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Safety and efficacy of the Yamane technique for intraocular three-piece lens implantation in Egyptian patients diagnosed with Marfan syndrome: a retrospective study

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Abstract

Background This study aimed to investigate the safety and efficacy of the Yamane technique (flanged intrascleral haptic fixation with double-needle technique /FIHFT) for three-piece intraocular lens (IOL) implantation in Egyptian patients diagnosed with Marfan syndrome (MFS) presented with subluxated lenses (ectopia lentis, EL).

Methods This was a retrospective evaluation of thirty-three patients who were diagnosed with MFS and had subluxated lenses in a total of forty eyes. Seven of these patients had bilateral subluxation. Lensectomy or phacoemulsification was performed with limited anterior vitrectomy, followed by IOL implantation using the FIHFT method. Data was collected from medical records, including preoperative and postoperative corrected distant visual acuity (CDVA) using logarithm of the minimal angle of resolution (log MAR), preoperative and postoperative refractions, intraoperative and postoperative complications, and follow-up periods.

Results The mean age of patients in the study was 30.79 years, with a mean follow-up of 23.9 months. Post-surgery, the refractive sphere decreased significantly from -9.1 ± 1.4 diopter (D) to -1.4 ± 0.7 D, and cylinder measurements dropped from -4.5 ± 0.8 D to -1.4 ± 0.6 D. The spherical equivalent (SEQ) also declined from -11.4 ± 1.5 D to -2.1 ± 0.8 D. The CDVA improved from 0.80 ± 0.32 to 0.18 ± 0.10 log MAR ($P < 0.001$). No intraoperative complications were identified. Postoperative complications included IOL decentration (12.5%), vitreous hemorrhage (7.5%), IOL slippage (5%), IOL tilt (5%), and retinal detachment (RD) (5%). Further surgical procedures were necessary for only four cases (10%), all of which had positive outcomes. IOL tilting and slippage occurring at average ages of 18 and 19 years, respectively. No other complications, such as hypotony, elevated intraocular pressure (IOP), corneal edema, iritis, IOL dislocation, cystoid macular edema (CME) or endophthalmitis, were reported.

Conclusions The Yamane technique has proven effective and safe for treating subluxated lenses in Egyptian patients with Marfan Syndrome, resulting in improved visual acuity with minimal complications, mostly minor

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and manageable. Comprehensive fundus examinations before and after surgery are essential for promptly identifying retinal breaks and reducing the risk of retinal detachment. IOL tilting and slippage are more common in younger patients.

Keywords Marfan syndrome, Ectopia lentis, Lenticular astigmatism, Scleral lens fixation, Yamane technique

Background

Marfan syndrome (MFS) is classified as an autosomal dominant connective tissue disorder, with an estimated prevalence of 1 in 5,000 individuals. This condition is characterized by complete penetrance, variable expressivity within and between families, and pleiotropic effects. Notably, it does not exhibit a preference for any specific gender, race, ethnicity, or geographic region [1].

MFS is caused by a mutation of the fibrillin-1 (FBN1) protein gene, affecting the elasticity and strength of connective tissues. This mutation leads to disordered and decreased incorporation of fibrillin into the connective tissue matrix. Ocular structures rich in fibrillin include the cornea, suspensory zonules of the lens, lens capsule, and sclera [2].

Ectopia lentis (EL) is one of the cardinal features of MFS, observed in approximately 60% of affected individuals. This condition arises from the weakness of the ciliary zonules, which serve as the suspensory ligaments of the lens. Myopia is one of the most common ocular features in MFS patients, affecting 34–44% of individuals with MFS and often progressing rapidly during childhood. Additional ocular manifestations may include increased axial length of the globe and corneal flattening. Studies have also revealed associations with strabismus, including exotropia and esotropia, vertical deviations, primary inferior oblique muscle overaction and glaucoma [3]. Retinal detachment (RD) also is reported in about 15% of patients with MFS [4].

For mild cases of EL associated with MFS, the initial treatment typically consists of spectacles or contact lenses. However, it is noteworthy that approximately 50% of these cases may progress to amblyopia. The surgical management of these conditions is complicated by the presence of zonular weakness. In the past, patients undergoing lensectomy and vitrectomy were often left aphakic. Advancements in surgical technology and intraocular lens (IOL) designs have introduced a variety of options, including angle-supported anterior chamber IOLs, sulcus-fixated IOLs, iris-claw IOLs, iris-sutured IOLs, and scleral-fixated posterior chamber IOLs (SFIOL) [5].

