

Repair of 50–75% full-thickness lower eyelid defects: Lateral stabilization as a guiding principle

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Introduction: Repair of large defects of the lower eyelid can be difficult. A common procedure performed to address these defects is a Hughes flap. This procedure has a number of disadvantages: The eye is closed postoperatively, a second stage is required, and the edge of the flap is often erythematous. The purpose of this paper is to describe a one-stage procedure for the repair of large full-thickness defects of the lower lid as an alternative to a Hughes flap. **Materials and Methods:** This is a retrospective study of patients who underwent the described procedure. The procedure employs lateral stabilization of the posterior lamella with a periosteal strip, medial transposition of the lateral posterior lamella for central and medial defects, and a myocutaneous advancement flap to stabilize the anterior lamella. **Results:** A total of 38 patients underwent the procedure to reconstruct full-thickness defects of the lower lid ranging from 50% to 75%. All patients underwent previous Mohs excision of a skin cancer. The average follow-up was 5.6 months. Eleven patients (29%) had postoperative sequelae, but only two patients (5%) required additional treatment. **Conclusion:** Lateral stabilization with a periosteal strip and myocutaneous advancement flap is an excellent one-step procedure that avoids many of the complications seen with the Hughes procedure and is comparable to other techniques used for the reconstruction of subtotal, full-thickness lower lid defects.

Key words: Eyelid reconstruction, full-thickness eyelid defect, lower eyelid defect

Multiple surgical techniques exist for the repair of lower eyelid defects.^[1–25] The approach to reconstruction varies depending on the size, location, and thickness of the defect. General teaching for full-thickness defects suggests direct closure can be appropriate for wounds less than one-third of the horizontal length of the eyelid. Larger defects often require rotational flaps, shared flaps, free grafts, or a combination of these techniques.^[3,15] All of the surgical options abide by the basic principles of maintaining an adequate blood supply to the tissue, maximizing horizontal tension, minimizing downward vertical tension, and maintaining anatomical canthal fixation.

Repair of full-thickness defects >50% of the horizontal length of the lower eyelid can be more complex. A common procedure performed to address a large, full-thickness defect is a tarsoconjunctival flap (Hughes procedure).^[8] Although this procedure is reliable, it has a number of disadvantages: The eye is closed postoperatively for at least 2 weeks; a second stage is required; there is a loss of eyelashes in the area of the flap; and the edge of the flap can be persistently erythematous.^[1,7,11]

The purpose of this study is to describe a one-stage procedure for the repair of large full-thickness defects of the lower lid which involve 50–75% of the horizontal length of the eyelid. The procedure employs lateral stabilization of the posterior lamella with a periosteal strip, medial transposition

of the lateral posterior lamella for central and medial defects, and a myocutaneous advancement flap to stabilize the anterior lamella. For defects ≥66% of the lower lid, a free tarsal graft is often necessary in addition to the periosteal strip to complete posterior lamellar reconstruction. The purpose of horizontal tarsal transposition for medial and central defects is to “shift the defect laterally,” which maintains medial lashes and utilizes the strength of the periosteal strip for lateral stabilization.

Materials and Methods

Patients were identified who underwent the described procedure below from the practice of one of the authors. This retrospective study was approved by the author’s Institutional Review Board and is HIPAA compliant. Charts of all patients undergoing lower eyelid reconstruction using this procedure between 2009 and 2013 were reviewed. The operating surgeon judged the preoperative size of the defect to be 50%, 66%, or 75%. Charts were reviewed for patient demographics; indication for surgery; defect size, type, and location; follow-up interval; complications; and need for further surgery. Charts with <4 months follow-up were excluded from this study.

Description of procedure

Patients underwent the following procedures after having the operative area (s) anesthetized with 1% lidocaine with 0.5%

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bupivacaine and 1:100,000 epinephrine and prepped sterilely: For lateral defects, a subciliary incision was made extending from the medial edge of the defect medially to the level of the punctum. Dissection was then performed between the orbicularis muscle and orbital septum to the inferior orbital rim. This dissection included the area inferior to the defect. The lateral orbital rim was exposed, and a periosteal strip was raised and reflected medially. If the periosteal strip was able to reach the lateral edge of the remaining medial posterior lamella, then it was sutured to the posterior lamella with a 5-0 Vicryl suture in a mattress fashion, with the edge of the periosteal strip anterior to the posterior lamella. If the periosteal strip was unable to reach the posterior lamella, the gap was measured, and a free tarsal graft from the contralateral upper lid was harvested and placed in the gap and sutured into position with 5-0 Vicryl suture to the posterior lamella and periosteal strip. This completed reconstruction of the posterior lamella [Supplementary Digital Content, Video 1].

