

# Incidence and management of rhegmatogenous retinal detachment after pars plana vitrectomy and sutureless scleral-fixated intraocular lens

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**Purpose:** To evaluate the incidence, risk factor(s), and surgical outcomes of rhegmatogenous retinal detachment (RRD) in patients undergoing pars plana vitrectomy (PPV) with sutureless scleral-fixated intraocular lens implantation (SFIOL). **Methods:** Records of patients (1311 eyes, 1234 patients) who underwent PPV and sutureless SFIOL from 2017 to 2018 were retrospectively analyzed. **Results:** The indications SFIOL were subluxated lens (33.7%), dislocated IOL (21.7%), surgical aphakia (20.1%), congenital lens subluxation (11.1%), nucleus drop (6.9%), and post-open globe injury (OGI) repair (6.5%). History of closed-globe injury (CGI) was present in 27.2% eyes. Twenty-two eyes (1.7%) developed RRD. The incidence of RRD in eyes, which underwent SFIOL surgery for subluxated lens, dislocated IOL, surgical aphakia, congenital lens subluxation, nucleus drop, and post-OGI repair was 1.4% (n = 6), 2.5% (n = 7), 1.1% (n = 3), 3.4% (n = 5), 0 and 1.2% (n = 1), respectively ( $P = 0.382$ ). The incidence of RRD in eyes with and without CGI was 1.7% each ( $P = 0.996$ ). Twenty-one eyes underwent RD surgery. Retinal reattachment was achieved in 76.2% eyes, while 66.7% eyes required only one surgery. The eyes in which retina failed to reattach had a high grade of proliferative vitreoretinopathy present at the time of presentation. Final best-corrected visual acuity of  $\geq 20/60$  and  $< 20/60$  to  $\geq 20/200$  and  $< 20/200$  was seen in 38.1%, 19.0%, and 42.9% eyes. **Conclusion:** Eyes with the congenital subluxated lens are at a marginally higher risk of developing post-SFIOL RRD. The surgical outcome of RD surgery in these eyes is good.

**Key words:** Closed globe injury (CGI), ectopia lentis, open globe injury (OGI), rhegmatogenous retinal detachment (RRD), sutureless SFIOL

Implantation of intraocular lens (IOL) in-the-bag is the best option following cataract surgery. However, this is not possible in the absence of adequate capsular support like in cases of trauma, complicated cataract surgery, congenital subluxation, pseudoexfoliation (PXF), etc. The surgical options available for the visual rehabilitation of such eyes are anterior chamber intraocular lens (ACIOL), iris-fixated IOL (IFIOL), and scleral-fixated IOL (SFIOL).<sup>[1]</sup> However, owing to the vitreous disturbance caused by the breach of the posterior lens capsule, surgery in such eyes can be complicated by rhegmatogenous retinal detachment (RRD).<sup>[2-4]</sup>

This study was done to analyze the incidence, risk factor(s), characteristics, and surgical outcomes of RRD in the eyes undergoing pars plana vitrectomy (PPV) with sutureless, glueless SFIOL.

## Methods

This was a retrospective study conducted at a tertiary-care eye hospital in South India. The study was conducted with the approval of the Institutional Review Board (Registration No. ECR/182/INST/TN/2013, dated 20.04.2013, Project code RET201700218) and adhered to the tenets of the Declaration of

Helsinki. Informed consent was taken from the patients or their attendants (in case the patient was  $< 18$  years old) after explaining the nature of the surgery and the associated complications.

All the patients who underwent PPV with sutureless, glueless SFIOL from 2016 to 2018 were included in the study. All the eyes were pre-operatively screened for the presence of any retinal breaks. In case retinal break(s) were noted, they were barraged with laser photocoagulation and taken up for SFIOL surgery after at least one month. The patients who had undergone RRD surgery prior to SFIOL surgery, had open globe injury (OGI) in zone III, or were lost to follow-up before 6 months were excluded from the study.

The case records were analyzed for demographic details; indication for which SFIOL was done; the history of prior ocular injuries and surgeries; presence or absence of RRD post-SFIOL; characteristics and surgical outcome of RRD.