Due to the high prevalence of high myopia in patients with MFS, which highlights the need to conduct regular, long-term and precise fundus examinations for these patients, particularly when surgery is performed at a young age, it is not advisable to use IOL implants that affect mydriasis, such as posterior iris-claw IOLs [6].

The advantages of SFIOL implantation are manifold, including minimal damage to the corneal endothelial cells, iris, and anterior chamber angle structures, alongside a reduced risk of secondary glaucoma and recurrent uveitis [7]. In this technique, the haptics of the IOL can be externalized and anchored within the sclera without requiring sutures. Some methodologies incorporate the use of scleral flaps or scleral tunnels that are aligned parallel to the limbus. The externalization of the haptics can be performed with forceps or needles, and the closure of the scleral flaps can be executed using 10–0 nylon or fibrin glue [8].

Since its introduction in 2014, the Yamane technique (flanged intrascleral haptic fixation with double-needle technique /FIHFT) has gained significant traction, eliminating the necessity for conjunctival peritomy or scleral flaps. This method involves the externalization of the haptics of a three-piece IOL through a 27-gauge (G) needle, followed by cauterization to form bulbs at the haptic ends, thereby enhancing stability within the scleral tunnels [9].

This research aimed to investigate the clinical results and possible complications linked to the application of the Yamane technique (FIHFT) in Egyptian patients diagnosed with MFS who exhibited EL.

Methods

This research was a retrospective single-armed cohort study involving thirty-three Egyptian patients diagnosed with MFS who had subluxated lenses, with data collected between April 2019 and January 2024. Within this group, seven individuals revealed bilateral subluxation, leading to the examination of a total of forty eyes. The study was conducted in the ethical guidelines of the Declaration of Helsinki and received approval from the Research Ethics Committee of the Faculty of Medicine at Beni Suef University (Approval No: FMBSUREC/07072024/Taha). Written informed consent was obtained from all patients or their legal guardians of young patients participating in the research.

Patients were excluded from the study based on several criteria: those diagnosed with MFS lacking lens subluxation, individuals with lens subluxation resulting from conditions other than MFS, patients with retinal vascular

issues and macular diseases, MFS patients exhibiting preoperative lattice degeneration and retinal detachment, and those who had a history of another ocular surgery.

Each patient underwent a comprehensive ophthalmological assessment, which encompassed evaluations of uncorrected distant visual acuity (UCDVA), corrected distant visual acuity (CDVA), refractive status of the eyes, slit-lamp examination (Fig. 1), and a thorough fundus examination utilizing slit-lamp bio-microscopy with + 90 diopter (D) fundus lens (Volk Opticals, Mentor, OH, USA) or indirect ophthalmoscopy. Preoperative biometry was performed using IOL Master 500/700 (Carl Zeiss Meditec, Oberkochen, Germany), and the IOL power was calculated using the SRK/T formula. The target for the postoperative refraction was a spherical refractive power of -0.50 D. Subsequent follow-up evaluations included measurements of UCDVA, CDVA, eye refraction, slit-lamp examination, and fundus assessment.

Surgical procedure (Fig. 2)

The surgical procedures were carried out exclusively by (A.H.A.) at Watany Eye Hospitals, starting with lensectomy or phacoemulsification, and a limited anterior vitrectomy. To prevent hypotony, a trocar with an infusion cannula was used. The Yamane Double-Needle Stabilizer (G-31496 for 30-G needles) from (Geuder AG, Germany), guided the needles for creating transconjunctival sclerotomies. An "L-shaped" scleral tunnel was formed using a 30-G ultrathin-wall needle, bent 7 mm from the tip and secured in the Yamane stabilizer after a 2 mm intrascleral tunnel was established. A second tunnel was created similarly, with both needles inserted 180 degrees opposite each other, remaining free-floating in the vitreous chamber to avoid retinal contact. The scleral tunnels were angled at 20 degrees to the corneal limbus and 10 degrees to the iris plane. Using the Yamane stabilizer, both 30-G guide needles were introduced before injecting the IOL and threading the haptics through the guide needles. After 1% acetylcholine chloride (Michol) injection, a preloaded foldable three-piece IOL (Sensar AR40 3-piece IOL) from (Abbott Medical Optics Inc., Santa Ana, CA, USA) was inserted into the viscoelastic-filled anterior chamber (AC), positioning the leading haptic on the iris and keeping the trailing haptic outside to prevent descent into the vitreous cavity.

