Surgical Technique

A new device for intraocular lenses explantation

David Pérez-Silguero[1,2], Amado Rivero-Santana[3,4,5]

Intraocular lenses (IOLs) used in cataract surgery sometimes have to be explanted because of eventual complications like incorrect power, dysphotopsia, opacification, or rupture during implantation. However, current explantation procedures present several shortcomings related to the need for incision enlargement and/or potential damage to ocular structures. We present a new device which increases safety while cutting the lens, allowing the explantation through the original incision, and applicable to any type of IOL.

Key words: Cataract surgery, explantation device, intraocular lenses

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In 1950, Dr. Ridley implanted the first intraocular lens (IOL) in the eye's posterior chamber, at St. Thomas Hospital in London. Currently, cataract surgery is a frequent and successful intervention, and IOLs are one of the most frequently implanted prostheses worldwide. Nonetheless, there are some uncommon situations in which IOLs have to be explanted: incorrect power, dysphotopsia, opacification, or rupture during implantation.[1,2] Most of the existing explantation techniques consist of first cutting the lens into two or three pieces;[2,3] however, they use a single support point for applying back pressure (usually with a Sinskey hook) while cutting, which has the risk of uncontrolled lens movements, with potential damage to the endothelium or the angular structures. Other techniques use special toothed scissors to hold the lens while cutting, so they do not need to apply back pressure, but they involve lengthening the incision to 3 mm.[4] The procedure described in the study by Henderson and Yang[5] does not require cutting the IOL, but it has been used only for one type of IOL and it is also necessary to enlarge the incision to a minimum of 2.75 mm. Recently, Bhaumik and Mitra[6] developed a device which does not require cutting the lens nor enlarging the incision, but it is not indicated for all types of IOLs.

In this article, we present a new device which allows the explantation of an IOL through the original wound, and that minimizes the risk of uncontrolled involuntary movements while cutting the lens, thus reducing the risk of complications and undesired outcomes.

Technique

The device, named after its designer, Dr. Pérez-Silguero, is manufactured by Asico LLC® (Westmont, USA). Authors do not have any financial or proprietary interest about its commercialization. It consists of a 5-mm long metal loop, with a 0.45-mm aperture, a radius of curvature of 5.1 mm, and a width of 22 Gauge [Fig. 1]. It offers two points of support, providing a large area of stability for the IOL, which therefore withstands the movements of the scissors without being displaced. The device works for any lens, be it plate haptic or C-loop. On the other hand, when necessary, it is easy to disinsert the IOL from the loop and insert it again. Once inserted, the IOL can be positioned as needed, with controlled movements, so that its edge is placed in front of the scissors.

The application of the device is shown in Video clip 1. First, the IOL is displaced into the anterior chamber, halfway between the endothelium and the posterior capsule, which were protected using a dispersive ophthalmic viscosurgical device. The loop is inserted through a 20-G incision and positioned in such a way that a segment of the IOL's optic edge is between its two arms (the length of this segment varies depending on the

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thickness of the optic edge, with a maximum of approximately 1.3 mm). We recommend performing the paracentesis more than one quadrant/90° away from the main incision, so that the site of insertion of the loop does not coincide with the IOL or its haptics, and adequate space is available to allow for maneuvering the loop in position, especially with plate-haptic IOLs [Fig. 2]. If necessary, Vannas scissors, a lens manipulator or a button spatula, introduced through the main incision, can be used to push the IOL and place it into the loop. The lens is immobilized in the loop, which can be used to vary its angle with small movements for further control. The IOL can then be cut into manageable pieces with the assurance that it will not move, thus safeguarding the anterior chamber angle, the posterior capsule, and the endothelium [Fig. 3].