## Surgical technique

Around 270° superior conjunctival peritomy was done followed by light scleral cauterization to the vessels. Two partial

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thickness scleral pockets were made 180° apart, 1.5 mm away, and parallel to the limbus, with the help of a 25 G microvitrectoretinal (MVR) trocar blade. A sclerocorneal tunnel was constructed superiorly with the help of a crescent blade. Vitrectomy was then done. The induction of posterior vitreous detachment (PVD) was not done in any of the cases. In case of dislocated lens or nucleus drop, pars plana lensectomy (PPL) was done with the help of a vitrectomy cutter or a fragmentome, depending on the hardness of the lens. Two ciliary sulcus-based sclerotomies were made close to the scleral pockets using a 22 G round needle. Then, anterior chamber entry was done through the sclerocorneal tunnel with the help of a keratome blade. A standard three-piece non-foldable IOL (Aurolab; Madurai, India) was used. The leading haptic was grasped at the tip with a 25-gauge end gripping forceps (Alcon Laboratories; Fort Worth, Texas, USA) and externalized through the ciliary sulcus-based sclerotomy and tucked into the scleral pocket. Tailing haptic was then dialed into the posterior chamber, grasped and externalized through the opposite sclerotomy under binocular indirect ophthalmomicroscope (BIOM) visualization. The second haptic was also tucked into the other scleral pocket. The retinal periphery was carefully inspected to look for any intraoperative breaks, which if present were treated with endolaser. The vitrectomy ports, sclerocorneal tunnel, and conjunctiva were sutured and inspected for wound leakage.

In case the dislocated IOL was a single-piece IOL, it was explanted through the sclerocorneal tunnel and a new three-piece IOL was installed as SFIOL following the steps as described above. However, if the dislocated IOL was a three-piece IOL, it was re-fixated as SFIOL. In these cases, only a localized peritomy was required at 3 and 9'o clock for the construction of the two scleral pockets and the adjacent ciliary sulcus-based sclerotomies. After core vitrectomy, the haptics of the same IOL were externalized and incarcerated into the scleral pockets. In these cases, a sclerotunnel was not required.

**Statistics**

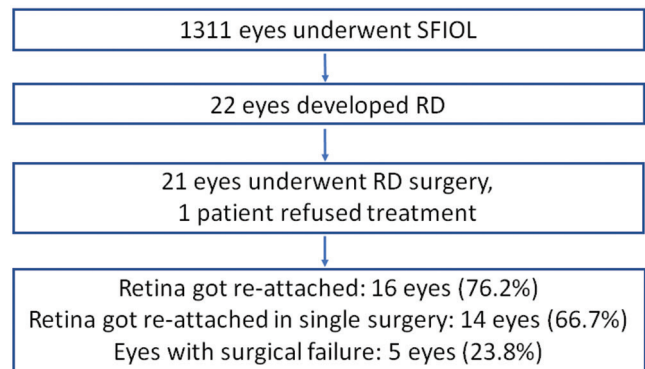
Statistical analysis was performed with STATA statistical software, Version 11.1 (StataCorp, College Station, Texas, USA). Continuous variables were expressed as mean (±standard deviation) and categorical variables were expressed as percentages. Any association between categorical data was seen using Chi-square/Fisher exact test while the difference in continuous data between two groups was seen using student's t-test/Mann-Whitney test. Change in variables after a procedure was done with the help of paired t-test. A P value of less than 0.05 was considered to be statistically significant.

**Results**

The study included 1311 eyes of 1234 patients, with a mean age of 52.4 ± 18.9 years (range, 9–92 years) [Fig. 1]. The indications for which patients underwent SFIOL were subluxated lens (n = 442, 33.7%), dislocated IOL (n = 285, 21.7%), surgical aphakia (n = 263, 20.1%), congenital lens subluxation (n = 146, 11.1%), nucleus drop (n = 90, 6.9%), and post-open globe injury (OGI) repair (n = 85, 6.5%). The patients with dislocated IOL underwent either IOL explantation along with new SFIOL (73 eyes) or re-fixation of the same IOL as SFIOL (212 eyes) depending on the type of IOL (as described in methods). A history of closed-globe injury (CGI) was present in 357 eyes (27.2%) [Table 1].

