

## The Revised 'T'Shaped Limbal Based Scleral Flap With Fornix Based Conjunctival Flap Trabeculectomy.

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### **Abstract:**

**Aim:** The aim of this study is to introduce the efficacy, longevity and safety of this new 'T' shaped limbal based sclera flap with fornix based conjunctival flap trabeculectomy leading to better result like controlling intra ocular pressure satisfactory, and no shallow anterior chamber after the surgery.

**Method:** As it is a clinical research which was done on 26 patients and all the patient went under the 'T' shaped limbal based scleral flap with fornix based conjunctival flap for angle closure glaucoma. To check the short and long term efficacy of this incision. Spss.18 paired sample test was done. All the data were analysed, before and after the surgery. And also the follow up of patient after 1.5 year were also analysed to check the outcome and efficacy of this surgical procedure.

**Result:** Under this research anterior chamber depth before surgery and after surgery were compared and found significant change ( $P < 0.05$ ). And intra ocular pressure before and after surgery were also compared and also found high significant change ( $P < 0.05$ ). Where as the comparative study was also done to compare the result after 1.5 year of follow up. In which anterior chamber after surgery compared with anterior chamber after 1.5 years of surgery and were found non-significant change ( $P > 0.05$ ), where as intra ocular pressure after surgery and after 1.5 years were also analysed and found non-significant change ( $P > 0.05$ ). Non-significant change of anterior chamber depth and intra ocular pressure after 1.5 year of follow up shows the patency and safety of this surgical procedure in long term as well as short term aspects.

**Conclusion:** Our research demonstrate the long and short term effectiveness of our revised T-shaped limbal based scleral flap with fornix based conjunctival flap trabeculectomy.

**Key words:** Scleral, Fornix Conjunctival Flap, 'T' shaped, IOP, Anterior Chamber depth.

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### **I. Introduction**

Glaucoma filtration surgery remains the most effective surgical procedure for lowering intra ocular pressure (IOP) in uncontrolled glaucoma. Over past few years, much advancement have been proposed to increase the survival and efficacy of this procedure, and some with widespread appeal are being used routinely in an attempt to lower the complications associated with this procedure and to improve long and short term outcome. The most important of these include the introduction of AB-Interno techniques and the utility of adjunctive antimetabolites such as 5-fluorouracil and mitomycin-C (MMC). Earlier studies showed that mitomycin C has complication like excessive hypotony with choroidal effusion and irreversible maculopathy [1]. Despite all mentioned endeavours, conventional trabeculectomy still faces potential complications in the perioperative interval, such as hypotony [2], wound leakage, flat anterior chamber [3] choroidal effusion, haemorrhage, hyphema [4] and infection. Although it is considered the gold standard and many variations exist in its surgical technique over the past few years. Much advancement have been proposed to increase the survival and efficacy of this procedure. The revised T-shaped scleral flap with fornix based conjunctival flap had shown a better result in problem like gradual obliteration of the filtering bleb, resulting in impairment of intra ocular pressure regulation as well as better healing of the incision with well maintained intra ocular pressure (IOP) and less chances of shallow anterior chamber after surgery.

Past studies have reported that eyes that received limbal-based trabeculectomy tended to develop cystic blebs when compared with those that underwent the fornix-based technique [5]. The fornix based conjunctival flap has many advantages like -better exposure of the operative field, facilitating dissection of the scleral flap into the cornea, elimination of 'buttonhole' damage to the conjunctiva, easier dissection if conjunctiva has been scarred by previous surgery, adherence of the conjunctiva flap on the limbus resulting in a posterior situated diffuse thicker walled bleb that does not overlie the limbus. A fornix-based conjunctival tenon's flap 7 mm long is raised at the limbus the conjunctiva and tenon's fascia are dissected back in a natural surgical plane between themselves and the sclera. There is less dissection of tenon's fascia compared to a limbus based flap. Any bleeding point on the flap or episclera is dealt with at this stage.

## II. Material

2% lidocain +0.75% bupivacaine 1:1 ratio for retrobulbar- 2ml, 2%lidocain + 0.75% bupivacaine 1:1 ratio for peribulbar- 2 ml, 2%lidocain +0.75% bupivacaine 1:1 ratio 4 ml for von lint block with anaesthesia syringe of 5ml.

