamination. Also, in our study, a very low rate of AC contamination was achieved with the use of only topical antibiotic (Ofloxacin) and preoperative 5% PI instillation. Diabetic patients did not show any AC contamination.

Positive conjunctival swab culture before surgery varies from 21.65–65% and after surgery from 4.12–16%.<sup>[5,9]</sup> The common organisms isolated were *Coagulase-negative Staphylococcus*, *diphtheroids* and *Propionibacterium*. In diabetics increased conjunctival flora with increased isolation of *Staphylococcus aureus* has been reported.<sup>[19,20]</sup> In our study, overall we found

a conjunctival culture rate of 18.66% on admission which was reduced to 6.33% with topical ofloxacin and further to 1.66% after 5% PI. There was a significant decrease in the conjunctival flora with topical ofloxacin when compared with the conjunctival culture on admission. But instillation of 5% PI caused a further decrease in the conjunctival bacterial isolate which was statistically significant (*P* value of 0.0068) in comparison to the decrease caused by topical ofloxacin alone. The bacterial pattern isolated was similar to other studies with *Staphylococcus epidermidis*, *diphtheroids* and *Propionibacterium* being the common isolates. In our study the diabetic population had almost similar conjunctival flora as non-diabetics.

Cataract surgery prophylaxis varies widely for routine uncomplicated cases. In the UK 99.5% of surgeons used 5% PI, 67.6% used subconjunctival antibiotics, 16.2% intracameral antibiotics and none used systemic antibiotics.<sup>[21]</sup> In Canada 98% used 5% PI, 17% used subconjunctival antibiotics, 15% intracameral antibiotics and 1% systemic antibiotics.<sup>[22]</sup> In Yemen 5.3% of surgeons used 5% PI, none used intraoperative antibiotics and 41.1% used systemic antibiotics.<sup>[23]</sup> Before this study the authors were also regularly using systemic fluoroquinolones for routine cataract surgery. After this study we have revised the use of systemic antibiotics only for complications like vitreous loss.

The use of systemic antibiotic needs to be rational and ethical to avoid the emergence of drug resistance and “super bugs”. Intracameral gentamicin via infusion fluid does not have a sustained level in the AC to maintain minimum inhibitory concentration (MIC),<sup>[24]</sup> though bolus dose of vancomycin has been shown to maintain MIC for up to 24 h.<sup>[15]</sup> But intracameral vancomycin has also been reported to induce complications like cystoid macular edema (CME).<sup>[25]</sup> Intracameral antibiotics also result in an increased cost of surgery. The US Center for Disease Control and Prevention has also cautioned against the generalized use of powerful antibiotics such as vancomycin because of the emergence of vancomycin-resistant strains of *coagulase-negative staphylococcus* and *enterococcus*.<sup>[26]</sup> In our study we have shown that conjunctival flora is considerably reduced by a combination of topical ofloxacin and 5% PI. Anterior chamber contamination rate was also minimal. Also, the ocular microbiological profile of well-controlled diabetics was similar to non-diabetics. Hence we conclude that for routine uncomplicated cataract surgery, both in non-diabetics and well-controlled diabetics, meticulous preoperative instillation of topical antibiotics started one day before surgery and 5% PI 15 min before surgery will be sufficient prophylaxis. In the absence of significant AC contamination routine use of systemic and intracameral antibiotics can only increase the cost, possible complications like CME and lead to drug resistance.

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**Cite this article as:** Kumar MA, Kurien SS, Selvaraj S, Devi U, Selvasundari S. Comparison of different techniques of cataract surgery in bacterial contamination of the anterior chamber in diabetic and non-diabetic population. *Indian J Ophthalmol* 2012;60:41-4.

**Source of Support:** Nil. **Conflict of Interest:** None declared.