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Outcomes of Flanged Intrascleral Intraocular Lens Fixation with Single Needle Techniques in Traumatic Eyes: An Interventional Case Series

ผลการศึกษาการผ่าตัดฝังเลนส์แก้วตาเทียมด้วยเทคนิค flanged intrascleral intraocular lens fixation with single needle ในผู้ป่วยอุบัติเหตุทางตา

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Abstract

Purpose: To propose and determine the clinical outcomes and safety of flanged intrascleral intraocular lens (IOL) fixation with a new single needle technique in traumatic eye injury.

Methods: Eyes with traumatic cataract with inadequate posterior capsule support, aphakia, or lens dislocation from traumatic eye injury were operated using flanged intrascleral IOL fixation with single needle techniques. Preoperative demographic data, best-corrected visual acuity (BCVA), refraction and complications were collected. Sub-analysis to compare fixating locations between 12-6 and 3-9 o'clock was performed.

Results: Ten eyes from 10 patients were reviewed. After surgery, BCVA improved to 0.28 logMAR,

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P < 0.001. Mean post-operative final manifest refraction (Spherical Equivalent) at the third month of follow-up was -0.15 diopters (D). The mean difference between the target refraction and final manifest refraction was 0.05 D. For the sub-analysis, there was a significant difference in the direction shift from the target refraction between the 2 locations. A minus shift from the target refraction occurred in location 3-9 o'clock, whereas a plus shift occurred mostly in location 12-6 o'clock (P=0.02). IOL fixed at location 3-9 o'clock had a lesser estimated refractive error (75% within 0.5 D) compared to that at location 12-6 o'clock (16.7%). Two eyes with vitreous hemorrhage were observed after surgery.

Conclusions: Flanged intrascleral IOL fixation with single needle technique resulted in good visual outcome and is a safe implantation technique in traumatic eye injury. Our data suggested that IOL fixed at location 3-9 o'clock tended to have a minus shift from the target refraction in contrast to IOL fixed at location 12-6 o'clock, which showed a plus shift.-

Keywords: Intraocular lens, traumatic eye injury, flanged intrascleral intraocular lens fixation, scleral intraocular lens fixation

บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาผลการผ่าตัดและภาวะแทรกซ้อนจากการผ่าตัดฝังเลนส์แก้วตาเทียมด้วยเทคนิคใหม่ flanged intrascleral intraocular lens fixation with single needle ในผู้ป่วยอุบัติเหตุทางตา

วิธีการศึกษา: เก็บข้อมูลจากตาที่ได้รับการผ่าตัดด้วยเทคนิค flanged intrascleral intraocular lens fixation with single needle ในผู้ป่วยอุบัติเหตุทางตาที่วินิจฉัยต้อกระจกและถุงหุ้มเลนส์ไม่แข็งแรง ไม่มีเลนส์แก้วตา หรือ เลนส์แก้วตาเคลื่อน โดยรวบรวมข้อมูลพื้นฐานของผู้ป่วย ระดับสายตา กำลังสายตา ภาวะแทรกซ้อน และวิเคราะห์กลุ่มย่อยเปรียบเทียบตำแหน่งฝังเลนส์แก้วตาเทียมระหว่าง 12-6 และ 3-9 นาฬิกา

ผลการศึกษา: วิเคราะห์ผลจาก 10 ตาในผู้ป่วยทั้งหมด 10 คน หลังผ่าตัดพบว่า ระดับสายตาดีขึ้นเป็น 0.28 logMAR (P<0.001) ระดับกำลังสายตาหลังการผ่าตัดเฉลี่ยที่ 3 เดือนเท่ากับ -0.15 ไดออปเตอร์ ค่าเฉลี่ยของความแตกต่างระหว่างกำลังสายตาเป้าหมายและกำลังสายตาจริงเท่ากับ 0.05 ไดออปเตอร์ การวิเคราะห์ย่อยพบมีความแตกต่างอย่างมีนัยสำคัญในทิศทางของกำลังสายตาจากกำลังสายตาเป้าหมายระหว่าง 2 ตำแหน่งที่ทำการฝังเลนส์แก้วตาเทียม การผ่าตัดฝังเลนส์แก้วตาเทียมที่ตำแหน่ง 3-9 นาฬิกามีแนวโน้มที่จะมีค่ากำลังสายตาไปทิศทางลบจากกำลังสายตาเป้าหมาย ตรงกันข้ามกับที่ตำแหน่ง 12-6 นาฬิกาที่มีทิศทางกำลังสายตาไปทางบวกเป็นส่วนใหญ่ (P=0.02) การผ่าตัดฝังเลนส์แก้วตาเทียมที่ตำแหน่ง 3-9 นาฬิกามีสัดส่วนความคลาดเคลื่อนของกำลังสายตาน้อยกว่า (75% พบอยู่ใน 0.5 ไดออปเตอร์) เมื่อเทียบกับที่ตำแหน่ง 12-6 นาฬิกา (16.7%) และมีจำนวน 2 ตาที่พบเลือดออกในวุ้นตาหลังผ่าตัด

