Smile Incision: An Innovation in Glaucoma Surgery

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Abstract
The success of trabeculectomy is dependent on various factors like patient age, ethnicity, type of glaucoma, status of conjunctiva, ocular co-morbidities, postoperative healing, postoperative adverse events, use of antifibrotic agents and tissue handling. Of these factors only the last is under control of surgeon and thereby needs to be mastered. We describe a surgical innovation in trabeculectomy in an attempt to influence the course of healing towards a more successful outcome.

Keywords: trabeculectomy, limbus based, fornix based

Introduction
Trabeculectomy is currently the commonest glaucoma surgery being performed to arrest the progression of blinding glaucoma. Unlike the more perfect cataract surgery the current avatar of trabeculectomy is besieged by a turbulent postoperative course with declining effectivity with time. The success of trabeculectomy is dependent on multiple factors that include adept tissue handling besides patient age, ethnicity, type of glaucoma, status of conjunctiva, use of antifibrotic agents ocular co-morbidities and postoperative adverse events (if any). Of these factors only tissue handling is truly dependent on the surgeon and needs to be mastered. We describe a surgical innovation in trabeculectomy in an attempt to influence the course of healing towards a more successful outcome.

Limbus Based Versus Fornix Based Incision
Conjunctival incision in trabeculectomy can be either limbus-based or fornix-based. A limbus-based incision is made 7-8 mm from corneoscleral limbus with sub-conjunctival dissection till limbus and closure is done with a running/locking suture. The benefits of this incision are reduced incidence of wound leak, minimal surgical astigmatism and suture induced discomfort. The problems associated with this incision are: ring of steel formation at suture site which initiates bleb fibrosis, increased surgical time with chances of conjunctival button-holing, increased cystic blebs, anterior bleb migration and bleb dysesthesia.

Fornix-based conjunctival flap closure is the reigning favourite due to enhanced exposure of surgical site and healthier bleb morphology.

The flip side of this incision is early bleb leak to the tune of 10-20% which is minimized by meticulous anchoring of conjunctiva to limbus by horizontal mattress suture at the cost of suture-induced astigmatism. Loss of tension by stretched conjunctiva between the anchoring sutures before complete limbal healing however can promote wound leak. Surgically induced astigmatism (SIA) with this incision is initially against the rule (ATR) and against the rule (WTR) during the later post op period.

Principle
Conjunctival frill incision: Singh’s Smile incision
Smile incision is a golden mean or a felicitous middle path incorporating benefits of both fornix and limbal based incision. This incision is made 1.5 to 2.0 mm from limbus leaving a frill of conjunctiva attached at limbus. (Figure 1a). This incision reduces distortion at surgical limbus and its suturing involves use of lesser number of sutures than the conventional fornix based incision thereby reducing surgically induced astigmatism (SIA). (Figure 1b, 2, 3)

Figure 1: (1a) Smile conjunctival incision at 1.5-2 mm from limbus leaving a frill of conjunctiva
(1b) Closure of smile incision at end of procedure

Surgical Steps of smile incision
(1) Conjunctival incision is made 1.5 mm to 2.0 mm from limbus and leaving a frill of conjunctiva attached. (Fig 1a)
(2) After adequately cauterising the conjunctival bleeders, a scleral incision is made.
(3) Superficial scleral flap is delineated centrally in a rectangular shape and scleral tunnel is dissected till 1.5 mm of clear cornea.
(4) A bevelled anterior chamber entry is initiated with a 3.5 mm keratome
(5) Pupil is miosed with intracameral pilocarpine and inner sclerostomy is done with Kelly’s punch at base of the sclera flap.
(6) A peripheral iridectomy is done and anterior camber reformed through a side port.
(7) The scleral flap is sutured with two fixed sutures in centre and two releasable sutures.
Figure 2: (L-R) Smile incision conjunctival suturing step by step

Figure 3: (L-R) Smile incision trabeculectomy a: Day 1 post op b: 2 weeks post op c: After suture removal d: 4 months post op
(8) Conjunctiva is sutured in a continuous manner starting from one end with the suture knot resting away from the superior limbus. (Figure 2)

(9) At end of surgery the bleb is raised by titration from side port. This step ensures water tightness of conjunctival closure and washes out any pigment out of the sclerostomy side into sub-conjunctival space.

**Advantages**

i. Expected scarring at incision site occurs at 1mm from limbus, which reduces possibility of an overhanging bleb, anterior migration and bleb dysesthesia.

ii. Since the bleb forming sutures are not passed through corneal limbus, both suture induced discomfort and suture induced astigmatism (SIA) are minimized.

iii. The incision size is smaller than fornix and limbus based thereby surgical time is less and tear film disruption minimal.

iv. Since it is closer to limbus than limbal based, both surgical time and conjunctival button holing incidence is less with good exposure of surgical site.

v. Surgical exposure is similar to fornix based.

vi. Wound leak is less than fornix based.

**Discussion**

Smile incision is a marriage of convenience between limbus and fornix based conjunctival incision which combines the advantages of both while overcoming few drawbacks of each. It can be effectively used in combined phacotrabeculectomy and manual SICS trabeculectomy surgeries as well. (Figure 3). In our experience of using this novel incision in over hundred eyes in past two years, there has been similar IOP lowering as compared to conventional fornix based incision. In our series no untoward incidence of bleb leak, wound gape or shallow anterior chamber has been noted during the early postoperative period. The enhanced patient comfort, reduced suturing time, decreased ocular surface disruption and minimal surgically induced astigmatism has popularized this incision in our surgical fraternity.

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