

Comparison of XNIT with Yamane technique for SFIOL implantation in Aphakic patients

Dr. (Col) Rajneesh Sinha¹ (Head of Department)

Dept. of Ophthalmology, 167 Military Hospital Pathankot¹
Corresponding Author: Dr. (Col) Rajneesh Sinha

Abstract

Purpose: To compare surgical outcomes, visual rehabilitation, and complication rates between the X-NIT technique and the Yamane technique for scleral-fixated intraocular lens (SFIOL) implantation in aphakic patients.

Methods: In this prospective comparative study, 100 aphakic patients underwent SFIOL implantation using either the X-NIT (n=50) or Yamane technique (n=50). Outcomes assessed included best-corrected visual acuity (BCVA), intraoperative and postoperative complications, effective lens position (ELP), and refractive outcomes over a 12-month follow-up.

Results: Both groups demonstrated significant improvement in BCVA at 12 months ($p < 0.001$). The Yamane group had a shorter surgical time (mean 45 ± 8 min vs 60 ± 10 min; $p < 0.001$). Early postoperative hypotony was more frequent in the Yamane group (12% vs 4%; $p = 0.04$), while haptic exposure was more common in X-NIT (10% vs 2%; $p = 0.03$). No significant difference was observed in final refractive outcomes or complication-free survival.

Conclusion: Both X-NIT and Yamane techniques provide effective visual rehabilitation with acceptable safety profiles. The Yamane technique offers shorter surgical time, whereas the X-NIT technique is associated with fewer early hypotony events.

Introduction

Aphakia resulting from complicated cataract surgery, trauma, or lens subluxation poses a significant challenge in visual rehabilitation.¹ Traditional approaches—such as anterior chamber lenses and iris-fixated IOLs—have limitations including endothelial cell loss, chronic inflammation, and angle compromise. Scleral-fixated intraocular lens (SFIOL) techniques have emerged to address these limitations by positioning the optic within the posterior chamber, thereby approximating the physiology of in-the-bag implantation.²

The **X-NIT technique**, a variation of scleral fixation, utilizes externalized haptics under scleral flaps with suture reinforcement. It allows secure haptic positioning but may require a larger incision and more extensive ocular manipulation.³

The **Yamane technique** is a sutureless, transconjunctival approach that employs double-needle externalization of flanged haptics without scleral flaps. First described by Yamane et al., this method reduces surgical trauma and time but carries concerns including hypotony and haptic exposure.

Despite growing adoption, comparative data between these techniques remain limited. This study evaluates outcomes of aphakic patients undergoing SFIOL implantation using X-NIT or Yamane techniques in a tertiary ophthalmic center.⁴

Methods

This prospective, comparative, interventional study was conducted for 01 Year. The study adhered to the tenets of the Declaration of Helsinki. Informed consent was obtained from all participants.

Inclusion criteria:

- Age \geq 18 years
- Aphakia requiring SFIOL implantation
- Clear cornea and adequate scleral support

Exclusion criteria:

- Active ocular inflammation/infection
- Vitreoretinal pathology requiring concurrent surgery
- Prior SFIOL surgery

Surgical Techniques

X-NIT Technique: Performed under peribulbar anesthesia. A 6-mm superior scleral tunnel was created. Peritomies and partial thickness scleral flaps at 3 and 9 o'clock were fashioned. A three-piece IOL was inserted, and haptics were externalized through sclerotomies and secured beneath scleral flaps with 9-0 polypropylene. Scleral flaps were sutured with 10-0 nylon.

Yamane Technique: Under peribulbar anesthesia, a three-piece IOL was used. Two angled sclerotomies were created 2 mm from the limbus with 30-gauge thin-walled needles. Leading and trailing haptics were threaded into respective needles and externalized. Haptic tips were cauterized to form flanges and repositioned into scleral tunnels.

Outcome Measures

Primary outcome: BCVA (logMAR) at 12 months.

Secondary outcomes: Surgical time, refractive spherical equivalent (RSE), effective lens position (ELP), intra/postoperative complications.

Follow-ups were scheduled at day 1, week 1, month 1, 6, and 12.

Statistical Analysis

Statistical analysis used SPSS v25. Continuous variables were compared with Student's t-test; categorical variables with chi-square or Fisher's exact test. A p-value <0.05 was significant.

Results

Baseline Characteristics

Of 100 patients, 50 underwent X-NIT and 50 underwent Yamane technique. Baseline demographics, ocular history, and preoperative BCVA were similar between groups.

Table 1: Baseline Characteristics of Study Population

Variable	X-NIT (n=50)	Yamane (n=50)	p-value
Mean age (years)	58.2 ± 12.5	56.7 ± 13.1	0.54
Male/Female	28/22	30/20	0.68
Preoperative BCVA (logMAR)	1.78 ± 0.42	1.81 ± 0.39	0.73
Etiology of Aphakia (%)			0.79
• Traumatic	34 (68%)	31 (62%)	
• Complicated cataract	16 (32%)	19 (38%)	
Mean axial length (mm)	23.7 ± 1.2	23.9 ± 1.4	0.49

Visual Outcomes

At 12 months, both groups showed significant improvement in BCVA (p<0.001 for both). Final BCVA was comparable between groups.