สรุป: การผ่าตัดฝังเลนส์แก้วตาเทียมด้วยเทคนิค flanged intrascleral intraocular lens fixation with single needle ให้ผลการมองเห็นในระดับดีและปลอดภัยสำหรับผู้ป่วยอุบัติเหตุทางตา จากข้อมูลการศึกษานำเสนอว่า การผ่าตัดฝังเลนส์แก้วตาเทียมที่ตำแหน่ง 3-9 นาฬิกามีแนวโน้มที่จะมีค่ากำลังสายตาไปทิศทางลบจากกำลังสายตาเป้าหมาย ตรงกันข้ามกับการผ่าตัดฝังเลนส์แก้วตาเทียมที่ตำแหน่ง 12-6 นาฬิกามีทิศทางกำลังสายตาไปทางบวก

คำสำคัญ: การผ่าตัดฝังเลนส์แก้วตาเทียม, อุบัติเหตุทางตา, การผ่าตัดฝังเลนส์แก้วตาเทียมสอดภายในผนังตาขาว, การผ่าตัดฝังเลนส์แก้วตาเทียมยึดกับผนังตาขาว

ผู้นิพนธ์ไม่มีส่วนเกี่ยวข้องหรือผลประโยชน์ใดๆกับพลิตภัณฑ์ที่ได้กล่าวอ้างถึงในงานวิจัยนี้

Introduction

Ocular trauma is a common problem and a common cause of vision loss. There are approximately 1.6 million blind people from injuries.[1] World Health Organization reported 750,000 cases per year admitted for traumatic eye injuries, including 200,000 patients suffering from traumatic open eye globe injuries.(1) Previous studies have shown incidences of hospitalization for eye injury ranging from 1.96 to 62.3 per 100,000 patients.[2-6] Most ocular traumas occur in young males and are related to outdoor activities, occupation, and sports.[6] In Thailand, Changmai University reported 249 *cases and hospitalizations* for traumatic eye injuries from 2015-2016. Of these, 48.6% were open globe injuries and 12.4% were traumatic lens injuries.(7) However, ocular trauma with lens injury can restore vision and has a good visual prognosis. Trauma-related lens injuries, including traumatic cataract with lens subluxation or dislocation, can sometimes not be implanted in the capsular bag or even in the sulcus, as is normally done in non-traumatic cataracts because of an abnormal anatomy and physiology. For patients with this condition, the other intraocular lens (IOL) implantation surgical techniques with insufficient or no capsular support could be done by an anterior chamber IOL, an iris-fixed IOL, a transscleral sutured posterior chamber IOL, fibrin glue-assisted sutureless posterior chamber IOL implantation, and flanged intrascleral IOL fixation with double-needle technique.[8-13]

Flanged intrascleral IOL fixation has recently been introduced for the past few years. It has advantages over the other techniques in terms of absence of suture-related complications, faster recovery, and lesser hypotony.[9, 12, 14-16]

Limited reports of the outcomes of flanges intrascleral IOL fixation in traumatic cases are available.[17,18] In addition, the flanged intrascleral IOL fixation originally involves passing 2 needles out of the sclera simultaneously (a.k.a. double-needle technique). This process allows a period of time when the first needle tip is left afloat inside the eye while the surgeon is passing another needle tip into the eyeball. Inadvertent complications related to the IOL or intraocular structure can occur during the time that the first needle tip has no control. In this study, I modified the flanged IOL fixation technique by using a single needle, one at a time, and applied it in ocular trauma cases which are one of the common causes requiring intrascleral IOL fixation. The primary objective of this study was to report clinical outcomes and complications of this proposed technique.

