TECHNIQUES

Scleral fixation without conjunctival dissection

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Scleral fixation of intraocular lenses (IOLs) and adjunctive capsular devices can be performed under the protection of a scleral flap. A modification of this technique uses a scleral pocket initiated through a peripheral clear corneal incision. Full-thickness passage of a double-armed suture through the scleral pocket and conjunctiva, with subsequent retrieval of the suture ends through the external incision for tying, facilitates scleral fixation. This modification offers several advantages over traditional methods: It eliminates the need for conjunctival dissection and scleral cauterization; a scleral pocket affords a greater surface area for suture placement through an ab externo or ab interno approach; retrieval of the sutures through the external corneal incision and subsequent tying allows the suture knot to pass under the protective roof of the scleral pocket, negating the need for suture knot rotation; and the architecture of the scleral pocket eliminates the need for sutured wound closure. Suture retrieval and scleral fixation through a corneoscleral pocket offers a refined method for fixation of IOLs and other intraocular adjunctive devices.

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Stabilization of decentered and secondary posterior chamber intraocular lenses (IOLs) that lack capsule support can be accomplished by means of iris fixation[1–3] and transscleral fixation through the ciliary sulcus or pars plana.[4–6] Although iris fixation of decentered IOLs is a popular technique, late-onset combined IOL–capsular bag subluxation resulting from zonular weakness or dialysis may be more easily repaired with scleral fixation.[7–9]

Techniques for transscleral fixation include ab interno methods,[10–14] in which the suture is passed from the inside of the eye to the external surface, and ab externo methods,[15–18] in which the suture is initially passed from the external surface. Common to all techniques for transscleral fixation is the need to bury, cover, or rotate the knot created for fixation so conjunctival erosion and subsequent endophthalmitis is less likely to develop.[19,20]

We describe a refinement of our previously reported scleral tunnel technique[21] for scleral fixation that uses a scleral pocket initiated through a peripheral clear corneal incision. Full-thickness passage of a double-armed suture through the scleral pocket and conjunctiva with subsequent retrieval of the suture ends through the external corneal incision for tying avoids the need for conjunctival dissection, scleral cauterization, or sutured wound closure. The technique is described for a subluxated IOL–capsular bag complex but can be used for any IOL or intraocular device that requires transscleral fixation.

SURGICAL TECHNIQUE

Calipers dipped in gentian violet are used to mark the locations for peripheral clear corneal incisions. These incisions are made 180 degrees from each other in a meridian that will facilitate proper final positioning of the IOL optic. The haptics should be incorporated in the suture passes unless a capsular tension ring (CTR) was previously placed, in which case the CTR can be secured within the suture passes.[8] The 3 o'clock and 9 o'clock meridians should be avoided to prevent damage to the long posterior ciliary arteries.

A guarded diamond step knife (#05-5027, Rhein Medical) or #64 Beaver blade (376400, BD) is used to make the 30-degree (1 clock hour) and 300 to 400 μm incisions just anterior to the conjunctival insertion at the limbus (Figure 1). The depth of these incisions can be modified depending on the amount of flattening desired

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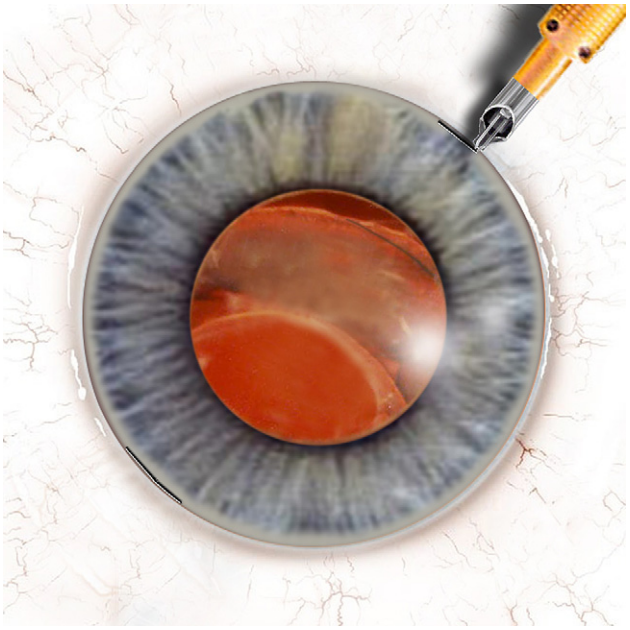