The length of the Vannas scissors determines the length of the cuts; with long scissors, we recommend making long cuts, and vice versa. In either case, the scissors should not be completely closed in the successive cuts, nor removed from the cutting face until the final cut; otherwise, it is difficult to reposition them in the same place, because as the IOL is cut, one piece of the portion already cut usually rises a little and the other moves down (this happens regardless of the explantation technique used, because of the characteristics of the lens' material). If the scissors are not completely closed or removed from the cutting face, the displacement of the two portions of the lens will not affect the cut. To make the final cut, the loop is slowly moved towards the paracentesis, but still holding a part of the IOL and thus maintaining its stability [see Video clip 1].

Figure 1: Device's loop

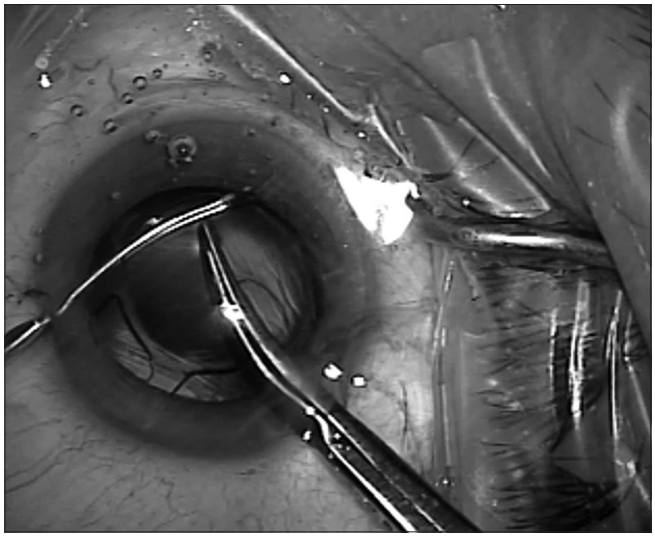

Figure 3: Cutting of the lens

Case Reports

We have used the device in six patients. All explantations were performed without complications. Endothelial cell count was performed before and after IOL extraction in cases 1, 2, and 6, with a mean loss of 4%.

The two first cases, men aged 60 and 71 years, respectively, required explantation because of refractive surprise, identified during the examination on the first postoperative day. They were an Akreos® Adapt (hydrophilic acrylic, double C-loop platform lens; Bausch + Lomb) and a Lentis LS-313Y® (monofocal, aspheric hydrophilic with a hydrophobic surface; Oculentis) plate-haptic IOL. They were explanted 2 days after implantation.

Two women (70 and 72 years) required explantation because a portion of the lens was fractured during the injection

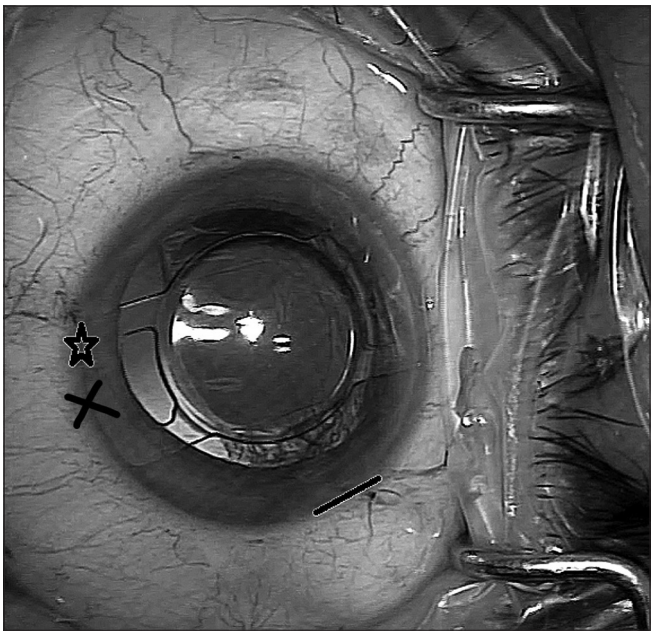

Figure 2: Recommended place for paracentesis (star). It should be performed at >90° (cross) from the main incision (straight line)

