

# Simple transscleral fixation of IOL technique without tying up haptics

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Received: 2019-07-24 Accepted: 2020-01-02

## Abstract

• **AIM:** To introduce a novel technique for transscleral fixation of the posterior chamber intraocular lens (PC-IOL) that requires no sutures on the IOL haptics.

• **METHODS:** Instead of suturing polypropylene onto the IOL haptics, the method simply winds the thread on the haptics. Fifteen eyes of 15 patients underwent this technique and were followed up for more than 18mo. Surgical outcomes and post-operative complications were evaluated and compared with those of the conventional transscleral fixation method.

• **RESULTS:** Postoperative cylinder was significantly lower in the thread winding group than in the conventional transscleral fixation method group ( $-1.02 \pm 0.46$  diopters vs  $-1.57 \pm 0.77$  diopters;  $P=0.01$ ). Further, no postoperative complications, such as optic capture, IOL dislocation, and hyphema, were detected in the thread winding group.

• **CONCLUSION:** We believe that our thread winding technique is better than previously reported methods because it is simple, mechanically stable, and free from suture-related complications.

• **KEYWORDS:** aphakia; transscleral fixation; pars plana vitrectomy; intraocular lens implantation

**DOI:10.18240/ijo.2020.07.20**

**Citation:** Lee J, Jang JY, Ji YS. Simple transscleral fixation of IOL technique without tying up haptics. *Int J Ophthalmol* 2020;13(7):1152-1155

## INTRODUCTION

Transscleral fixation is widely used to implant intraocular lenses (IOLs) in eyes that have insufficient capsular support, as well as to treat dislocated posterior chamber intraocular lens (PC-IOL). Two main surgical approaches are used to perform transscleral fixation: transscleral suturing of the PC-IOL or sutureless scleral tunnel<sup>[1-3]</sup>.

Transscleral suturing of PC-IOLs to the ciliary sulcus or pars plana has long been used. However, the method has some complications, such as tilting or decentration of the IOL. Furthermore, friction between suture knots and the iris can cause ocular inflammation, elevated intraocular pressure (IOP), and macular edema, and suture erosion can cause breakage of suture knots, resulting in IOL dislocation<sup>[3-6]</sup>.

Recently, Agarwal *et al*<sup>[7]</sup> developed a technique that uses scleral tunnel and fibrin glue, without the need for sutures on the sclera or IOL haptics. This technique does not lead to the same suture-related complications, but the procedure is complicated and has been linked to long-term complications, such as IOL dislocation, disconnection of the optic-haptic junction, and exposure of the haptic, which result in IOL tilting and decentration<sup>[8-10]</sup>.

In the present study, we introduced a novel technique for transscleral fixation of PC-IOLs. Instead of suturing polypropylene onto the IOL haptics, our method involves winding thread onto the haptics, which can prevent suture knot-related complications. Our long-term follow-up results showed no tilting or decentration of the IOL.

## SUBJECTS AND METHODS

**Ethical Approval** This study conforms to the Declaration of Helsinki and written informed consent was obtained from all subjects.

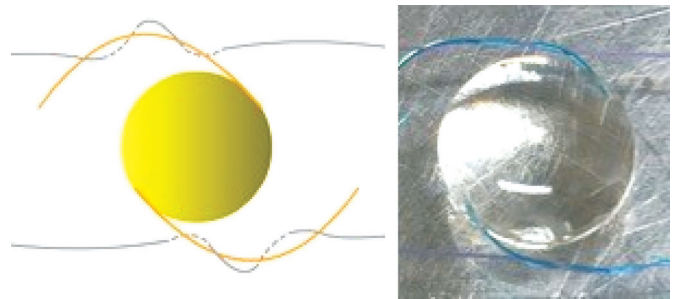
The present study was a retrospective chart review of 15 patients who underwent transscleral PC-IOL fixation using the thread winding technique in Chonnam National University Hospital (CNUH) between May 2015 and September 2017. All patients were followed up for more than 18mo after surgery to allow for adequate evaluation of long-term outcomes (Table 1). We also analyzed 48 patients who underwent conventional transscleral fixation between February 2013 and September 2017 in CNUH and were followed up for more

