

Limbus Sparing Limbal Incision - A New Modified Conjunctival Incision Technique in Strabismus Surgery.

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ABSTRACT

Background: The aim of the study is to introduce a newer technique of conjunctival incision called 'Limbus Sparing Limbal Incision (LSLI)' for horizontal rectus muscle strabismus surgeries. **Methods:** 20 patients were randomly divided into two groups of 10 each. In group 1, the conventional limbal incision was given in the conjunctiva and in group 2, a modified limbal incision, Limbus Sparing Limbal Incision (LSLI) was given. Each patient was followed post operatively on 1st, 7th and end of six weeks. Symptoms like pain, discharge, FB sensation, conjunctival congestion, excessive watering and lid swelling were noted. A record was also made of the conjunctival hyperaemia/chemosis, gaping in conjunctival incision, conjunctival retraction/coiling, thickened conjunctival flap, suture granuloma, corneal abrasion, dellen formation, other signs of ocular surface disorders, need for suture removal and need for resuturing. **Results:** The mean pain score in group 1 was 1.30 ± 0.68 and 2.10 ± 0.57 in group 2 ($p=0.010$). Mean foreign body sensation score in group 1 was 1.10 ± 0.32 , and 2.30 ± 0.68 in group 2 ($p<0.001$). In 20% of patients in group 2, re-suturing of the wound had to be done. Dellen formation was seen in 10% of patients in group 1 and none in group 2 ($p=1.0$). **Conclusion:** Though, the new modified conj incision spares the damage to perilimbal tissue and stem cells, the post op discomfort and delayed healing limited its use. However, large scale studies are needed which can compare the two techniques in terms of outcomes, complication rates, and patient satisfaction.

Keywords: Strabismus, Limbus.

INTRODUCTION

Strabismus surgery is a commonly performed procedure in paediatric as well as adult population. The initial conjunctival incision is a crucial part of the strabismus surgery for exposure of the extra-ocular muscles. An ideal incision should be easy to perform, should provide adequate surgical exposure with less dissection of tissues, minimal visible scar in palpebral aperture, facilitate re-surgery, and should result in minimal post-operative adhesions between tenon's capsule, muscle sheaths and sclera and minimal damage / injury to limbal stem cells and perilimbal vasculature.

The choice of the conjunctival incision in strabismus surgery affects muscle exposure, manipulation of tissues and exposure, thereby affecting post-operative healing and patient's comfort. Different conjunctival incisions have been described: limbal

(Von Noorden, 1968),^[1] para limbal (Swan et al,^[2] 1954) and, fornix incisions (Park, 1968).^[3] Various modifications for each technique have been recommended. Recently Mojon has described a new technique for exposure of horizontal muscle, known as MISS (minimal invasive strabismus surgery).^[4] This technique involves giving two small or multiple keyhole incisions parallel to the insertion of the horizontal recti at the superior and inferior border of the muscle, a little distance away from limbus, thus avoiding the limbal area. But the restricted openings can cause a hindrance in the view of surgery and is a bit difficult for beginners.

In this study, we describe a new modification to the limbal incision. This modification while providing all the advantages of a limbal incision, minimises the damage to the perilimbal tissue. We describe the incision as 'limbus sparing limbal incision'.

MATERIALS AND METHODS

This study was conducted in a tertiary care hospital in north India. A total of 20 patients of all age groups, both sexes and horizontal strabismus were included in the study. All the patients underwent

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detailed assessment including history, examination and investigations. The patients were randomly divided into two groups of 10 each. In group 1, the conventional limbal incision was given in the conjunctiva and in group 2, a modified limbal incision, Limbus Sparing Limbal Incision (LSLI) was given.

In the modified limbal incision, conjunctival incision was initiated at 3 o'clock/ 9 o'clock position (depending upon the horizontal muscle to be operated upon) about 2 mm from the limbus with radial cuts extending in the form of a triangle for about 5 mm each.

At the end of the surgery, the conjunctiva was closed by 8-0 vicryl sutures with buried knots. The number of sutures needed to close the incision were more in group 2 a.c.t. group 1. All patients received topical antibiotic-steroid combination eyedrops 6 times a day for two weeks and then tapered. Along with this, topical lubricating eyedrops were given 3 times a day for two weeks and then tapered. During the surgery difficulty in exposing the muscle, excessive bleeding and difficult suturing were recorded. Each patient was followed post operatively on first post op day, 7th post op day and at the end of six weeks. Symptoms like pain, discharge, foreign body sensation, conjunctival congestion, excessive watering and lid swelling were noted. A record was also made of the conjunctival hyperaemia/chemosis, gapping in conjunctival incision, conjunctival retraction/coiling, thickened conjunctival flap, suture granuloma, corneal abrasion, dellen formation, other signs of ocular surface disorders, need for suture removal and need for resuturing.