Figure 1. Subluxated IOL–capsular bag complex containing Soemmering's ring. Two 30-degree (1 clock hour) and 300 to 400 μm clear corneal incisions are made 180 degrees apart with a diamond step knife. The incisions are placed in a meridian that will allow fixation of the IOL haptics to the sclera.

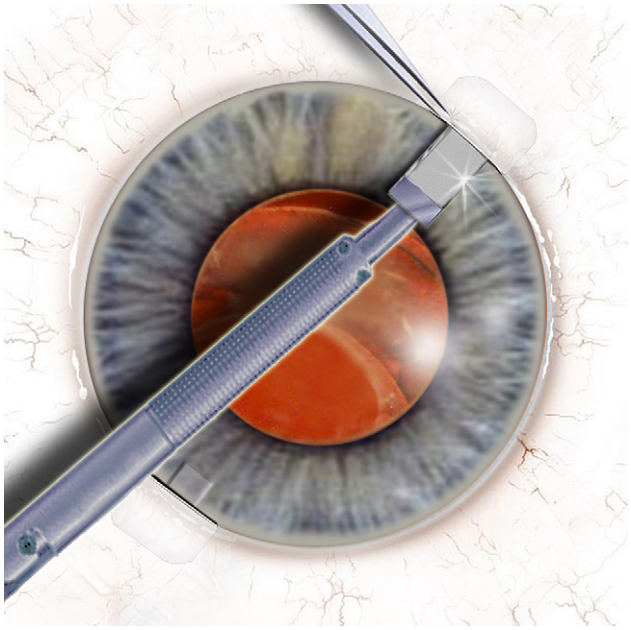

Figure 2. Posterior dissection of scleral pockets using a diamond crescent blade. Note the paracentesis originating anterior to the clear corneal incision.

in the meridian. Two scleral pockets are then dissected posteriorly from the 2 opposing incisions using a diamond crescent knife (#60505 Mastel Precision) or a metal crescent blade (990002 A-OK, Alcon Laboratories) (Figure 2). The pockets are extended approximately 3.0 mm posteriorly from the clear corneal incisions.

A 1.0 mm paracentesis is created from each clear corneal incision into the anterior chamber to aid in suture placement. Initiating the paracentesis just anterior to the clear corneal incision instead of within the incision will facilitate passing the polypropylene (Prolene) sutures since the external opening of the paracentesis can be more easily identified. The paracentesis can also be placed immediately adjacent to the clear corneal incision. The 1.0 mm paracenteses can be used to place single iris hooks to expose the peripheral capsular bag or concealed IOL haptics. A small quantity of ophthalmic viscosurgical device (OVD) is placed in the anterior chamber through 1 paracentesis to stabilize the anterior chamber. An OVD can also be placed in the ciliary sulcus underlying the scleral pocket to aid the suture passes.

