TECHNIQUE

New surgical approach for intrascleral fixation using an intraocular lens with hook-shaped haptics

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We report a new surgical technique of intrascleral posterior chamber intraocular lens (PC IOL) fixation using a newly developed hook-shaped haptic IOL (NX-70CH) and a 25-gauge loop-shaped haptic manipulator. Previous techniques of intrascleral PC IOL fixation had 2 major technical challenges; that is, externalization of the haptic and fixation of the haptic into the scleral tunnel. The new IOL and manipulator can facilitate externalization and secure fixation of the IOL haptic and can be used for suture fixation or implantation in the capsular bag in cases with presumed subluxated lens.

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Online Video

The concept and technique of intrascleral fixation of a posterior chamber intraocular lens (PC IOL) were first reported by Gabor and Pavlidis in 2007[1] and further detailed by Agarwal et al.[2] as a glued-IOL technique. Since then, several modifications to these techniques have been reported, including Y-fixation[3] and double-needle techniques.[4] At present, intrascleral-fixated PC IOL surgery is widely performed as a safe and an effective technique for IOL implantation in eyes with insufficient capsule support.

There are several advantages of the intrascleral-fixated IOL technique, including no suture breakage or degradation and reduced chronic inflammation compared with the conventional suture-fixated IOL technique.[5,6] However, there is a learning curve for surgeons for these techniques.

We report a new technique that uses a hook-shaped haptic IOL and a purpose-designed manipulator for intrascleral-fixated IOL surgery. The surgery was performed at the Japanese Red Cross Gifu Hospital, Japan. This study was approved by the hospital's institutional review board and adhered to the tenets of the Declaration of Helsinki. All patients provided informed written consent after receiving an explanation of the nature and possible outcomes of the procedure.

SURGICAL TECHNIQUE

Intraocular Lens and Manipulator

The new NX-70CH IOL (Figure 1) was developed by modifying the conventional NX-70 3-piece IOL (both Advanced Vision Science, Inc.). The overall length is 14.0 mm, and the optic diameter is 7.0 mm. The polyvinylidene fluoride haptics have a length of 2.0 mm and a hook-shaped portion at the tip. The hook-shaped haptic is grasped with a disposable 25-gauge IOL loop manipulator (Katalyst Surgical, LLC). This manipulator was modified from a 25-gauge cannula.

Intrascleral Fixation

Initially, a standard 25-gauge 3-port pars plana vitrectomy is performed. Two sclerotomy sites are marked with surgical ink at the 3 o'clock and 9 o' clock positions 1.5 mm from the limbus. Two oblique sclerotomies are created using a 23-gauge microvitreoretinal blade (MVR) (MVR23AD, Mani, Inc.) (Figure 2). For fixation of the hook-shaped haptic, a scleral tunnel is created just inside the sclerotomy site. For IOL implantation, a 3.2 mm wide sclerocorneal incision is made at the 12 o'clock position.

The IOL injector is inserted into the eye, and the IOL is inserted until the leading haptic enters the anterior chamber (Figure 3, *A* and *B*). With the other hand, a 25-gauge

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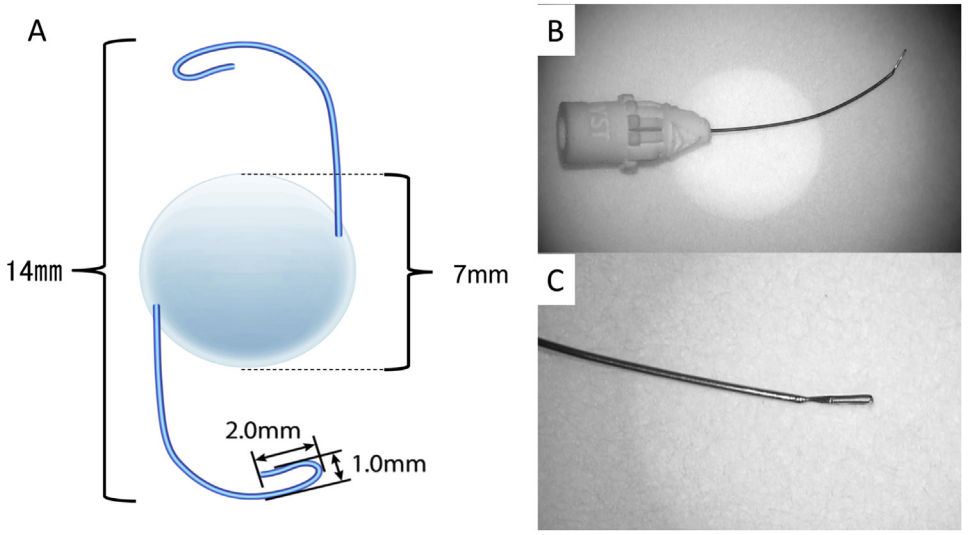

Figure 1. Hook-shaped haptic IOL (*A*) and IOL loop manipulator (*B* and *C*).

