



Original research

A novel technique for full thickness medial canthal reconstruction; playing with broken lines

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Abstract

Purpose: To introduce a new modification of transposition flap technique for reconstruction of the medial canthal region.

Methods: This prospective study included 58 patients with the full thickness involvement of both upper and lower lid in the medial canthal area. Reconstruction of posterior lamella was performed by utilizing periosteal flaps and tarsoconjunctival grafts, and anterior lamellar reconstruction was performed using transposition of multiple full-thickness skin flaps, a modified form of rhomboid flap technique. Post-surgical outcomes, advantages, and drawbacks of this technique are discussed.

Results: Between 2010 and 2014, 58 patients with basal cell carcinoma (BCC), proven by histopathologic study, underwent medial canthal reconstruction. The mean age was 72.8 ± 8.3 years. In 30 patients, the lacrimal apparatus was excised, and periosteal flaps or tarsoconjunctival grafts were prepared to reconstruct the posterior lamella. Anterior lamellar reconstruction was performed in all patients, and the mean number of transposition flaps was 3.63 in addition to the blepharoplasty flap. Patients were followed for 24 months. None of the patients developed flap necrosis or other intraoperative and postoperative complications, with acceptable aesthetic and functional outcomes.

Conclusion: Full-thickness reconstruction of the medial canthal area by utilizing periosteal flaps and modified transposition flap technique all in one session can be considered an alternative method in medial canthal reconstruction, with acceptable functional and aesthetic outcomes.

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Keywords: Medial canthal reconstruction; Rhomboid; Modified transposition flap technique; Periosteal flap

Introduction

Complex anatomy and function of the medial canthus and its deeply situated position make it one of the most challenging structures in reconstructive surgery.^{1,2} On the other hand, most of the malignancies that involve this region have a

worse prognosis and more aggressive nature in comparison to other sites in the periorbital area. The high risk nature of malignant lesions here makes it mandatory to have extensive tissue excision to reach safe margins. Considering the growing rate of malignancies and higher efficacy of chemotherapeutic adjuvant therapies, more patients need an acceptable cosmetic reconstruction in addition to a well-functioning structure in the site of the excised tumor. Reconstructive surgery aims to provide safe free margins, minimally manipulate the adjacent normal tissue, and seal the tissue defect with an appropriate aesthetic and functional feature. Reconstruction of the posterior lamella can be performed by harvesting the buccal mucosa and hard palate graft; however, it is not a good choice in cases with a small and deeply-sited medial canthal area, especially when the medial canthal tendon reconstruction is also

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mandatory. For reconstruction of anterior lamella, various types of skin flaps have been introduced previously, and rhomboid flap technique is one of the mostly used techniques.^{1–5} The defects smaller than 1 cm² can be filled with a single rhomboid flap, but in larger defects, more flaps should be prepared. In this study, we present a modified form of rhomboid flaps for the cases with larger defects not possibly filled with a single flap. We also introduce utilizing preseptal excessive skin as one of the flaps, named blepharoplasty flap. This flap is utilized to reconstruct the upper part of the defect where the texture of the lost skin is thin, similar to the specific context of eyelid skin.

Methods

In this study, 58 patients with medial canthal lesions who underwent medial canthal reconstruction were included. Histological investigation confirmed the diagnosis of basal cell carcinoma (BCC) in all of these patients. The study was implemented in accordance with the tenets of the Declaration of Helsinki. The study protocol was approved by the local Ethics Review Committee of Tehran University of Medical Sciences, and all participants provided us with written informed consents prior to being included.

Simultaneous excision of the primary lesion and reconstruction was performed under local anesthesia in all of the patients. Reconstruction was performed utilizing crossed periosteal flaps for posterior lamella and modified transposition flaps and blepharoplasty flap technique for anterior lamella. Patients were visited on the first day, 2 weeks, one month, six months, and 2 years after reconstruction surgery. Despite free margins reported in all of our cases, the site of surgery was investigated carefully for any evidence of recurrent disease. The surgeon evaluated cosmetic feature, efficiency of defect closure, complications, and patient satisfaction in all postoperative visits.

