

Scleral fixation of PC IOL

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Placement of intra-ocular lens is a common and routine procedure in ophthalmic surgery. There is broad consensus that placement of a posterior chamber intraocular chamber lens (PC-IOL) in the capsular bag remains the preferred location. However, in the absence of adequate capsular support, surgeon has to decide about alternative techniques like placing lens into the anterior chamber angle (AC-IOL), an iris clipped IOL or a scleral fixated IOL. Malbran et al first reported transscleral sulcus fixation of PCIOLs in 1986. PCIOLs can also be sutured at the pars plana. Scleral fixation offers more physiological position for IOL implantation. This can be carried with help of specialized IOL with holes in haptic and 10-0 poly propylene suture. Owing to recent concerns about durability of 10-0 polypropylene, there has been increase in use of 9-0 polypropylene. However foldable PCIOLs can also be implanted by this technique.

Indications for scleral fixation

1. Aphakic with inadequate or absent posterior capsular support
2. Grossly subluxated lens
3. Diffuse or grossly weakened zonules
4. Lack of inferior PC (one side SF)

5. Dense adhesion between PC and the iris which makes sulcus fixation difficult

Technique

The aim in the most commonly used techniques is to place these lenses into the ciliary sulcus, although the final position is not predictable because it is often undertaken as a blind procedure. To overcome this problem Timothy W (AJO 2010) used endoscopic guidance while passing suture. Advantages of this technique included excellent visualization and haptic localization, optimal lens centration, buried knots and minimal vitreous- and haemorrhage related complications. Disadvantages include the learning curve, increased operative time, and limited availability of intraocular endoscopes. With respect to technique, there are several stages in the procedure where significant variations have been described.

1. The method of introducing suturing needles —ab externo or ab interno
2. The number of points of PCIOL fixation (2 point /4 point)
3. The method of avoiding suture / knot erosion