Suture placement is initially directed toward the haptic that was exposed through the pupil secondary to the IOL decentration. A 27-gauge needle is passed through the conjunctiva and the full thickness of the scleral pocket 1.0 mm posterior to the surgical limbus. This needle is inserted into the eye, behind the iris and in front of the capsular bag far enough to allow visualization of the beveled tip. A double-armed 10-0 Prolene suture on a long straight needle (STC-6, Ethicon) is inserted through the opposite paracentesis, docked into the 27-gauge needle (Figure 3), and both are removed externally through the scleral pocket and the conjunctiva. (A double-armed 9-0 Prolene suture on a long curved needle [D-8229 CTC-6L, Ethicon] is preferable to postpone eventual suture degradation but may be difficult to acquire.) The 27-gauge needle is again passed through the conjunctiva and the full thickness of the scleral pocket 1.0 mm posterior to the surgical limbus and 1.0 to 2.0 mm adjacent to the first pass of the needle. This 27-gauge needle is inserted into the eye but behind the capsular bag equator. The needle perforates the capsular bag central to the IOL haptic and passes completely through the posterior and anterior capsules. The second arm of the double-armed Prolene suture is passed through the opposite paracentesis and docked with the 27-gauge needle; both are again removed through the full thickness of the eye (Figure 4).

At this point, all suture passes are through the full thickness of the sclera at the ciliary sulcus. By removing the needles from all suture passes, each suture end can be retrieved through the scleral pocket opening by passing a Sinskey hook into the pocket and pulling the trailing suture end through the corneal incision so the sutures now

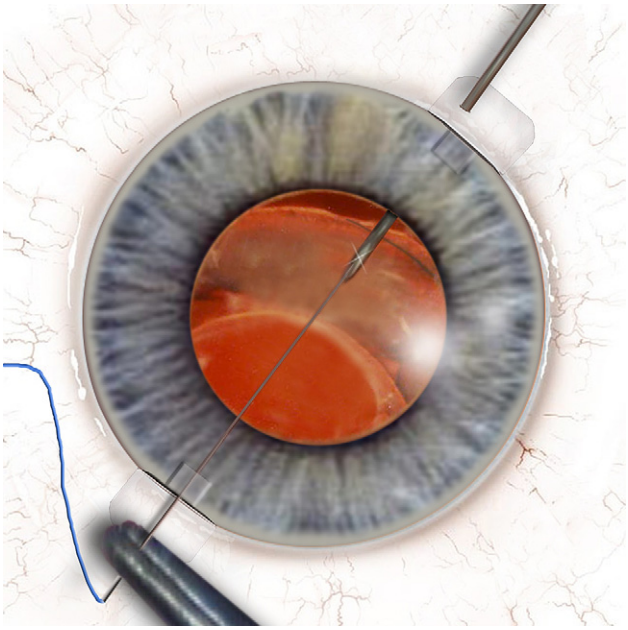

Figure 3. Docking the Prolene suture needle into a 27-gauge hollow needle above the capsular bag. The suture needle is passed through the 1.0 mm paracentesis. The 27-gauge needle is passed into the eye through the conjunctiva and the scleral pocket 1.0 mm posterior to the surgical limbus.

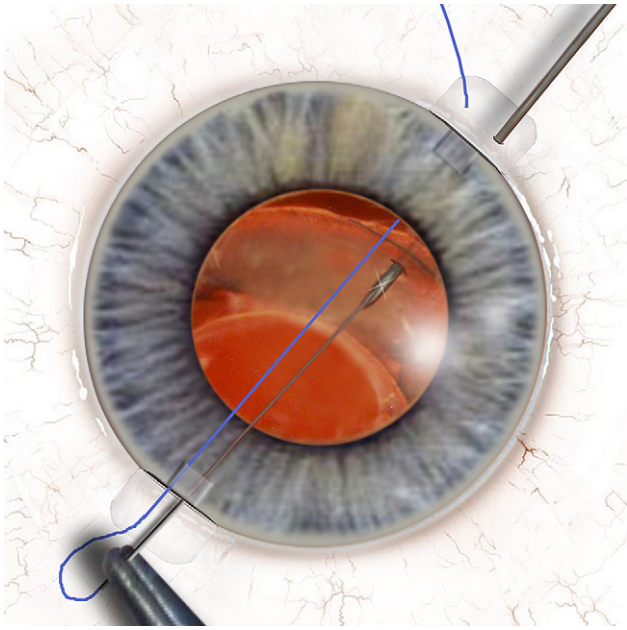

Figure 4. Second arm of the double-armed Prolene suture is inserted through the paracentesis and docked with a second 27-gauge needle that has perforated the capsular bag central to the exposed haptic.

pass through the corneal incision, through the floor of the scleral pocket (1.0 mm posterior to the surgical limbus), and into the eye through the ciliary sulcus. When the sutures are retrieved through the corneal incision, the other suture of the double-armed pass should be held with a forceps to prevent pulling the suture end out of the eye inadvertently (Figure 5).