The primary haptic was then introduced into a 30-G needle utilizing 23-G micro-forceps, after which the secondary haptic was inserted into a second needle employing the double-needle technique. Subsequently, the haptics externalized onto the conjunctiva. The forceps secured the haptic 2 mm from its tip, and plugs were created by cauterizing the ends with an ophthalmic cautery device (Accu-Temp cautery, Beaver-Visitec), resulting in a flange formation from the distal end. These plugs were positioned within the scleral tunnel, and the conjunctiva was mobilized. A wash of the AC from viscoelastic material was done, followed by the injection of triamcinolone acetate, and then an additional wash was done to assess for vitreous prolapse. The trocar was subsequently removed, and the sclerotomy was closed using wet-field diathermy. Any identified leaks were managed with hydro-suturing, and if necessary, a corneal stitch was taken and scheduled for removal after one month. Postsurgery, all patients received antibiotic and steroid eye drops for two weeks.

Statistical analysis

The analysis of the data was carried out using SPSS version 27 for Windows. Continuous variables were presented as means and standard deviations, while categorical variables were represented as counts and percentages. A paired t-test was utilized to investigate the ophthalmological outcomes. Risk factors associated with complications were identified through univariate analysis, employing an independent t-test for age and a chi-squared test for sex and lens type. For the

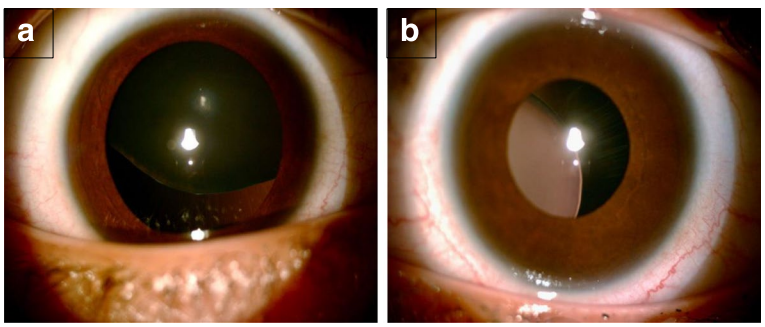

Fig. 1 Slit-lamp examination showed crystalline lens subluxation (ectopia lentis) in Egyptian patients diagnosed with Marfan syndrome. **a** superior temporal subluxation with intact zonules. **b** inferior temporal subluxation with intact zonules

