Blepharoptosis Repaired by Frontalis-orbicularis Oculi Flap: A New Technique

Keerapat Bhiromekraibhak MD*

** Plastic and Reconstructive Division, Department of Surgery, Faculty of Medicine, Panyananthaphikkhu Chonprathan Medical Center, Srinakharinwirot University, Nonthaburi, Thailand*

***Background**: The treatment of blepharoptosis depends on the degree of ptosis and the function of the levator muscle. In cases of severe blepharoptosis, however, the levator muscle is essentially nonfunctional, thus frontal sling procedure, a static correction method, is usually performed. Recently the orbicularis oculi flap has become popular but lagopthalmos is still a bothersome problem. A new technique has been introduced in order to reduce the lagopthalmos.*

***Material and Method**: Our technique is modified from a technique using double breast frontalis-orbicularis oculi muscle flap. The technique enhances mobility and amount of the pretarsal orbicularis oculi muscle and is devoid of vertical cutting of the flap and orbital septum involvement.*

***Results**: The technique was performed in 8 patients (12 lids) between 2007 and 2008. All patients were congenital and had severe ptosis. All of them were able to close their eyelids completely by 2 weeks. There was no complication in the series.*

***Conclusion**: This novel technique yields an excellent result in cases of severe blepharoptosis. The technique is superior to the technique using frontalis muscle flap because there is only one incision, no forehead depression and no neurovascular injury. In addition, this technique also reduced period of lagopthalmos compared with the original technique.*

***Keywords**: blepharoptosis, lagopthalmos, frontalis and orbicularis oculi*

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Congenital ptosis is often characterized by underdevelopment of the levator palpebrae superioris muscle. In these cases, a detailed patient interview usually reveals a chronic history of ptosis associated with the clinical pictures of lagophthalmos and lid lag on downward gaze. Prior to surgical intervention, it is imperative to make an accurate diagnosis regarding the etiology of the ptotic eye lid. Although several procedures have been proposed for the correction of this form of ptosis, the generally accepted procedure of choice is the frontalis sling[1,2].

Crawford indicated that in small children younger than 3 years of age, there is difficulty in harvesting this material because the leg is too short, and insufficient amounts of fascia lata are obtained[3,4]. For these reasons he proposed that banked fascia lata could be a possible alternative. Wagner et al[5] and Wasserman et al[6] reported a recurrent ptosis rate of 8.3% and 51.4% using banked fascia lata, respectively. In a study by Wilson and Johnson[7], the frontalis suspensions failure using banked fascia lata increased as the length of follow-up increased, reducing the success rate of surgery from 90% at 2 to 3 years to 50% at 9 years after surgery.

However, Frontalis muscle suspension needed a lot of materials and also had some problems, which were unnatural shape of eyelids after operation, needed donor site, and had a possibility of recurrence of blepharoptosis owing to the fascia was stretched or partly resorbed. Recently, a new technique has been introduced in which an orbicularis oculi muscle flap is used to correct blepharoptosis in patients with poor or without levator function[8]. The authors has made the patients' result of ptosis repair be dynamic. In this technique, the patients are able to move their eyelids with the help of a superior orbicularis oculi muscle-based flap that is continuous with the orbital septum and the frontalis muscle (Fig. 1). The technique using the adjunct orbital septum entails a risk of perforation into conjunctiva and the orbicularis oculi muscle cannot

Correspondence to: Bhiromekraibhak K, Plastic and Reconstructive Division, Department of Surgery, Faculty of Medicine, Panyananthaphikkhu Chonprathan Medical Center, Srinakharinwirot University, Nonthaburi 11120, Thailand. Phone: 0-2962-5737, Fax: 0-2583-8398

move freely. Further modification by Borman et al[9] comprised double breast orbicularis oculi flap which was modified form superiorly based rectangular orbicularis oculi muscle flap[10].

Our technique used the upper muscle flap tunneled under the lower flap and sutured to the tarsus which based on Borman's technique but without cutting the upper flap, merely adjusted the flap to fit the tarsus, and no orbital septum involvement which results in better mobilization of orbicularis oculi.

