

## Visual outcome and complications after modified Cionni endocapsular tension ring and intraocular lens implantation in eyes with subluxated lenses

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### ABSTRACT

**Objective:** To evaluate the visual outcome and complications after modified capsular tension ring (CTR) and intraocular lens implantation (IOL) in eyes with subluxated lenses.

**Methodology:** This is a prospective case series managed at Al Shifa Trust Eye Hospital, Rawalpindi, Pakistan. Thirty three eyes with subluxated lenses having zonular weakness less than 180 degrees were implanted modified CTR and IOL implant after lens matter aspiration. Main outcome measures were postoperative best-corrected visual acuity (BCVA), IOL centration, and complications.

**Results:** The age of 24 patients ranged from 2.5 to 38 years, mean  $13.34 \pm 9.8$  years. The follow up period was  $20.87 \pm 2.40$  months. The mean pre operative logMAR BCVA was  $0.98 \pm 0.52$  SD and the mean post operative logMAR BCVA was  $0.38 \pm 0.32$  SD ( $p$  value 0.000). Intractable secondary glaucoma was seen in 01(03%) eye. One eye (03%) needed surgical anterior capsulotomy for anterior capsular phimosis. At the last follow-up visit, the modified CTR provided excellent centration and positioning in all cases.

**Conclusion:** Modified CTR and primary IOL implantation in the capsular bag gives good visual outcome with no serious complications. However, it requires a highly experienced surgeon and sufficient patience for a relatively time-consuming procedure.

**KEY WORDS:** Capsular tension ring; Subluxated lenses.

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### INTRODUCTION

Ectopia lentis is related to a number of causes. Apart from trauma, nontraumatic causes include high myopia, buphthalmos, Marfan's syndrome, Weill-Marchesani syndrome and homocystinuria.<sup>1</sup> It can be idiopathic and in some cases it is hereditary. Mechanisms for vision impairment in ectopia lentis include lenticular myopia, astigmatism, and anisometropia. Moreover, an anteriorly subluxated lens may induce elevation of intraocular pressure (IOP), thereby necessitating lens removal.<sup>2</sup> In our practice, we have observed that non traumatic ectopia lentis usually presents in young age and carries risk of amblyopia in children if not optimally corrected with spectacles.

Management of subluxated lenses initially involves optical refraction but lens removal should be considered if there is impaired vision due to the subluxated lens that is not amenable to spectacle correction.<sup>2</sup> In the past, surgical intervention in eyes with subluxated lenses was considered difficult due to high rate of complications. Different surgical techniques for the management of ectopia lentis have been reported such as lensectomy and anterior chamber IOL implantation, open loop<sup>3,4</sup> or scleral fixation of IOL implant (SF-IOL).<sup>5</sup> However, the risks include iritis, pigment dispersion, corectopia, glaucoma, corneal endothelial loss, and retinal detachment. We share our experience of using modified CTR to centralize and stabilize the bag after lens matter aspiration followed by posterior chamber IOL implantation in the capsular bag.

### METHODOLOGY

This study was conducted at Al Shifa Trust Eye Hospital, Rawalpindi, Pakistan between July 2009 and July 2011. After obtaining the approval from ethical research/review committee, 29 patients having subluxated lenses with zonular weakness less than 180 degrees were recruited to the study for lens aspiration, modified CTR (type 1G Morcher) and posterior chamber IOL implantation. Eyes with ectopia lentis having zonular weakness more than 180 degrees and subluxated lenses due to buphthalmos were excluded from the study. Out of 29 patients, 5 patients were lost to follow up and excluded from the study. We only included 24 patients, who completed the follow up, for final analysis of the data.

All patients had a detailed eye examination that included BCVA measurement using age appropriate visual acuity tests, anterior segment examination was performed with handheld slitlamp in children while table mounted slitlamp was used for older age group, IOP was measured with Goldmann applanation tonometer or Tono-Pen (Medtronic Solan) and indirect ophthalmoscope was used for dilated fundus examination. Echocardiogram was advised to the patients with Marfan's syndrome. After written informed consent (and counseling with parents), patients had surgery under general anesthesia. All surgeries were performed by the same surgeon. The surgery was performed through a 5.5 mm scleral tunnel wound. Sodium hyaluronate 1.4% was used and anterior capsulorhexis was performed. Anterior chamber was maintained with AC maintainer and lens material was aspirated by using vitrectomy machine (Millennium Bausch and Lomb). The

posterior capsule was left intact. Iris hooks were used to stabilize the capsular bag wherever needed. Cionni modified CTR with one suturable eyelet was used for centration of the capsular bag. The leading end of CTR was introduced under the rim of the anterior capsulorhexis and feeding the rest of the ring by pushing it from behind and dialing it into the bag. The trailing end was then released beneath the edge of the capsulorhexis. The eyelet of modified CTR was sutured anterior to the capsular bag in ciliary sulcus with 9-0 polypropylene suture. An acrylic foldable IOL (Rayner) was implanted in the bag in three eyes while 30 eyes were implanted PMMA rigid posterior chamber IOL (5.5mm optic). The wound was closed with 10-0 nylon non absorbable monofilament suture.