Subjectively, the patients were evaluated on the following scores:

Pain score grading from 0 to 3 (ranging from no discomfort to severe pain),

Foreign body sensation score grading from 0 to 3 (score 0 – no discomfort, score 1 – occasional foreign body sensation only on blinking, score 2 – constant foreign body sensation, score 3 – severe foreign body sensation; patient unable to open the eye), Conjunctival congestion score grading from 0 to 3 (ranging from no congestion to severe congestion).

Statistical Analysis

All the data was collected. Statistical analysis was conducted with the statistical package for the social science system version SPSS 17.0. Continuous variables are presented as mean \pm SD, and categorical variables are presented as absolute numbers and percentage. The comparison of normally distributed continuous variables between the groups was performed using Student's t test. Nominal categorical data between the groups were compared using Chi-squared test or Fisher's exact

test as appropriate. $P < 0.05$ was considered statistically significant.

RESULTS

The two groups comprised of 10 patients each. The mean age was 16.90 ± 4.38 years in group 1, while 16.30 ± 4.81 years in group 2. The male to female ratio was 3:2 in group 1 and 3:7 in group 2. The frequencies of pre-op and post-op visual acuities are as shown in figures 1 and 2 and the difference was found not to be statistically significant ($p=0.419$). In both the groups, 10% patients had excessive bleeding during surgery. The mean pain score in group 1 was 1.30 ± 0.68 a while it was 2.10 ± 0.57 in group 2. This difference in mean pain score was statistically significant ($p=0.010$) [Figure 3]. None of the patients in any group complained of discharge in eyes after surgery. The mean foreign body sensation score in group 1 was 1.10 ± 0.32 , while it was more i.e. 2.30 ± 0.68 in group 2. This difference was statistically significant ($p < 0.001$) [Figure 4]. In group 1, 90% patients had foreign body sensation score 1 and 10% patients had score 2, while in group 2, 10% patients had score 1, 50% patients had score 2 and 40% patients had score 3. The difference in frequencies among the two groups was also statistically significant ($p=0.001$). Regarding conjunctival congestion score, in group 1, the mean score was 2.00 ± 0.47 and in group 2, it was 2.20 ± 0.63 . The difference in the mean values was not significant ($p=0.433$). 10% patients in group 1 had conjunctival congestion score 1, 80% patients had score 2 and 10% patients had score 3, while in group 2, 10% patients had score 1, 60% patients had score 2 and 30% patients had score 3 ($p=0.526$). In both the groups, 10% patients had excessive bleeding during the surgery. In group 1, 10% had excessive watering during first 2 weeks of post-op period while in group 2, 40% patients had this complaint ($p=0.303$). Lid swelling was not seen in any of the patients in any group. Conjunctival chemosis was seen in 10% of patients in group 1 and 20% of patients in group 2 ($p=1.0$). During first 2 weeks of post-op period, gapping in conjunctival incision was seen in 30% of patients of group 2 while conjunctival retraction / coiling was seen in 20% of patients of group 2 only. These problems were not seen in group 1 patients. This difference was not statistically significant. Thickening of conjunctival flap during first 2 weeks of post-op period was seen in 20% patients in group 1 while none in group 2 ($p=0.474$). Suture granuloma was not seen in any patients in either groups and there had been no need of suture removal in any patient. However, in 20% of patients in group 2, re-suturing of the wound had to be done. Dellen formation was seen in 10% of patients in group 1 and none in group 2 ($p=1.0$). There were no signs of corneal abrasion, filamentary keratitis or corneal ulceration in any patient in both the groups.

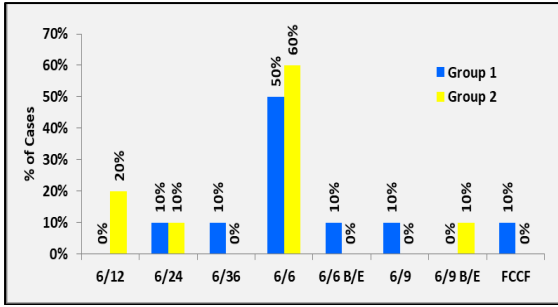


Figure 1: Bar diagram showing correlation of pre-op visual acuity between the groups.