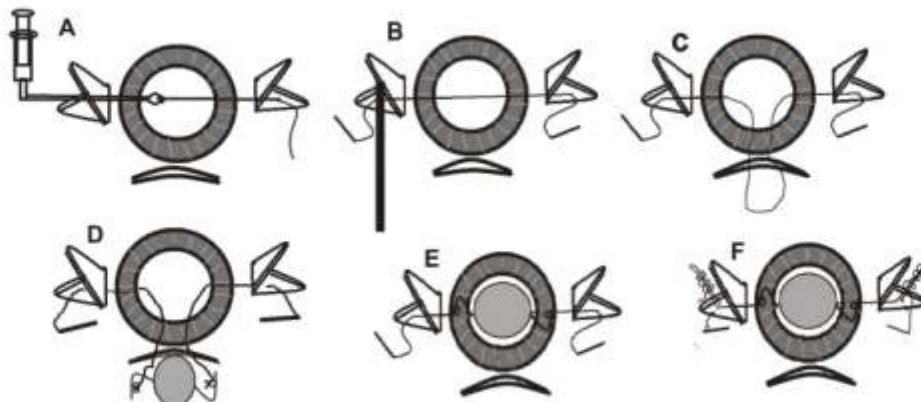


Figure 1: Ab externo Technique

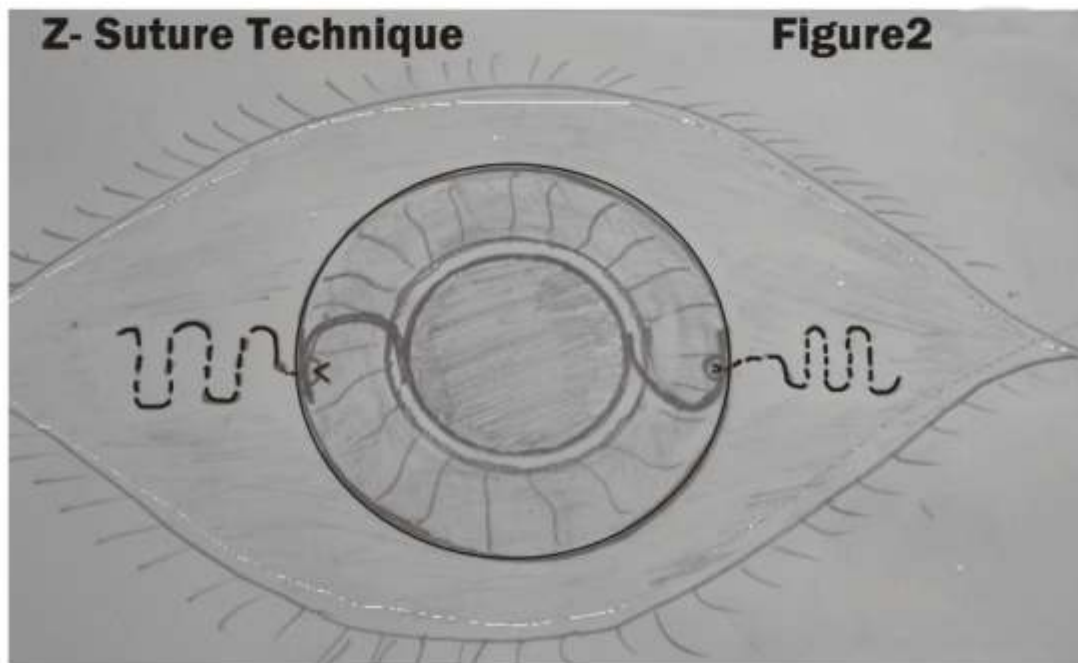
Technique.

1. A superior conjunctival peritomy is fashioned from 11 to 1 o'clock and also small peritomy at 3 and 9 o'clock position.
2. Triangular scleral flaps 3 mm high by 2 mm wide are fashioned at 3 and 9 o'clock.
3. A 7-8mm scleral tunnel wound is made followed by anterior vitrectomy superiorly.
4. A straight needle attached to a 10-0 polypropylene suture is passed through the bed of a scleral flap 1.5 mm posterior to the limbus in a direction parallel to the iris, until its tip is Visualized through the pupil (fig1A).
5. A 26-G hollow needle passed through the opposite scleral bed is used to retrieve the straight needle via its barrel(Fig1B).
6. The hollow needle is withdrawn from the eye, leaving the 10-0 polypropylene suture traversing the eye from one scleral bed to the other.
7. A Mc Pherson or Sinsky hook is used to pull out a loop of this suture out through the superior Tunnel(Fig1D).
8. This loop is cut, and cut ends tied to holes in haptic of the IOL (Fig1E).
9. The IOL is inserted into the ciliary sulcus and the sutures gently pulled to secure the position of the lens.

10. Each needle is passed through partial-thickness sclera 1mm posterior to the exit from the sclera, and then tied to itself (Fig1F).
11. This is repeated at the other scleral bed.
12. The scleral flaps and conjunctival peritomy are closed.

Advantage of this method is that it is simpler and less time consuming but has disadvantage of suture erosion because of knot.

Knotless methodz suture: As the knotless approach reliably avoids suture erosion, external fixation can be performed without any protecting scleral flaps or lamellar grooves. The needle is simply passed through the sulcus. After emerging from the sclera at about 1.5 mm distance from the limbus the needle is reintroduced for an intrascleral pass directly adjacent to the exiting site and the polypropylene suture is secured in the sclera using a zigzag-shaped intrascleral suture (Z-suture) as shown in Fig 2. Each pass starts directly adjacent to the exiting site. Five passes are sufficient to reliably fix the suture so that it resists even maximum tractive forces. Once this procedure is done, the suture can be cut without any knot. By avoiding suture knots, and hence the need for intrascleral flaps, this knotless approach may help to reduce suture-related complications such as scleral atrophy, suture erosion and infections.