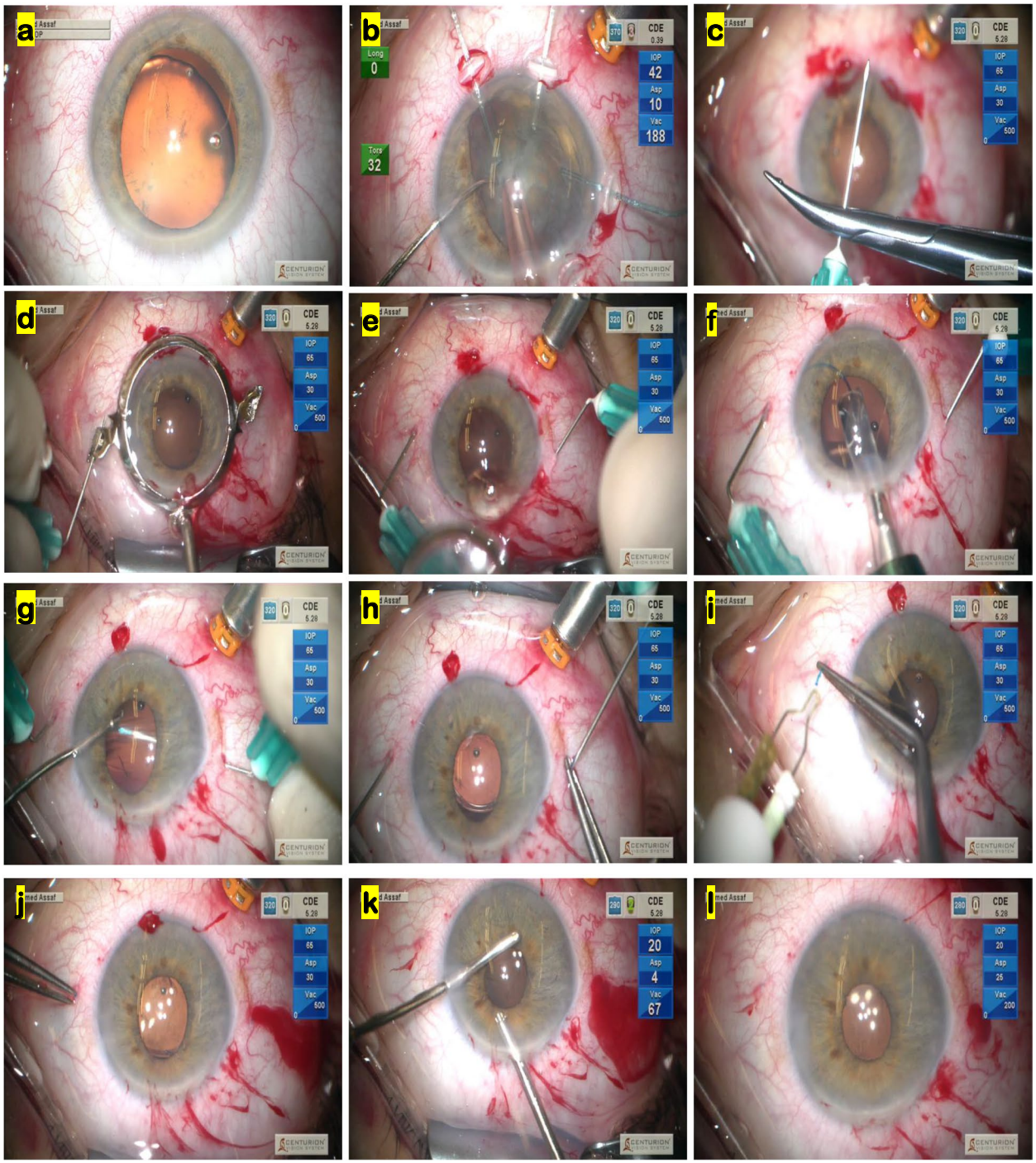

Fig. 2 The flanged intrascleral haptic fixation technique (FIHFT/Yamani) involves several key steps: (**a**) visualizing the subluxated lens, (**b**) performing phacoemulsification and limited vitrectomy (note the trocar with an infusion cannula), (**c**) bending 30-G needles positioned 7 mm from its tip, (**d**) employing the Yamane double-needle stabilizer to create 180-degree transconjunctival sclerotomies, (**e**) simultaneous introduction of 30-G guide needles, (**f**) injecting the 3- pieces intraocular lens (IOL), (**g**) threading the haptics through the guide needles, (**h**) externalizing the haptics onto the conjunctiva, (**i**) securing the haptic with forceps and creating cauterized plugs, (**j**) positioning the plugs in the scleral tunnel, (**k**) washing the anterior chamber after injecting triamcinolone acetate, (**l**) and achieving a well-centred IOL at the end of the procedure

Table 1 Baseline characteristics of the studied patients

Items	Values (No. = 40)
Age in years	
Mean ± SD	30.79 ± 13.69
Median (range)	31 (9–55)
Sex	
Female [No. (%)]	20 (60.6%)
Male [No. (%)]	13 (39.4%)
Lens	
Clear [No. (%)]	13 (32.5%)
N1 [No. (%)]	9 (22.5%)
N2 [No. (%)]	8 (20.0%)
N3 [No. (%)]	10 (25.0%)
Follow up period in months	
Mean ± SD	23.9 ± 10.6
Median (range)	21 (6–42)

No number, *SD* standard deviation, *N* nuclear cataract grade

Table 2 Following up the ophthalmological outcomes

Outcomes		Mean	SD	*P*-value
SPH	Before	-9.137	1.4322	< 0.001*
	After	-1.3812	0.72719	
Cyl	Before	-4.537	0.8195	< 0.001*
	After	-1.3875	0.63284	
SEQ	Before	-11.4062	1.47488	< 0.001*
	After	-2.07500	0.820315	
CDVA	Before	0.7950	0.31700	< 0.001*
	After	0.1750	0.09541	

SD standard deviation, *SPH* sphere, *Cyl* cylinder, *SEQ* spherical equivalent, *CDVA* corrected distant visual acuity; **P*-value is significant

multivariable analysis, binary logistic regression was applied. The Kruskal–Wallis nonparametric test was employed to compare various complications concerning age, with a significance level established at a *P*-value of less than 0.05.

Results

Baseline characteristics of the studied patients

The mean age of the studied patients was 30.79 ± 13.69 years and most of them were females (60.6%). The majority of patients had a clear lens (32.5%) and the mean duration of follow-up was 23.9 ± 10.6 months (Table 1).