**Table 1 Demographic characteristics of patients who underwent thread winding transscleral fixation technique**

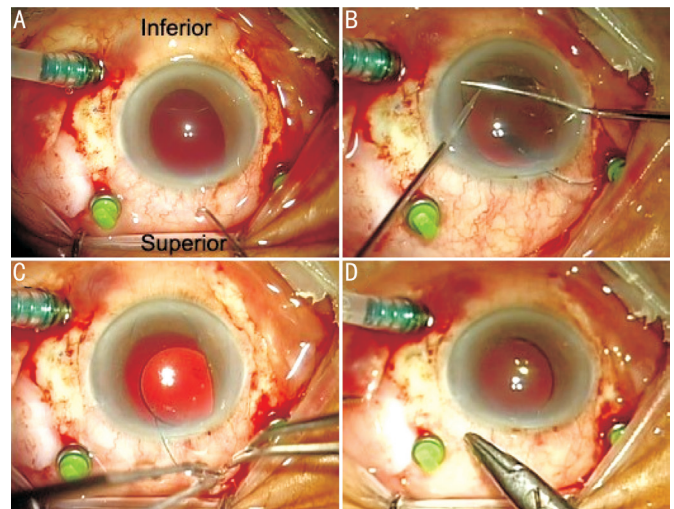
| Patient number | Gender | Age (y) | Etiology                               |
|----------------|--------|---------|--|
| 1              | M      | 55      | Zonular dialysis                       |
| 2              | F      | 62      | Capsule rupture                        |
| 3              | M      | 47      | Capsule rupture                        |
| 4              | M      | 66      | Aphakia                                |
| 5              | F      | 65      | Aphakia                                |
| 6              | F      | 45      | Zonular dialysis                       |
| 7              | M      | 61      | Capsule rupture                        |
| 8              | F      | 51      | Zonular dialysis                       |
| 9              | M      | 48      | Capsule rupture                        |
| 10             | M      | 33      | Traumatic crystalline lens dislocation |
| 11             | M      | 76      | Capsule rupture                        |
| 12             | F      | 49      | Capsule rupture                        |
| 13             | M      | 83      | Capsule rupture                        |
| 14             | M      | 67      | Aphakia                                |
| 15             | M      | 68      | Traumatic crystalline lens dislocation |

than 18mo. We compared the efficacy of the two techniques. Specifically, postoperative best-corrected visual acuity (BCVA), IOP, and complications were evaluated and compared between the two techniques. The time for IOL manipulation and fixation was measured. Patients were excluded if they had open globe injury or any other preoperative ocular diseases that can affect visual acuity (corneal opacity, uveitis, glaucoma, age-related macular degeneration, macular pucker, macular hole, *etc.*).

**Surgical Technique** Figure 1 shows a schematic picture of the thread winding technique. Briefly, after administration of retrobulbar anesthesia, two limbal conjunctival flaps were made—nasally and temporally—to expose the sclera. A standard three-port pars plana vitrectomy (PPV) was then performed. Next, four points were marked 2 mm posterior to the limbus and 6 mm vertically apart at approximately 2, 4, 8, and 10 o'clock. Two clear corneal side ports were then created at 3 and 9 o'clock, and sodium hyaluronate 1.0% (Unial injection; Unimed, Republic of Korea) was injected into the anterior chamber through one of them. A clear corneal incision was created superiorly using 2.75-mm keratome. Two double armed 10-0 polypropylene sutures were passed through each mark in parallel—from 10 to 2 o'clock and from 8 to 4 o'clock—using the ab interno and ab externo methods, respectively. The superior polypropylene loop was externalized using a Sinsky hook (Figure 2A). A 3-piece IOL (Alcon, Fort Worth, TX, USA) was then injected through the superior corneal incision into the anterior chamber, while the trailing haptic of the IOL remained outside the eye. Next, instead of suturing, we wound the inferior polypropylene loop twice onto the leading haptic using microforceps (Figure 2B). The externalized



**Figure 1 Schematic images of the thread winding transscleral fixation technique** The IOL is well supported by two parallel threads at four points, showing no tilt.



**Figure 2 Representative pictures of the thread winding transscleral fixation technique** A: Two double armed 10-0 polypropylene sutures were passed through each mark in parallel—from 10 to 2 o'clock and from 8 to 4 o'clock—using the ab interno and ab externo methods, respectively. B: The inferior polypropylene loop was wound twice onto the leading haptic using microforceps. C: The externalized superior loop was also wound twice onto the trailing haptic. D: Each end of the polypropylene was sutured.

superior loop was also wound twice onto the trailing haptic, which was then internalized into the anterior chamber (Figure 2C). The IOL was translocated to the posterior chamber and centered by adjusting the polypropylene on both sides. Finally, each end of the polypropylene was sutured, and the conjunctiva was covered using fibrin glue (Figure 2D). The corneal incision wound was hydrated without suture.

**RESULTS**

The subjects in the thread winding group comprised 10 men and 5 women, ranging in age from 33 to 83y. Their postoperative outcomes were compared with those in the conventional transscleral fixation group. Table 2 summarizes the surgical outcomes in these two groups. The mean postoperative BCVA (logMAR) was 0.11±0.07 in the thread winding group and 0.14±0.08 in the conventional transscleral fixation group, while the mean sphere was -0.13±0.79 diopters in the thread winding group and 0.04±0.69