For medial defects involving the lacrimal system, a subciliary incision was made extending from the lateral edge of the defect to the lateral canthus [Fig. 1a]. Dissection then proceeded between the orbicularis muscle and the orbital septum to the inferior orbital rim [Fig. 1b]. This dissection included the area inferior to the defect. A lateral cantholysis was then performed to mobilize the remaining posterior lamella. The posterior lamella was then transposed medially, shifting the posterior lamellar defect laterally [Fig. 1c]. The medial portion of the posterior lamella was sutured to the posterior lacrimal crest at the level of the medial canthal tendon with a single 4-0 Vicryl suture. Before tying the suture, the lacrimal system was intubated with Crawford stents. The stent was placed in a position posterior to the posterior lamella. The resulting lateral defect was then repaired as noted above for the posterior lamella [Fig. 1d, e and Supplementary Digital Content, Video 2].

For central defects, a subciliary incision was made extending from the punctum medially to the medial aspect of the defect.

An additional subciliary incision was made extending from the lateral aspect of the defect to the lateral canthus. Dissection was then carried out along the length of the lower eyelid between the orbicularis and orbital septum to the inferior orbital rim. A lateral canthotomy and inferior cantholysis were performed. The lateral posterior lamella was then transposed medially to the medial posterior lamella, shifting the defect in the posterior lamella laterally. The medial and lateral edges of the posterior lamella were then sutured together using interrupted 5-0 Vicryl suture through the anterior surface of the tarsus in a lamellar fashion. The lid margin was then reapproximated using interrupted 7-0 Vicryl sutures in a vertical mattress fashion. The resulting lateral defect was then repaired as noted above for the posterior lamella [Supplementary Digital Content, Video 3].

The anterior lamella was addressed after repair of the posterior lamella by the advancement of a myocutaneous flap. Depending on the size of the anterior lamellar defect and redundancy of the tissue, a mid-face lift was often performed.^[26] The anterior lamella was fixated to the periosteal flap and free tarsal graft with 5-0 Vicryl sutures in a mattress fashion and to the native tarsus with 5-0 fast absorbing gut suture at the subciliary incision [Fig. 1f].

Results

Thirty-eight patients underwent the procedure to reconstruct full-thickness defects of the lower lid ranging from 50% to 75% [Figs. 2-4]. Twenty-three patients were female. Fifteen defects were on the right side, 23 on the left. The average age was 73.9 (range 28–90) years. All patients underwent Mohs excision of a skin cancer: 33 patients with basal cell carcinoma and 5 with squamous cell carcinoma. The average follow-up was 5.6 (range 4–16) months. None of the patients with lateral defects had a complication, while eight patients with central and three with medial defects did, two of which required intervention noted below. Postoperative sequelae in the central group included two patients with a misdirected lash, one granuloma, one hypertrophic scar (treated with triamcinolone),

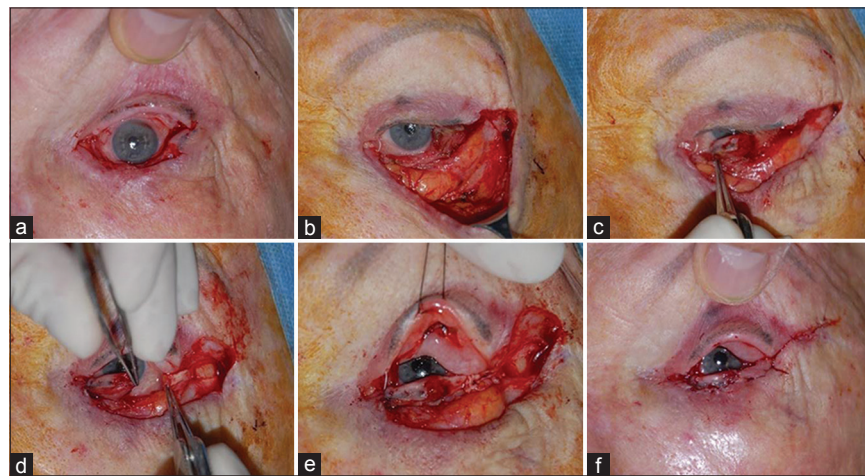


Figure 1: A 66% full-thickness of defect of the left lower eyelid is inspected which includes the punctum and canaliculus (a). A subciliary incision is extended from the defect to the lateral canthus. The lacrimal system has been intubated with a bicanalicular silicone stent. Dissection is then performed between the orbicularis muscle and the orbital septum to the inferior orbital rim (b). A lateral cantholysis is then performed to release the lateral portion of the tarsus, the tarsus is then transposed medially (c). A periosteal strip is then raised which cannot reach the lateral edge of the tarsus (d). A free tarsal graft is then harvested from the upper lid and sutured between the lateral edge of the tarsus and the periosteal strip (e). The cheek is fixated laterally to the lateral orbital rim. Incisions are then closed (f)