Ophthalmological assessment of the studied patients

Ophthalmological assessment showed a significant decrease of sphere from -9.1 ± 1.4 D before the operation to -1.4 ± 0.7 D after the procedure. Also, the cylinder measurements decreased significantly from -4.5 ± 0.8 D preoperatively to -1.4 ± 0.6 D postoperatively. A marked reduction of the spherical equivalent (SEQ) was also observed from -11.4 ± 1.5 D to -2.1 ± 0.8 D. The final CDVA using logarithm of the minimal angle of resolution (log MAR) was improved significantly after the operation from 0.80 ± 0.32 to 0.18 ± 0.10 ($P < 0.001$) (Table 2).

Assessment of complications among the studied patients

During the surgical procedures, no intraoperative complications were found. Out of the 40 eyes that had surgery, 26 eyes (65% of the total cases) had no complications during the follow-up assessments. The most common postoperative complication was IOL decentration, which occurred in 5 eyes (12.5%). This was followed by vitreous haemorrhage in 3 eyes (7.5%), while postoperative IOL slippage, IOL tilt, and RD were each observed in 2 eyes (5%) (Fig. 3). In only four cases (10%), additional surgical procedures were necessary, and all of them led to positive results. Additionally, there were no reports of other complications, such as hypotony, elevated intraocular pressure (IOP), corneal oedema, iritis, dropped IOL, cystoid macular edema (CME), or endophthalmitis.

We noted instances of IOL decentration on the first postoperative day. These occurrences were classified as mild and became apparent only after pupil dilation, thus negating the need for further surgical intervention.

Early manifestations of vitreous haemorrhages were observed, likely attributable to trauma from the guided syringes. Fortunately, all instances resolved spontaneously within two weeks, eliminating the necessity for additional surgical procedures.

In two specific cases, IOL slippage was reported, occurring spontaneously six and eleven months post-surgery. These instances necessitated further surgical intervention (Fig. 4,a). In one case, the slippage haptic was stabilized within its scleral track, followed by edge trimming and cauterization. In the second case, the similar technique was unsuccessful, necessitating IOL replacement. Both cases ultimately yielded favourable outcomes.

Tilted IOLs (Fig. 4,b) were confirmed in two cases via iTrace Ray-tracing, with mild cylinder measured less than (3.00) D. These were effectively managed with corrective glasses, resulting in patient satisfaction.

The two cases of RD were recorded at different intervals, specifically seven and thirteen months post-operation. These cases were managed through pars plana vitrectomy, by a vitreoretinal surgeon, leading to positive results. The final CDVA for these patients was documented at 0.20 and 0.30 log MAR.