Materials and Methods

This study was approved by the Institutional Review Committee of the Surin Hospital. This study was conducted according to the principles of the Declaration of Helsinki. The medical chart review of eyes that underwent flanged IOL fixation with single needle techniques between July 2019 and June 2020. The inclusion criteria were traumatic lens injury with unstable zonular support, aphakia, posterior crystalline lens or IOL dislocation/subluxation, open globe or closed globe injury, according to the Birmingham Eye Trauma Terminology (BETT). The exclusion criteria

were retinal disease with requiring treatment, any ocular infection, age below 18 years, and patients with follow-up less than 3 months. Demographic data, ocular history, axial length, corneal keratometry, operative procedures, preoperative and postoperative best-corrected visual acuity (BCVA), manifest refraction, and postoperative complications were collected. The BCVA was measured using the pinhole method. The follow-up was at 1 week, 1 month, and 3 months in all cases. Sub-analysis to compare the outcomes of fixating locations between 12-6 and 3-9 o'clock was performed.

Surgical procedure of flanged intrascleral IOL fixation with single needle techniques

All cases were performed by a single surgeon at Surin Hospital. The traumatic crystalline lens was removed by phacoemulsification cataract extraction, lens aspiration, or pars plana lensectomy, depending on the status and position of the lens after injury. All open globed injury had undergone primary repair prior, resulting in adequate wound integrity. A 23-gauge pars plana vitrectomy was performed only in cases with prolapsed vitreous. A 3-piece foldable IOL (Acrysof MA60AC series, Alcon, Ft Worth, TX) was used for fixation in all cases. The IOL power was calculated using the SRK/T formula. The first minus refraction was considered as the target refraction. The manifest refraction and target refraction were reported in spherical equivalent.

Procedure step

- The three-piece foldable IOL was inserted via a main corneal incision, 2.75 mm in size, temporal for the location 12-6 o'clock, and superior for the location 3-9 o'clock. The location selection was at the surgeon's convenience which was determined intraoperatively.

- A sclerostomy was created with a 27-gauge needle 2 mm from the limbus. The needle tunnel was tangential to the limbus with a downward angle of 10°.

- Intraocular forceps were advanced through a side port to thread the leading IOL haptic into the needle lumen.

- Externalizing the first haptics through the needle tunnels and using an electrocautery was done to heat both ends of the haptics, creating the flanges.

- The same technique was performed at 180 ° apart.

- The haptics were adjusted until the optic was center then, the flanges were rotated back until they were fixed within the scleral tunnels under the conjunctiva.

Statistical analyses

The Snellen BCVA was converted to logMAR units for statistical analyses. Continuous variables were assessed as mean values ± standard deviations. Data were analyzed using the Fisher's exact test and t-test. The paired t-test was used to compare the preoperative and postoperative BCVA. The difference of estimated refractive error from target refraction was compared between the two IOL fixed locations using the Fisher's exact test. A P value of less than 0.05 was considered statistically significant. Statistical analyses were performed using Stata 13.0 (StataCorp, College

Station, TX).

Results

Flanged intrascleral intraocular lens IOL fixation with single needle technique was performed in 10 eyes from 10 patients with traumatic eye globe injuries. Seventy percent were closed globe injuries and 30% were open globe injuries. There were 5 mature cataracts with subluxated crystalline lens, 2 aphakic eyes, and 3 posterior crystalline lens dislocations. All cases had a pre-operative IOP below 21 mmHg. The pre-operative mean BCVA (LogMAR) was 2.22 ± 0.30 for all cases, 2.83 ± 0.38 for cases with IOL fixed location of 12-6 o'clock and 2.13± 0.13 for location 3-9 o'clock. The demographic variables were reported in **Table 1**.

After operation, visual acuity improved in all

Table 1 shown the demographic variables

Parameters	All	Location 12–6 o'clock	Location 3–9 o'clock	P value
N (eyes)	10	6	4	
Age (years) Mean (SD)	54.7 (18.7)	56.3 (15.6)	52.3 (25.1)	0.76*
Gender				
Male	6	3	3	0.57**
Female	4	3	1	
Eye				
Right	4	1	3	0.19**
Left	6	5	1	
Type of injury				
Open	3	2	1	1.00**
Closed	7	4	3	
Combined with PPV				
Yes	3	2	1	1.00**
No	7	4	3	
Combined with lens surgery				
Yes	8	5	3	1.00**
No	2	1	1	
Axial length (mm) Mean (SD)	23.76 (1.12)	24.05 (1.25)	23.33 (0.85)	0.35*
Pre-operative curvature				
With the rule	6	3	3	0.57**
Against the rule	4	3	1	

*t-test, **Fisher's exact test

Abbreviation: PPV; pars plana vitrectomy

eyes with a statistical significance from the pre-operative visit. None of the patients had a drop in BCVA. At the third month of follow-up, mean post-operative BCVA (LogMAR) was 0.28 ± 0.11 with 0.30 ± 0.13 in the location 12-6 o'clock group, and 0.25 ± 0.10 in the location 3-9 o'clock group. The comparison of pre-operative and post-operative BCVA is shown in **Table 2** and **Figure 1**.