Figure 2: Left: An 89-year-old female status post-Mohs excision of basal cell carcinoma. Lateral defect is judged to be 66% of the left lower lid. Right: 4 month postoperative photo. Patient underwent a horizontal tarsal transposition flap, periosteal strip, and free tarsal graft

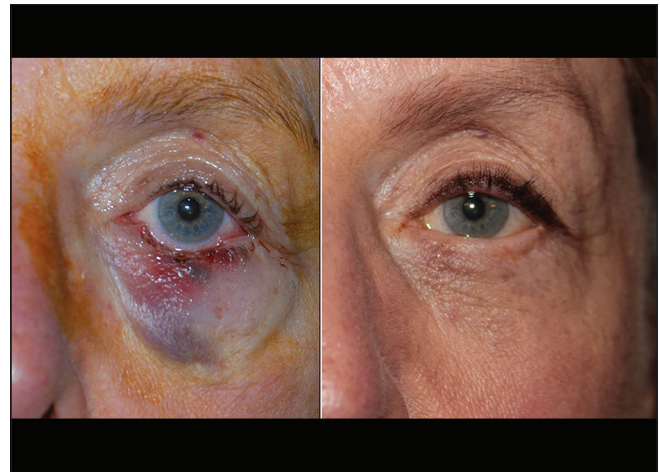


Figure 3: Left: A 62-year-old female status post-Mohs excision of basal cell carcinoma with a 66% central defect of the left lower eyelid. Right: 4 month postoperative photo. Patient underwent horizontal tarsal transposition flap, periosteal strip, and free tarsal graft

one segmental trichiasis (treated with wedge resection), two ectropion, and one small area of symblepharon. Postoperative issues in the medial group included one kink of the upper lid free tarsal graft donor site, one ectropion, and one continued tearing with patent lacrimal system [Table 1].

Conclusion

We believe the described procedure is an additional option to consider in the repair of full-thickness defects which involve 50–75% of the horizontal length of the eyelid. The procedure has the following advantages over a Hughes flap: The eye is not closed postoperatively; a second stage is not required; eyelashes are preserved medially; and the lid margin heals well without erythema.

Lateral repositioning or shifting of the defect is critical to provide stabilization of the eyelid postoperatively. This involves transposing the native posterior lamella medially in central and medial defects. The shifting of the posterior lamellar defect laterally then allows the development of strong stabilization with a periosteal strip which maintains the structure and canthal anatomy of the lower lid. This also preserves lashes medially. Any remaining deficit of the posterior lamella between the periosteal strip and native tarsus can be repaired with a free tarsal graft. With the posterior lamella stabilized, the anterior lamella can then be adequately advanced with a myocutaneous advancement flap that engages periosteum of the inferior orbital rim and lateral orbital rim for support. The myocutaneous flap avoids a full-thickness skin graft (FTSG) and uses tissue of similar texture and color to provide an excellent blood supply and cosmetic result. Defects that would require an FTSG would be better served by a Hughes flap.

Although a critical review of our data shows that 29% of patients have some postoperative issue, only 5% were judged significant enough by the patient or physician to require any further intervention. The majority of the complications occurred in the central defect group (eight patients). Two of these patients required additional surgical intervention

Table 1: Demographics and complications of 38 patients who underwent lower lid reconstruction with the described procedure

	Lateral defects	Central defects	Medial defects	Total
Number of patients	9	21	8	38
Size of defect (%)				
50	2	14	4	20
66	6	7	4	17
75	1			1
Follow-up (months)	5.7	5.8	5.4	5.6
Average age (years)	81.5	68.3	71.9	73.9
Gender (female, male)	6, 3	12, 9	5, 3	23, 15
Neoplasm				
BCC	7	18	8	33
SCC	2	3		5
Right versus left	4, 5	8, 13	3, 5	15, 23
Complications (%)	None	8 (38)	3 (37.5)	11 (29)
Additional surgery required (%)	None	2 (9.5)	None	2 (5)