Sodium chloride injection 0.9% for surface irrigation ,beta dine 0.55% for surface cleaning ,long sum eye sheet, balanced salt solution(bss)500 ml from Bausch and Lomb for anterior chamber irrigation ,amikacin injection ,10-0 ethilon (polyamide- 6 -black monofilament non absorbable suture w1770),5-0 mersilk(silk braded non –absorbable suture w550), auto-refract meter (Huvitz hrk 7000), Tonometer (x-pert-nc advance),A-scan (Tomey–ud 6000),operating microscope(zeiss opmi–lumera-i), keratome 3-0mm SLIT, crescent 2.5mm(BEAVER),Optimum 15\*(BEAVER),K1-5101 barraquer wire speculum,K4-7400 eye scissor straight,K5-9900 Hartman mosquito forceps straight ,K4-3004 Westcottenotomy scissor,K4-5111 keratome-vennas scissor 7mm curved,K4-400 McPherson –Westcott stich scissor,K5-1500 colibriforceps 0.12 mm teeth,K3-900 Castroviejo calliper straight,K2-6548 diamond step knife-10facet, K2-9505 Luntz-Dodicktrabeculectomy punch,K6-1124 Blumenthalconjunctival dissector,K6-3310 barraquer needle holder curved,K7-3520 air injection cannula 27 gauge.

The 26 patient where enrolled for this research, having angle closure glaucoma and all the patients were from jiangbing hospital, Zhenjiang PR-China,they undergone revised T-shaped limbal based scleral flap with fornix based conjunctival flap trabeculectomy surgery .Out of 26 patient the number of female patient were 8 and the male patient were 18, and all the 26 patient were ranging from 54-83 years old.

**Method** - All the patient before surgery undergone all the necessary investigation like refraction ,anterior chamber depth, fundus examination ,tonometry, view field, B-scan but in our research we have mainly focus on intra ocular pressure (IOP) and anterior chamber depth before and after the surgery and even after one an half year of follow up after surgery. We take all the reading of intra ocular pressure(iop) and anterior chamber before and after the surgery even one an half year of follow up,we calculate the reading with the help of spss.18 software (paired sample test) and tried to know the result of this procedure with the help of p-value significance. Before starting the surgical procedure a culture should be taken from conjunctival sac forty-eight hour before the surgery .The operating surface should be clean or sterilized by beta dinesolution at least two time to insure that the surface is completely free from bacterial growth. Akinesia is achieved through retrobulbar, peribulbar and von lint's block with the help of 2% lidocain with 0.75% bupivacaine in 1:1 ratio 2ml injected in retro bulbar,2ml peribulbar and 4ml in von lint's block .Give pressure for at least 4-5 min to spread the anaesthesia completely all over and also to decrease the pressure of eye ball . After the insertion of lid speculum a traction suture is passed through the belly of superior rectus muscle3mm behind its insertion .Half ml of lidocain injected in conjunctiva before flap is made to make patient comfortable during the surgery. Than fornix based flap is made ,the conjunctiva which is picked up with plain forceps at corneo-scleral junction the semi lunar incision made from 11'Oclock to 1'Oclock position and conjunctiva is free from adhesion and retracted 4-5 mm away from limbus (fig 1.A). A half thickness 'T' shaped external scleral flap ,which comprised longitudinal incision of 3mm and both arms of 'T' which is of 1.5mm away from limbus should be 4mm horizontally long from each side (fig 1.B). The edge of the scleral flap is lifted with a toothed forceps and the flap is raised by a few stroke of a razor fragment in the half-thickness plane .It is extended forward until the anterior 2mm of its bed consist of cornea,with the help of high power operating microscope (Zeisslumera –i), two horizontal incision is made one on scleral spur which is of 2mm horizontally long and second incision just parallel to first incision 1mm anterior to first incision (fig 1.C). The strip of sclera between first and second incision is cut and iris usually prolapsed. A small amount of peripheral iridectomy is done, to release the pressure and by which the iris can settled down back to its primary position. With the help of (K2-9505) Luntz – Dodicktrabeculectomy punch which is of bullet shape tip is easy to insert into the sclera-corneal tunnel ,its angled cutting edge is designed to engaged the scleraposterior to tunnel edge and 1.0mm deep bite is made (fig 1.D).