Postoperatively, antibiotic and steroid eye drops were prescribed two hourly with a tapering schedule. Data analysis was performed using SPSS software. Mean  $\pm$  standard deviation were calculated. Paired t test was used. Differences were considered statistically significant when the p value was less than 0.05.

### RESULTS

In thirty three eyes of 24 patients, lens matter aspiration followed with capsular bag stabilization with modified Cionni CTR and posterior chamber IOL implantation was performed. The age of the patients ranged from 2.5 to 38 years, mean  $13.34 \pm 9.8$  years. Eighteen patients (75%) were male and 06 (25%) female. Twenty two (66.7%) eyes had non syndromic lens subluxation, 10 (30.3%) eyes had ectopia lentis due to Marfan's syndrome and 01 (3%) eye had traumatic lens subluxation. Table-I shows demographic data of 24 patients. Thirty (90.90%) eyes were implanted PMMA 5.5 mm IOL while acrylic foldable IOL was implanted in 03(9.09%) eyes.

In this study, the mean follow up period was  $20.87 \pm 2.40$  months (range 15-24 months). The mean pre operative LogMAR BCVA was  $0.98 \pm 0.52$  SD and the mean post operative LogMAR BCVA was  $0.38 \pm 0.32$  SD (p value 0.000). Table-II shows postoperative Snellens BCVA in 33 eyes. Thirty one (93.9%) out of 33 eyes showed no complications peroperatively or postoperatively during the follow up period. Intractable secondary glaucoma was seen in 01(03%) eye during follow up period, which led to removal of CTR and IOL complex. In addition, 01(03%) eye needed surgical anterior capsulotomy for anterior capsular phimosis. At the last follow-up visit, the modified CTR provided excellent

Table-I: Demographic data of 24 patients.

S. No	Age in yrs	Gender	Cause of Ectopia lentis
1	5	male	Non-syndromic
2	4	male	Non-syndromic
3	38	male	Non-syndromic
4	9	female	Non-syndromic
5	7	male	Non-syndromic
6	5	male	Marfans syndrome
7	27	male	Non-syndromic
8	21	female	Trauma
9	4	female	Non-syndromic
10	21	female	Non-syndromic
11	17	male	Non-syndromic
12	25	female	Marfans syndrome
13	14	male	Marfans syndrome
14	3	female	Non-syndromic
15	10	male	Non-syndromic
16	15	male	Marfans syndrome
17	4	male	Non-syndromic
18	5	male	Non-syndromic
19	9	male	Marfans syndrome
20	20	male	Non-syndromic
21	2.5	male	Non-syndromic
22	16	male	Marfans syndrome
23	6	male	Non-syndromic
24	10	male	Non-syndromic

centration and positioning in all cases. No eye developed retinal detachment or endophthalmitis.

## DISCUSSION

Surgical management of ectopia lentis is a challenge to an eye surgeon. Invention of modified CTR to stabilize the capsular bag created a safe and preferred option for IOL implantation. In our study, we found that implanting a modified CTR and then suturing it to the sclera improves capsular centration and facilitates IOL implantation with good visual outcome. In the current study, postoperative BCVA of 6/12 or better was achieved in 19 (57.58%) eyes. Vasavada and colleagues<sup>6</sup> reported a series of 35 eyes and found postoperative BCVA of 6/12 or better in 46% of patients. The mean post operative logMAR BCVA in our study was  $0.38 \pm 0.32$  SD (p value 0.000) which is comparable to a recent study by Vasavada and coworkers<sup>7</sup> with mean postoperative BCVA of  $0.33 \pm 0.21$  logMAR in 41 eyes (p 0.001).

A traditional CTR without suturable eyelet has been used previously in cases of subluxated lenses for IOL implantation.<sup>8</sup> Traditional CTR may not provide enough support and the capsular bag may remain decentered. As a result, postoperative pseudo phacodonesis can lead to pigment dispersion and chronic inflammation.<sup>2</sup>

Table-II: Postoperative best corrected visual acuity in 33 eyes.

