Original Article

Surgeries and Outcome in Subluxated and Dislocated Lens in Eastern Nepal

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ABSTRACT

Introduction: Many ocular or systemic conditions can cause weakening of the zonules, leading to subluxation or complete dislocation of lens into the anterior chamber or vitreous cavity.

Objectives: To evaluate the outcome of surgery in cases with subluxated and dislocated lens.

Materials and methods: Retrospective chart review of all cases with subluxated and dislocated lens who underwent surgery in a one-year period from 2019 January to 2019 December was conducted. Demographic profile, systemic comorbidities, initial and final best corrected visual acuity (BCVA), surgical procedure were recorded along with all the intraoperative and post-operative complications.

Results: A total of 62 eyes of 60 patients with mean age of 50.18 ± 15.18 years (18 to 87 years) were included with the modal duration of presentation of one week. Among these, trauma was found to be the most common etiology. Subluxation was present in 55 eyes and seven eyes had dislocation. Intracapsular Cataract Extraction (ICCE) was performed in 41 while 21 underwent Extracapsular Cataract Extraction (ECCE); and surgical intervention elicited a statistically significant ($p < 0.05$) improvement in the visual acuity. The BCVA was statistically better among the pseudophakic patient. Most common complication encountered intraoperatively was vitreous loss and post operatively was significant corneal edema.

Conclusion: Cataract extraction in cases with subluxated and dislocated lens due to different etiology results in the improvement in the visual acuity of the patient. In cases where ECCE cannot be performed, ICCE also results in comparable visual improvement.

Key words: Dislocation; intracapsular cataract extraction; subluxation, vitrectomy.

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INTRODUCTION

Many ocular or systemic conditions can cause weakening of the zonules, leading to subluxation or complete dislocation of lens with lens lying outside the patellar fossa in the anterior or posterior chamber. Common acquired causes include blunt trauma and iatrogenic zonular dehiscence (Hoffman et al., 2013). Hereditary forms are usually associated with ocular anomalies and systemic disorders commonly Marfan syndrome, Homocystinuria, Weill-Marchesani syndrome but may also occur in isolation (Hakin et al., 1992).

The amount of visual disturbance mainly depends on the type and degree of displacement. There may be no visual symptoms if the subluxation is minimal while, larger degree of zonular loss may induce lenticular myopia and astigmatism. Monocular diplopia, glare may also be present. It may also be associated with glaucoma, uveitis, cataract, or retinal detachment (Nirankari and Chaddah, 1967; Nelson and Maumenee, 1982).

When there is minimal lens instability with intact capsule and zonule, the traditional phacoemulsification or a standard extracapsular extraction may be performed with adjunctive devices like Capsule tension ring (CTR), modified CTR (m-CTR/ Cionni Ring), Capsular tension segments (CTS), Capsular support hooks (Salehi-Had and Turalba, 2010). However, if severe lens instability is present, routine phacoemulsification techniques used today may not be suitable necessitating large incision extracapsular or intracapsular extraction (Khokhar et al., 2018). The choice of IOL in these cases depends on the preference of the surgeon and the existence of other ocular comorbidities.

The study was conducted to evaluate the outcome of surgery in cases with subluxated or dislocated lens and try to describe the demographic profile, determine outcome in terms of type of surgery, status of lens, and experience of the surgeon.

MATERIALS AND METHODS

A retrospective chart review of all cases of subluxated and dislocated lens that underwent surgery at Mechi eye hospital in Eastern Nepal within a period of one year (2019 January 1 to 2019 December 31) was done after approval from the institutional ethical committee (Ref. IRB-31/077) and the study adhered to the tenets of Declaration of Helsinki (2013). All the cases of subluxated or dislocated lens that underwent single or multiple procedures and had a minimal follow-up of six weeks after the last procedure were included in the study. Cases with incomplete records, additional open globe injury, history of any other ocular surgery, and follow-up duration of less than six weeks were excluded.

The demographic details of each case were recorded and detailed history was taken with emphasis on the duration of presentation and history of recent or past trauma. In addition, any syndromic association, systemic comorbidities and family history of the patient were reviewed. The visual acuity of the patient recorded using Snellen's Chart were converted to Logarithm of minimum angle of resolution (LogMAR) units with the value of Counting fingers (CF), Hand Movement (HM), Perception of light (PL), and No Perception of Light (NPL) taken as 1.80, 2.30, 2.80, and 3.00 LogMAR respectively (Holladay, 1997). Details of ocular evaluation were taken in all the cases.

All the cases underwent surgery with a peribulbar block. In cases with posterior dislocation the patient underwent pars plana vitrectomy with phacofragmentation while in all the other cases, phacoemulsification was planned if the subluxation was less than one quadrant, Manual Small Incision cataract surgery (MSICS) if one to three quadrant and Intracapsular Cataract Extraction (ICCE) if more than three quadrants. However, the decision of the type of surgery was finalised by the operating team.