After completing the procedure both the deep scleral ends were not sutured only repositioned to insure that aqueous humour is flowing out in normal manner(fig 1. E) .Than the superficial scleral flap is put on primary position and again sutured with 10-0 ethilon . First suturing is done on longitudinal flap of 'T' at both the end at 90<sup>0</sup> ,(fig 1. F) than suturing is done at both the arms of 'T' which is near to limbus ,make note that the suture at the arms of 'T' should not be so tight ,it should have less pressure on incision .Note that before repositioning the conjunctiva it should be stretched and stitched at limbus taking some bite of limbal scleral tissue .The conjunctiva should be tight and proportionate enough that no leakage is present . This should achieved accurate reposition of the conjunctiva with no bulky tissue at the limbus. Failure to ensure a well apposed conjunctival tissue maylead to excessive leakage and corneal irritation in the post operative period.

After completing all the surgical procedure injection amikacin is used to wash conjunctival sac. Erythromycin eye ointment is put in conjunctival sac. And an eye pad and shield are applied.

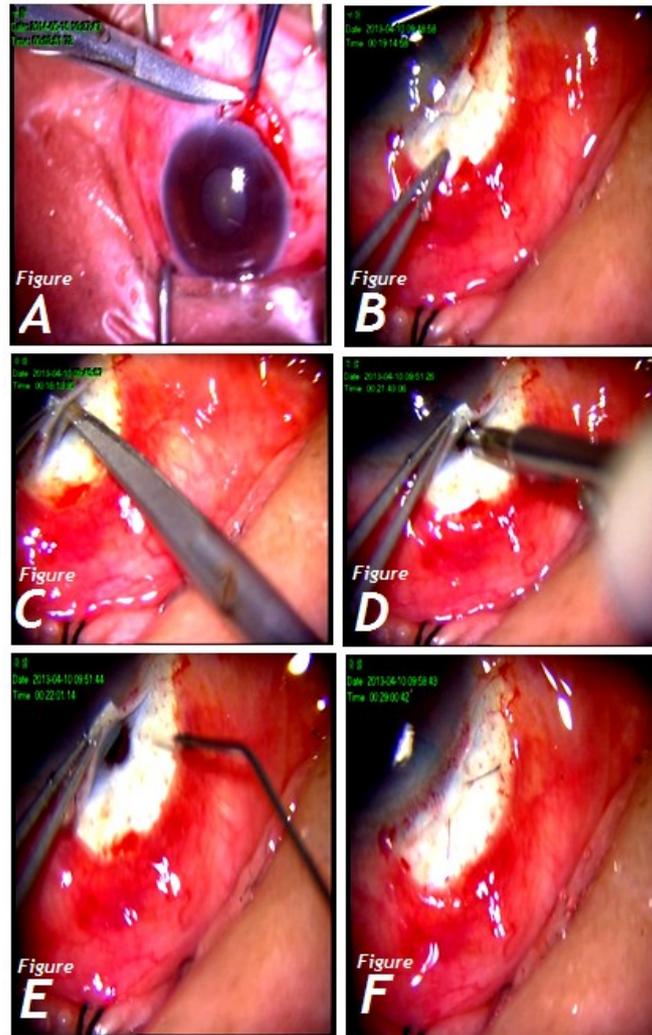


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**Figure 1. T- shaped limbal based scleral flap with fornix based conjunctival flap trabeculectomy.**

### III. Result

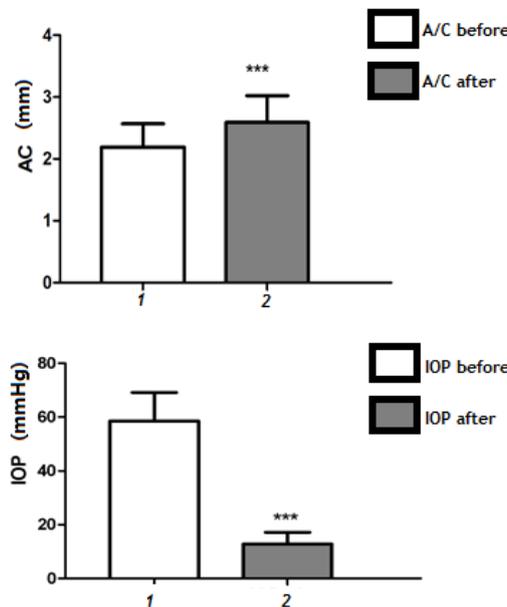
The total number of patients were 26 out of which (8 female and 18 male) were included in our research. The patients were registered on the basis of similar condition and having angle closure glaucoma. All the data were collected pre-operatively and post operatively and even after 1.5 years of follow up and the data were analysed by the help of paired sample test with the help of spss.18 Software. The mean paired difference between intra ocular pressure (IOP) before the surgery and IOP after surgery were calculated which was  $45.68_{\text{mmhg}}$  with  $10.7 \pm 2.09$  and having p-value ( $P < 0.05$ ). Anterior chamber depth (AC) before and after the surgery shows mean difference of  $0.43_{\text{mm}}$  having  $0.58_{\text{mm}} \pm 0.11_{\text{mm}}$  and with p-value ( $P < 0.05$ ). Intra ocular pressure after surgery and IOP after 1.5 year were also calculated having mean difference of  $1.70_{\text{mmhg}}$ , with  $4.66_{\text{mmhg}} \pm 0.91_{\text{mmhg}}$  and with p-value  $P > 0.05$ . Finally the anterior chamber depth after surgery and after 1.5 year were also analysed with mean difference of  $0.02_{\text{mm}}$  and  $0.55_{\text{mm}} \pm 0.10_{\text{mm}}$  having p-value ( $P > 0.05$ ).

