

Dynamic temporalis muscle transfer revisited – a Technique for correction of lagophthalmos in leprosy patients

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Abstract

Background: Leprosy is the most common cause of facial paralysis in India. Lagophthalmos is its most common manifestation. The temporalis muscle transfer ensured a good functional eyelid closure thus preventing corneal exposure and progression to impairment of visual acuity. **Patients and Methods:** 20 patients of leprosy who presented with lagophthalmos were included in the study. All cases underwent dynamic temporalis myofascial sling transfer for correction of lagophthalmos. Change in appearance of the eye and function of the eyelids was assessed post operatively.

Results: All cases underwent dynamic temporalis myofascial sling transfer for correction of lagophthalmos. Temporalis Muscle transfer for bilateral cases were done in the same sitting. Anderson's modification of Gillies procedure was done in 13 cases and Johnson's operation was done in 7 cases. Mean lid gap reduced to 9.09 mm in straight gaze, 1.59 mm in gentle closure and 0.5 mm in tight closure. **Conclusion:** The temporalis muscle transfer ensured a good functional eyelid closure thus preventing corneal exposure and progression to impairment of visual acuity.

Keywords: Leprosy, Lagophthalmos, Temporalis Muscle Transfer.

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INTRODUCTION

Leprosy/Hansen's disease is a chronic infectious disease caused by *Mycobacterium Leprae*. It affects mainly the peripheral nerves. It is the most common cause of facial paralysis in India. Lagophthalmos is its most common manifestation. Lagophthalmos is inability of voluntary closure of the eyelids. It has an incidence of approximately < 0.1 leprosy patients¹. Involvement of zygomatic branch of facial nerve may be partial or complete; unilateral or bilateral. Paralysis of frontalis and Orbicularis oculi- which are innervated by zygomatic

branch of facial nerve, leads to lagophthalmos. It leads to the following problems to the eyes –

1. Eye is more prone to injury by foreign body, dust, smoke, which leads to conjunctivitis and keratitis.
2. Inadequate blinking and eversion of lower lids may lead to malposition of lacrimal puncta and subsequent epiphora and lacrimal duct stenosis.
3. Exposure keratitis, corneal ulcer, perforation and blindness.
4. Cosmetic disfigurement.

Though leprosy is cured by multiple drug regimen, surgery is required for correction of remaining stigmata of disease like lagophthalmos. Lagophthalmos is common and may often need urgent treatment to prevent impairment of vision secondary to exposure keratitis. Though there are several options, as a dynamic procedure, Temporalis myofascial slingoperation has many advantages over others. Use of Temporalis myofascial transfer to the eyelids to augment lid closure is an age old operation. With time several modifications have been added as some cases ended up with unfavorable results. Present study proposes to evaluate few modifications of temporalis muscle transfer to assess

the functional and aesthetic outcome of the patient suffering from lagophthalmos. 20 patients with lagophthalmos were operated in this technique and followed up to assess its usefulness and drawbacks. Patients were assessed based on parameters like symmetry of eyes, opening of eyes, lid gap, epiphora, etc both pre and post operatively.

METHODS

After the approval of The Ethical Committee, the patients were explained in detail about the whole procedure and study methods and informed consent was taken. Pre-operative investigations as per protocol were done. This study included 20 lagophthalmos patients who were operated with a minimum follow-up period of 6 months. Of the twenty cases studied, 12(60%) were male and 8(40%) were female. A total of 18 cases were suffering from unilateral lagophthalmos and only two presented with bilateral lagophthalmos. In this study, cases of blindness and dacryocystitis were excluded. Along with lagophthalmos, exposure keratitis was found in 36 % cases. More than 68 % cases presented with epiphora and about 54% with loss of corneal sensation. Patients were assessed regarding post operative results on the basis of vertical lid gap on gentle eye closure with chewing and were categorized as –

- Excellent - zero lid gap.
- Good - 1-2 mm lid gap
- Fair - 3-5 mm lid gap
- Unsatisfactory - more than 5mm lid gap.

Most of the patients were cooperative and motivated. All cases underwent dynamic temporalis myofascial sling transfer for correction of lagophthalmos. TMT transfer for bilateral cases were done in the same sitting. Anderson's modification of Gillies procedure was done in 13 cases and Johnson's operation was done in 7 cases.

Surgical Procedure: Techniques of dynamic temporalis muscle transfer used in this study were – A- Gillies procedure, B- Johnson's procedure

Anderson's modification of Gillies technique

Operation procedure: **A. Anaesthesia:** General or local anaesthesia.

B. Shaving: Temporal area of scalp is shaved, though it is not mandatory.

C. Position: Supine, with head rotated slightly towards the opposite side.

D. Infiltration: Infiltration of 2% Xylocaine with adrenaline(4cc diluted to 15 cc) to the temporal area of scalp and proposed sites of incision on outer margin of orbit, upper and lower eye lids, lateral wall of nose will

provide haemostasis and relatively avascular dissection. Infiltration of N-saline is equally effective.