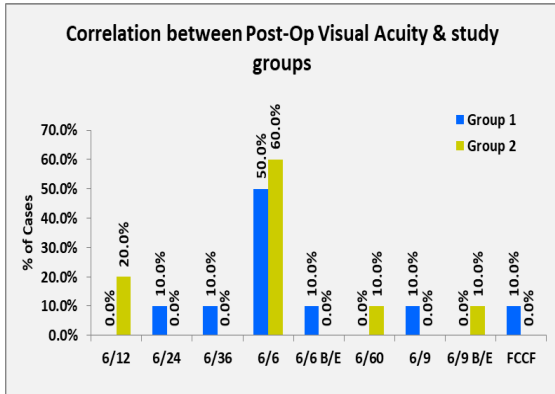


Figure 2: Bar diagram showing correlation of post-op visual acuity between the groups.

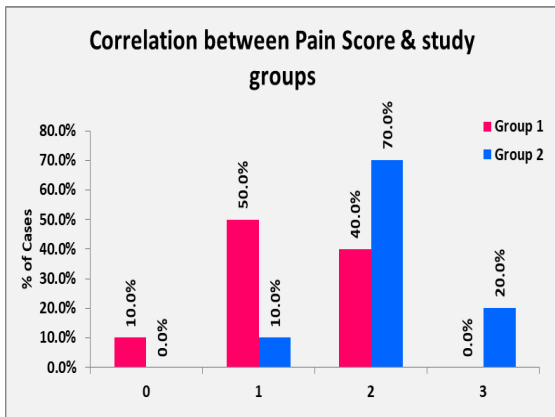


Figure 3: Bar diagram showing correlation of pain score between the two groups.

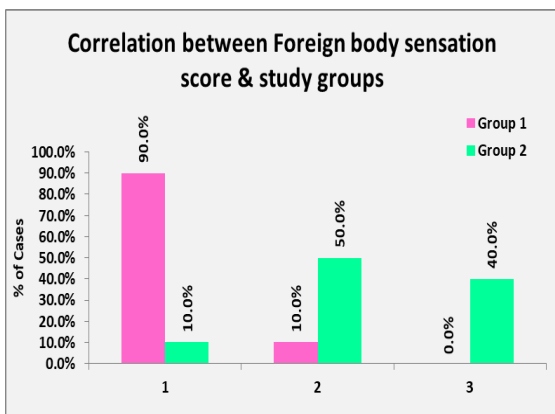
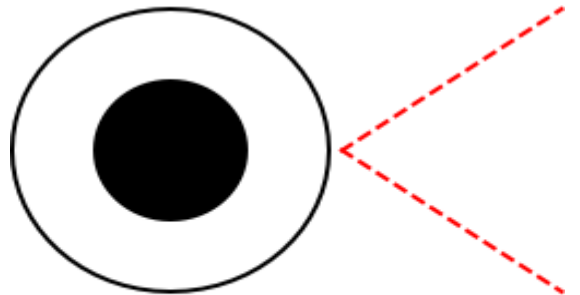
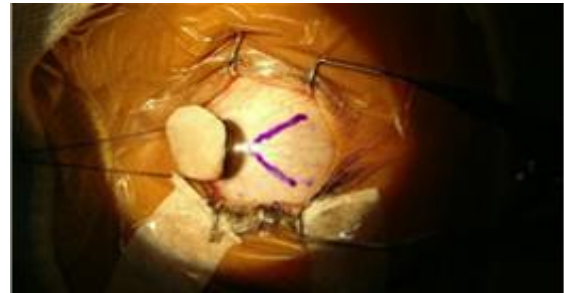
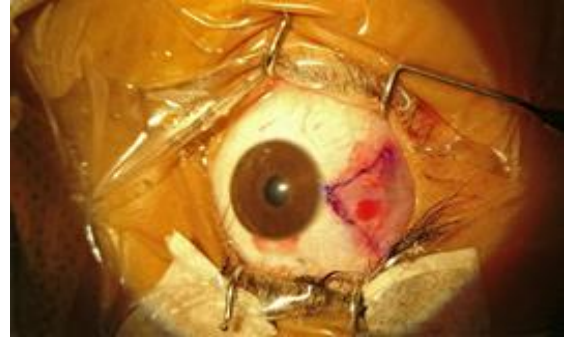
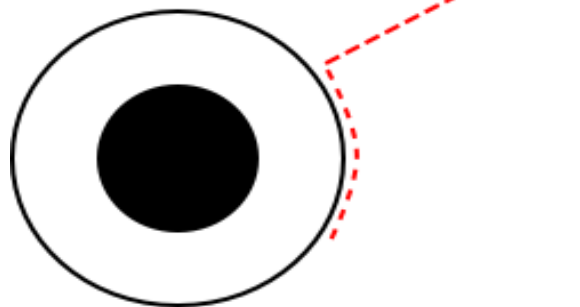


Figure 4: Bar diagram showing correlation of foreign body sensation score between the two group.