With our previous data it is seen that the data between IOP before and after surgery is significant in their change p-value is zero ( $P < 0.05$ ). The anterior chamber before and after surgery also analysed and found highly significant change ( $P < 0.05$ ). In our follow up we observe that IOP after surgery and after 1.5 year were also analysed found non-significant change ( $P > 0.05$ ). The same condition with anterior chamber depth after surgery and after 1.5 year and found non-significant change. Hence the non-significance of data after 1.5 year

shows no change in anterior chamber depth as well as well-maintained IOP even after 1.5 years of surgery. This data shows the vitality of this procedure in short and long term prospects.

**Table 1– Showing mean paired difference between intra ocular pressure and anterior chamber depth before and after surgery and even 1.5 year of surgery.**

Name	Mean	Standard deviation	P-value
IOP before - after surgery	45.68	10.7 ± 2.09	P<0.05
IOP after surgery- IOP after 1.5 yrs	1.70	4.66 ± 0.91	P<0.05
AC before-after Surgery	0.43	0.58 ± 0.11	P>0.05
AC after surgery- AC after 1.5 yrs	0.02	0.55 ± 0.10	P>0.05



**Figure -2 . Graphical presentation of intra ocular pressure and anterior chamber depth before and after surgery.**

**Table-2. Showing the statically computed data difference between intra ocular pressure and anterior chamber depth before,after and after 1.5 years of surgery.**

Mean	Before surgery	After surgery	After 1.5 yrs of surgery
Intra ocular pressure	58.85mmHg	12.85mmHg	14.55mmHg
Anterior chamber depth	2.15mm	2.58mm	2.61mm

#### IV. Discussion

This study shown the patency and longevity of T-shaped limbal based sclera flap with fornix based conjunctival flap trabeculectomy .The study was conducted on 26 patients out of which 8 were male and 18 were female, having age range from 34-83 years old .The procedure showed the satisfactory control of intra ocular pressure (IOP) and no shallow anterior chamber after the surgery. As under this research all the data's were evaluated and compared with the help of statistical analysis in reference to p-value significance.

A number of investigators have advocated the use of a fornix-based instead of a limbal-based conjunctival flap theoretically but, a fornix-based flap having no incision through tenon's capsule may offer an untouched area for aqueous humour re-absorption, while a limbal based flap may result in a dense scar at the site where conjunctiva and tenon's capsule are cut [6]. Limbus has stem cells which help the conjunctiva to heal more rapidly and less chances of infection too. Most of the investigators using randomised prospective study design, however found no difference between IOP regulations when comparing both method. Under this procedure after the T-shaped scleral flap is made, just under the T-shaped flap we had made two parallel horizontal incision and with the help of luntz-dodick trabeculectomy punch a sclera edge is taken out, it will form a tunnel which also look like T-shape. The basic idea about making this T-shaped flap is that, the flow of aqueous humour will be equal in all the direction and a proper amount of aqueous will flow out due to equal resistance from all the sides of flap. After the T-shaped scleral flap is closed a gentle pressure is given on the sclera to observe that whether the aqueous is flowing out or not. But always keep in mind to avoid large amount of aqueous to flow out. As the T-shaped flap having equal resistance at all the sites, the horizontal incision inside the base of scleral flap is re-positioned and left un-sutured and T-shaped flap is required to reposition over it and sutured. The T-shaped trabeculectomy is revised surgical procedure in comparison to surgery introduced by Cairns (1968). In previous surgery as we saw that the square shaped scleral flap was made just touching the limbus and the result were not so promising. Because the scleral flap which is near the limbus even after conjunctiva reposition, do not get enough counter-pressure at the root of flap near limbus, by which flap did not closed properly and there was chances of infection like – endophthalmitis, very low intra ocular pressure, or chances of shallow anterior chamber depth. But these problems have been properly managed by our new T-shaped limbal based scleral flap with fornix based conjunctival trabeculectomy, because in this procedure the scleral incision was made 1.5mm away from the limbus. So when the stretched conjunctiva is repositioned over the scleral flap the conjunctiva will give counter pressure over the scleral flap and allow the aqueous humour to flow posterior to the flap in sub conjunctival space. This will also help in washing the primary collagen from the site of flap and lead to minimal scar formation.