Tying the suture ends recenters the IOL and allows the knot to be concealed as it slides under the protective roof of the scleral pocket.

The same technique can be performed on the opposite haptic using the second scleral pocket and the opposing paracentesis (Figure 6). An iris hook can be placed in the first paracentesis to aid visualization of the capsular bag equator and lens haptic for the second fixation site. Suturing the scleral pockets is not necessary. The OVD can be removed by injecting acetylcholine hydrochloride (Miochol-E) into the anterior chamber while depressing the posterior lip of one of the paracenteses or with bimanual irrigation and aspiration cannulas inserted into both paracenteses.

DISCUSSION

Numerous methods are currently used for transscleral fixation of IOLs and adjunctive surgical devices.[22] Common to these techniques is the requirement for conjunctival dissection and the need to prevent suture knot erosion of the overlying conjunctiva with the ensuing risk for endophthalmitis. Existing methods for knot concealment include covering the knot with a patch graft,[23] fascia lata,[24] or a triangular scleral flap,[11,15,25–28] in addition to suturing within

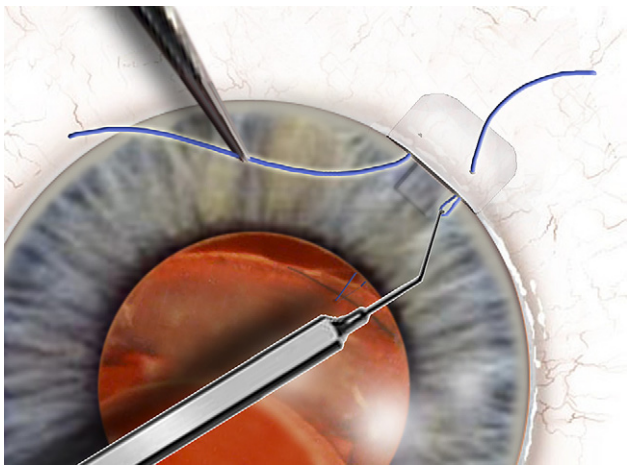

Figure 5. Following the second pass of the double-armed suture, the needles are removed and the suture ends are retrieved through the scleral pocket incision using a Sinskey hook. Note that the left suture has been retrieved and is being held with a forceps to avoid inadvertent suture loss during retrieval of the right suture.

Figure 6. Prolene sutures for each haptic are tied, allowing the knot to slide under the roof of the scleral pocket.

a scleral groove[29–31] and suture knot rotation into the eye.[32–34]

All these techniques have limitations. Scleral patch grafts and fascia lata coverings require additional procurement of tissue from eye banks or the patient's body and add unnecessary time to the procedure. Use of a triangular scleral flap necessitates extremely accurate suture placement when using an ab interno technique to ensure the suture passes through the floor of the dissection. Similarly, the scleral groove technique can be used for ab externo suture passes but by nature of the limited groove area, it cannot be used effectively with an ab interno method. Rotation of full-thickness scleral suture knots can be impeded by short suture passes and may be more difficult with the larger knots that result from currently recommended thicker 9-0 Prolene and 8-0 Gore-Tex suture gauges.[35,36]