Postoperative BCVA	No. of eyes (n=33)	Percentage (%)
6/12 or better	19	57.58
6/15	7	21.21
6/19	5	15.15
6/30 or less	2	6.06

BCVA= Best corrected visual acuity.

Implantation of traditional CTR in children with extensive zonular dialysis was not recommended due to significant postoperative problems. Reports exist where multiple surgeries were required for reposition of IOL after CTR insertion in a child with Marfan's syndrome bilaterally.<sup>9</sup>

Surgeons have used various surgical procedures to manage subluxated lenses. Morrison and associates<sup>4</sup> implanted anterior chamber IOL (AC-IOL) in Marfan's syndrome. SF-IOL can be visually rewarding in selected cases, but there is a high rate of complications during a long-term follow-up.<sup>5</sup> Mazhry and Qadri<sup>10</sup> reported good visual outcome with SF-IOL but experienced vitreous haemorrhage a frequent complication. In our practice, we perform SF-IOL in selected eyes having zonular weakness more than 180 degrees but have not experienced vitreous haemorrhage so far. However, the capsular bag is not preserved either with SF-IOL or AC-IOL implantation technique along with its associated complications. Lensectomy followed by aphakic spectacles is safe but not an ideal treatment option to manage ectopia lentis in pediatric eyes. However, IOL implantation can be considered with the help of modified CTR in pediatric eyes for better optical correction.<sup>11</sup> We consider, modified CTR a preferred and safe option to stabilize the capsular bag. In literature different techniques have been mentioned to apply the suture to stabilize the subluxated capsular bag.<sup>2</sup> Suturable eyelet is sutured to the sclera without piercing the capsular bag.<sup>12</sup> In this study we used modified CTR with an extra eyelet and none of the patients required CTR or IOL repositioning during the follow up period of  $20.87 \pm 2.40$  months. However, one eye developed intractable secondary glaucoma and required removal of CTR-IOL complex. Malyugin<sup>13</sup> used Malyugin modified Cionni CTR in 18 eyes with mean follow-up period of  $16 \pm 4.3$  months and achieved capsular bag centration in all eyes.

Cionni and associates<sup>14</sup> recommended 9-0 polypropylene suture for fixation of modified CTR. Similarly, in our study we did not encounter any incidence of suture breakage during follow up period.

Posterior capsulorhexis is particularly challenging in eyes with zonular weakness, and the posterior capsule is often left intact in the primary operation in these patients. Boomer and Jackson<sup>15</sup> provide scientific and clinical data to support the role of CTR in reducing posterior capsular opacification (PCO). If the CTR is larger than the capsular bag, the two ends of the CTR overlap each other in the bag. If the CTR is smaller, it leaves a large gap between its two ends. This gap facilitates the migration of lens epithelial cells posteriorly and causes PCO. None of our patients developed capsular opacification. The overlapping ends of CTR could be a factor in prevention of PCO. However, a longer follow-up of our patients or a larger series is required to make this assumption credible. Cases have been reported in which severe anterior capsular phimosis occurred in eyes with CTR and PMMA IOL.<sup>16</sup> In current study, one eye (3%) developed anterior capsular phimosis and required surgical capsulotomy.

Generally, foldable IOLs are implanted in cataract surgery. In subluxated lenses insertion of foldable lenses is challenging. In our study, only three eyes underwent acrylic foldable IOL implantation. We observed that the foldable IOL puts too much pressure on compromised zonules and capsular bag is pushed back by an unfolding lens. Thus, increasing the chance of post capsular rupture. To prevent these accidents, we resorted to rigid PMMA IOL implantation in rest of the cases.

Regarding the performance of modified CTR, a study<sup>17</sup> showed that intra operative and postoperative centration of IOL is definitely improved in case of profound dialysis. In a study of 15 eyes of 12 patients with Marfan's syndrome, Bahar and co workers<sup>18</sup> reported that Cionni ring provided excellent centration and positioning in all cases over mean follow-up of 14±9.49 months. Similarly, in our patients the modified CTR provided good centration and positioning of IOL without serious complications. Konradson and co workers<sup>19</sup>, in their study on 37 eyes, found this procedure safe with no serious complications such as glaucoma, retinal detachment, or endophthalmitis.

## CONCLUSION

We believe that management of ectopia lentis using a modified CTR and primary implantation of a rigid IOL in the capsular bag gives good visual outcome with no serious complications. However, positioning and suturing of the fixation eyelet requires an intact capsular bag and large anterior capsulorhexis, a highly experienced surgeon and

sufficient patience for a relatively time consuming procedure.

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