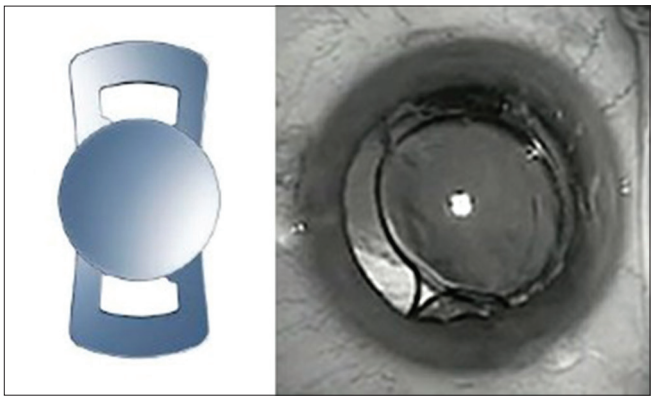

Figure 4: Model of the lens implanted in patient 6 (left). Subluxated lens with haptic folded in the anterior chamber (right)

process, making it impossible for the IOL to maintain stability in the capsular bag. The lenses were two single C-loop platform lenses: monofocal, hydrophilic acrylic Super*flex*® Aspheric 970C (Rayner) and hydrophobic acrylic Bi-Flex POB-MA (Medicontur). The hydrophobic lens was the one that showed the most resistance when extracting it through the incision.

The fifth case was of a 52-year-old woman who presented with pseudoexfoliation syndrome and capsular contraction during the first month after surgery, in a hypermetropic eye with amblyopia. The contraction pushed back the lens (Lentis LS-313Y®), causing intolerable hypermetropia.

The sixth case was of a 65-year-old man, who suffered the loss of vision 1 month after an uneventful cataract intervention in the left eye, with no traumatic antecedents. A subluxation of the lens (hydrophilic acrylic AS-IOL®, AJL Ophthalmic, S.A.) was detected into the anterior chamber [Fig. 4], and during the explantation surgery, it was observed that capsules were fused in the subluxated area. After explantation, a three-piece lens was implanted in the sulcus.

Discussion

Although uncommon, IOLs sometimes need to be explanted. The ideal explantation procedure should comply with the following requisites: being safe, easy to perform and cheap, needing the least possible number of additional instruments, and allowing the explantation through the original size of the main incision (2.2 mm being the most used currently). The presented device can be inserted through a paracentesis of 20 G and has a curvature that adapts to the IOL's optic edge, even in those of a plate haptic type. Additional instruments needed are those found in any ophthalmology operating room: a Vannas scissors and a toothed forceps to extract the portions.

Compared with microforceps, perhaps the most commonly employed instrument for the removal of one-piece IOLs, this new device has the advantage of providing two points of support instead of one; when only one point is used, there is a risk of shift and slippage of the lens if this point and the scissors are not oriented across the diameter of the IOL (especially if they form a 90° angle). In such a case, if the applied technique does not permit a one-time cut, there is an increased risk of damage to the structures of the angle, the sulcus, and the endothelium.

It was not necessary to enlarge the incision in any of our patients, although in the case of the hydrophobic lens, the required traction to extract it was slightly stronger than with the hydrophilic ones. Regardless, there was no permanent damage to the incision. We did not find any complication, and iatrogenic effects derived from the use of the device are not expected if it is used by experienced professionals (for whom the learning curve of the technique is minimal) and our recommendations are followed. At most, minimal edema without clinical consequences could occur in the area of the main corneal incision, because of the extraction of the lens' pieces. We emphasize that the process respects the endothelium, iris, and posterior capsule, as the cut is made slightly above the iris plane, and with complete control of the position of the lens, allowing small controlled and voluntary movements in order to orient the IOL's edge to the scissors.

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Conflicts of interest

There are no conflicts of interest.

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