Material and Method

All patients who were clinically diagnosed as congenital blepharoptosis and underwent frontalis-orbicularis oculi flap procedures at Panyananthaphikkhu Chonprathan Medical Center, Nonthaburi between 2007 and 2008 were reviewed. There were 8 consecutive patients and twelve eyelid operations; 4 were bilateral and the remaining was unilateral.

Measure of the eyelid excursion of ptosis was the same as previously described in the literature: placing ruler over the lid by a hand and gauging the amount of elevation of the affected lid by another one while the eye was navigated to look up and compared to its position when it looks down[11]. The affected eyebrow was immobilized at the time of measurement. The distance between 0-5, 6-10 and 11-15 millimeters is considered as severe, moderate and mild cases, respectively. Complete ophthalmologic examination was undertaken in all patients.

Although the hospital has yet appointed ethical committee, this project in which it constitutes a less invasive, minimally modified technique had been discussed within the department and has been ultimately approved by Chief of the Department and Rector of the Institution prior to conduct the study. In addition, all patients had been informed regarding the advantage and disadvantage of this procedure before the operation.

Surgical Technique

The operation is performed under local anesthesia in cooperative children and under general anesthesia in young patients. The skin incision is made at the upper eyelid crease in cases of bilateral blepharoptosis and at the level identical to the contralateral normal side in cases of unilateral blepharoptosis. The incision for creation of upper and lower flap is made at orbicularis oculi muscle at the level above the upper border of the tarsus just enough to correct the abnormal level of the affected side (Fig. 2). The upper flap is severed from

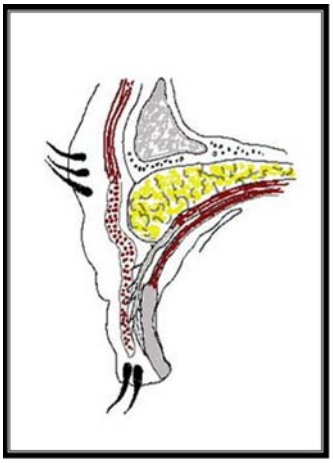

Fig. 1 Schematic drawing of an anatomy shows frontalis muscle and its fascia joined to the orbicularis oculi muscle at the level of eyebrow.

orbital septum and subcutaneous tissue with Metzenbaum scissor until the frontalis muscle at the level of eyebrow is reached without cutting the upper flap. The upper flap is then sutured to the upper border of tarsal plate with 6-0 nylon as the length of approximation equal to the distance of tarsal width. The desired level of upper eyelid is made and equal to level of the upper border of limbus because the subside of post-operative swelling of the eyelid usually results in a further drop of the upper eyelid approximately 1 millimeter. The excess muscle is removed. The lower flap is left in place without suturing to the upper flap, thereby allowing for free mobilization and more natural function of the eyelids. Skin to tarsus to skin suture is accomplished with interrupted 6-0 Nylon (Fig. 3,4).

Results

Eight patients consisted of 5 males and 3 females with average age of 6.9 ± 4.45 years (range, 1 to 16 years). All of them experienced severe blepharoptosis in which the measure of excursion of the levator muscle in the patients revealed distance from zero to 5 millimeters.

The operation was considered as successful or satisfactory when all of the following had been achieved:

1) There was complete closure of eyelids.

2) Absence of significant difference of the level between eyelids.

3) The upper eyelid can sit at 1-2 mm below the upper border of the ipsilateral limbus.

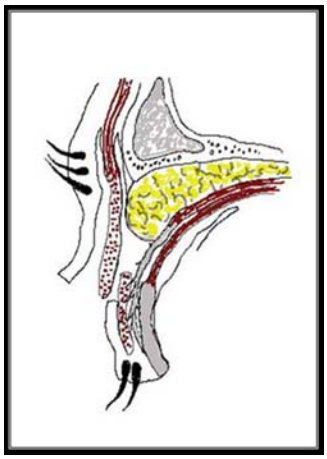

Fig. 2 Schematic drawing shows upper flap dissected beyond the eyebrow level. The upper and lower flap is divided at a level superior to upper border of tarsus which is equal to a level adjusted for raising the lid

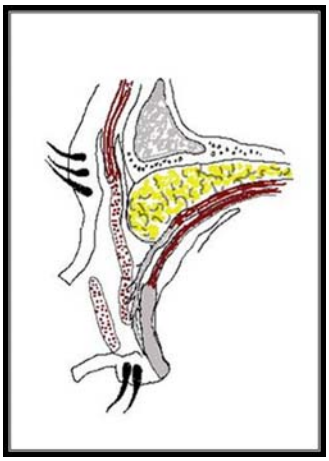

Fig. 3 Schematic drawing shows the upper flap fixed to the tarsus and the lower flap is left in place.