AB EXTERNO FOUR-POINT FIXATION WITH SCLERAL POCKET

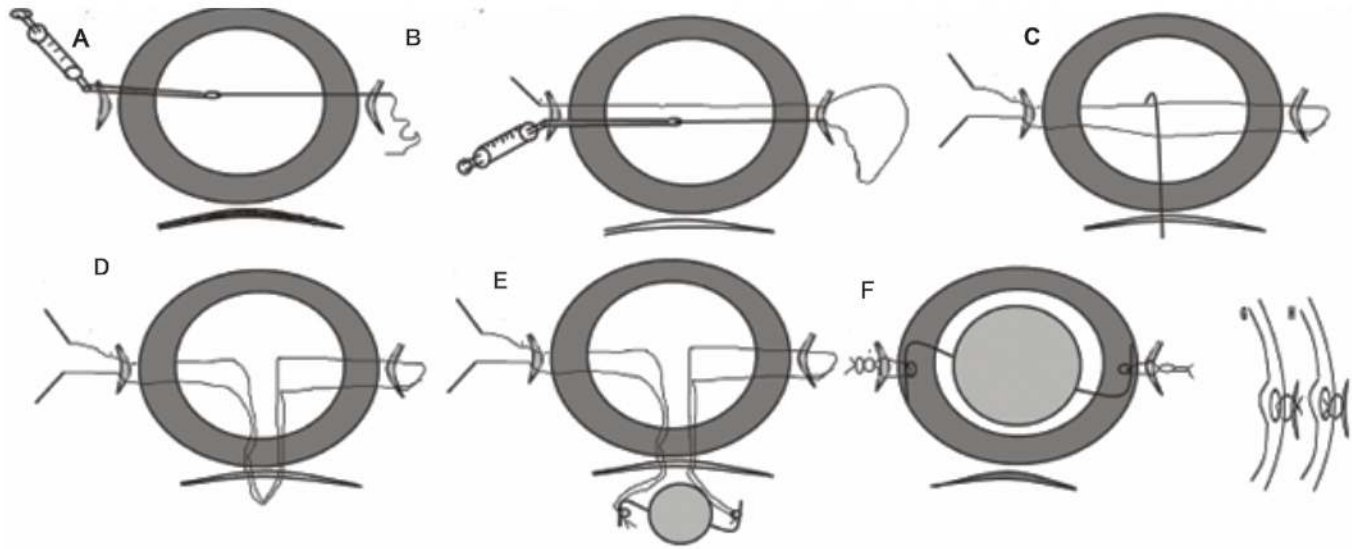


Figure 3 : Ab externo four-point fixation with scleral pocket

Technique

1. A superior conjunctival peritomy is fashioned from 11 to 1 o'clock and also small peritomy at 3 and 9 o'clock position.
2. Scleral pockets about 3mm wide are fashioned at 3 and 9 o'clock.
3. Superiorly A 7-8mm scleral tunnel wound is made followed by anterior vitrectomy.
4. A straight needle attached to a 10-0 polypropylene suture is passed through the bed of scleral Pocket, 1.5 mm posterior to the limbus in a direction parallel to the iris, until its tip is visualized through the pupil.
5. A 26-G hollow needle passed through the opposite scleral bed is used to retrieve the straight needle, via its barrel. (Figure 3A)
6. The hollow needle is withdrawn from the eye, leaving the 10-0 polypropylene suture traversing the eye from one scleral bed to the other.
7. Step 4, 5 and 6 are repeated using needle attached to other end of same suture.
8. About 2mm gap is maintained between the entry of these two sutures.
9. A Mc Pherson or Sinsky hook is used to pull out these suture loops out through the superior tunnel (Figure 3C).
10. These loops are cut in the centre, and cut ends of one side tied to holes in Superior haptic of the IOL .The cut end of other side tied to inferior haptic hole. (Figure3E)
11. The IOL is inserted into the ciliary sulcus and the sutures gently pulled to secure the position of the lens.(Figure3F)
12. The initial knot is rotated out and the long loops are cut, shortened, and tied
13. The final knot is rotated into the eye (Figure 3 H)

Though it is a time consuming and difficult procedure, there is less risk of suture erosion as suture knot is rotated inside and covered by roof of scleral pocket

