The frontalis musculocutaneous island flap offers advantages of immediate repair for small to medium-sized forehead defects (0.5-5 × 0.5-5 cm). Based on the supraorbital artery, the flap is both adaptable and dependable. Advantages of this flap include the ability to perform the procedure immediately and in one stage, rapid aesthetic restoration, minor donor-site morbidity, and technical ease. A clinical report demonstrating the use of this flap for repair of an electrothermal injury to the glabella is presented.

Key Words: Supraorbital artery flap, electric burns, forehead reconstruction

Reconstructive methods for the repair of forehead defects have evolved from skin grafts,1,2 to forehead flaps,3-7 periosteal flaps,8 island scalp flaps,9 scalp flaps using the "crane principle,"10-13 temporal fascial flaps,14 and galeal flaps.15 Free transfer of omentum covered with skin grafts,16 radial forearm fascial flap and skin graft, groin flap,17 and latissimus dorsi flap have also been used.18-22 Soft tissue expansion is an acceptable method of reconstructing adjacent forehead defects.23-28 However, the advantages of musculocutaneous flaps for forehead reconstruction have been largely ignored; Abenavoli29 and Hallock30 were the most prominent of those advocating this approach.

To achieve superior facial reconstruction, adjacent tissues are most favorable. The forehead midline provides vascular supply to allow for reconstructions with minimal donor site deformity and good color and texture match. Jackson31 defined three separate sources of forehead blood supply with rich anastomotic connections:

1. Medial: the dorsal nasal artery from the ophthalmic artery (from the internal carotid);
2. Lateral: the angular artery passes under the levator labii superioris nasi; it originates from facial artery (from the external carotid); and
3. Additional lateral: the supratrochlear artery from the ophthalmic artery (from the internal carotid).

In addition, the supraorbital artery pierces and supplies the frontalis muscle and its overlying skin.32

In this report, the frontalis musculocutaneous island flap, supplied by the supraorbital artery, was used for reconstruction of a forehead full-thickness skin defect with bone exposure.

**Supraorbital Artery Musculocutaneous Island Flap**

**Applied Anatomy**

The occipitofrontalis muscle is a broad myofibrous layer, which covers the entire side of the skull’s vertex from the nape of the neck to the eyebrow’s upper border. Its frontal portion, the frontalis muscle, is quadrilateral and thin and intimately adherent to the superficial fascia. The medial margins from both sides join at a variable distance above the nasal root.

**Blood Supply**

The frontal branch of the superficial temporal artery (branch of the facial artery) is the major vascular pedicle to the frontalis muscle. It penetrates the muscle at its lateral border, coursing horizontally. In addition, segmental minor pedicles (supratrochlear
and supraorbital arteries—branches of the ophthalmic artery) pierce the frontalis to supply the muscle and overlying skin. These vessels are the basis for median and paramedian forehead flaps (so-called Indian flaps) for nasal reconstruction. The island forehead flap based on the supraorbital artery differs from the routine "Indian flap" by the absence of the usual cutaneous pedicle and its vascularization source.

**Clinical Report**

A 33-year-old man with a full-thickness electric burn of the glabella region (4 × 4.5 cm) was admitted to the burn unit 3 hours after trauma. Initial treatment consisted of wound debridement. The resulting soft tissue defect (4.5 × 5 cm) with exposed bone was evident. Reconstructive surgery was carried out on day 7 postadmission. Doppler flowmetry of supratrochlear and supraorbital arteries on both sides was performed, detecting occlusion of both supratrochlear arteries. Surgical debridement with forehead skin incision and trepanation in the area of frontal sinuses was performed. Absence of "dew-drops" on the bone surface was evidence of total full-thickness necrosis of the superficial cortical layer of the frontal bone, resulting in a 4 × 4-cm open frontal osseous defect. Curettage of frontal sinuses was performed. The soft tissue defect was replaced with an island myofasciocutaneous flap based on the left supraorbital artery verified by Doppler flowmetry (Figs 1 and 2). The vessel was located at the midline of the left eyebrow. An appropriately sized flap was outlined over the paramedian aspect of the forehead skin (Fig 3A). The full-thickness skin with the frontalis muscle fragment was incised around in the inverted pattern of the defect. The lower border of the flap was incised up to the subcutaneous tissue. This superficial incision was then extended vertically to the medial orbital rim. A subcutaneous base (approximately 2 cm wide) was created and elevated from the underlying galea. It was extended as closely as possible to the origin of the supraorbital vessel as it emerges from the orbit’s upper rim. After undermining the flap, it was rotated by 90° inferiorly, partially obliterating the frontal sinuses by its muscular component (Fig 3B). The donor site was closed primarily with 5-0 Prolene sutures. Drains were placed under the flap and sterile dressing was applied. At the end of surgery, mild transient venous insufficiency was observed, which resolved spontaneously 4 hours postoperatively, resulting in complete survival of the flap. A satisfactory aesthetic outcome was achieved, both immediately after the
operation (Fig 3C) and at follow up at 6 months (Fig 4A, B).

**DISCUSSION**

Forehead flaps based on supratrochlear, combined supratrochlear, and supraorbital arteries or on the frontal branch of superficial temporal artery have been used most frequently.\(^{32-36}\) Flaps based solely on the supraorbital artery have not been well described. The use of supraorbital artery myocutaneous island flap for bony sinus coverage has certain advantages for the repair of defects in the glabellar area with exposed sinus.

The flap provides satisfactory soft tissue coverage for defects unsuitable for skin grafting. Unlike others flaps, dissection is easier and faster; blood loss is minimal; venous and lymphatic drainage from the flap is not interrupted; the flap remains smooth and flat in the recipient site. These factors may be of greater relevance in elderly or unstable patients. To achieve safe flap elevation, direct visualization of the supraorbital artery is not necessary and may be dangerous. A subcutaneous base ensures adequate flap perfusion. In addition, preoperative and intraoperative Doppler flowmetry to identify the supraorbital artery is helpful in determination of pivot point and flap design. This flap provides greater mobility over other types of forehead flaps because the subcutaneous base is more readily transposed and the flap is more easily adjusted into the recipient bed. Another advantage is the single-stage operation. The transposed flap is maximally suitable based on color, texture, and consistency.

On the other hand, venous congestion of the flap during the first 24 hours after transposition was observed, which can be prevented by harvesting the wide fascial base of the flap. In addition, paresthesia
of the area innervated by supraorbital and supratrochlear nerves can be experienced.

REFERENCES