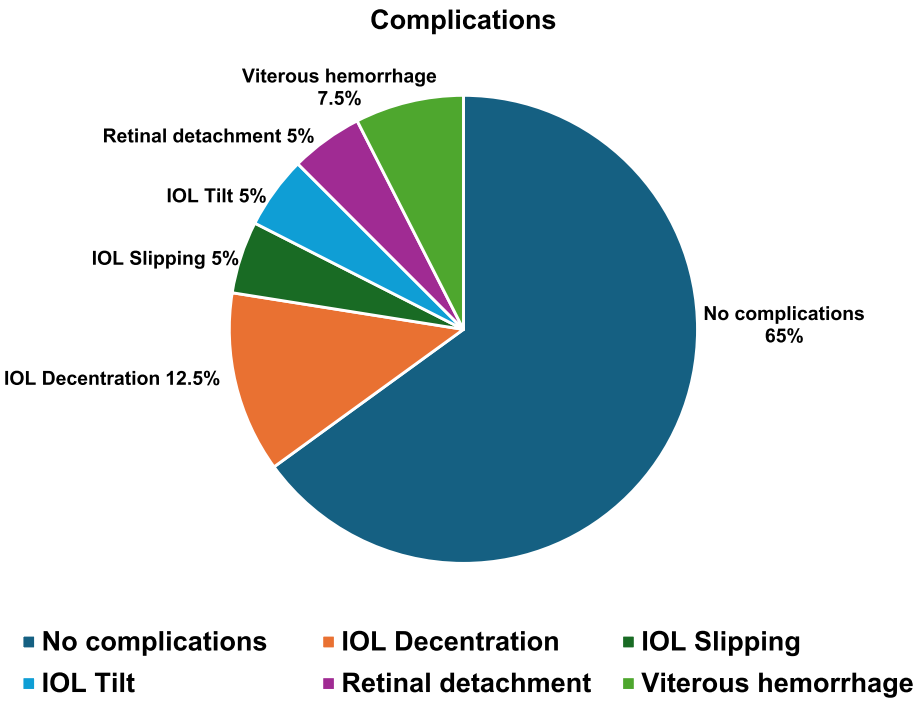

Fig. 3 Incidence of postoperative complications

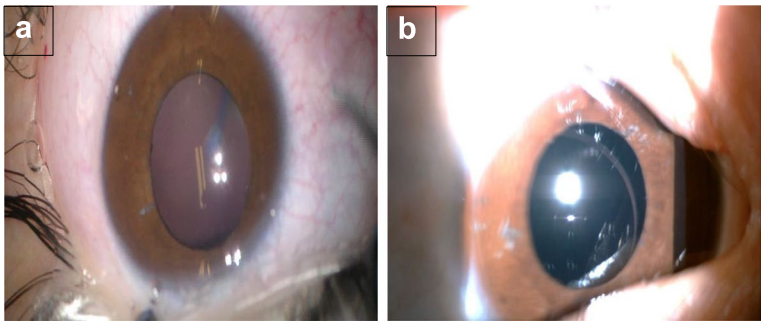

Fig. 4 Postoperative complications included (**a**) intraocular lens (IOL) slippage, visible during intraoperative view, and (**b**) IOL tilt, detectable through slit lamp examination with pupillary dilatation

Assesment of risk factors associated with complications

The sex, age, lens type and axis of astigmatism had no role in predictivity of complications either by univariate or multivariable analysis (Table 3).

The analysis revealed no notable statistical difference between the various types of complications and the age of the patients, which may be attributed to the limited sample size. However, a clinically significant difference was observed, with IOL tilting and slipping incidents occurring at average ages of 18 and 19, respectively. (Table 4).

Discussion

The Yamane technique is a sophisticated method of IOL fixation that circumvents the need for sutures, glue, and scleral or conjunctival dissection [10]. In our study, we assessed the utilization of the Yamane technique in Egyptian patients diagnosed with MFS presented with EL. The study showed a significant improvement in the visual outcomes as demonstrated by the significant reduction of sphere measurements from -9.0 ± 1.4 D before the operation to -1.4 ± 0.7 D after the procedure. Also, the cylinder measurements decreased significantly from -4.5 ± 0.8 D preoperatively to -1.4 ± 0.6 D postoperatively. A marked reduction of the SEQ was also observed from -11.4 ± 1.5

Table 3 Univariate and multivariable analysis for detection of risk factors associated with occurrence of complications

Risk factors	Not complicated (No. = 26)	Complicated (No. = 14)	*P*-value	Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Age (mean ± SD)	29.9 ± 14.2	32.4 ± 13.0	0.629	1.01 (0.9,1.1)	0.9 (0.7,1.10)
Sex [No. (%)]					
Female	12 (54.5%)	8 (72.7%)	0.456	Ref	Ref
Male	10 (45.5%)	3 (27.3%)		0.45 (0.09,2.1)	0.4 (0.05,3.1)
Lens [No. (%)]					
Clear	10 (38.5%)	3 (21.4%)	Ref	Ref	Ref
N1	4 (15.4%)	5 (35.7%)	0.129	4.1 (0.6, 26.2)	51.3 (0.9,2866.7)
N2	6 (23.1%)	2 (14.3%)	0.920	1.1 (0.1, 8.6)	11.1 (0.01,8222.8)
N3	6 (23.1%)	4 (28.6%)	0.386	2.2 (0.4, 13.5)	73.8 (0.01,40,175)
Axis (mean ± SD)	97.3 ± 51.5	113.9 ± 41.1	0.306	1.008(0.9,1.02)	1.01(0.9,1.02)

No number, *SD* standard deviation, *OR* odds ratio, *CI* confidence interval, *Ref* reference category, *N* nuclear cataract grade

Table 4 Comparison between types of complications regarding their patient age

Complications	No	Median (IQR)	*P*-value (KW)
None	26 (65%)	26.0 (17.0,40.0)	0.352
IOL decentration	5 (12.5%)	31.0 (25.0,42.0)	
IOL tilt	2 (5%)	18.0 (14.0,22.0)	
IOL slipping	2 (5%)	19.5 (10.0,29.0)	
RD	2 (5%)	43.0 (36.0,50.0)	
Vitreous hemorrhage	3 (7.5%)	29.0 (22.0,36.0)	

No number of studied eyes, *IQR* interquartile range, *KW* Kruskal Wallis, *IOL* intraocular lens, *RD* retinal detachment

D to -2.1 ± 0.8 D. The CDVA log MAR was increased significantly after the operation from 0.80 ± 0.32 to 0.18 ± 0.10.