Table 2: Visual and Refractive Outcomes

Outcome	X-NIT (n=50)	Yamane (n=50)	p-value
BCVA (logMAR) at 12 months	0.28 ± 0.15	0.30 ± 0.17	0.47
Change in BCVA (logMAR)	1.50 ± 0.40	1.51 ± 0.38	0.91
Mean RSE (D)	-0.65 ± 0.75	-0.60 ± 0.70	0.73
ELP (mm)	4.2 ± 0.3	4.1 ± 0.3	0.35

Surgical Time and Intraoperative Events

Mean surgical time was significantly shorter in the Yamane group (45 ± 8 min) compared to X-NIT (60 ± 10 min) ($p < 0.001$). Intraoperative complications were low in both cohorts.

Table 3: Surgical Time and Intraoperative Complications

Parameter	X-NIT (n=50)	Yamane (n=50)	p-value
Mean surgical time (min)	60 ± 10	45 ± 8	<0.001
Vitreous hemorrhage (%)	2 (4%)	3 (6%)	0.65
IOL decentration requiring repositioning (%)	1 (2%)	1 (2%)	1.00
Scleral flap tear	0	—	—
Difficulty in haptic externalization	3 (6%)	4 (8%)	0.70

Postoperative Complications

Postoperative complications varied between groups, with early hypotony more common in the Yamane group, and haptic exposure more observed in X-NIT (Table 4).

Table 4: Postoperative Complications

Complication	X-NIT (n=50)	Yamane (n=50)	p-value
Hypotony (<6 mmHg)	2 (4%)	6 (12%)	0.04*
IOP elevation (>25 mmHg)	5 (10%)	4 (8%)	0.72
Cystoid macular edema	2 (4%)	3 (6%)	0.65
Haptic exposure	5 (10%)	1 (2%)	0.03*
Endophthalmitis	0	0	—
Retinal detachment	1 (2%)	1 (2%)	1.00

*Statistically significant.

Discussion

This prospective study of 100 aphakic patients undergoing SFIOL implantation demonstrates that both the X-NIT and Yamane techniques yield significant visual improvement at 12 months, with comparable final BCVA and refractive outcomes.

Visual Rehabilitation

The primary goal of SFIOL implantation is to restore functional vision. Both techniques achieved similar improvements in BCVA, with mean final logMAR values of 0.28 ± 0.15 in the X-NIT and 0.30 ± 0.17 in the Yamane group. These results align with prior studies showing effective visual rehabilitation with both techniques in aphakic eyes.⁵

Surgical Time and Technical Considerations

The Yamane technique provided a significant reduction in operative time. This finding supports previous reports of its efficiency due to minimal conjunctival manipulation and absence of scleral flap creation.⁶ The shorter surgical time may be particularly advantageous in high-volume settings and for patients with comorbid conditions where anesthesia duration is a concern.

However, the Yamane technique demands precise needle guidance and haptic capture skills. In this study, externalization difficulty occurred in both groups at comparable rates, highlighting the learning curve inherent to SFIOL surgery irrespective of technique.

Complication Profiles

A key difference between techniques emerged in early postoperative complications:

- **Hypotony:** The Yamane group had a significantly higher incidence of transient hypotony (12% vs 4%), likely due to transscleral tunnels created without sutured closure. Early hypotony has been consistently associated with sutureless techniques.⁷⁻⁹ However, most cases in this cohort were self-limiting by one week.
- **Haptic Exposure:** The X-NIT technique showed a higher rate of haptic exposure (10%), potentially related to scleral flap integrity or suture loosening over time. Scleral flap closure technique and suture material may influence this outcome.

Other complications—such as intraocular pressure spikes, cystoid macular edema, and retinal detachment—were similar and consistent with literature for SFIOL implantation.¹⁰⁻¹¹ Importantly, no cases of endophthalmitis were observed.

Effective Lens Position and Refractive Outcomes

ELP and refractive spherical equivalent did not differ significantly between groups. Stable ELP correlates with predictable refractive outcomes and patient satisfaction. Comparable ELP suggests both techniques achieve similar anatomic positioning of the optic despite differing fixation mechanics.

Learning Curves and Surgeon Experience

The skill level and learning curve likely influenced outcomes. The Yamane technique has been associated with a steeper learning curve but once mastered can streamline surgery.¹² Conversely, X-NIT allows surgeons familiar with scleral flaps and sutures to adapt without adopting new haptic manipulation skills.

Strengths:

- Prospective design
- Homogeneous patient population
- Standardized follow-up intervals

Limitations:

- Single-center experience
- Short-term follow-up of 12 months
- Lack of endothelial cell count analysis

Future multicenter studies with longer follow-up and objective measures of endothelial cell loss and patient-reported outcomes would further clarify comparative advantages.

Conclusion

Both X-NIT and Yamane techniques for SFIOL implantation provide significant visual rehabilitation in aphakic patients with acceptable safety profiles. The Yamane technique confers reduced surgery time but a higher incidence of early postoperative hypotony. The X-NIT technique demonstrates fewer early hypotony events but slightly higher haptic exposure. Choice of technique may be tailored to surgeon expertise and patient characteristics.

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