All the ICCE and MSICS were performed using a sclero-corneal tunnel and vitreous loss, if present was managed by using 20G anterior vitrector with cutting speed of 1200 cpm. The lens implanted in MSICS were primarily Posterior Chamber Intraocular lens (PCIOL) but, ACIOL was used in cases with capsule related complications and ICCE. In cases where ACIOL couldn't be implanted, patients were left aphakic and planned for secondary IOL as Scleral fixation Intraocular lens (SFIOL). Phacoemulsification was done using a clear corneal incision of 2.8 mm and foldable hydrophilic Acrylic PCIOL were used. If placement of CTR was possible, CTR of diameter 12 mm or 13 mm were used based on the axial length of the eye. Any intraoperative complications, if present were recorded in the case sheets.

The patients were reviewed post-operatively on day one, one week and six weeks. In each visit, detailed clinical examination was done and visual acuity, IOP and significant findings like complications were noted. Post-operative medications included topical corticosteroids, antibiotics and oral ciprofloxacin as per the institutional protocol. In cases with suspected endophthalmitis, intravitreal injection of antibiotics was given and if required, core vitrectomy was done.

The data was finally analysed using IBM SPSS Statistics for Windows, version 23 (IBM Corp., Armonk, N.Y., USA) with appropriate statistical tool like percentage, mean, median, mode, and analytical tools like analysis of variance (ANOVA).

RESULTS

Of the 75 eyes of 72 patients operated in the year, a total of 62 eyes of 60 cases that satisfied all the inclusion criteria were included in the study. The mean age was 50.18 ± 15.18 years (18 to 87 years) with the maximum number of patients being in the age group 46 – 60 years (29, 46.8%) with male to female ratio of 2.9:1. Right, left and both eyes were operated in 34, 24, and two patients respectively.

The modal duration of presentation was one week with duration varying from one week to ten years. Seventy percent of patients presented with trauma as the predisposing cause. Among the eyes operated, 55 eyes (88.7%) had subluxation while seven eyes (11.3%) had dislocation of the lens. Among the seven eyes with dislocated lens, anterior and posterior dislocation was seen in three and four eyes respectively. Syndromic association was seen in five cases with four (80%) suspected for Marfan's syndrome while one (20%) had Retinitis Pigmentosa.

The presenting visual acuity and the final best corrected visual acuity (BCVA) have been tabulated (Table 1).

Table 1: Best corrected visual acuity at the initial and final presentation.

At presentation		Final	
BCVA	**Number (Percent)**	**BCVA**	**Number (Percent)**
>6/18	-	>6/18	21 (33.9)
6/18- 6/60	9 (14.5)	6/18- 6/60	15 (24.2)
5/60- 3/60	5 (8.1)	5/60- 3/60	6 (9.7)
2/60- PL	45 (72.6)	2/60- PL	18 (29)
NPL	3 (4.8)	NPL	2 (3.2)

BCVA: Best Corrected Visual Acuity, PL: Perception of light, NPL: No Perception of Light

Preoperative IOP was raised in 19 (30.6%) eyes and the maximum IOP recorded was 60 mm of Hg. Post-operatively, 16 eyes had IOP controlled with oral and topical anti-glaucoma medications. However, eight eyes persisted to have raised intraocular pressure during their duration of follow-up despite the medical management. Two eyes with raised IOP and NPL vision had no improvement of vision but attained a normal IOP after the surgery.

A Wilcoxon signed – rank test showed that surgical intervention elicited a statistically significant change in visual acuity in eyes with subluxation/ dislocation of lens ($Z=-5.46$, $p<0.005$). Also on comparison of pre and post-operative visual acuity, it was found that 49 eyes had improved post-operative visual acuity (Median BCVA 1.80 log mar to .60 log mar). However, six eyes had reduced BCVA after treatment and seven eyes showed no change.

Forty-one (66.1%) eyes underwent ICCE while ECCE was done in 21 (33.9%) eyes. Among the 21 eyes, 19 (90.5%) underwent SICS and two (9.5%) underwent phacoemulsification. The CTR was used in 14 eyes (SICS: 13, Phacoemulsification: 1). Fifteen cases of ICCE were left aphakic while two cases of ECCE were left aphakic. Three eyes with posterior dislocation of lens and two eyes with subluxated lens, which also had retinal detachment underwent Pars plana vitrectomy while one eye with suspected endophthalmitis underwent Core vitrectomy. The need for anterior vitrectomy, status of IOL and position of IOL is as presented (Table 2 and 3). It was found that possibility of requiring anterior vitrectomy in

Table 2: Anterior vitrectomy and status of lens in different surgeries.