E. Incision: Various types, preauricular straight, sickle shaped, s- shaped are in practice. All of the incisions should expose the area from zygomatic arch below to superior temporal line above^{1,2,3}

F. Dissection: after making the incision, the dissection is carried up to the deep temporal fascia (fascia covering temporalis muscle), which can be identified by its shiny tough texture.

G. Isolation of the fascial strip: Two vertical parallel incisions are made over temporal fascia, about 1 cm apart, distally extending up to zygomatic arch and superiorly about 5mm short of the area where the fascia blends with pericranium. A third incision, transversely made near zygomatic arch, connecting these two and a tongue shaped flap is raised with the base superiorly placed. The flap is dissected off the temporalis muscle starting inferiorly proceeding superiorly and ending about 1.5 cm short of the superior margin.

H. Isolation of muscle: Two vertical slightly diverging incisions are made 2cm apart, beginning at the superior margin of the muscle where it just blends with the pericranium, and proceeding distally towards zygomatic arch. With the help of periosteum elevator the muscle segment is elevated from the skull, remaining attached with the fascial strip superiorly and having its neurovascular pedicle coming from distal aspect.

I. Tunneling: incision (1.5-2cm) is placed on the lateral rim of the orbit and a tunnel is made from the preauricular incision and the myofascial unit is brought out through it. The width of the tunnel should be adequate enough so that the muscle tendon unit plays through it comfortably.

J. Dissection over medial canthus: The 5th incision made longitudinally (1.5cm) over the lateral wall of nose was developed and the medial canthal ligament was dissected K.

Adjustment of tension: With the help of the hemostats traction is applied to the fascial strips with both the strips are in apposition. The amount of tension should be such that the upper lid overlaps the lower lid by about 2 mm.

Postoperative: The patient is put on liquid diet for 3 weeks. Stitches were removed on 7th postoperative day. After 21th postoperative day the patient is allowed to have semisolid diet and 6 weeks post operative- normal diet is advised.

Physiotherapy: 3 weeks after the operation the patient is asked to perform exercise that is closure of eye and clinching the teeth together.

RESULTS AND ANALYSIS

Table 1: Demographic and clinical profiles of 20 patients

	Male	Female	Total
Patients	12	8	20
Age (median - in yrs)	35	42.5	36
Duration of lagophthalmos (mean in yrs)	2.54	4.25	3.22
Bilateral lagophthalmos	1	1	2
Unilateral lagophthalmos	11	7	18

To begin with, 23 cases were considered for present study. Two cases had chronic dacryocystitis and one case was blind. These cases were excluded from this study as per the exclusion criteria. Remaining twenty cases were taken for study. Of these twenty cases, 12 were male and 8 were female. The median age of male cases was 35 yrs and that of female cases was 42.5 yrs. Overall median age

was 36 yrs. Median of age was taken as the no. of cases was small so median was a better indicator. The mean duration of lagophthalmos is 2.54 yrs in male and 4.25 yrs in female candidates. Mean duration in all cases was 3.22 yrs. Eleven male and seven female cases had unilateral lagophthalmos. Bilateral lagophthalmos was found in a single male and female each.

Table 2: Mean lid gap (in mm) during gentle and forced closure at pre operative, post operative and follow up

	Pre operative	Post operative	Follow up 3 months	Follow up 6 months
Vertical interpalpebral gap (during straight gaze)	12	9.86	9.18	9.09
Gentle closure	7.81	2.54	1.90	1.59
Forced closure	4.13	0.9	0.5	0.5

In the eye with lagophthalmos, mean lid gap (in mm) during straight gaze at pre op time was 12mm, 9.8 mm at post op time and 9.1mm at 3 mth and 9.0 mm at 6 mth follow up period. Mean lid gap in gentle closure was found to be 7.8 mm at pre op time, 2.54 mm at post op

time at 3 wks, 1.9mm at 3 mth and 1.59mm at 6 mth follow up period. Mean lid gap in forced closure of eyes was 4.13mm in pre op period, 0.9 mm at 3 wks post op and 0.5 mm in both 3 and 6 mth post op follow up period.

Table 3: Distribution of TMT results according to functional and aesthetic criteria

Results	Total of eyes	%
Excellent	16	72.72
Good	4	18.18
Fair	1	4.54
Unsatisfactory	1	4.54

Considering the level of patient satisfaction after TMT operation, criteria like cornea protection during sleep and symmetry of both palpebral fissures were taken into account. About 16 (72%) patients reported excellent results with complete eyelid closure with chewing. Good result with eyelid closure (within 1-2mm) with chewing was found in 4(18%) cases and fair result with incomplete eyelid closure with chewing and compromised corneal protection was found in single (4.54%) case.