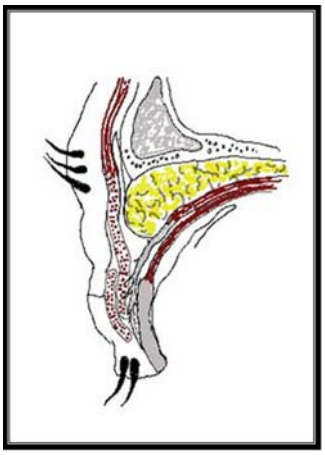

Fig. 4 Schematic drawing shows the relation of the upper and lower flap at the end of the procedure.

4) There was no distortion.

All patients in the present study could reach the above criteria. The follow-up time averaged 3 months (ranging, 2 to 6 months). Post-operatively, half of patients (4/8) had complete closure of eyelids by 1 week, whereas the remaining patients achieved complete closure of eyelids by 2 weeks. There was no corneal erosion nor hematoma nor asymmetry in the study (Fig. 5-7).

Discussion

Although there are numerous techniques for correction of blepharoptosis, in a severe case the generally accepted procedure of choice is the frontalis sling[1,2,12]. Even so, it is quite difficult to achieve an acceptable result in the case of severe blepharoptosis since the direction of traction in this method is anatomically different from that of levator resection. Some exploited levator plication and levator resection under minimal skin incision proposed in severe cases, others mentioned the use of selective superior musclebased flaps using frontalis muscle to repair severe eyelid ptosis with satisfaction[13,14]. Limitations exist in both techniques since they are successfully used in selective cases. In addition, a technique using frontalis muscle for direct transplantation has been proposed to cope with patients with severe eyelid ptosis and for those with previously failed surgery[15,16]. Notwithstanding, frontalis muscle advancement may not reach the tarsal plate easily in the technique and its shortcomings include unnatural appearance, lagophthalmos, long distance from the frontalis muscle to the tarsal plate and injury to the supraorbital neurovascular bundle[17-19].

In frontal sling procedure, a static correction method, the eyelid is surgically attached to the frontal muscle at the desired height using autologous, heterologous or alloplastic materials[20-25]. However, this technique carries some disadvantages, for example, presence of donor site morbidity secondary to autogenous fascia lata collection, long period of lagophthalmos, upward gaze-related ptosis in the affected eyelid, a risk of lifting away of eyelid by upward gaze due to the incorrect direction of muscle sling, great risks of extru-

Fig. 5 Series of a patient's chronological photographs. A) A 14 year-old girl presented with severe congenital blepharoptosis at right side, B) An intraoperative view, C and D. Post-operative appearance at 1 week.

Fig. 6 A 3 year-old girl with bilateral congenital blepharoptosis. A) Preoperative appearance shows severe degree of blepharoptosis, B) Immediate postoperative appearance, C) Appearance at 1 week postoperatively, D) Appearance at 1 month postoperatively.

Fig.7 A 16 year-old boy with congenital blepharoptosis at right side. A) Preoperative appearance reveals severe blepharoptosis, B and C) Appearance at 1 week post-operatively show nearly complete closure of eyelid.

sion with artificial materials, presence of granuloma and infection, looseness at the site of the frontalis muscle and recurrence of ptosis[12,26,27].

