

Review article:

Incision in phacoemulsification and its significance : Review

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Abstract

The smaller cataract incisions is thought to induce less astigmatism. The superotemporal, superonasal , superior incisions of 3.0-3.5 mm width present surgical induced astigmatism (SIA) of 0.70-0.80 D, temporal incisions 0.60-0.70 D, while nasal incisions produce more SIA of 1.5 D. A study by Altan-Yaycioglu R et al reported that temporal and superotemporal incisions resulted in small astigmatic changes compare to superior, superonasal, and nasal incisions which induced more astigmatism. Performing clear corneal incision for phacoemulsification of cataract at the steep meridian resulted in small changes with temporal incisions, whereas nasal incisions produced higher surgically induced astigmatism. Shepherd JR analyzed the astigmatic changes in 99 cataract/intraocular lens patients with 4.0 mm incisions. The study revealed that 0.13D WTR astigmatism was induced at one week, degrading to 0.22 D of against-the-rule at three months. This compares favorably with previously reported results of 6.0 mm and 10.0 mm incisions. Thus low amount of induced cylinder and rapid stabilization of the wound confirms an advantage of small incision surgery.

Keywords : astigmatism ,surgical management

Introduction:

The smaller cataract incisions is thought to induce less astigmatism.¹ The superotemporal, superonasal , superior incisions of 3.0-3.5 mm width present surgical induced astigmatism (SIA) of 0.70-0.80 D, temporal incisions 0.60-0.70 D, while nasal incisions produce more SIA of 1.5 D.²

A study by Altan-Yaycioglu R et al reported that temporal and superotemporal incisions resulted in small astigmatic changes compare to superior, superonasal, and nasal incisions which induced more astigmatism. Performing clear corneal incision for phacoemulsification of cataract at the steep meridian resulted in small changes with temporal incisions, whereas nasal incisions produced higher surgically induced astigmatism.³

Shepherd JR analyzed the astigmatic changes in 99 cataract/intraocular lens patients with 4.0 mm incisions. The study revealed that 0.13D WTR astigmatism was induced at one week, degrading to 0.22 D of against-the-rule at three months. This compares favorably with previously reported results of 6.0 mm and 10.0 mm incisions. Thus low amount of induced cylinder and rapid stabilization of the wound confirms an advantage of small incision surgery.⁴

The valvular phaco incision

The classical phaco incision is a three step incision shaped like a Z. One limb of the Z is the vertical gutter at the external site of the incision (Scleral gutter), the second limb is the horizontal dissection (sclerocomeal tunnel) and the third limb is the angled entry into the anterior chamber (corneal valve).⁵

The incision should start just ahead of the limbal vascular arcade i.e. just anterior to the insertion of the conjunctiva

to the limbus.

Size of the incision

The length varies from 2.8 to 3.2mm. The regular phaco needles are shaped like straight tubes and are usually loose fitting in the incision. The Micro seal needle on the other hand has a thin shaft which is covered with a heat insulating sleeve. This allows it to have a snug fit in the incision and at the same time safeguards against leak through incision. This results in a deep and a much more stable anterior chamber.

Thickness of the roof of the tunnel

The thickness should be about 300 microns, as thickness more than this can lead to an inadvertent entry into the anterior chamber. The length of the clear corneal tunnel should be about 1.75mm.³

There are two ways to start the clear corneal incision:

1. By making an initial partial thickness vertical incision
2. Without an initial incision

A straight partial thickness vertical incision of the required length is made in the corneal tissue just anterior to the limbal vascular arcade.

A keratome of required breadth usually 2.8mm is taken and introduced into the corneal stroma just short of the full depth of the incision. The blade is held parallel to the corneal surface and advanced with the tip pointed towards the anterior chamber. Pressure is then applied for the blade to emerge in the anterior chamber.

When the clear corneal incision has to be made without an initial groove the tip of the keratome should first dip into the corneal tissue to the desired level before traversing the cornea.

The Hinged phaco wound

When pressed on the posterior lip in clear corneal incision, wound leak can occur. The wound can be made more secure and entirely self sealing by creating a hinge before the corneal tunnel is dissected.

The hinged incision creates a 600 microns deep groove that is 3.2mm wide and a tunnel in the anterior one third of the stroma with a 3.2mm keratome. The groove should be perpendicular to the corneal curvature and the tunnel should be perpendicular to the groove to obtain a totally self sealing wound.³

Extension of the phaco incision

The extension is done with a blunt tipped extension keratome. The size of the keratome should equal the diameter of the IOL optic that needs to be implanted through it or the required size of the foldable lens.

Closing the Phaco incision

The corneal incision can be sealed using by hydrating the side ports at the entry anterior chamber by irrigating fluid. The high pressure inside the chamber forces the two lips of the internal opening against each other to close them. The integrity of the incision can be checked by depressing the posterior lip of the incision.

Step-by-Step Approach to the Clear Corneal Incision⁶

Step 1. using corneal forcep stabilize the globe by holding at the limbus.

Step 2. Enter at the Limbal Arcade. Using a trapezoidal blade that is precisely matched in width to your phaco tip, enter at the end of the terminal vessels in the limbal arcade. If the incision is made too posteriorly, infusion of fluids from the phaco tip can create conjunctival chemosis that can result in pooling of fluids over the surface of the cornea and reduced visualization.