Out of 1311 eyes, 22 (1.7%) eyes developed RRD. The patients presented at a mean period of 76.4 ± 54.3 days after the SFIOL surgery (range, 10 to 230 days). The interval between the SFIOL surgery and presentation with RRD was <1, 1-3, 3-6, and >6 months in 5, 11, 5, and 1 eyes, respectively. Among the patients who underwent bilateral surgery, none developed bilateral RRD. The incidence of RRD in the eyes, which underwent SFIOL surgery for subluxated lens, dislocated IOL, surgical aphakia, congenital lens subluxation, nucleus drop, and post-OGI repair was 1.4% (n = 6), 2.5% (n = 7), 1.1% (n = 3), 3.4% (n = 5), 0 and 1.2% (n = 1), respectively (P = 0.382). No association was found between RRD and various indications of SFIOL (P = 0.339). The incidence of RRD was 2.4% (n = 5/212) in the eyes, which underwent IOL explantation along with a new SFIOL and 2.7% (n = 2/73) in the eyes, which underwent re-fixation of same IOL as SFIOL (P = 0.914). The incidence of RRD in the eyes with and without a history of CGI was 1.7% (n = 6/357) and 1.7% (n = 16/954), respectively (P = 0.996). The mean age of patients who developed post-SFIOL RD was 46.6 years while the age of those who did not develop RD was 52.4 years (P = 0.146).

At the time of presentation, seven eyes had total RD; while the rest 15 eyes had localized RRD. The types of breaks responsible for the RD were horse-shoe tear (HST), giant retinal tear (GRT), and retinal dialysis in 12, 4, and 3 eyes, respectively while in 3 eyes no break could be identified. One eye had a full-thickness macular hole (FTMH).



**Figure 1:** Flowchart representing the number of eyes, which developed retinal detachment after scleral-fixed intraocular lens surgery and the outcomes of retinal detachment surgery

**Table 1: Indications for which patients underwent scleral-fixed intraocular lens**

Indications	Number of patients	
Dislocated IOL		
No history of CGI	247	285
With history of CGI	38	
Subluxated lens		
No history of CGI	123	442
With history of CGI	319	
Congenital lens subluxation		146
Nucleus drop		90
Post-OGI repair		85
Surgical aphakia		263

IOL: Intraocular lens, CGI: Closed globe injury, OGI: Open globe injury

Out of the 22 eyes that developed RD, 21 eyes underwent retinal reattachment surgery, i.e., PPV with silicone oil (SO) tamponade. An inferior periphery iridectomy (PI) was made in all the cases. SFIOL explanation was not required in any of the eyes. After single RD surgery, retinal reattachment was achieved in 14 (66.7%) eyes. Out of the seven eyes that did not achieve retinal reattachment, six eyes underwent further surgery. Overall, retinal reattachment was achieved in 16 (76.2%) eyes. All these 16 eyes underwent SO removal (SOR), with no recurrence of RRD. The five eyes in which retina failed to reattach despite RD surgery had proliferative vitreoretinopathy (PVR) grade C or higher at the time of presentation. Among the eyes that failed to reattach, two (9.5%) eyes had a shallow subretinal fluid inferior to the inferior arcade with good vision, while three (14.3%) had a poor prognosis due to advanced PVR changes. Final best-corrected visual acuity (BCVA) of  $\geq 20/60$  and  $< 20/60$  to  $\geq 20/200$  and  $< 20/200$  was seen in eight (38.1%), four (19.0%), and nine (42.9%) eyes.

## Discussion

The treatment of aphakia is one of the daunting tasks for ocular surgeons.<sup>[1]</sup> SFIOL surgery is associated with a number of complications, among which RRD is one of the gravest. A number of studies have evaluated the complication profile associated with different techniques of SFIOL.<sup>[5-17]</sup> However, due to its rarity, not many studies have evaluated the management of post-SFIOL RRD.

