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Original Article

A study to evaluate whether CTR increases refractive unpredictability between predicted and actual IOL position

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ABSTRACT

Background: The surgical management of cataract associated with extensive zonular loss presents a challenge for ophthalmic surgeon. Capsular Tension Ring (CTR) is commonly being used to stabilize the capsular bag in patients with zonular dialysis. CTR helps to avoid capsular collapse and vitreous presentation in AC during surgery and maintains the capsular bag, allowing the circular contour of the capsular bag, allowing intra ocular lens to be easily placed in the bag. The aim of the study was to know if there is any shift of IOL following use of CTR ring.

Method: We did a Ultrabiomicroscopy (UBM) examination to find out shift in PCIOL in cases in which CTR ring and compared it with cases without CTR ring.

Result: It was found out through UBM in this study that there is actually a posterior shift of PCIOL after use of CTR ring leading to hypermetropic correction needed after surgery.

Conclusion: It is suggested that posterior shift of IOL following use of CTR should be kept in mind and the IOL implanted should be of + 1.0 to 2.0 D more than that calculated preoperatively.

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Introduction

Predictability of final refraction is an important aspect of a patient's satisfaction and comfort in Intra Ocular Lens implantation surgery. It is to be appreciated, that IOL implantation is a one-time surgery, refractive power of pseudophakia is final, and patient must live with any mistake

committed in calculation of IOL power. The spherical error, amount of astigmatism and the amount of anisometropia are the three principal factors in the ultimate visual result and comfort of the patient.¹

To manage zonular weakness or dehiscence a variety of Capsular Tension Rings are available for the surgeon.² Implantation of these implants for obvious reasons, leads to

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Table 1 – Final refractive error at 45 days after surgery (n = 25).

Sr. no.	Refractive state (spherical error)	No. of patients	Percentage (%)
1	+0.5 Dioptre	6	24
2	+1.0 Dioptre	9	36
3	+1.5 Dioptre	7	28
4	+2.0 Dioptre	3	12

a conformational change in the anatomy of ocular structures like, change in the shape of capsular bag.^{3–7} This change for obvious reasons leads to refractive change in the ocular complex.^{8–11}

The aim of this retrospective study was to evaluate the refractive shift following planned/unplanned Capsular Tension Ring implantation intra operatively with PCIOL implantation in 25 cases. Although, many have noticed unpredictability, some authors have quoted a statistically insignificant shift.^{12–14} We performed a series of Ultrasonic Bio Microscopy in these cases to see if there is any shift of PCIOL following use of CTR ring.^{15–18}

Materials and methods

This is a retrospective study of 25 eyes of 25 patients in which CTR ring was implanted due to either preoperative zonular dialysis (14 cases) or intra operative zonular dialysis (11 cases). Only cases with 2–5 clock hours of subluxation were included. All cases with vitreous presentation were subjected to limited vitrectomy. Cases with high myopia and high hypermetropia were excluded from the study. The IOL power was calculated by using SRK II formula. IOL Master was used in all cases for IOL power calculation. All patients were examined on days 1, 3, 7, 14, 30 and 45 postoperatively. On each visit visual acuity and slit lamp bio-microscopic examination was done. A dilated papillary examination was done at 4 weeks. On day 45,

Fig. 1 – PCIOL position in case without CTR. **Fig. 2 – PCIOL position in case with CTR.**

a UBM exam along with final refraction was done with prescription of corrective spectacles.

Surgical technique

1. Clear corneal incision was made.
2. Continuous curvilinear capsulorhexis was done.
3. CTR introduced just after gentle multi quadrant hydro dissection in cases with preoperative zonular dialysis and just after zonular dehiscence in cases where intra operative dehiscence was noticed.
4. Phacoemulsification was done using low power, low vacuum and low flow rate.
5. Cortical irrigation-aspiration was performed.
6. In the bag all PMMA single piece 6.5 mm optic PCIOL implantation was done.

Results

The average age of patients was 55 yrs. All the 25 cases underwent phacoemulsification by a single surgeon using similar technique. The decision regarding insertion of CTR was taken preoperatively in 14 cases (56%) and intra operatively in 11 cases (44%). Successful IOL implantation was possible in all cases. The duration of follow up was from immediate postoperative period to 6 months post operatively.

BCVA, anterior segment examination and fundus examination were done at each follow up visit. All lenses were found to be well centred with un-dilated pupil. The final refractive error of each patient postoperatively was observed to be hyperopic, at least to some degree (Table 1). The hyperopic shift after insertion of CTR intra operatively was found to be ranging from +0.5 D to +2.0 D. This correlated well with UBM images showing increased AC depth by 0.15–0.5 mm in these cases as compared to cases who had undergone a routine phacoemulsification without a CTR implantation (Figs. 1 and 2).

Conclusion and discussion

The surgical management of cataract associated with extensive zonular loss presents a challenge for ophthalmic surgeon. When more than four to five clock hours of zonules are missing, many surgeons prefer an intra capsular cataract extraction with ACIOL/scleral fixated IOL implantation. However, these lenses have their own problems and are inferior to in the bag PCIOL.³

In 1993, a PMMA Capsular Tension Ring (CTR) for use in humans was designed to stabilize the capsular bag in patients with zonular dialysis. CTR helps to avoid capsular collapse and vitreous presentation in AC during surgery and maintains the capsular bag, allowing the circular contour of the capsular bag, allowing intra ocular lens to be easily placed in the bag.^{1–6}

In this study, we evaluated the refractive shift following planned/unplanned CTR implantation intra operatively with PCIOL implantation in 25 cases. We found out through UBM that there is actually a posterior shift of PCIOL after use of CTR ring leading to hypermetropic correction needed after surgery. This should be kept in mind and the IOL implanted should be of +1.0 to 1.5 D more than that calculated preoperatively.

Conflicts of interest

All authors have none to declare.

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