BCC: Basal cell carcinoma, SCC: Squamous cell carcinoma

(one patient with segmental trichiasis treated with wedge resection; one patient with residual scar treated with triamcinolone injection). There were three patients in the medial defect group with postoperative sequelae, but none required additional intervention. No complication was seen in the lateral defect group. Twenty patients required the use of a free tarsal graft in addition to a periosteal strip to complete the posterior lamella. All patients with a 66% defect or greater required a free tarsal graft as did two patients with a 50% defect. Of these patients, only one (5%) had a complication of the donor site from the contralateral upper lid (tarsal kink) which did not require further intervention. No eyelid margin erythema was noted in any of the patients, a common postoperative sequelae after a Hughes procedure reported in up to 37% of patients.^[7]

Numerous techniques involving various types of grafts, flaps, or lid sharing maneuvers have been described as alternatives to the traditional tarsoconjunctival flap originally described by Hughes.^[1-25] Although numerous case reports exist, only a few series have sufficient numbers to critically compare their technique to the historically successful tarsoconjunctival flap. Our results are comparable to other techniques described as alternatives to the Hughes procedure. Table 2 lists those studies with five patients or more employing a technique to address subtotal, full-thickness eyelid defects with an average of $\geq 50\%$ of the lower lid. Of these procedures the average number of patients was 17 (range 5–43), the average complication rate was 38.6% (range 0–100%), and the average need for additional intervention for a reported complication was 6.2% (range 0–37.5%) [Table 2].



Figure 4: Left: A 62-year-old male status post-Mohs excision of basal cell carcinoma with a 66% medial defect of the right lower lid involving the lower canaliculus. Right: 4 month postoperative photo. Patient underwent a horizontal tarsal transposition flap, periosteal strip, free tarsal graft, cheek lift, and stenting of lacrimal system

Although the periosteal strip as a posterior lamellar replacement has been described in the past for lateral defects, shifting medial canthal defects laterally has not been described to our knowledge.^[27] Transforming central and medial defects into lateral defects allows the surgeon to utilize the strength of lateral stabilization in reconstruction. This procedure could be particularly useful in patients who have poor vision in the fellow eye, are unable or unwilling to tolerate multiple procedures, need medications or monitoring in the operated eye (glaucoma/cornea), or are a poor candidate for a tarsoconjunctival flap. One potential limitation of this technique is that it requires adequate skin laxity in the lower lid/upper cheek for the myocutaneous advancement flap. Patients with abnormal or insufficient tissue may not be candidates for this procedure (i.e. previous radiation, previous surgery, young age). In addition, use of the periosteal strip for reconstruction of the posterior lamella does place the patient at risk for chronic irritation due to the nonepithelialized surface of the periosteal strip. Although we did not have any patients complain of irritation due to this issue, it is a consideration anytime a nonepithelialized posterior lamellar substitute is employed.

In summary, numerous surgical options exist for the repair of lower eyelid defects. It is useful for the surgeon to have multiple options to adjust to each individual patient in an effort to restore structure and function to the lower lid with an acceptable cosmetic result. Lateral stabilization with a periosteal strip and myocutaneous advancement flap is an excellent one-step procedure that avoids many of the complications seen with the Hughes procedure and is comparable to other techniques used for the reconstruction of subtotal, full-thickness lower lid defects.

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Conflicts of interest

There are no conflicts of interest.

Table 2: Studies describing alternative surgical techniques to the Hughes procedure addressing subtotal, full-thickness defects with 5 or more patients

Procedure	Number of patients (%)	Complications (%)	Additional intervention (%)
Lateral stabilization (periosteal strip \pm free tarsal graft)*	38	11/38 (29)	2/38 (5)
Free tarsoconjunctival graft ^[7]	43	9/43 (21)	1/43 (2)
Helical composite sandwich graft ^[25]	13	5/13 (38.5)	1/13 (7.5)
Hubner tarsomarginal grafts ^[5]	17	7/17 (41)	None
Composite grafts ^[2]	42	>24	None
Internal cantholysis ^[19]	18	13/18 (72)	None
"Sandwich technique"- orbicularis muscle advancement flap with free posterior and anterior lamellar grafts ^[16]	13	5/13 (38.5)	2/13 (15)
Switch flap ^[21]	8	3/8 (37.5)	None
Double mucosal and myocutaneous island flap ^[6]	33	28/33 (85)	None
Multiple subcutaneous pedicle flaps with chondromucosal graft ^[14]	9	9/9 (100)	None
Conchal chondro-perichondral graft with myocutaneous flap ^[17]	26	4/26 (15)	4/26 (15)
Orbicularis rotational flap and palatal mucosal graft ^[12]	12	1/12 (8)	None
Rotation-advancement tarsoconjunctival cheek flap ^[24]	9	1/9 (11)	1/9 (11)
Upper eyelid orbicularis flap with tarsoconjunctival island ^[20]	5	None	None
Reverse auricular flap ^[18]	8	4/8 (50)	3/8 (37.5)

*Present study

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