We retrospectively reviewed the records of 1311 eyes, which underwent SFIOL for various indications. The trailing haptic was dialed into the posterior segment instead of doing handshake in the anterior segment as the space available for manipulation is greater in the posterior segment. As a result,

the second haptic can externalize without compromising the stability of the anterior chamber. Since all patients underwent vitrectomy, manipulation in the posterior segment was safe. PVD was not induced actively in any case as it can create peripheral retinal breaks and even intraoperative RRD. Singh *et al.* reported a higher incidence of retinal breaks after PVD induction in eyes with ectopia lentis.<sup>[18]</sup> The overall incidence of RRD in our study cohort was 1.7%, which is similar to that reported in literature [Table 2].<sup>[5-17]</sup> The reported incidence of RRD after macular surgeries is also similar.<sup>[19,20]</sup> Previous studies have reported trauma and ectopia lentis to be risk factors for developing post-SFIOL RRD.<sup>[16,18,21-23]</sup> However, such a finding was not noted in our study. The incidence of RRD in patients with a history of CGI was similar to the other cohort of patients (1.7% each). Although eyes with congenital lens subluxation were at a higher risk of developing RRD than other eyes, the difference was not statistically significant. On the contrary, Luebke *et al.* reported a higher incidence of post-SFIOL RRD in eyes with ectopia lentis compared to other indications (14.8% vs 9.7%).<sup>[22]</sup> Other authors also have reported an incidence of 1.5–15.4% in eyes with ectopia lentis.

The absence of a formed vitreous in post-vitrecomized eyes predisposes them for early detachment. In our series, the earliest detachment was seen after 10 days, while nearly three-fourth detachments were seen within three months. Sen *et al.* also reported that one-third of the detachments in their study of post-SFIOL RRD in children occurred within 6 weeks.<sup>[13]</sup> During the initial vitrectomy, peripheral breaks were not identified in any of the eyes that developed RRD. There was a high incidence of GRT and retinal dialysis in our study. This finding was also similar to that reported by Sen *et al.*, who reported GRT in around one-fifth of the patients.<sup>[13]</sup> Such breaks may occur due to the trauma to the vitreous base and traction on the peripheral

**Table 2: Incidence of rhegmatogenous retinal detachment (RRD) after scleral-fixated intraocular lens (SFIOL) surgery in the clinical studies publishes from 2009-19**

Author	Technique	FU, months	No. eyes, Total	No. eyes, RRD	Results of RRD surgery
Krause <i>et al.</i> (2009) <sup>[5]</sup>	Sutured SFIOL, anterior vitrectomy	23 (6-83)	119	3 (2.5%)	NA
McAllister <i>et al.</i> (2011) <sup>[6]</sup>	Sutured SFIOL, anterior vitrectomy	83.3 (6.7-166.5)	82	4 (4.9%)	Successful visual outcome in 3 eyes
Ohta <i>et al.</i> (2014) <sup>[7]</sup>	Conventional sutured SFIOL	NA	40	1 (2.5%)	NA
	Sutured SFIOL (Y-fixation technique)		44	1 (2.3%)	
Kang <i>et al.</i> (2015) <sup>[8]</sup>	Glued IOL, $\pm$ PPV	9 (3-27.7)	65	1 (1.5%)	NA
Melamud <i>et al.</i> (2016) <sup>[9]</sup>	Conventional sutured SFIOL, PPV	13.2 (6-20)	24	1 (4.2%)	NA
Sindal <i>et al.</i> (2016) <sup>[10]</sup>	Conventional sutured SFIOL, PPV	18.9 (12-55)	50	5 (4.6%)	NA
	Sutureless SFIOL, PPV		59		
Dimopoulos <i>et al.</i> (2018) <sup>[11]</sup>	Sutured (Knotless Z-suture technique)	64 (36-135)	66	10 (15.2%) (2 recurrence)	100% anatomical success
Sen <i>et al.</i> (2018) <sup>[12,13]</sup>	Conventional sutured SFIOL, PPV in children	39.7	279	16 (5.7%)	87.5% anatomical success (68.8% after 1 surgery)
Balakrishnan <i>et al.</i> (2018) <sup>[14]</sup>	Glued SFIOL, PPV	5	28	1 (3.6%)	NA
	Conventional sutured SFIOL, PPV		40	1 (2.5%)	
Kokame <i>et al.</i> (2018) <sup>[15]</sup>	Conventional sutured SFIOL	72 (24-297)	118	2 (1.7%)	NA
Aaltonen <i>et al.</i> (2018) <sup>[16]</sup>	Sutured SFIOL (Friction knot technique), PPV	11.7 (0.7-64.8)	152	13 (8.6%) (1 recurrence)	100% anatomical success
Bonnell <i>et al.</i> (2018) <sup>[17]</sup>	Sutured SFIOL (Gore-Tex suture), PPV	16 (minimum 12)	14	1 (7.1)	NA