There was no intraoperative complication, including inadvertent needle injuries to the ocular structure and broken IOL haptics, observed in this series. Early postoperative vitreous hemorrhage occurred in 2 eyes which were subsequently resolved within 1 month. Both cases had IOL fixation at location 12-6 o'clock. IOL capture, retinal detachment, suprachoroidal hemorrhage, and endophthalmitis were not found in this study.

Mean post-operative final manifest refraction, at the third month of follow-up was -0.15 ± 0.91 diopter (D) with 0.17 ± 1.03 D for the location 12-6

Table 2 best corrected visual acuity outcomes of flanged intrascleral IOL fixation pre-operative visit and post-operative visit

Location	Pre-operative BCVA (LogMAR)	Post-operative BCVA (LogMAR)	P value*	95% CI of mean difference
All Mean (SD)	2.22 (0.30)	0.28 (0.11)	< 0.001	(1.72, 2.16)
Location subgroup Mean (SD)				
12-6 o'clock	2.28 (0.38)	0.3 (0.13)	< 0.001	(1.58, 2.39)
3-9 o'clock	2.13 (0.13)	0.25 (0.10)	< 0.001	(1.60, 2.15)
P value**	0.45	0.52		

*Paired t-test, **Student t-test

Abbreviation: logMAR; logarithm of the minimum angle of resolution, BCVA; best corrected visual acuity

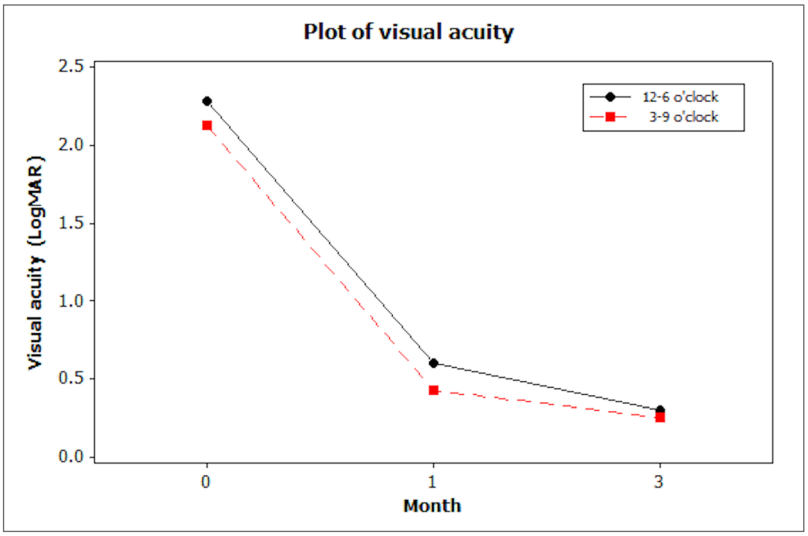

Figure 1 shown a plot graph of visual acuity at first month and third month of follow-up
Y axis: Visual Acuity; LogMAR; X axis: Month of follow-up after surgery

Table 3 Shown the refractive outcomes of flanged intrascleral IOL fixation

Parameters	All	Location 12–6 o'clock	Location 3–9 o'clock	P value
Post-operative final manifest refraction (SE) mean (SD)	-0.15 (0.91)	0.17 (1.03)	-0.65 (0.43)	0.19*
Difference between target refraction (SE) and final manifest refraction (SE); Diopter Mean (SD)	0.05 (0.85)	0.35 (0.93)	-0.41 (0.05)	0.15*
Estimated refractive error from target refraction				
Within 0.25 Diopter	3 (30%)	1 (16.7%)	2 (50.0%)	0.19**
> 0.25 Diopter, ≤ 0.5 Diopter	1 (10%)	0	1 (25.0%)	
> 0.5 Diopter	6 (60%)	5 (83.3%)	1 (25.0%)	
Direction shift from target refraction				
Plus shift	5	5	0	0.02**
Minus shift	5	1	4	
Post-operative lens astigmatism; Diopter Mean (SD)	0.57 (0.81)	0.79 (1.01)	0.25 (0.20)	0.33*