As we know that conjunctiva have elastic property, so the conjunctiva which was pushed posteriorly where first rolled up and distal conjunctiva are gently unrolled, the conjunctiva is then stretched to slightly beyond its original insertion point. Simple interrupted sutures are used to anchor the nasal and temporal edges of the conjunctiva to slightly beyond their original position. The conjunctiva become stretched between the nasal and temporal both the wings and sutured and this is confirmed if an indented line is seen running from nasal to temporal wing, and the conjunctiva should be water tight at this point, But after 1-2 days as the conjunctival flap get loosen and again allow the aqueous humour to flow at sub-conjunctival space. We have seen that trabeculectomy with either single suture or adjustable suture is an efficient surgical procedure for reduction of intra ocular pressure, transconjunctival adjustable should be loose enough to permit aqueous outflow but tight enough to reduce complication related to excessive filtration [7]. The releasable suture technique was shown to be an effective and safe method of providing sufficient aqueous humour outflow by easily removing the suture with forceps. In cases of exposed suture endophthalmitis is seen due to contamination with bacteria [8, 9].

For controlling the conjunctiva wound leak some surgeon use conservative treatment, mainly for surface leak because they are difficult to treat surgically, so conservative treatment should be applied. Conservative treatment consist of patching eye, aqueous supplements and the use of antibiotics drop known to induce scarring such as gentamycin or tobramycin, if no response than use bandage contact lens, collagen shield, tamponade with simmon shell. Simmon shell may be applied to the eye but the shell has a plate that can be positioned over the sclerotomy site for maximum tamponade, however patient may tolerate it poorly and daily ocular examination is required. And also may cause corneal epithelial defect and hypotony which is seen frequently [10]. But still the best way to avoid postoperative leak is to meticulously close the conjunctiva preoperative. It is strongly recommended to look for any leaks. If there is any leak it should be handled with appropriate measures.

At preoperative time there was no such complications seen. But in early post operative period some cases faced the complication of high intraocular pressure (IOP) with shallow anterior chamber but it was managed just by separated the edges of scleral flap with digital pressure. No late post operative complication where noted except mild sub-conjunctival haemorrhage which was also disappear after 6 days of surgery. Anterior chamber depth before the surgery and after the surgery was found significant change  $P < 0.05$ . The mean AC depth before surgery in our study was 2.15mm and after the surgery was found mean of 2.58mm. In the same way intra ocular pressure before and after surgery evaluated and found changed  $P < 0.05$ . Well the mean iop before surgery was 58.85<sub>mmhg</sub> and after surgery was 12.85<sub>mmhg</sub>. In our long time follow up program which we have done after 1.5 year of surgery, we saw that iop after 1.5 years the mean iop was 14.55<sub>mmhg</sub>. The same changes we saw in anterior chamber depth after 1.5 years and we found mean AC of 2.61mm, it shows that there is no major change in iop as well as anterior chamber depth even 1.5 year of surgery. Hence this

procedure shows vitality and longevity of this new T-shaped limbal based scleral flap with fornix based conjunctival flap trabeculectomy.

## V. Conclusion

The T-shaped limbal based scleral flap with fornix based conjunctival flap trabeculectomy shows the highly significant change. It shows that with a good clear scleral flap and having equal resistance at all the side make the flap to heal better and keep the aqueous to flow in sub-conjunctival space without any further complication. In this procedure we didn't use any toxic drugs to produce scarring as well as less surgical cost to the patient and easy to perform. So this procedure keep the patency and effectively maintaining the intra ocular pressure as well as anterior chamber depth after 1.5 year of surgery.

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