Surgical technique

This method was used to reconstruct the large medial canthal defects involving full thickness of both upper and lower lids. In 30 of the patients, parts of lacrimal drainage system including punctums, canaliculi, and medial canthal tendon were resected. Posterior lamellar reconstruction was performed by preparing the periosteum of the lateral nasal bones in the area of medial canthus in a scissor crossed pattern. A square-shaped periosteal flap with the size of 1 cm² with anterior base was prepared. It was horizontally cut into two parallel stripes, and it was crossed; the lower half was sutured to the remnant of the upper tarsus, and the upper half was sutured to the remnant of the lower tarsus using Vicryl 5-0 sutures. Then the large skin defect was reconstructed by means of its surrounding skin, considering the excessive chalatic upper lid preseptal skin as one of the flaps. After reconstruction of deep structures, the two largest perpendicular diameters of the anterior lamellar defect were measured by caliper. Hemostasis was established by bipolar cautery. Only

defects with a surface area larger than 2 cm² involving both medial canthal skin overlying nasal wall and medial portion of lower and upper lid were included for this technique.

Drawing a sketch of incisions in the configuration of broken lines in the tissue surrounding the defect was the first step in reconstruction. Then 3 modified transposition flaps were prepared on the medial canthal skin covering the nasal wall as follows: Considering the defect as a round area with the radius of “a” in Fig. 1, the line of incision was drawn in continuity with the radius of the circular defect area, making a 90° angle with the tangential line passing through that point, to the extent equal to the size of the radius. The outline was then broken by the angle of 60–80°. It was then continued to the size equal to the radius in the new orientation (Fig. 1).

Outline and orientation of the lines were not strict. Dynamic adjustment of the design and array of tissue puzzle was possible and depended upon the judgement of the surgeon by taking the skin tension lines into account to have the least amount of scar or webbing.

Then upper lid blepharoplasty drawing, with some modification, was prepared as one of the flap fractions and was rotated medially to fill the lateral region of the defect area (Fig. 1). This flap was utilized to reconstruct the upper part of the defect. Term modification referred to unilateral partial removal of the excessive skin of the upper lid, whereas the

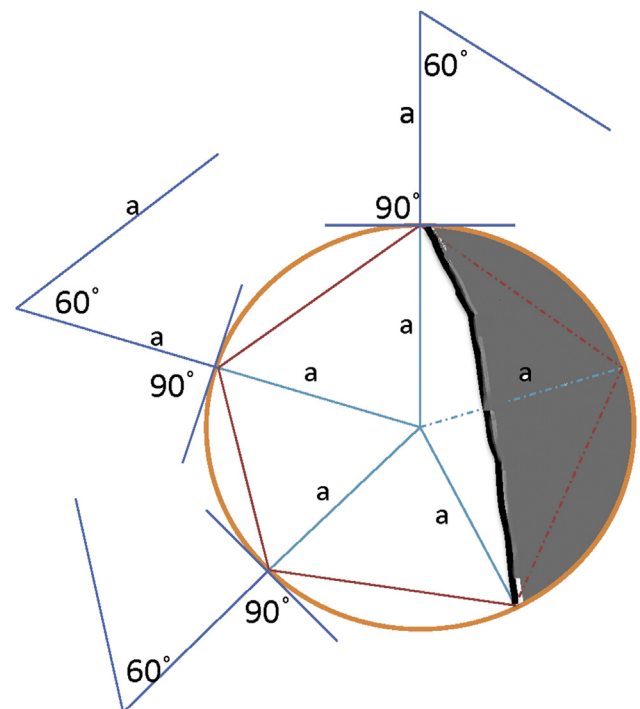


Fig. 1. Illustration of the geometric configuration of the modified transposition flap technique. The line of incision is drawn in continuity with the radius (a) of the circular defect area to the extent equal to the size of the radius; then it is broken by the angle 60°, and it is continued then to the amount equal to the radius of the defect. Utilizing modified blepharoplasty skin flap (gray part) for covering of the medial portion of upper and lower eyelid and sealing the remainder of the defect by means of 3 modified transposition flap technique for coverage of skin defect covering the nasal bone in the right side. Four flaps are rotated counterclockwise.