FU: Follow-up, NA: Not available, PPV: Pars plana vitrectomy

retina during the externalizing of the IOL haptics through the ciliary sulcus-based sclerotomies.<sup>[13,24,25]</sup>

Vitrectomy was the best option for the treatment of RRD in these eyes as they all had undergone prior vitrectomy. The retinal reattachment rate of RD surgery in our study was good. Retinal reattachment was achieved in nearly three-fourth of eyes, with two-third requiring single surgery. All the eyes with failed surgery had advanced PVR. Sen *et al.* reported a success rate of 87.5%, with 68.7% eyes requiring single surgery. In their study, the final reattachment rate in eyes with and without PVR was 75% and 100%, respectively.<sup>[13]</sup> These eyes are prone to PVR due to increased inflammation caused by multiple surgeries, trauma, and multiple manoeuvres in both anterior as well as posterior segment. Apart from the eyes with failed surgery, four other eyes also had final BCVA <20/200. Sen *et al.* also reported a significant loss of BCVA due to the development of RD with recurrence of RD and associated increased number of surgeries having a negative impact on the final visual outcome.<sup>[13]</sup>

This was the largest study that evaluated the incidence, characteristics, and surgical outcome of post-SFIOL RRD. The results showed that eyes with congenital lens dislocation are associated with a slightly higher risk of RRD while traumatic eyes are not. The surgical outcome of post-SFIOL RRD is good. The limitations of the study include its retrospective design and induction of selection bias as some patients were lost to follow-up. The incidence of RRD may actually have been lower because the patients who have had good postoperative vision are more likely to be lost to follow-up.

## Conclusion

Eyes with the congenital subluxated lens are at a marginally higher risk of developing post-SFIOL RRD. Our study shows that the surgical outcome of RD surgery in these eyes is good.

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## Conflicts of interest

There are no conflicts of interest.