Later development of superior muscle-based flap technique by Borman et al, a modified Tsai technique, is the use of orbicularis oculi muscle in preference to frontalis muscle which offers several advantages over the conventional frontalis muscle-based flap. The advantages consist of single incision on the supratarsal fold, the preservation of frontalis muscle function, no depression on the forehead, no risk of neurovascular injury and relatively easy technique with less complication. The disadvantage of the technique is the cutting of orbicularis oculi muscle and orbital septum which may interfere with the blood supplies and function of orbicularis oculi muscle. Also, the septum dissections contain a risk of perforation. The fixation of the upper and lower flap probably might cause a limitation of the orbicularis oculi muscle movement. However, lagopthalmos, which is still one of the most concerned postoperative index for considering universally accepted technique for the treatment of severe ptosis, which usually lasts 3-6 months in this technique postoperatively[9,10].

In this paper all patients had severe ptosis at the affected side. Our technique is a modified superior muscle-based flap technique which is devoid of vertical cutting of the orbicularis oculi muscle and fixation of the lower flap. Therefore it was able to move freely and separated the upper flap from the orbital septum so that there was less chance of perforation. The results were excellent compared with other superior muscle-based flap technique in which there was complete closure of eyelid in less than two weeks. There was neither recurrence nor complications after the 3 month-period of follow-up in the study.

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การผ่าตัดรักษาภาวะหนังตาตกโดยใช้กล้ามเนื้อสำหรับยกคิ้วร่วมกับกล้ามเนื้อสำหรับหลับตา: วิธีใหม่

กีรพรรดิ ภิรมย์ไกรภักดิ์

ภูมิหลัง*: การเลือกวิธีการรักษาภาวะหนังตาตกขึ้นอยู่กับ ระดับของความหย่อน และระดับการทำงานของกล้ามเนื้อ levetor palpebrae ในโรคระดับรุนแรงมากซึ่งจะพบว่า ไม่มีการทำงานของกล้ามเนื้อ levetor การรักษามักจะเลือกใช้วิธี frontalis sling ในระยะหลังพบว่าการใช้กล้ามเนื้อ orbicularis oculi มาใช้รักษาเริ่มเป็นที่นิยม แต่ก็ยังมีปัญหาหลับตา ไม่สนิทตามมาอยู่ การรักษาในระยะต่อมาจึงมีจุดมุ่งหมายเพื่อลดปัญหาการหลับตาไม่สนิท*

วัสดุและวิธีการ*: เทคนิคการผ่าตัดนี้ดัดแปลงมาจากวิธีการผ่าตัดของ Borman และคณะซึ่งใช้กล้ามเนื้อ orbicularis oculi วิธีที่เรานำเสนอมีการเพิ่มการทำงานและปริมาณของกล้ามเนื้อ orbicularis oculi ส่วนล่างหน้าต่อ tarsus ไม่มีการตัดกล้ามเนื้อในแนวตั้งซึ่งอาจรบกวนระบบไหลเวียนเลือด และเลาะกล้ามเนื้อแยกจาก orbital septum ซึ่งอาจมีความเสี่ยงต่อการทะลุ*

ผลการศึกษา*: การศึกษาได้ทำในผู้ป่วยหนังตาตกทั้งหมด 8 คน จำนวน 12 ข้าง ระหว่างปีพ.ศ.2550-2551 ผู้ป่วยทั้งหมดเป็นแต่กำเนิด และระดับรุนแรงมาก พบว่าได้ผลดี สามารถหลับตาได้สนิทในสองสัปดาห์แรก ไม่มีภาวะแทรกซ้อนหลังผ่าตัด*

สรุป*: วิธีการผ่าตัดที่นำเสนอพบว่าสามารถได้ผลการรักษาที่ดีในผู้ป่วยหนังตาตกในระดับความรุนแรงสูง มีข้อได้เปรียบกว่าการใช้กล้ามเนื้อ frontalis อย่างเดียวคือ มีแผลผ่าตัดเดียว ใช้เนื้อเยื่อในบริเวณผ่าตัด ไม่มีรอยบุ๋มที่หน้าผาก ไม่มีความเสี่ยงต่อการบาดเจ็บของระบบเส้นเลือดและประสาท ทำได้ง่าย และลดระยะเวลาของการ หลับตาไม่สนิทหลังผ่าตัดหากเทียบกับวิธีผ่าตัดวิธีเดิมโดยใช้กล้ามเนื้อ orbicularis oculi*