The findings from our recent study on postoperative complications indicated that IOL decentration was the most common complication, affecting five eyes (12.5%). This was followed by vitreous hemorrhage in 3 eyes (7.5%). Additionally, IOLslippage, IOL tilt, and RD were each observed in 2 eyes (5%). Although the statistical analysis did not demonstrate significant differences in the types of complications concerning patients age (possibly due to the small cohort) there was a clinically significant

Table 5 Comparison of data between our study and Tao et al.'s study

	Our recent study	Tao et al
Study design	retrospective study	retrospective study
Number of sudied eyes	40	18
Number of patients (male/female)	33 (13/20)	11 (8/3)
Age in years		
Mean ± SD	30.79 ± 13.69	13 ± 9
Range	(9–55)	(4–34)
Follow up period in months		
Mean ± SD	23.9 ± 10.6	6 ± 3
Range	(6–42)	(3–12)
CDVA (log MAR) change from preoperative to final follow-up examination (mean ± SD)	0.80 ± 0.32 to 0.18 ± 0.10	0.49 ± 0.20 to 0.21 ± 0.14
Complications required further intervention (%)	4 (10%)	6 (38.9%)
Postoperative iris capture	0	6 (38.9%)
IOL slippage	2 (5%)	0
RD	2 (5%)	0

SD standard deviation, *CDVA* corrected distant visual acuity, *log MAR* logarithm of the minimal angle of resolution, *IOL* intraocular lens, *RD* retinal detachment

observation, as IOL tilt and slippage occurred at mean ages of 18 and 19 years, respectively.

The Yamane technique has gained popularity worldwide, and several modifications have been described. It has now become preferred approach for IOL fixation when there is no adequate capsular support for a traditional IOL. It seems to be a quite an easy and fast procedure in the hands of an experienced surgeon, with a short learning curve. It is a minimally invasive method of IOL intrascleral fixation [11].

Our study corroborates the findings of Tao et al. (Table 5), who investigated FIHFT effects in MFS patients, the only previous research on this topic precisely. They reported significant improvements in postoperative UCDVA and CDVA. Specifically, preoperative CDVA averaged 0.49 ± 0.20 log MAR, increasing to 0.21 ± 0.14 log MAR postoperatively, with a statistically significant change of 0.28 ± 0.20 ($P < 0.001$). In contrast, Tao et al. reported a higher incidence of postoperative iris capture, affecting six eyes (38.9%), which managed using a 30-G needle in one case and mydriatics in five cases. Despite their efforts to prevent recurrence with miotics, the outcomes were disappointing, with iris capture recurring in five eyes during follow-up [12]. Their study has a few limitations that are worth noting. Firstly, their follow-up period was shorter, and the size of the group they studied was smaller compared to the scope of our research. Additionally, unlike in our study, they did not specify whether the surgeries were performed by multiple surgeons or a single surgeon. Furthermore, they did not gather information on the refractive status of all eyes in their study.

Multiple analyses have examined the Yamane technique for different causes of EL, yielding results like ours. Ucar et al. analyzed 21 eyes from 16 children, with indications for scleral fixation surgery including EL due to MFS ($n = 8$), aphakia from complex cataract extraction ($n = 8$), traumatic aphakia ($n = 3$), and dislocated IOLs ($n = 2$). Average CDVA improved significantly from (1.03 ± 0.49) log MAR preoperatively to (0.33 ± 0.44) log MAR postoperatively ($P < 0.001$) [13].

Randerson et al. studied the clinical outcomes of the Yamane technique for various indications, finding that the most common postoperative complication was a transient increase in IOP in 19 eyes (15.7%). Recurrent protrusion of the flanged haptic occurred in 11 eyes (9.1%). Other complications included CME in 7 eyes (5.8%) and corneal oedema in 6 eyes (5.0%). Rare complications included vitreous hemorrhage (4 eyes, 3.3%), hyphema (2 eyes, 1.65%), transient hypotony (4 eyes, 3.3%), and reverse pupillary block (4 eyes, 3.3%). Severe complications were noted in 11 eyes (9.1%), with six eyes (5.0%) requiring further surgery [14].