blepharoplasty skin resection is mostly bilateral symmetrical. Also, medial attachment of the incised excessive skin was not separated, to provide a flap and not a graft, for better circulation purposes. Due to the special texture of the skin in the lids, providing the skin from the lid itself has a better cosmetic and functional outcome because of similarities in thickness, color, and texture. The blepharoplasty flap was the first flap that was situated in its position and sutured. The remainder of the defect was then sealed by utilizing the 3 modified transposition flaps that were prepared after drawing. Rotation of the flaps on the right side was counterclockwise and clockwise on the left side. In suturing all these flaps, subcutaneous tissue was stabilized in position by means of Vicryl 5-0 sutures, and skin was closed using Nylon 6-0 interrupted sutures.

Results

Between the years 2010–2014, 58 patients, 28 females and 30 males, were included in the study. The mean age of the patients was 72.8 ± 8.3 years, with the range of 52–86 year old. In 38 patients, the tumor had a deeper extension, and the lacrimal apparatus and medial canthal tendon could not be saved. In 30 patients, remnants of the periosteum in the medial canthal area was prepared to reconstruct the posterior lamella, and in 8 patients, the extent of the eyelid involvement made it necessary to consider tarsoconjunctival graft for posterior lamellar reconstruction. For anterior lamella, the mean size of the area of the excised skin was 3.24 ± 0.7 cm², ranged from 2.18 cm² to 3.84 cm². The mean number of transposition flaps needed was 3.63 flaps in addition to the blepharoplasty flap. Four transposition flaps were used in 37 patients, and 21 patients needed 3 flaps beside the blepharoplasty flap. No intraoperative or postoperative complication such as wound dehiscence or flap necrosis was seen, and the entire procedure was tolerated under local anesthesia. No lid lag, ectropion, ptosis, or other eyelid deformity or malfunction was observed in the follow-up of the patients. Tearing was the inevitable finding in the patients whose lacrimal apparatus was excised.

As mentioned above, eight patients had more extensive involvement of the upper or lower lid or both. In these cases, free tarsoconjunctival graft was harvested from the ipsilateral upper lid. The upper third of the tarsus of the upper lid with its conjunctiva on place was spliced longitudinally with an attached end resembling a “Y”. The wings of the “Y” were sutured in continuity with the remaining upper and lower tarsal plates by Vicryl 5-0. Then the shaft of the “Y” was fixed to the medial orbital wall after drilling by means of Prolene 4-0. The periosteal flap was then sutured to the tarsoconjunctival graft. After that, anterior lamellar reconstruction was performed by the modified transposition flap technique similar to other cases (Fig. 2). One of the patients had BCC in medial canthal regions bilaterally. We considered modified transposition flap technique on the right side, and glabellar flap was used for the left side in this patient. Aesthetic superiority of the reconstruction on the right side over the glabellar flap technique used on the left side was notable in this patient (Fig. 3A and B).

Aesthetic results were satisfactory despite the large primary defect and many incision lines. Patient satisfaction was considerably high in our series, as we asked patients and recorded their information in their medical profiles in each follow-up visit. Incision scars were invisible after 6 months in all patients (Fig. 4).