There are several advantages of the scleral pocket technique for scleral fixation. First, a larger surface area can be created for suture passes than with triangular scleral flaps or scleral grooves. This allows the suture needles to exit anywhere inside the large dissected pocket as long as they are at the appropriate distance from the surgical limbus (0.5 to 1.0 mm for ciliary sulcus fixation[37]). This is especially useful when using an ab interno approach. Second, dissection of the scleral pocket initiated from a clear corneal incision avoids the need for conjunctival dissection or scleral cautery. This should induce less discomfort in patients having procedures with topical anesthesia in which unforeseen complications may necessitate use of scleral fixated lenses or fixated capsular bag prostheses. The dissection of the distal scleral pocket is also easier to perform than a triangular flap in the distal location since the dissection can proceed directed away from the surgeon in a slightly "downhill" direction. In addition, the procedure can be expedited relative to a triangular flap technique since conjunctival dissection is avoided and sutured wound closure is unnecessary. Finally, less astigmatism may be induced than with the placement of 2 radial sutures through each of 2 opposing triangular flaps in the same meridian. Although 2 opposed 30-degree vertical clear corneal incisions have a small flattening effect in the meridian of placement (Figure 7), the small arc length and relatively superficial depth compared with traditional limbal relaxing incisions induce little astigmatic effect and this can be modified by using more superficial 300 μm incisions, depending on the desired astigmatic result.

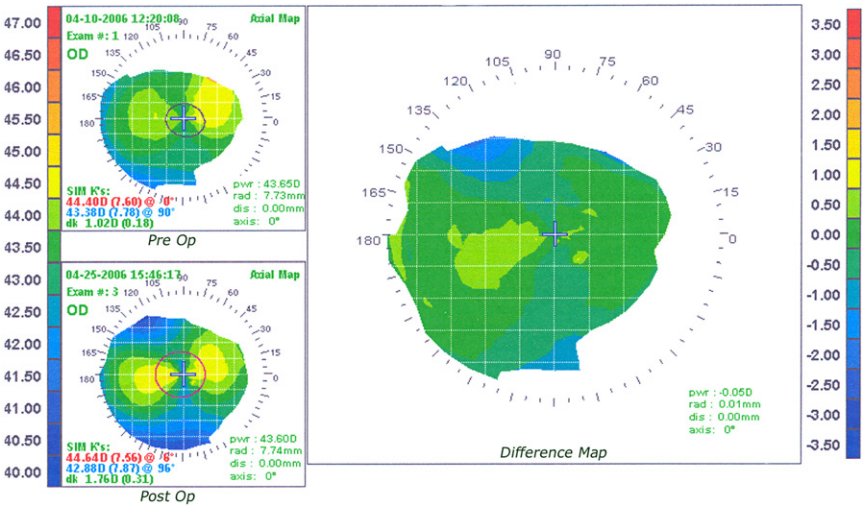

Figure 7. Two weeks postoperatively, surgically induced astigmatism of 0.75 diopter resulting from two 30-degree 400 μm clear corneal incisions and scleral pockets placed at the 105/285 axis. The patient was an 81-year-old man with pseudoexfoliation and a subluxated IOL–capsular bag complex.

Scleral fixation of secondary IOLs within a scleral pocket does require 2 suture passes through the sclera for each haptic. This has the disadvantage of creating twice as many potential adverse bleeding events compared with a suturing technique in which a single suture is passed and the suture is tied to itself in the dissected bed of a triangular flap. However, the double-pass technique has the advantage of 4-point fixation, which should improve the incidence of lens tilt.[38]

Use of a scleral pocket with hook retrieval of the suture ends can be performed for any procedure requiring transscleral fixation. This includes implantation of secondary IOLs, repair of dislocated IOLs,[7–9,39,40] use of adjunctive surgical devices such as Ahmed capsular tension segments and Cionni capsular tension rings,[41] and repair of iridodialyses.[42–45] This modification of the traditional scleral flap allows simpler creation of a scleral covering, negating the need to rotate suture knots while facilitating needle placement for an ab interno or ab externo technique.

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