*t-test, **Fisher's exact test

Abbreviation: SE; Spherical equivalence

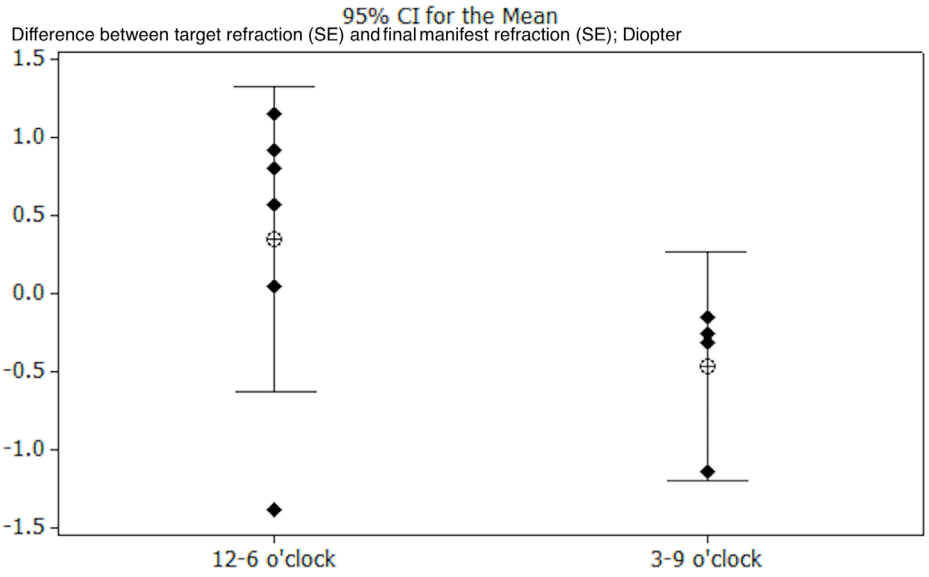

Figure 2 Individual value plot of the difference between target refraction (SE) and final manifest refraction (SE) of flanged intrascleral IOL fixation at location 12-6 and 3-9 o'clock

Y axis: Difference between target refraction (SE) and final manifest refraction (SE); Diopter (D)

X axis: Location of IOL fixation

o'clock group and -0.65 ± 0.43 D for the location 3-9 o'clock group. The mean difference between target refraction and final manifest refraction was 0.05 ± 0.85 D, 0.35 ± 0.93 D and -0.41 ± 0.05 D, for all cases, 12-6, and 3-9 o'clock group, respectively. The refractive outcomes are shown in **Table 3**. **Figure 2** shows an individual value plot of the difference between target refraction and final manifest refraction of flanged intrascleral IOL fixation at locations 12-6 and 3-9 o'clock. At IOL fixed location 12-6 o'clock, there are 5 eyes with plus shift refraction and 1 eye with minus shift refraction from target refraction. All eyes with fixed IOLs at locations 3-9 o'clock had a minus shift refraction from target refraction. **Figure 3** shows a bar graph showing the estimated refractive error from the target refraction of flanged intrascleral IOL fixation at locations 12-6 and 3-9 o'clock.

Discussion

Many publications have shown that traumatic eye injury with lens involvement has a good visual prognosis after IOL implantation.[17,19,20] Traumatic eye injuries can cause natural anatomical distortion. Traumatic cataracts may involve zonular injury or dislocations of the crystalline lens. In eyes with insufficient or no capsular support, IOL implantation and fixation techniques are options reported in many publications.

Yang et al. reported IOL techniques with transscleral suture fixation of the posterior chamber in traumatic eyes (N=15), using prolene 10-0 fixed with the sclera. The study showed a mean post-operative VA of 0.14 logMAR (20/25-20/32). Eighty-seven percent had a VA greater than 20/40.(18) Similar to a study by Roger et al., the same techniques with larger eyes