SCLERAL FIXATION THROUGH SAME TUNNEL

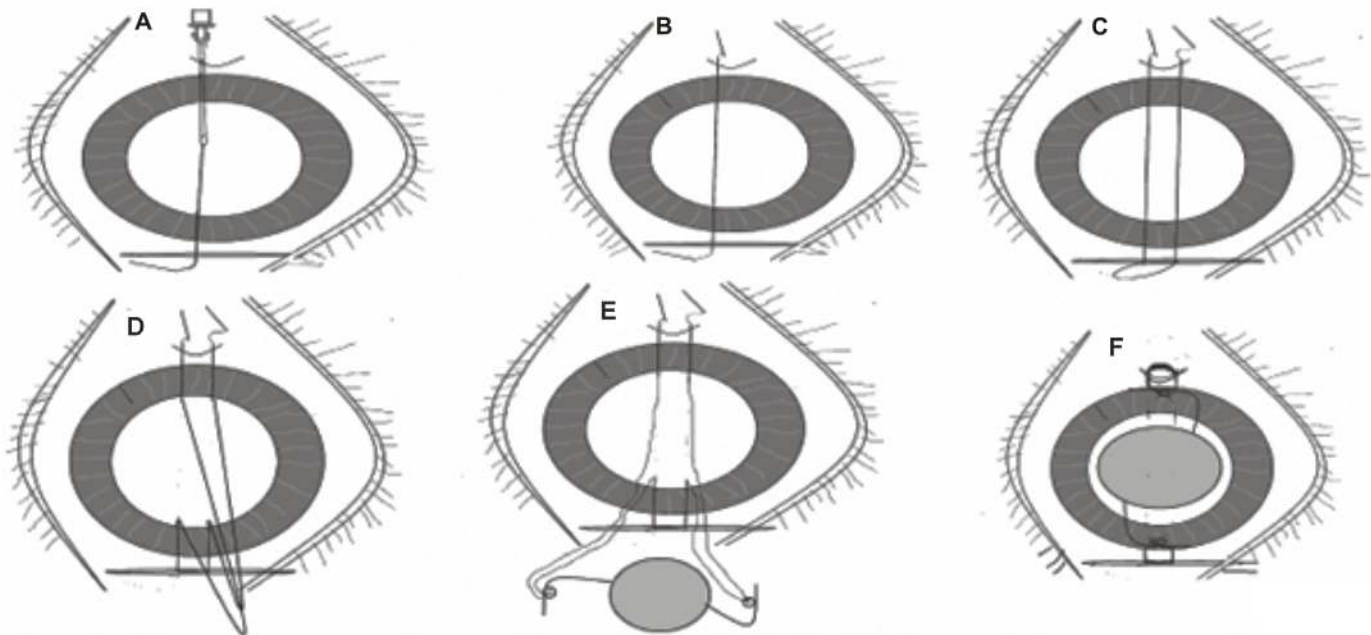


Figure 4 : SF through scleral tunnel

Technique

1. A temporal conjunctival peritomy at about 3 clock hours and nasal about 1 clock hours are made.
2. Scleral pockets about 3mm wide are fashioned at nasal peritomy site.
3. Temporal 7-8mm scleral tunnel wound is made followed by anterior vitrectomy.
4. A straight needle attached to a 10-0 polypropylene suture is passed through the bed of a scleral tunnel 1.5 mm posterior to the limbus in a direction parallel to the iris, until its tip is visualized through the pupil.
5. A 26-G hollow needle passed through the bed of nasal scleral pocket, is used to retrieve the straight needle via its barrel.
6. Step 4 and 5 are repeated using another needle of same suture to get both needle to one side (Figure 4B). Care should be taken that these sutures should be parallel to each other and equi-distant from horizontal line bisecting eye.
7. Pull out these suture loops out through the temporal tunnel using Mc Pherson and cut in centre. (Figure 4C)
8. Cut ends belonging to nasal side are tied to holes in one of the haptic of the IOL and cut end of temporal side tied to other haptic hole. (Figure 4D)
9. The IOL is inserted into the ciliary sulcus and the sutures gently pulled to secure the position of the lens.
10. The initial knot is rotated out and the long loops are cut, shortened, and tied.
11. The final knot is rotated into the eye.
12. Peritomy closed with 8-0 vicryl.

Advantage of this method

1. Most of the scleral fixation are being done in PXE or post traumatic cases, in whom glaucoma risk is high, superior conjunctiva is spared for future trabeculectomy.
2. In post cataract surgery superior conjunctiva is scarred and hence it is easier to make temporal tunnel.