**Table 2 Visual outcomes after scleral fixation of IOL**

| Parameters                      | Thread winding group | Conventional transscleral fixation group | <i>P</i> |
|---------------------------------|----------------------|--|----------|
| No. of patients (eyes)          | 15                   | 48                                       |          |
| Age (y)                         | 58.4±3.4             | 61.9±1.52                                | 0.29     |
| Gender (M/F)                    | 10/5                 | 29/19                                    | ns       |
| Mean follow up (mo)             | 22.53±0.72           | 24.94±0.89                               | 0.14     |
| Postoperative BCVA (logMAR)     | 0.11±0.07            | 0.14±0.08                                | 0.13     |
| Postoperative mean sphere (D)   | -0.13±0.79           | 0.04±0.69                                | 0.42     |
| Postoperative mean cylinder (D) | -1.02±0.46           | -1.57±0.77                               | 0.01     |
| Operation time (min)            | 13.93±1.71           | 26.04±3.15                               | 0.0001   |

**Table 3 Complications after scleral fixation of IOL**

| Complications            | Thread winding group | Conventional transscleral fixation group | <i>P</i> |
|--------------------------|----------------------|--|----------|
| Optic capture            | 0/15                 | 4/48 (8%)                                | 0.56     |
| IOL decentration (>1 mm) | 0/14                 | 8/48 (17%)                               | 0.18     |
| IOL dislocation          | 0/15                 | 4/48 (8%)                                | 0.56     |
| Cystoid macular edema    | 0/15                 | 4/48 (8%)                                | 0.56     |
| Temporary IOP elevation  | 2/15 (13%)           | 12/48 (25%)                              | 0.49     |
| Secondary glaucoma       | 0/15                 | 1/48 (2%)                                | ns       |
| Vitreous hemorrhage      | 0/15                 | 2/48 (4%)                                | ns       |
| Hyphema                  | 0/15                 | 4/48 (8%)                                | 0.56     |
| Retinal detachment       | 0/15                 | 2/48 (4%)                                | ns       |

IOP: Intraocular pressure.

diopters in the conventional transscleral fixation group, showing no significant difference between two groups. However, the postoperative mean cylinder was significantly lower in the thread winding group than in the conventional group (-1.02±0.46 vs -1.57±0.77 diopters; *P*=0.01). Notably, the thread winding method took significantly less time than the conventional method (*P*=0.0001), with mean operation times of 13.93±1.71min and 26.04±3.15min, respectively.

With regards to safety outcomes, the thread winding group showed a lower incidence of surgical complications, although the difference was not significant (Table 3). Severe optic capture, which requires surgical correction, was not observed in the thread winding group, nor were IOL decentration, IOL dislocation, and cystoid macular edema. Elevated IOP occurred in two cases (13%) after the thread winding operation, but it was well controlled using temporary antiglaucoma topical medication, and all patients' IOP values were within the normal range at the final visit. In contrast, 25% of the conventional group showed IOP elevation, and one of them had progressed to secondary glaucoma, resulting in visual field defect. In the conventional group, 4% of patients had hemorrhage in the vitreous cavity, 8% had hyphema, and 4% had retinal detachment; no such complications were observed in the thread winding group.

## DISCUSSION

In a previous study, McAllister and Hirst<sup>[11]</sup> reported

complications, such as suture breakage or hyphema, in patients with sutured scleral-fixated PC-IOLs. To overcome these complications, a sutureless technique was introduced. However, this method had drawbacks, including haptic slippage, disconnection of the optic-haptic junction, and hypotony<sup>[8-9]</sup>. In the present study, we introduced a novel technique for transscleral fixation of PC-IOLs that requires no sutures on the IOL haptics. Instead, the method involves winding thread onto the haptics. We compared the surgical outcomes of this technique with those of the conventional sutured scleral fixation technique. Postoperative BCVA and mean sphere showed no significant difference between the two groups. However, mean cylinder was significantly lower in the thread winding group. In the conventional technique, we also performed small incision surgery. Briefly, the IOL was inserted using an IOL injector that required a 2.75-mm corneal incision. The superior haptic was sutured using polypropylene, the IOL was rotated in the anterior chamber, and the other haptic was externalized and sutured. The corneal incision size was the same in both groups, so corneal astigmatism did not differ between the two—IOL tilt is significantly correlated with astigmatism<sup>[12]</sup>. We postulated that the thread winding method supports the IOL from four points, reducing the possibility of tilt (Figure 1). This four-point anchor may prevent migration of dexamethasone implants into the anterior chamber, but this requires in-depth study.

Our thread winding method was also superior to the conventional method in terms of surgical complications. The thread winding group showed no optic capture, decentration, or IOL dislocation during the follow-up period. Moreover, no suture-related complications were detected, such as hyphema, macular edema, and vitreous hemorrhage.

In conclusion, our novel thread winding method for transscleral fixation of PC-IOLs might be useful for IOL implantation in eyes with insufficient capsular support. We believe that the thread winding technique has many advantages over previously reported methods because it is simple, time-saving, mechanically stable, and free from suture-related complications.

#### ACKNOWLEDGEMENTS

**Conflicts of Interest:** Lee J, None; Jang JY, None; Ji YS, None.

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