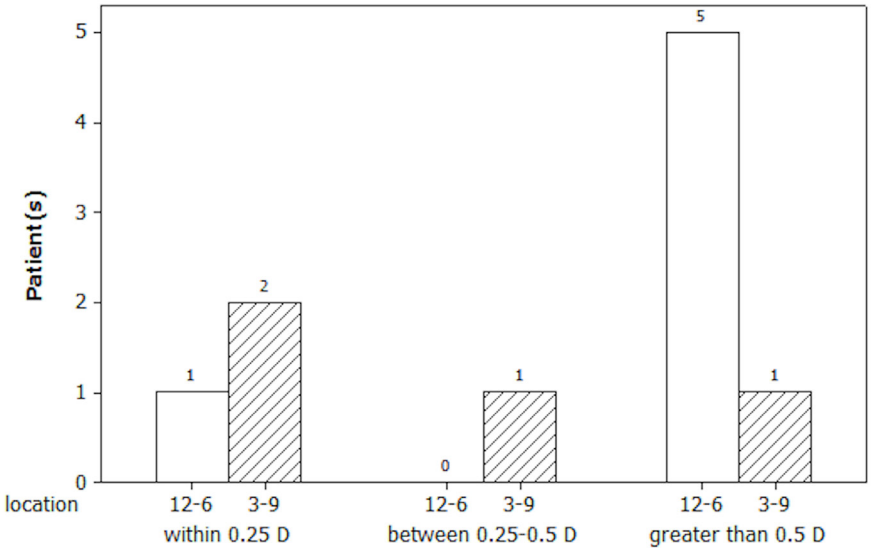

Figure 3 Bar graph showing the estimated refractive error from target refraction of flanged intrascleral IOL fixation at location 12-6 and 3-9 o'clock
Y axis: Patient(s)
X axis: Estimated refractive error from target refraction; Diopter (D)

Table 4 comparison of studies on IOL implantation surgical techniques in eye trauma

Author (Year, Journal)	Study design	Surgical techniques	Eyes	IOL	Post-operative VA (Snellen compare)	Refraction (Diopter)	Complications
Yang CS (2016, J Chin Med Assoc)	Retrospective study	Transscleral suture fixation of PC IOL	15	CZ70BD and P366UV-A double-armed 10- 0 polypropylene (prolene)	Mean logMAR VA 0.14 (20/25-20/32)	Myopic shift from predicted (SE) 1.18±1.47	Ciliary body hemorrhage, IOP raising, suture erosion
Rogers G (2014, J Cataract Refract Surg)	Case series	Sutured PC IOL	59	CZ70BD and A double-armed 10- 0 polypropylene (prolene)	Median decimal VA 0.5 (20/40), 67% VA³ 20/70	Mean post-operative SE 1.797	Angle recession and IOP raising
Saleh M (2013, J Cataract Refract Surg)	Cases series	G1: Sutureless intrascleral haptic fixation	8	MN60AC	Mean logMAR VA 0.55 (20/63-20/80)	Mean difference final SE from predicted value 0.19±1.66	Haptic broken, macular edema
		G2: retro-pupillary iris-claw IOL fixation	18	Verisyse	Mean logMAR VA 0.32 (20/40-20/50)	Mean difference final SE from predicted value 0.73±0.70	Macular edema
This study	Prospective, interventional case series	Flanged intrascleral IOL fixation with single needle techniques	10	MA60AC	Mean logMAR VA 0.28 (20/32-20/40)	-Mean post-operative final manifest refraction (SE) -0.15±0.91 -Mean difference between target refraction (SE) and final manifest refraction (SE) 0.05±0.85	Vitreous hemorrhage
		IOL fixation at location 12-6 o'clock	6	MA60AC	Mean logMAR VA 0.3 (20/40-20/50)	-Mean post-operative final manifest refraction (SE) 0.17±1.03 -Mean difference between target refraction (SE) and final manifest refraction (SE) 0.35±0.93	Vitreous hemorrhage
		IOL fixation at location 3-9 o'clock	4	MA60AC	Mean logMAR VA 0.25 (20/32-20/40)	- Mean post-operative final manifest refraction (SE) -0.65±0.43 - Mean difference between target refraction (SE) and final manifest refraction (SE) -0.41±0.05	

were performed (N=59), showing mean post-operative decimal VA of 0.5 (20/40), 67% of patients with a VA of at least 20/70.[20] However, the complication of this technique are a broken suture and exposed suture, which may lead to IOL subluxation. Previous studies reported the occurrence of broken sutures at around 27.9% after 6 years of follow-up postoperatively.[16] Saleh et al. demonstrated the clinical outcomes of intrascleral haptic fixation and retro-pupillary iris-claw IOL fixation in traumatic eye injuries with lens involvement, showing that BCVA improved postoperatively with mean BCVA of 0.55 (20/63-20/80) logMAR and 0.32 (20/40-20/50) logMAR retrospectively. Complications included a broken haptic and macular edema.[17] Recently, Yamane et al. reported flanged intrascleral IOL fixation using the double needle technique. The benefits of this technique are a small wound and no suture. Therefore, suture-related problems, postoperative hypotony, and large astigmatism are eliminated. The study showed successful IOL fixation in aphakia and crystalline lens or IOL dislocation. The results showed a mean postoperative BCVA of 0.25 LogMAR (20/32-20/40).[8] **Table 4** shows the comparison of studies on IOL implantation surgical techniques in eye trauma.[17, 18, 20]