Group 2



Group 1

DISCUSSION

The present study compared the conventional limbal incision with limbal sparing limbal incision (LSLI) while performing horizontal strabismus surgeries. The overall sample consisted of young patients only i.e. age between 10 to 25 years. This eliminated the

possibility of variability in results due to different surgical responses in small children and older patients. In this study we compared various subjective parameters like pain, redness, foreign body sensation, etc and objective parameters like gaping, conjunctival retraction / coiling, chemosis, suture granuloma, corneal abrasion, etc, between the two groups. In our study, two variables i.e. pain and foreign body sensation scores were found to be significantly more in patients who underwent LSLI. This could be attributed to more number of sutures applied in this technique as compared to simple limbal incision technique. Other problems such as conjunctival gaping, retraction/ coiling and need for resuturing were only seen in LSLI group and not even in a single patient in limbal incision group. However, this observation was not statistically significant. This may be related to triangular shape of the conjunctival flap where one suture has to be applied at the apex near limbus where conjunctiva usually tends to retract back or recoil upon itself.

The limbal incision is probably the easiest to perform and most versatile of the various techniques. Wide exposure of the muscle and adjacent sclera, excision of conjunctival scar tissue causing restrictive strabismus, debulking of anterior tenon's capsule, facilitating reoperations in which previous scarring has disrupted the normal anatomical planes, and in elderly patients where there is loss of conjunctival elasticity; remain its major advantages.^[5,6] However, it is also associated with a few drawbacks like dellen formation, post op discomfort and a possible loss of stem cells at the limbus and a disturbance of the perilimbal vasculature. Other disadvantages include higher risk of conjunctival scarring within palpebral fissure, interference with possible future trabeculectomy and difficulty in post-operative adjustment because of incision being far from the muscle insertion.^[1,7,8] In our study, one patient from the limbal incision group developed dellen formation in his operated eye but none from the other group. This observation was statistically not significant. To the best of our knowledge, there have been no large scale studies which have independently related limbal incision with dellen formation. In our study, this observation may be considered as a chance finding.

Agrawal et al compared limbal (von Noorden) and paralimbal (Santiago) conjunctival incisions for adjustable recessions of horizontal recti. The incisions were studied on the subjective (pain) and objective (hyperaemia, chemosis, discharge and gap in incision) variables at follow ups of 1st day post adjustment, 2 weeks and 12 weeks. A statistically significant favorable response to limbal incision) in observations was noted at 12 weeks for all study variables (pain, hyperaemia, chemosis & discharge) except gap in incision.^[9]

The fornix incisions of Park are also popular for better cosmesis as they are away from limbus but they are a bit difficult to master due to limited view and require a well-trained assistant. Also fornix incision requires a certain degree of conjunctival elasticity for proper visualisation of muscle insertion, so has a limited role in old patients.^[3]

All the techniques have their own merits and demerits. Ultimately, the choice of conjunctival incision varies from surgeon to surgeon and the procedure to be done, whether simple recessions / resections, adjustable surgeries or re-operations.

Summary

The present study on a new modification of limbal incision, Limbus Sparing Limbal Incision (LSLI), was done keeping in view the possible damage to perilimbal tissue and a possible damage to stem cells with the conventional limbal incision. Clinically speaking, there is a definite reduction in the damage to the perilimbal tissue and a further possible damage to stem cells as this incision spares the limbal area. It also offers most of the advantages of a conventional limbal incision. But overall, the comfort of the patient and post op healing was not as good and early as the conventional limbal incision.

We can say that this new modification of the limbal incision has not much of an advantage over the conventional limbal incision.

CONCLUSION

We recommend the conventional limbal incision technique over the newer limbal sparing limbal incision technique (LSLI) for horizontal muscle surgeries. However, large scale studies are needed which can compare the two techniques in terms of outcomes, complication rates, and patient satisfaction.

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