Discussion

Several techniques have been reported in the literature for the reconstruction of medial canthal region.^{3,6} Simple direct closure for small defects, skin grafts, and local and regional transposition or rotational flaps such as upper lid myocutaneous flap, infraglabellar transnasal bilobed flaps, and modified glabellar flaps have been satisfactory in the reconstruction of this region.^{1,2,6}

Combinations of many flap techniques together are used in the reconstruction of large areas of tissue defect based on the clinical judgement of the surgeon.⁷

Flap technique is one of the simple and versatile techniques that was first described by Limberg in 1946.⁴ Transposition flaps are mostly appropriate in elderly patients with a high amount of skin laxity,⁴ but can also be considered useful means in younger patients by some modification. The current study was designed upon the concept that splicing the large area of surrounding tissue to smaller pieces in larger numbers is preferred to fewer numbers of fragments and larger pieces. It can decrease the tension over the tissue transposed to the area of defect by distributing the tension over multiple pivots. This would distribute the imposed force in a larger area on the tissue adjacent to the area of defect. As the number of flaps goes up, theoretically, the blood supply of the reconstructed area would grow richer because the sources of the supply becomes extended. The angle that is considered 60–80° is due to the surgeons concept along the operation for which angle is better to choose, to become more parallel to the skin tension lines, and to have the least possible crossover with these lines. Actually, the term modification points to the versatility of the angle, orientation, and the number of flaps to have the least tension and webbing with the best circulation and aesthetic outcome.

Due to the topographic position of the medial canthus, the multi-piece nature of the tissue tiles makes it easier to cover the defect with minimal deformity. Bending of the smaller tissue fragments is simpler in comparison to larger pieces of tissue. When the defect is divided into smaller sectors with a smaller angular arc, the rotation of the flaps is more facilitated, and tension over the flap bases also decreases.

The cosmetic outcome was highly acceptable in our patients. In these 58 patients, one of the cases had minimal webbing of the tissue between the eyebrow and nasal bridge, and there was a small amount of inferior displacement of the medial side of the eyebrow in one of the cases. Of course, as many of our cases were elderly patients, excessive skin made utilizing the upper eyelid blepharoplasty flap an option which provided suitable skin for reconstruction and gave a highly acceptable cosmetic feature in our patients.

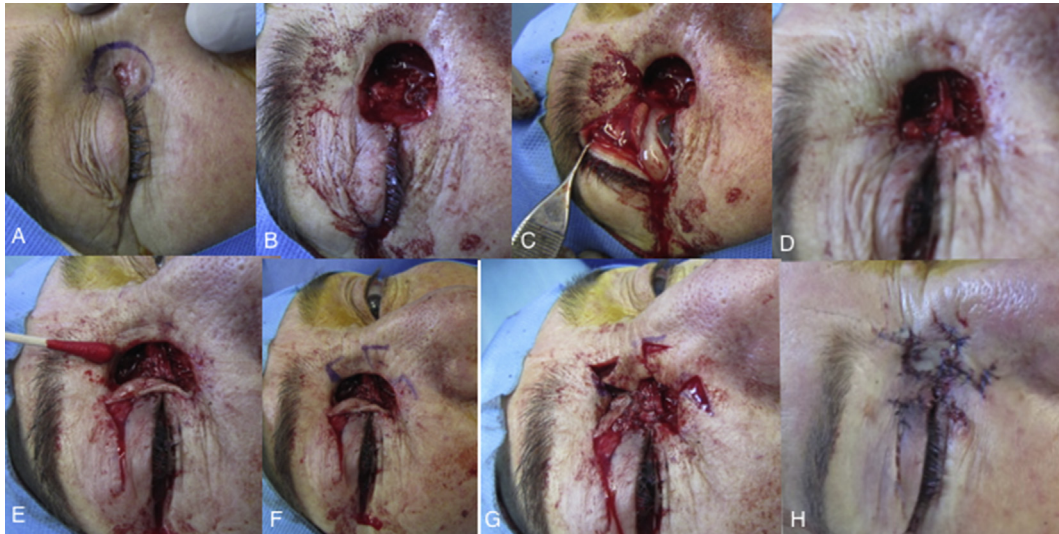


Fig. 2. The large area of defect in a 60-year-old female patient (A, B). The stages of the reconstruction are demonstrated (C to H). After tarsal conjunctival graft harvesting (C) and reconstruction of the posterior lamella (D), upper lid blepharoplasty flap is demonstrated in preparing to reconstruct the lateral portion of the defect (E). Drawing of the broken lines has been performed to sketch the plan of flap preparation for anterior lamellar reconstruction (F). Three transposition flaps are prepared to seal the remainder of the defect (G). End of the operation after suturing the flaps in place (H).