In this study, I applied flanged intrascleral IOL fixation and modified it using a single needle. The results showed improvement in BCVA after surgery. Mean postoperative BCVA of 0.28 LogMAR (20/32-20/40), which is similar to the double needle technique and other studies.[8] All the patients had a VA ≥ 20/70. The single needle technique prevents the haptic of the IOL to detach from the needle and fall into the vitreous. Unlike double needle techniques, the single needle technique places the first haptic on the conjunctiva and the flange at the end of the haptic, which is then repeated in the other haptic. In addition to good visual acuity, this technique provides satisfactory postoperative lens astigmatism refraction. The mean post-operative lens astigmatism refraction was 0.57 D. Compared with the double technique by Yamane, which showed a refractive difference of 1.08 D with MA60AC, this study showed a refractive difference of 0.05D, 0.35 D and -0.41 D at location 12-6 and 3-9 o'clock, respectively. Unlike transscleral suture fixation, the IOL is fixed forward and a myopic shift of -1.0 D has been reported.[18,21]

From the sub-analysis, IOL fixed at location 3-9 o'clock showed a better average post-operative BCVA and lesser estimated mean refractive error, even though it was not statistically significant. At location 3-9 o'clock, the estimated refractive error from the target refraction within 0.5 D was 75%, whereas that from location 12-6 o'clock was 16.7%. The significant minus shift from the target refraction was seen in IOL fixed at location 3-9 o'clock and the mean final manifestation was -0.65 D. IOL fixed at location 12-6 o'clock showed a plus shift from the target refraction in most cases, and the mean final manifestation was 0.17 D. Based on the lower estimated refractive error and minus shift from the manifest refraction, IOL fixed at location 3-9 o'clock showed a better postoperative BCVA. The reflection of direction shifts from the target refraction occurred in different locations. I suggest that the target

refraction of IOL should aim for minus when using fixed IOL at location 12-6 o'clock and prefer less minus when at location 3-9 o'clock.

Vitreous hemorrhage is a common complication of scleral fixed IOL techniques. In this report, there were 2 eyes of spontaneously resolved vitreous hemorrhage without other associated complications. The corresponding reports were 5% in flanged IOL fixation with double needle technique[8] and 7% in IOL suture. (16) Retinal detachment is a serious complication in scleral fixed IOL, approximately 8%.[22] Even though I did not find retinal complications in this study, I cannot conclude that this technique had retinal complications due to the limitation in the number of eyes in this study and some of the eyes in this study underwent par plana vitrectomy, which can easily control IOP during the operative times and eliminate vitreous traction.

Nevertheless, flanged intrascleral IOL fixation technique with single needle techniques has limitations. First, the learning curve played a role in the surgical times and success. The difficult part of this technique is the insertion of the second haptic of the IOL into the needle. A gentle insertion was considered without pushing and using the viscoelastic technique to avoid the optic touching the cornea and stabilize the anterior chamber. Second, the cauterization device is not a common instrument in cataract extraction procedures. Additional instruments should be prepared and tested before undergoing the procedure. I recommend using the high-temperature cautery for flanging the tail of the haptic.

Although the BCVA improved at the first month after operation and stayed stable until the third month, the longer follow-up time with larger number of subjects to access long-term IOL stability, IOL position, and long-term complications such as endothelial cell count loss is recommended. Lastly, the observation regarding the difference in refractive outcomes between fixating locations is needed to be proven further by a well-designed, prospective study.

In conclusion, flanged intrascleral IOL fixation with the single needle technique results in good visual outcome and represents a safe technique for traumatic lens injuries with aphakia or crystalline lens dislocation or inadequate posterior capsule support in traumatic eye injury. The data suggested that IOL fixed at location 3-9 o'clock tended to have a minus shift from the target refraction in contrast to IOL fixed at location 12-6 o'clock, which showed a plus shift.