Step 3. Make the intrastromal length of the Incision Equal to the Width of the Incision. Direct the tip of the blade anteriorly until the tip of the blade has reached an intrastromal length which is equal to or slightly longer than the width of the blade. If the incision has longer width, introduction of the phaco tip may create folds in Descemet's membrane, which makes visualization of the anterior chamber difficult. As emphasized above if the incision is shorter than the width of the incision, they are likely to leak.

Step 4. Complete the Internal Incision. Direct the tip of the blade parallel to the iris plane and enter the anterior chamber. Be sure that the internal incision is complete, but be careful; if you are using a side cutting blade, do not enlarge the incision inadvertently. This can result in poor fluidics during the procedure and an incompetent incision at the end of the case.

Step 5. At the end of the procedure, fill the anterior chamber and inspect the incision carefully. Descemet's flap should not be incarcerated in the incision and make sure the incision is secure. Gently hydrate the margins of the incision and all side ports with balanced salt solution (BSS).

Step 6. If the Incision Is Not "Rock Solid" Perfect, Suture It. If the incision is poorly constructed or if there is leak with rigorous external pressure, suture the incision and then reexamine. If there is Descemet's flap in wound, then gently irrigate the flap into the anterior chamber and suture the incision.

Step-by-Step Approach to the Scleral tunnel Incision⁵

Step 1. Perform a conjunctival peritomy. Create a fornix-based conjunctival flap by removing all Tenon's fibers for better hemostasis. Cauterize lightly. Excessive cauterization can result in scleral shrinkage, which can lead to increased postoperative astigmatic changes and poor approximation of the margins of the external incision.

Step 2. Create a Scleral Groove and Scleral Tunnel. Make a scleral groove 1 to 2 mm posterior to the limbus at a depth of approximately 250 microns. The width of the scleral groove should be equal to or only slightly wider than the width of the keratome, which will be used to make the internal entry into the anterior chamber. By using a "crescent blade," create a scleral tunnel by dissecting into clear cornea at least 1.5 mm anterior to the limbus. The scleral groove and tunnel dissection should not be significantly wider than the keratome used to enter the anterior chamber. This may lead to difficulties with anterior chamber maintenance as it may result in a widening of the internal incision and excessive outflow of irrigating fluids during phacoemulsification.

Step 3. Complete the Internal Incision. Use a keratome that is precisely matched to the width of your phaco tip, direct the blade parallel to the iris plane and enter the anterior chamber at the end of the scleral tunnel. The use of a keratome that is too narrow for the phacoemulsification instrument may lead to restriction of flow through the irrigation sleeve leading to overheating of the phaco tip, and thermal injury to the incision. The use of a keratome

that is too large results in excessive outflow around the irrigation sleeve and difficulties with anterior chamber maintenance during the procedure.

Step 4. Examine and Hydrate the Incision. If the Incision Is Not Perfect, Suture It. At the end of the procedure, examine the incision carefully. If the incision appears well constructed, gently hydrate the margins of the incision and all side ports with BSS and fill the anterior chamber. If a Descemet's flap is observed, gently irrigate the flap into the anterior chamber and suture the incision. If the incision is poorly constructed or if it leaks with rigorous external pressure, suture the incision and reexamin⁶

ADVANTAGES OF SCLERAL TUNNEL INCISION: Scleral tunnel incisions have some advantages like-

- Better wound closure.
- Safest incisions to perform especially for the trainee surgeon.
- Decreased endothelial damage.
- Easy to convert to SICS.
- Since it is covered by conjunctive there are decreased chances of endophthalmitis.

DISADVANTAGES OF SCLERAL TUNNEL INCISION:⁶

- More surgery time.
- Requires cautery and the potential for subconjunctival haemorrhage and hyphaema.
- It cannot be performed under topical anaesthesia.
- Visibility during the phacoemulsification procedure is not better due to longer tunnel.
- Leaves superior conjunctiva disturbed for future trabeculectomy.
- Disturbs the filtering bleb in an eye with a functional bleb.

ADVANTAGES OF CLEAR CORNEAL INCISION:⁷

Temporal clear corneal incisions have become popular because of several reasons:

- Less surgery time.
- Elimination of the need for cautery and the potential for subconjunctival hemorrhage and hyphaema.
- Promotes rapid visual recovery and visual restoration.
- Well tolerated by the patients.
- It can be performed under topical anaesthesia.
- Visibility during the phacoemulsification procedure is better due to shorter tunnel.
- No obstruction from the brow as in deep set eyes and therefore no need of bridlesuture.
- Good red reflex because of perpendicular iris location to the light of microscope.
- Irrigating fluids spontaneously drain from the eye without pooling.
- Leaves superior conjunctiva undisturbed for future trabeculectomy.
- Does not disturb the filtering bleb in an eye with a functional bleb.

DISADVANTAGES OF CLEAR CORNEAL INCISION:

- Not suitable for the trainee surgeon.
- Endothelial damage.
- Conversion into SICS is not possible.
- Increased risk of endophthalmitis as it is not covered by conjunctiva.

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