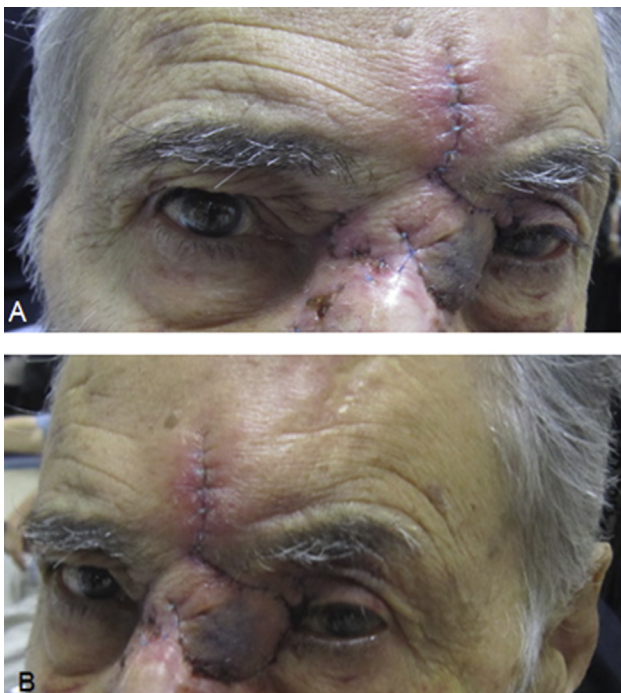


Fig. 3. A 71-year-old patient with bilateral medial canthal basal cell carcinoma; rhomboid transposition flap technique is utilized on the right side (A) and glabellar flap on the left side (B); vertical scar in the glabellar area and thickness of the glabellar flap are considered drawbacks of glabellar flap technique.

As mentioned previously, aesthetic superiority of the reconstruction by means of modified transposition flaps over glabellar flap technique is the inappropriate thickness of the flap and unfavorable midline forehead scar as drawbacks of the glabellar flap technique.

In functional assessment, the eyelid closure was appropriate in all the patients. No ectropion, entropion, medial canthal

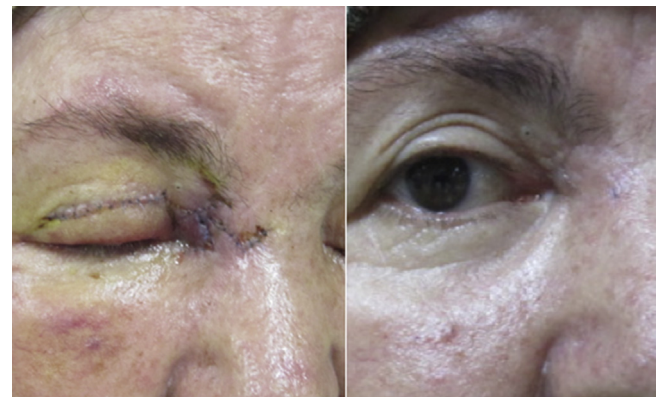


Fig. 4. Appearance of the site of the surgery 2 weeks (left) and 1 month (right) after reconstructive surgery.

eversion, incomplete blinking, or ptosis occurred in our cases. In patients with the lacrimal sac and canaliculi involvement, it was mandatory to excise the lacrimal apparatus, and these patients had inevitable tearing after surgery.

This study has some limitations. We did not have a control group. Since there is no consensus about the best method of medial canthal reconstruction as standard of care, the control group was difficult to be defined. However, although the sample size is small, we believe that for introducing a new technique, 58 cases and 24 months of follow-up can be considered acceptable.

In brief, modified transposition flap technique that has similarities to rhomboid flap technique can be useful in reconstruction of the anterior lamellar in the medial canthal area. The ability to perform it in the same session by reconstruction of deeper structures is a favorable issue which ends in acceptable aesthetic and functional outcomes.

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