Anterior vitrectomy	Status of lens	Type of cataract surgery, n (%)	
		ICCE	**ECCE**
No	Aphakic	1 (33.3)	2 (66.7)
	Pseudophakic	2 (14.3)	12 (85.7)
Yes	Aphakic	14 (100)	-
	Pseudophakic	24 (77.4)	7 (22.6)

ICCE: Intracapsular Cataract Extraction, ECCE: Extracapsular Cataract Extraction

Table 3: Position of lens in different surgeries.

Location of IOL	Type of surgery, n (%)		
	ICCE	SICS	Phacoemulsification
In the bag	-	14 (87.5)	2 (12.5)
Sulcus	-	1 (100)	-
Anterior chamber	23 (92)	2 (8)	-
Scleral fixed	3 (100)	-	-

IOL: Intraocular lens, ICCE: Intracapsular Cataract Extraction, SICS: Small Incision Cataract Surgery

patient undergoing ICCE was 2.78 (1.51 – 5.12, CI 95%) times that of patient undergoing ECCE in eyes with subluxation or dislocation of lens.

The most common intraoperative complication encountered was vitreous loss, occurring in 33 eyes (80.5%) undergoing ICCE and seven eyes (33.3%) undergoing ECCE. Among the seven eyes of ECCE, three cases of vitreous loss occurred due to posterior capsular rent. Other intraoperative complications encountered were iridodialysis in one case, extension of zonular dialysis in one case and loss of cortical matter into the vitreous cavity in two cases.

Post-operatively, significant corneal edema was the most common complication occurring in 18 eyes (29%). Other complications encountered were one case each of retinal detachment, endophthalmitis, hyphema, pupillary block, incomplete vitrectomy and wound leak.

One way ANOVA test was used to determine the relation of lens status after surgery and final BCVA. It was found that BCVA among pseudophakic eyes (0.86±0.71 log MAR) was better than those among aphakic (1.42±1 log MAR) and the difference was found to be statistically significant ($F(1, 60) = 6.02$, $p = 0.017$). Separate group for pseudophakic eye could not be compared because of small number of eyes in each group. The BCVA after ECCE (0.94 ± 0.85 log MAR) was better than that after ICCE (1.05 ± 0.84 log MAR). The difference was not found to be statistically significant ($F(1, 60) = 0.237$, $p = 0.63$).

Eighteen (29%) were operated by surgeon with less than two years of surgical experience, 10 (16.1%) operated by surgeon with two to four years of surgical experience and 34 (54.8%) eyes were operated by surgeon with more than four years of surgical experience (Table 4).

Table 4: Surgical experience and type of performed surgery.

Surgical experience (in years)	Type of surgery performed, n (%)				
	ICCE	SICS	SICS + CTR	Phacoemulsification	Phacoemulsification + CTR
<2	10 (55.5)	2 (11.1)	6 (33.3)	-	-
2 to 4	7 (70)	1 (10)	2 (20)	-	-
>4	24 (70.6)	2 (5.89)	6 (17.65)	1 (2.94)	1 (2.94)

ICCE: Intracapsular Cataract Extraction, SICS: Small Incision Cataract Surgery, CTR: Capsular Tension Ring

The final BCVA among the first group was 0.85±0.84 log MAR, which was better than that of second group (1.05±0.77 log MAR) and third group (1.09±0.86 log MAR) but this difference was not found to be statistically significant (p >0.05), this may be implicated to large number of eyes requiring ICCE in third group (24, 72.7%) compared to group one (10, 55.5%) highlighting the complicated cases tackled by group three.

DISCUSSION

Subluxated and dislocated lenses can lead to visual degradation resulting from changes in refractive status, astigmatism and intermittent phakic and aphakic zones. Literature has described both ICCE and ECCE for the management such cases (Barraquer, 1972; Jensen and Cross, 1972; Maumenee and Ryan, 1969; Sellyei Jr and Barraquer, 1973) and cryoextraction (Barraquer, 1972; Malbran et al., 1989).

In current study, surgical intervention elicited a statistically significant change in visual acuity in eyes with subluxation/ dislocation of lens. Literature has also found the statistical change in post-operative visual acuity, where they had performed limbal lensectomy in cases of non-traumatic subluxated/ dislocated lens, and post-operatively there were no cases of elevated IOP (Behki et al., 1990). However, in the present case, eight eyes persisted to have raised IOP.

There is a great challenge in treating the subluxated or dislocated lens, whenever it is associated with secondary glaucoma. In these cases, surgeons have to deal with structural damage of both anterior and posterior segments of the eye, dealing with aphakic state after removing subluxated/dislocated lens. In such cases, the surgery has to be planned according to grade of cataract and degree of subluxation with consideration for use of iris hooks and scleral fixation (Ma et al., 2008).