DISCUSSION

The prevalence of lagophthalmos in leprosy patients varies considerably among populations, primarily as a result of life expectancy, previous leprosy control efforts and composition of population under study. It has an incidence of approximately < 0.1%. All the patients in this study had received complete MDT treatment. Patients with lagophthalmos suffer from a loss of blink reflex/response in the affected eye, leaving the eye vulnerable to a host of insults. Partial or complete paralysis of the orbicularis oris muscle, disruption of the lacrimal pump and tear flow, upper lid retraction and the unopposed pull of gravity on the lower lid contribute to

corneal exposure, an increased risk of exposure keratitis, corneal ulceration, loss of vision and disfigurement. Management of eyelid closure in these patients must therefore focus on restoration of the effects of the blink reflex/response, preventing exposure and dryness of eye. Temporalis Muscle Transfer for paralytic lagophthalmos, which was first proposed by **Gillies, H (1934)**⁴ and later developed by **Deutinger et al (1991)**⁵ and by **Andersen (1961)**⁶ has been one of the most common treatment modalities for paralytic lagophthalmos. In this study, the median age of male cases was 35 yrs and that of female cases was 42.5 yrs. Overall median age was 36 yrs. Median of age was taken as the no. of cases was small so median was a better indicator. **P. Das et al. (2011)**⁷ who found mean age in male cases as 39.2 yrs and in female cases as 33.4 yrs. The mean age in that study was 38.6 yrs. All cases underwent dynamic temporalis myofascial sling transfer for correction of lagophthalmos. TMT transfer for bilateral cases were done in the same sitting Anderson's modification of Gillies procedure was done in 13 cases and Johnson's operation was done in 7 cases. In a study by **P. Das et al (2011)**⁷, all 69 cases underwent Johnson's operation. Gillies technique was followed by

R. Baccarelli et al (1995)⁸ in 34 patients. In the study by **Qian J. et al (2000)**⁹, sixty-five eyes were corrected with Johnson's procedure (Johnson's TMT group) and 62 with the modified TMT procedure (modified TMT group). In our study, in the eye with lagophthalmos, mean lid gap (in mm) during straight gaze at pre op time was 12mm, 9.8 mm at post op time and 9.1mm at 3 mth and 9.0 mm at 6 mth follow up period. Our findings are in accordance with **P. Das et al (2011)**⁷ whose study found mean lid gap to be 12.6mm in pre op period, 9.8 mm at 3 wks post op and 9.9 mm in both 3 and 6 mth post op follow up period. In our study, mean lid gap in gentle closure was found to be 7.8 mm at pre op time, 2.54 mm at post op time at 3 wks., 1.9mm at 3 mth. and 1.59mm at 6 mth. follow up period. Our findings are in accordance with **P. Das et al (2011)**⁷ whose study found mean lid gap to be 7.9mm in preop period, 2.4 mm. at 3 wks. postop and 2.8 mm in both 3 and 6 mth. postop follow up period. Mean lid gap in forced closure of eyes was 4.13mm in pre op period, 0.9 Mean lid gap in forced closure of eyes was 4.13mm in pre op period, 0.9 mm at 3 wks postop and 0.5 mm. in both 3 and 6 mth. postop follow up period. Our findings are in accordance with **P. Das et al (2011)**⁷ whose study found mean lid gap to be 4.8mm in pre op period, 0.2 mm at 3 wks post op and 0.3 mm in both 3 and 6 mth post op follow up period. In the study by **Qian J. et al (2000)**⁹, In Johnson's TMT group, the mean lid gap on light closure was reduced to 3.1 mm postoperatively from 7.7 mm preoperatively; and the mean lid gap on tight closure was reduced to 0.5 mm postoperatively from 6.1 mm preoperatively%. In the modified TMT group, the mean lid gap on light closure was reduced to 3.3 mm postoperatively from 7.5 mm preoperatively; and the mean lid gap on tight closure was reduced to 0.6 mm. postoperatively from 6.3 mm preoperatively. Good result with eyelid closure with moderate effort and fair result with incomplete eyelid closure with moderate effort and corneal protection was found in 27.2% cases each. In the study by **R. Baccarelli et al (1995)**¹⁰, from the 51 surgically treated eyes the functional result was excellent in 19 (37,26%) eyes , good in 15 (29,41%) eyes , fair in 15(29,41%) eyes and unsatisfactory in 2 (3,92 %) eyes. **Soares D. et al (1997)**¹¹ achieved a 77.26% success in complete lid closure after TMT transfer. This achievement rate is quite close to the analysis by **Miyamoto S. et al, (2009)**¹² who found it to be 78.7 %. Other studies like **TLM Naini (2011)** found an appreciable 85% lid closure rate. Other earlier studies **Soares D and Chew M, (60%)**¹¹ and **Ranney and Furness (57%)**¹³ had lesser success rates. A total of 72.72% patients reported excellent results with complete eyelid closure on gentle effort with chewing. Good result

with eyelid closure (within 1-2 mm) on gentle effort was found in 18% cases. The temporalis muscle transfer ensured a good functional eyelid closure thus preventing corneal exposure and progression to impairment of visual acuity.

CONCLUSION

For correction of lagophthalmos, temporalis myofascial sling operation is a very effective dynamic procedure. The temporalis muscle transfer ensured a good functional eyelid closure thus preventing corneal exposure and progression to impairment of visual acuity. It gave a satisfactory aesthetic appearance to the eye.

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