IOL loop manipulator is then inserted from the scleral incision and the haptic is captured with it (Figure 3, *C*). The leading haptic is placed behind the iris with the manipulator left in place and not held in the surgeon's hand (Figure 3, *D*). The IOL is further injected and the optic completely inserted into the posterior chamber. The trailing haptic is kept at the scleral incision. A conventional IOL hook is used to place the trailing haptic in the anterior chamber on the iris (Figure 3, *E*); it is then captured with the IOL loop manipulator from the second sclerotomy (Figure 3, *F*).

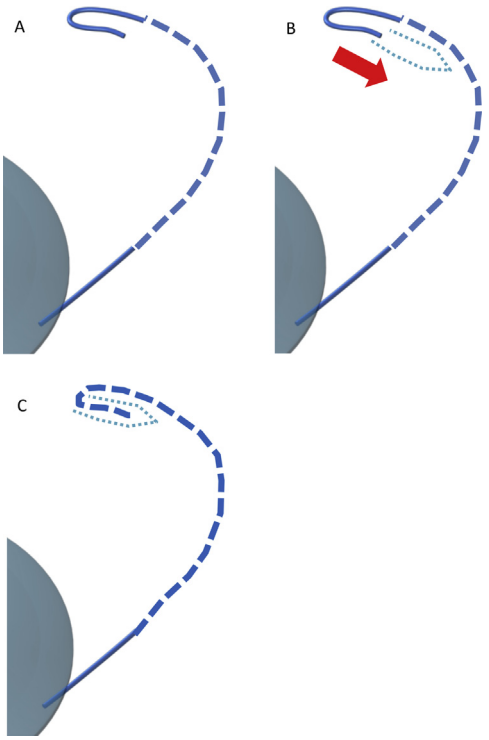

Figure 2. Detailed surgical maneuver to fixate the hook-shaped IOL haptics in the scleral tunnel. *A*: Externalized hook-shaped haptic. After a scleral tunnel is created just inside the sclerotomy (*dotted line*) (*B*), the hook-shaped part of the IOL haptic is inserted (*C*). The red arrow shows the direction of haptic insertion into the scleral tunnel.

Both haptics are then externalized (Figure 3, *G* and *H*) (Video 1, available at http://jcrsjournal.org). The tip of the hook-shaped haptic is inserted into the scleral pocket without a suture (Figure 3, *I* and *J*) (Video 2, available at http://jcrsjournal.org). At the end of the surgery, all trocars are removed and the absence of leakage from all sclerotomies is confirmed.

DISCUSSION

In intrascleral-fixated IOL surgery, it is important to determine which IOL is to be used. Inappropriate length, optic size, or material of the IOL haptic can greatly affect surgical outcomes. In a large case series reporting complications after intrascleral-fixated IOL surgery by Kumar and Agarwal,[7] optic capture occurred in 4.4% of cases, IOL decentration in 3.3% of cases, and haptic extrusion in 2.9% of cases. Intraocular lens decentration and dislocation are related to IOL optic size and overall length, respectively. Matsui et al.[8] state that short haptics might be placed under unnatural tension, which can lead to extrusion of the IOL. The average horizontal corneal diameter in Japanese eyes is 11.5 to approximately 12.0 mm; 2 sclerotomies are created 1.5 mm from limbus in intrascleral-fixated IOL surgery. Based on these figures, we calculated that the optic diameter and overall length of our new IOL should be 7.0 mm and 14.0 mm, respectively.

There are 2 technically challenging steps in intrascleral-fixated IOL surgery. The first is the secure externalization of IOL haptics. The intraocular forceps technique could cause deformation of the IOL haptics when they are externalized out of the sclerotomy.[9] We believe that our technique using the IOL loop manipulator causes less deformation of the IOL haptics compared to an intraocular forceps. The double-needle technique is a variation of this surgical step in which the IOL haptics are captured inside the needle. However, the needle should be perfectly aligned with the haptic tip for this procedure to succeed. Because hook-shaped haptics can be approached by the IOL loop manipulator from various directions, capturing the haptic