FLAPLESS METHOD OF LEWIS

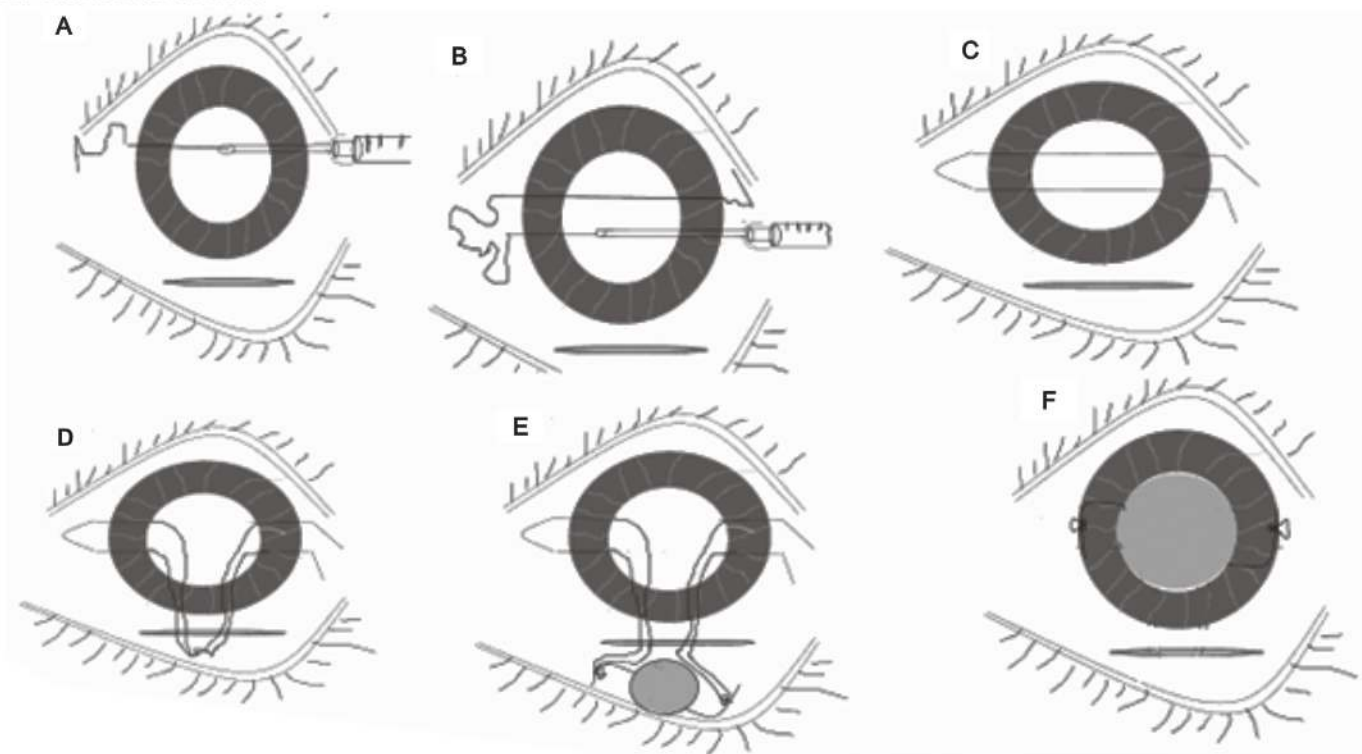


Figure 5 : Lewis Flapless method

Lewis technique is similar to abexterno four point fixation exceptions being no scleral flaps created: This technique (Fig. 5) allows burying the knot and does not require a scleral flap as needles are passed through sclera directly without flap after opening conjunctiva. Thus making procedure quick and also avoids suture related complications. (Lewis JS: Ab externo sulcus fixation. *Ophthalmic Surg* 22:692--5, 1991)