Dislocated lens secondary to trauma can be associated with various anterior and posterior ocular pathologies. Poor visual outcome has been depicted by Greven et al. (2002) where they had managed cataract/subluxated lens secondary to trauma. Similarly, in the present case, two patients with NPL vision preoperatively secondary to trauma had no change in vision post-operatively and were operated to control intraocular pressure which was accomplished. Six eyes with traumatic dislocation of the lens had reduced BCVA after treatment.

In present study cases, Pseudophakic eyes had statistically significantly better BCVA than that of aphakic eyes and BCVA after ICCE was comparable with that after ECCE. Smiddy et al. (1995) observed that the outcome with PCIOL was better than that of ACIOL. Yet, in very severe cases of subluxation, it is challenging to salvage capsular bags. Khokhar et al. (2018b) implemented the modified technique with use of endocapsular lens aspiration in 32 eyes in severely subluxated lens and found that in severely subluxated lens, endocapsular lens aspiration with removal of lens capsular bag was effective and implanting ACIOL could be an easier alternative for SFIOL.

SFIOL is a safe and effective technique for aphakic eyes with insufficient support of the posterior capsule (Yadav et al., 2012). Many studies have described the success with SFIOL with minimum complications (Buckley, 2008;

Epley et al., 2001; Sharpe et al., 1996). The findings in the current study were similar among the three cases undergoing SFIOL with mean BCVA improved from 1.78 to 0.75. In cases where SFIOL is contraindicated, anterior lensectomy, and vitrectomy with aphakic correction can be considered safe (Utz et al., 2014). This procedure has yielded a good improvement in vision especially in cases with Marfan syndrome with subluxated lens (Rezar-Dreindl et al., 2019) as seen among the cases in this study with mean improvement in BCVA from 2.05 to 1.42 log mar.

Successful visual outcome and safe implantation of IOL with scleral fixated CTR have been shown by Konradsen et al. (2007) They managed total of 37 eyes of ectopic lens with Cionni-modified CTR in 33 eyes and CTR and IOL in four eyes with good results (Das et al., 2009).

A randomised intervention study, done by Goel et al. (2012) in both phacoemulsification and MSICS, zonular dehiscence was a common complication and difficulty in capsular opening was higher in cases with greater zonular dialysis. Nonetheless, they reported capsular bag retention was possible in 76.7% MSICS and 90% of phacoemulsification cases and concluded that visual outcome was excellent with both phacoemulsification and MSICS in managing subluxated lenses. Current study finding was comparable with their finding as we were able to retain capsular bags in 78.9% SICS and 100% phacoemulsification. Similarly, retention of the capsular bag was challenging in cases with large subluxation and BCVA was better among ECCE groups.

Varga (1971), Jarett (1967), Jensen and Cross (1972), and Maumenee (1981) all have reported post-operative complications like retinal detachment and glaucoma in cases under going ICCE and ECCE for ectopia lentis and posterior segment complications like retained lens fragments, vitreous hemorrhage can be managed with PPV with good visual restoration (González-Castaño et al., 2006). In the present study, we had five cases of non-traumatic syndromic cases. We had no complications in those cases post-operatively. But in other non-syndromic cases, we did encounter complications like retinal detachment, hyphema, wound leak, and endophthalmitits post-operatively. However, there are studies that have reported no post-operative complications (Peyman et al., 1979).

In the present study, we compared the mean last BCVA of the surgeries performed by surgeons with different grades of experience and found that the BCVA was better among groups with less than two years of experience; which was contrary to our expectation. This might be due to the fact that they were allocated a comparably smaller number and relatively less complicated cases, while the senior surgeons tackled bulk of the complicated and challenging cases, like those with secondary glaucoma, completely dislocated lens resulting in ICCE and eyes with posterior segment pathology. In addition, the senior tackled the majority of cases with poor presenting visual acuity.

The main limitation of the study is that it was conducted retrospectively taking into account only a short duration of one year. The study also highlighted our deficit in collecting the adequate information at the time of presentation regarding variables such as amount of subluxation.

CONCLUSION

It can be inferred from findings of this study that intervention with cataract extraction in cases with subluxated and dislocated lens due to different etiology results in the improvement in the BCVA of the patient. In addition, it is advisable to aim for the pseudophakic status ideally with ECCE whenever possible. Nevertheless, in cases where ECCE cannot be performed due to various factors, ICCE also results in comparable visual improvement. Case selection and decision to undertake the patient to surgery should always be weigh against the possible adverse outcome of poor visual outcome especially among those with functional BCVA.

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