## References

- Por YM, Lavin MJ. Techniques of intraocular lens suspension in the absence of capsular/zonular support. *Surv Ophthalmol* 2005;50:429-62.
- Smiddy WE, Guerro JL, Pinto R, Feuer W. Retinal detachment rate after vitrectomy for retained lens material after phacoemulsification. *Am J Ophthalmol* 2003;135:183-7.
- Moore JK, Scott IU, Flynn HW Jr, Smiddy WE, Murray TG, Kim JE, *et al.* Retinal detachment in eyes undergoing pars plana vitrectomy for removal of retained lens fragments. *Ophthalmology* 2003;110:709-13; discussion 713-4.
- Salam GA, Greene JM, Deramo VA, Tibrewala RK, Ferrone PJ, Fastenberg DM. Retinal tears and retinal detachment as factors affecting visual outcome after cataract extraction complicated by posteriorly dislocated lens material. *Retina* 2005;25:570-5.
- Krause L, Bechrakis NE, Heimann H, Salditt S, Foerster MH. Implantation of scleral fixated sutured posterior chamber lenses: A retrospective analysis of 119 cases. *Int Ophthalmol* 2009;29:207-12.
- McAllister AS, Hirst LW. Visual outcomes and complications of scleral-fixated posterior chamber intraocular lenses. *J Cataract Refract Surg* 2011;37:1263-9.
- Ohta T, Toshida H, Murakami A. Simplified and safe method of sutureless intrascleral posterior chamber intraocular lens fixation: Y-fixation technique. *J Cataract Refract Surg* 2014;40:2-7.
- Kang JJ, Ritterband DC, Toles SS, Seedor JA. Outcomes of glued foldable intraocular lens implantation in eyes with preexisting complications and combined surgical procedures. *J Cataract Refract Surg* 2015;41:1839-44.
- Melamud A, Topilow JS, Cai L, He X. Pars plana vitrectomy combined with either secondary scleral-fixated or anterior chamber intraocular lens implantation. *Am J Ophthalmol* 2016;168:177-82.
- Sindal MD, Nakhwa CP, Sengupta S. Comparison of sutured versus sutureless scleral-fixated intraocular lenses. *J Cataract Refract Surg* 2016;42:27-34.
- Dimopoulos S, Dimopoulos V, Blumenstock G, Trevino-Rodriguez H, Bartz-Schmidt KU, Spitzer MS, *et al.* Long-term outcome of scleral-fixated posterior chamber intraocular lens implantation with the knotless Z-suture technique. *J Cataract Refract Surg* 2018;44:182-5.
- Sen P, S VK, Bhende P, Rishi P, Rishi E, Rao C, *et al.* Surgical outcomes and complications of sutured scleral fixated intraocular lenses in pediatric eyes. *Can J Ophthalmol* 2018;53:49-55.
- Sen P, Shaikh SI, Sreelakshmi K. Rhegmatogenous retinal detachment in paediatric patients after pars plana vitrectomy and sutured scleral-fixated intraocular lenses. *Eye (Lond)* 2018;32:345-51.
- Balakrishnan D, Mukundaprasad V, Jalali S, Pappuru RR. A comparative study on surgical outcomes of glued intraocular lens and sutured scleral fixated intraocular lens implantation. *Semin Ophthalmol* 2018;33:576-80.
- Kokame GT, Yanagihara RT, Shantha JG, Kaneko KN. Long-term outcome of pars plana vitrectomy and sutured scleral-fixated posterior chamber intraocular lens implantation or repositioning. *Am J Ophthalmol* 2018;189:10-6.
- Aaltonen P, Oskala P, Immonen I. Outcomes of intraocular lens scleral fixation with the friction knot technique. *Acta Ophthalmol* 2019;97:e506-13.
- Bonnell AC, Mantopoulos D, Fine HF, Shah SP, Wheatley HM, Prenner JL. One-year outcomes of a novel surgical approach for fixation of a posterior chamber intraocular lens using Gore-Tex suture. *Retina* 2019. doi: 10.1097/IAE.0000000000002456.
- Singh MS, Casswell EJ, Boukouvala S, Petrou P, Charteris DG. Pars plana vitrectomy and lensectomy for ectopia lentis with and without the induction of a posterior vitreous detachment. *Retina* 2018;38:325-30.
- Rizzo S, Belting C, Genovesi-Ebert F, di Bartolo E. Incidence of retinal detachment after small-incision, sutureless pars plana vitrectomy compared with conventional 20-gauge vitrectomy in macular hole and epiretinal membrane surgery. *Retina* 2010;30:1065-71.
- Vaziri K, Schwartz SG, Kishor KS, Fortun JA, Moshfeghi AA, Smiddy WE, *et al.* Rates of reoperation and retinal detachment after macular hole surgery. *Ophthalmology* 2016;123:26-31.
- Fan F, Luo Y, Liu X, Lu Y, Zheng T. Risk factors for postoperative complications in lensectomy-vitrectomy with or without intraocular lens placement in ectopia lentis associated with Marfan syndrome. *Br J Ophthalmol* 2014;98:1338-42.
- Luebke J, Reinhard T, Agostini H, Boehringer D, Eberwein P. Long-term follow-up after scleral lens fixation in patients with Marfan syndrome. *BMC Ophthalmol* 2017;17:235.
- Zheng D, Wan P, Liang J, Song T, Liu Y. Comparison of clinical outcomes between iris-fixated anterior chamber intraocular lenses and scleral-fixated posterior chamber intraocular lenses in Marfan syndrome with lens subluxation. *Clin Exp Ophthalmol* 2012;40:268-74.
- Lee JG, Lee JH, Chung H. Factors contributing to retinal detachment after transscleral fixation of posterior chamber intraocular lenses. *J Cataract Refract Surg* 1998;24:697-702.
- Bajgai P, Tigari B, Singh R. Outcomes of 23- and 25-gauge transconjunctival sutureless vitrectomies for dislocated intraocular lenses. *Int Ophthalmol* 2018;38:2295-301.