ABINTERNO METHOD OF SCLERAL FIXATION OF PCIO

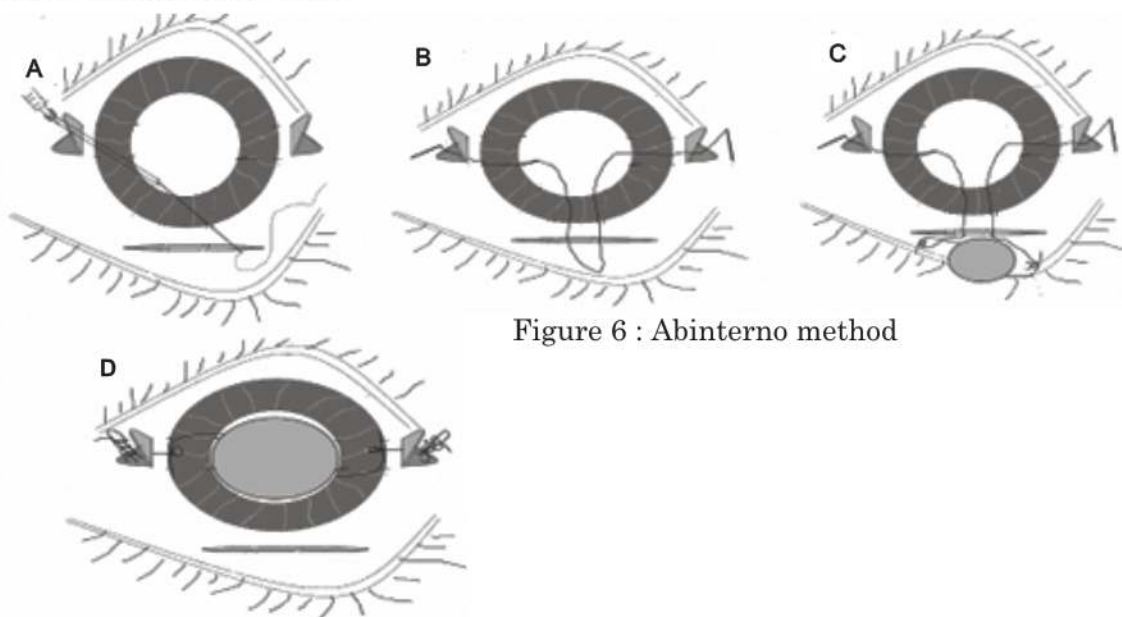


Figure 6 : Abinterno method

Technique

1. A superior conjunctival peritomy is fashioned from 11 to 1 o'clock and also small peritomy at 3 and 9 o'clock position.
2. Triangular scleral flaps 3 mm high by 2 mm wide are fashioned at 3 and 9 o'clock.
3. A 7-8mm sclera tunnel wound is made followed by anterior vitrectomy
5. One needle is passed through the incision, behind the iris and brought out through the sclera 1 mm behind the limbus at 3 o'clock (Figure6A)
6. Another needle is passed through the incision, behind the iris and brought out through the

- sclera 1 mm behind the limbus at 9 o'clock (Figure 6 B).
7. Polypropylene suture is bisected and the ends tied to holes in the haptics of a PMMA (Figure6C) lens with square knots and the IOL is inserted with forceps. Adjust suture tension externally.
8. Each needle is passed through partial-thickness sclera 1mm posterior to the exit from the sclera, and then tied to itself (Figure 6D).
9. Scleral flaps closed with 10-0 nylon and conjunctiva with 8-0 vicryl.

SCLERAL FIXATION OF FOLDABLE IOL

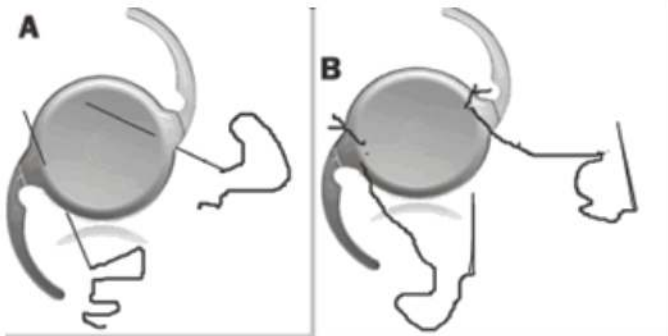
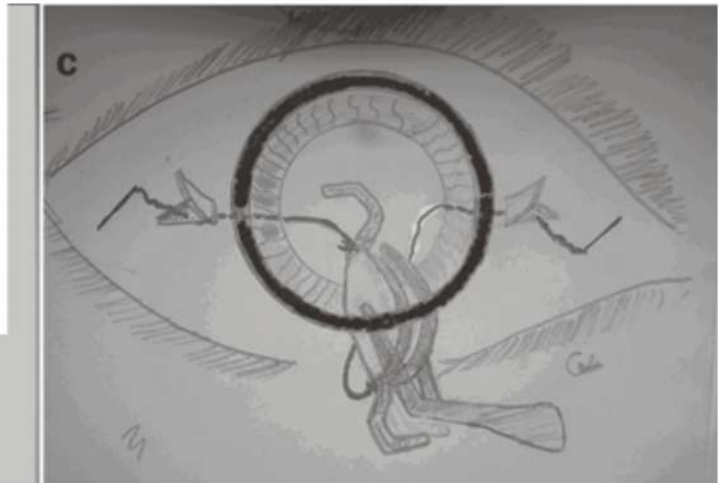