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References

1. Negrel AD, Thylefors B. The global impact of eye injuries. Ophthalmic Epidemiol. 1998;5(3):143-69.
2. Karlson TA, Klein BE. The incidence of acute hospital-treated eye injuries. Arch Ophthalmol. 1986;104(10):1473-6.
3. Klopfer J, Tielsch JM, Vitale S, See LC, Canner JK. Ocular trauma in the United States. Eye injuries resulting in hospitalization, 1984 through 1987. Arch Ophthalmol. 1992;110(6):838-42.
4. Fong LP. Eye injuries in Victoria, Australia. Med J Aust. 1995;162(2):64-8.
5. Wong TY, Tielsch JM. A population-based study on the incidence of severe ocular trauma in Singapore. Am J Ophthalmol. 1999;128(3):345-51.

6. Cillino S, Casuccio A, Di Pace F, Pillitteri F, Cillino G. A five-year retrospective study of the epidemiological characteristics and visual outcomes of patients hospitalized for ocular trauma in a Mediterranean area. BMC Ophthalmol. 2008;8:6.
7. Choovuthayakorn J, Worakriangkrai V, Patikulsila D, Watanachai N, Kunavisarut P, Chaikitmongkol V, et al. Epidemiology of Eye Injuries Resulting in Hospitalization, a Referral Hospital-Based Study. Clin Ophthalmol. 2020;14:1-6.
8. Yamane S, Sato S, Maruyama-Inoue M, Kadonosono K. Flanged Intrascleral Intraocular Lens Fixation with Double-Needle Technique. Ophthalmology. 2017;124(8):1136-42.
9. Downing JE. Ten-year follow up comparing anterior and posterior chamber intraocular lens implants. Ophthalmic Surg. 1992;23(5):308-15.
10. Hyun DW, Lee TG, Cho SW. Unilateral scleral fixation of posterior chamber intraocular lenses in pediatric complicated traumatic cataracts. Korean J Ophthalmol. 2009;23(3):148-52.
11. McCluskey P, Harrisberg B. Long-term results using scleral-fixated posterior chamber intraocular lenses. J Cataract Refract Surg. 1994;20(1):34-9.
12. Agarwal A, Kumar DA, Jacob S, Baid C, Agarwal A, Srinivasan S. Fibrin glue-assisted sutureless posterior chamber intraocular lens implantation in eyes with deficient posterior capsules. J Cataract Refract Surg. 2008;34(9):1433-8.
13. Azar DT, Wiley WF. Double-knot transscleral suture fixation technique for displaced intraocular lenses. Am J Ophthalmol. 1999;128(5):644-6.
14. Drolsum L. Long-term follow-up of secondary flexible, open-loop, anterior chamber intraocular lenses. J Cataract Refract Surg. 2003;29(3):498-503.
15. Biro Z. Results and complications of secondary intraocular lens implantation. J Cataract Refract Surg. 1993;19(1):64-7.
16. Vote BJ, Tranos P, Bunce C, Charteris DG, Da Cruz L. Long-term outcome of combined pars plana vitrectomy and scleral fixated sutured posterior chamber intraocular lens implantation. Am J Ophthalmol. 2006;141(2):308-12.
17. Saleh M, Heitz A, Bourcier T, Speeg C, Delbosc B, Montard M, et al. Sutureless intrascleral intraocular lens implantation after ocular trauma. J Cataract Refract Surg. 2013;39(1):81-6.
18. Yang CS, Chao YJ. Long-term outcome of combined vitrectomy and transscleral suture fixation of posterior chamber intraocular lenses in the management of posteriorly dislocated lenses. J Chin Med Assoc. 2016;79(8):450-5.
19. Dannenberg AL, Parver LM, Fowler CJ. Penetrating eye injuries related to assault. The National Eye Trauma System Registry. Arch Ophthalmol. 1992;110(6):849-52.
20. Rogers G, Mustak H, Hann M, Steven D, Cook C. Sutured posterior chamber intraocular lenses for traumatic cataract in Africa. J Cataract Refract Surg. 2014;40(7):1097-101.
21. Ahn JK, Yu HG, Chung H, Wee WR, Lee JH. Transscleral fixation of a foldable intraocular lens in aphakic vitrectomized eyes. J Cataract Refract Surg. 2003;29(12):2390-6.
22. Bourke RD, Gray PJ, Rosen PH, Cooling RJ. Retinal detachment complicating scleral-sutured posterior chamber intraocular lens surgery. Eye (Lond). 1996;10 (Pt 4):501-8.