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ORIGINAL ARTICLE

Motorized injector-assisted intrascleral intraocular lens fixation

Jia-Horung Hung [a,b], **Shih-Hao Wang** [a,c], **Yu-Ti Teng** [a,b], **Sheng-Min Hsu** [a,d,*]

[a] *Department of Ophthalmology, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan*
[b] *Institute of Clinical Medicine, College of Medicine, National Cheng Kung University, Tainan, Taiwan*
[c] *Department of Public Health, College of Medicine, National Cheng Kung University, Tainan, Taiwan*
[d] *Department of Ophthalmology, College of Medicine, National Cheng Kung University, Tainan, Taiwan*

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Abstract For eyes with deficient capsular support, intraocular lens (IOL) implantation has long been a technical challenge. Recently, intrascleral fixation of the haptics of a three-piece posterior chamber IOL has become a popular option. In this procedure, externalization of the leading haptic during IOL injection is a stressful step. We present a modified technique to improve the ease and safety of this step. Our modified technique involves IOL injection with a motorized injector with several important modifications described here. With these modifications, a surgeon can easily maintain the correct orientation of the IOL in a well-controlled manner during IOL injection. The records of 13 patients who underwent this technique were retrospectively evaluated. Corrected-distance visual acuity improved significantly after surgery ($p < 0.05$). No postoperative retinal detachment, endophthalmitis, IOL decentration, or vitreous hemorrhage was noted during the follow-up period. In conclusion, the motorized injector-assisted intrascleral IOL fixation technique is a safe and effective alternative to the conventional procedure. This technique makes the process of leading haptic externalization easier and more controllable.

Conflicts of interest: All authors declare no conflicts of interests.

* Corresponding author. Department of Ophthalmology, National Cheng Kung University Hospital, No. 138, Sheng-Li Road, Tainan City, Taiwan.
E-mail address: shengmin@mail.ncku.edu.tw (S.-M. Hsu).

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Introduction

Ideal modern cataract surgery includes removal of the crystalline lens and intraocular lens (IOL) placement completed as a single procedure, resulting in a postoperatively centered IOL supported by the capsular bag. In the absence of adequate capsular support, the IOL can be implanted into the anterior chamber (AC), fixated on the iris, or fixated in the posterior chamber using trans-scleral sutures. However, each procedure has its limitations [1]. AC IOL can lead to corneal endothelium decompensation, chronic uveitis, and glaucoma, and trans-scleral IOL fixation is associated with IOL decentration, tilt, and dislocation related to suture degradation [2].

Since the pioneer study in the development of the intrascleral fixation of the haptics of a three-piece posterior chamber IOL by Scharioth and Pavlidis [3] in 2007, it has become a popular option for eyes with deficient capsular support [4]. This procedure avoids the disadvantage of suture degradation, has the advantage of posterior chamber placement and good IOL stability as well as less decentration or tilting postoperatively than other alternatives [5]. Many innovative variations [4,6—21] have been reported to improve certain steps, including the introduction of fibrin glue for wound closure (glued IOL technique) [6], the handshake technique for intraocular manipulation of the haptics [10], and the no-assistant technique [12] for trailing haptic externalization.

However, externalization of the leading haptic during IOL injection remains a stressful step. Here, we report a modified technique to tackle this important problem. Instead of using a manual injector, our technique utilizes a motorized injector, which improves the stability of the procedure. This enhanced functionality and ease of use allow much better control of this critical step.

Methods

Patients and statistical analysis

This retrospective study was approved by the Institutional Review Board of National Cheng Kung University Hospital (B-ER-105-096; Tainan, Taiwan). It was conducted in accordance with the tenets of the Declaration of Helsinki. Written informed consent was obtained from all the patients prior to the operation.

Patients who underwent motorized injector-assisted intrascleral IOL fixation between January 1, 2015 and May 31, 2016 were included. Surgical indications included aphakia, crystalline lens, or IOL subluxation. Patients with preoperative retinal detachment were excluded. Each patient was followed up until July 31, 2016.

The decimal corrected distance visual acuity (CDVA) was converted to the logarithm of the minimum angle of resolution (logMAR) for the statistical analyses. Preoperative and postoperative CDVA were analyzed using the Wilcoxon signed-rank test. A p value < 0.05 was considered significant. All statistical analyses were performed using R software, version 3.3.1 (R Core Team (2016). R Foundation for Statistical Computing, Vienna, Austria).

Surgical technique

Our technique was divided into five major parts: creation of the scleral flaps and infusion setup; preparation of the motorized injector; IOL injection with externalization of the leading haptic; externalization of the trailing haptic; and haptic tuck and fibrin glue-assisted wound closure. The entire surgical procedure is demonstrated in the Video in the supplementary material.

Supplementary video related to this article can be found at http://dx.doi.org/10.1016/j.kjms.2017.01.001

Creation of scleral flaps and infusion setup

A localized peritomy at the exit site of the IOL haptics was performed with judicious cauterization of the sclera. Two 2.5 mm $\times$ 2.5 mm partial thickness limbus-based scleral flaps were created exactly 180° diagonally apart. Based on the procedure and the surgeon's preference, a pars plana infusion cannula or an anterior chamber (AC) maintainer cannula was fixated. For convenience, the infusion cannula was positioned in the inferonasal quadrant [6]. A 20-gauge blade or 22-gauge needle was used to create two pars plicata sclerotomies 1 mm from the limbus under the previously created scleral flaps. Anterior vitrectomy through the sclerotomies or corneal incisions was performed to release vitreous traction.

Preparation of motorized injector

An Autosert IOL Injector (Alcon Laboratories, Fort Worth, TX, USA) was utilized as the motorized injecting system. The Monarch II C cartridge (Alcon Laboratories) was loaded with a standard foldable three-piece IOL (Figure 1A). The cartridge was then installed into the IOL injector handpiece.

Before entering the preload step, the trailing haptic was kept away from the plunger tip with a hook or forceps (Figure 1B); otherwise, the haptic might have been trapped and damaged by the plunger during subsequent movement. Then, the preload step was initiated. The surgeon verified that the plunger automatically pushed the optic forward smoothly. The IOL became folded as it advanced along the tunnel inside the cartridge. When the IOL stopped in front of the nozzle, it was ready to be injected (Figure 1C). At this stage, the surgeon ensured proper configuration of the leading haptic. If the leading haptic was folded in the cartridge, it could be straightened out with an IOL dialer [22]. If the trailing haptic was damaged or disconnected from the optic, the plunger was retracted and the broken IOL replaced.

IOL injection with externalization of leading haptic

A 2.8-mm corneal incision with a keratome was fashioned, followed by creation of a side port. The cartridge tip was inserted into the AC through the incision (Figure 1D); then a 23-gauge glued IOL forceps (Epsilon, Chino, CA, USA) was introduced from the left sclerotomy. With supination movement of the right wrist, the cartridge was rotated clockwise,