Guerin et al. studied the functional outcomes of the Yamane technique versus the retro-pupillary iris-claw technique. In the Yamane group ($n = 58$), the most common early complication was increased IOP in 12 patients (21%). Corneal oedema occurred in 2 patients (4%), and 7 (12%) experienced IOL dislocation or tilt requiring repositioning. Hemorrhagic events were noted in 5 patients (9%), all resolving without intervention. Late complications included CME in 8 patients (14%), glaucoma progression in 6 patients (10%), and three cases of RD. No cases of pupillary block, corneal decompensation, endophthalmitis, or choroidal effusion were reported [15].

Safran and colleagues identified factors contributing to IOL tilt and decentration in the Yamane technique. Unequal needle tunnel lengths, improper positioning relative to the limbus, and inadequate haptic flange creation can lead to lens tilt and displacement, causing refractive errors and astigmatism that impair visual quality. To reduce these risks, proper instrumentation and careful surgical techniques are essential [16].

In our study, we found that the most common complication was IOL decentration, which affected five eyes (12.5%) and was observed on the first day after surgery. As the IOL decentration was observed only after pupil dilation and did not affect vision, no intervention was necessary. We hypothesize that MFS is a genetic connective tissue disorder that causes elastic fibres to behave abnormally, particularly after eye surgeries such as anterior vitrectomy, which can affect IOP. However, we do not have evidence from the literature to support this theory regarding MFS.

The results of our study suggest that the occurrence of IOL tilt and slippage in individuals aged 18 and 19 years can be linked to the increased scleral elasticity found in younger populations. The human sclera reaches its maximum size and elasticity between the ages of 12 and 13 years, after which there is a progressive reduction in compliance and a corresponding rise in rigidity [17]. In young patients, particularly those with thin sclera and low scleral rigidity, such as in the case of MFS, the flexibility of the sclera is extremely important when considering the fixation of an IOL within it [13].

Risk factors for RD in MFS include younger age, EL, and aphakia. RD can also occur as a complication of surgery to remove a dislocated lens. While significant lenticular displacement and severe axial myopia increase RD risk after vitreo-lensectomy, modern surgical techniques have greatly reduced this complication [18].

This study's strengths include its execution at a single location with a homogeneous ethnic group and consistent surgical procedures by the same surgeon. However, limitations include a small patient cohort that may hinder

statistical analysis and a non-comparative retrospective design that poses challenges due to incomplete documentation. Further large-scale prospective research is needed to better understand the safety and efficacy of the Yamani technique for managing MFS eyes with EL.

Conclusions

The Yamane technique has demonstrated both efficacy and safety in the management of subluxated lenses among Egyptian individuals diagnosed with Marfan Syndrome. This approach has led to enhancements in visual acuity while maintaining a low incidence of complications, which are predominantly minor and manageable. It is crucial to conduct thorough fundus examinations before and following the surgical procedure to swiftly detect any retinal breaks, thereby minimizing the likelihood of retinal detachment. IOL tilting, and slippage tend to be more prevalent in younger patients.

Abbreviations

FIHFT	Flanged intrascleral haptic fixation with double-needle technique
IOL	Intraocular lens
MFS	Marfan syndrome
EL	Ectopia lentis
CDVA	Corrected distant visual acuity
log MAR	Logarithm of the minimal angle of resolution
D	Diopter
SEQ	Spherical equivalent
RD	Retinal detachment
IOP	Intraocular pressure
CME	Cystoid macular oedema
FBN1	Fibrillin-1 protein
SFIOL	Scleral-fixated posterior chamber intraocular lens
G	Guage
UCDVA	Uncorrected distant visual acuity
AC	Anterior chamber
n	Number

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12886-024-03724-y.

Supplementary Material 1.

Supplementary Material 2.

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Authors' contributions

FME: Conceptualization, data management, project management, writing review and editing. AHA: Performed surgical procedures, supervision, examination and evaluation of patients. SAA: Data management, formal analysis, validation, writing review and editing. NFS: Patients examined, data retention and investigation. AAK: Data management, article layout, writing original draft, validation, review and editing, investigation and methodology. MMA: Preservation, validation, modification and editing of monitored data. MFM: Data preservation and software analysis. ENI: Data monitoring and preservation. AMA: Data analysis and editing. MSA: Data preservation, evaluation and editing. All authors have read and approved the final manuscript.

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Data availability

All data generated or analysed during this study are included in this published article [and its supplementary information files].

Declarations

Ethics approval and consent to participate

The present study was approval by the Research Ethics Committee of the Faculty of Medicine at Beni Suef University (Approval No: FMBSUREC/07072024/Taha). Written informed consent was obtained from all patients involved in the research.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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