Figure 7 .Foldable SF IOL



Technique:

1. Conjunctiva opened at 3 and 9'o clock positions.
2. Two Triangular scleral flaps 3 mm high by 2 mm wide are fashioned at 3 and 9 o'clock positions.
3. The anterior chamber is entered by performing a 3-mm three-plane corneal incision by keratome
4. Thorough anterior vitrectomy done
5. 10-0 polypropylene suture with two needles used. One of needles is passed through, b perforating the haptics of the IOL in its wider part, which is near the optic. Same procedure repeated with other needle in other haptic. (Figure 7A&B)
6. Ab interno method as explained above is followed to pass the suture and IOL; only modification being IOL inserted by holder folder method. (Figure 7 C)

The implantation of foldable lenses maintains the advantages of small incision surgery, working with a closed system, less astigmatism, faster wound healing, and early visual rehabilitation. *Muhittin Taskapili, MD. et al.* [Ophthalmic Surg Lasers. Imaging 2009;40:434-436.]

Complication of Scleral fixation:

- Suture erosion being the commonest complication can be avoided by thick flap or rotating knot inside. If happens it can be managed by lamellar graft or dural graft.
- Tilt & decentration can be minimized by 4 point fixation, large IOL and making suture entry point diagonally opposite. Blekmann has stated that decentration less than 2mm is not associated with diplopia or deviation from desired refraction(Bleckmann H, JCRS 1994)
- Vitreous hemorrhage usually occurs while passing needle through sclera. If minimal clears by itself in few days and if sever may require vitrectomy.
- CME risk is more because of manipulation, lack of posterior capsule and vitreous trapping between IOL and iris.
- RD risk can be minimized by adequate vitrectomy
- Endophthalmitis mainly due to knot exposure can be minimized by knot burial and covering suture with thick flap

Special situations;

In pediatric cases there may be associated problems such as a subluxated lens from traumatic or congenital causes, which prevent in-the bag or sulcus fixation of the lens without sutures. If contact lenses are used, compliance, hygiene and infection become important factors in post cataract surgery aphakic patients. In these situation scleral fixation is better option to reduce risk of amblyopia and to reduce cost and inconvenience of contact lenses. IOL is calculated depending on age. Small eye and small anatomical limbus makes surgery difficult. Most studies

recommend caution in transsclerally fixating PCIOLs in children, because the long-term effects and potential complications are still unknown

Suggested Reading

- 1) Malbran ES, Malbran E, Negri I: Lens guide suture for transport and fixation in secondary IOL implantation after intracapsular extraction. *Int Ophthalmol* 9:151-60, 1986
- 2) Z-suture: a new knotless technique for transscleral suture fixation of Intra ocular implants, P Szurman, K Petermeier, S Aisenbrey, M S Spitzer, G B Jaissle, *Br J Ophthalmol* 2010;94:167e169
- 3) Lewis JS: Sulcus fixation without flaps. *Ophthalmology* 100: 1346-50, 1993
- 4) Pars Plana Vitrectomy With Endoscope-Guided Sutured Posterior Chamber Intraocular Lens Implantation in Children and Adults Timothy W. Olsen and Jonathan T. Pribila (*Am J Ophthalmol* 2011;151:287-296.
- 5) Techniques of Intraocular Lens Suspension in the Absence of Capsular/Zonular Support, Y.M. Por, FRCS (Glasg), MRCOphth, MRCSEd, MMed (Ophth), 1 and M.J. Lavin, MBBCh, FRCS, FRCOphth. *SURVEY OF OPHTHALMOLOGY VOLUME 50 _ NUMBER 5 _ SEPTEMBER-OCTOBER 2005*
- 6) Incidence and management of complications of transsclerally sutured posterior chamber lenses..... Kerry Solomon, M.D, *Journal of cataract and refractive surgery, vol.19, July1993*
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- 8) Eryildirim A: Knotless scleral fixation for implanting a posterior chamber Intra ocular lens. *Ophthalmic Surgery, 26:82-4, 1995*
- 9) Teichmann KD: Pars plana fixation of posterior chamber intraocular lenses. *Ophthalmic Surg* 25:549-53, 1994



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