The anatomical boundaries of the forehead unit are the natural hairline (in patients without alopecia), the zygomatic arch, the lower border of the eyebrows, and the nasal root (Fig. 4.1). The upper extent of the forehead unit in patients with alopecia can be identified as the most superior extent of the frontalis muscle. Typically, a distinct superior crease of the forehead marks this spot. The hairline and eyebrows provide camouflaged anatomical boundaries in which to hide incisions. These hair-bearing areas simultaneously limit flap designs to those that do not distort the natural hairline and eyebrow shape.

The forehead unit can be divided into five subunits. Anatomically, the central forehead is an extension of the scalp and retains many similar characteristics. Central forehead skin is thick, rather inelastic, and tightly adherent to the underlying frontalis muscle. On either side of the central forehead is the lateral forehead or temple region, which is more elastic and often acts as a reservoir of tissue for reconstruction. The frontalis muscle is not present in the temple, and the skin is loosely attached to the underlying temporalis fascia. In addition, whereas the central forehead is convex, the temple is somewhat concave. The eyebrows are subunits unto themselves with hair-bearing skin.

The relaxed skin tension lines (RSTLs) run horizontally in the central forehead, as demonstrated by the typical forehead wrinkles. Upon reaching the temporal scalp, they curve in an inferior direction.
Fig. 4.1 Aesthetic subunits of the forehead.
Sensory innervation to the central forehead originates from branches of the supraorbital and supratrochlear nerves (Fig. 4.2). Medially, these sensory nerves branch immediately, pierce the overlying muscle fibers, and run superiorly in a superficial subcutaneous plane. More laterally, the nerves run for quite a distance under the frontalis muscle, rather than in the subcutaneous plane. If care is taken when raising flaps, these large sensory branches can be identified and preserved. The origin of the supraorbital nerve can usually be palpated at the foramina in the superior orbital rim border. The supratrochlear neurovascular bundle is usually very close to or within the glabellar creases. This landmark is especially useful when elevating paramedian forehead flaps for nasal reconstruction.

Small defects of the forehead can be closed in a fusiform manner, but a long incision is often required to avoid standing cones at either end; this is preferable to using an M-plasty, which extends outside the RSTLs and is therefore more noticeable. Fusiform repairs should be limited to locations and sizes that do not elevate the eyebrow. Vertical incisions in the central forehead between the medial extent of the brows heal exceptionally well. Midline closures take advantage of the lax tissue in the temple. The M-plasty technique can be used in the inferior extent of a vertical closure, to take advantage of the camouflaging effect of the glabellar wrinkles and to avoid traversing into the nasal aesthetic subunit.
Fig. 4.2 Sensory innervation of the forehead. (Adapted from Fatah MF. Innervation and functional reconstruction of the forehead. Br J Plast Surg 1991;44:351–358.)
Larger forehead defects are best repaired with flaps (Fig. 4.3). Skin grafts provide a poor match in thickness and color, and at best they should be considered a temporary measure. Central forehead defects are repaired primarily with advancement and rotation flaps using incisions placed in the RSTLs or hairline. These central forehead flaps take advantage of the more lax tissue found laterally in the temple region.

Central forehead defects should be assessed for both horizontal and vertical tissue tension. The closure with least tension is selected. The rectangular advancement flap is the repair of choice for most moderate-sized defects of the central forehead (Fig. 4.4). The long arms of the flap are usually placed in existing wrinkle lines. If a single advancement flap is inadequate, bilateral flaps are used. The vertical limb is placed in the midline by varying the length of the long limbs of each of the advancement flaps planned. For superficial defects with intact subcutaneous tissue, the flaps can be elevated in the subcutaneous plane, just superficial to the frontalis muscle. If the defect extends to the depths of the galea or the periosteum, then the flaps are incised to the depth of the periosteum, and a deep-layer galea closure is used. Releasing incisions in the galea may be needed to decrease wound-closing tension. Care in incising and elevating flaps may allow preservation of sensory nerve branches.
Fig. 4.3 Forehead subunits. FTSG, full-thickness skin graft.
Fig. 4.4 (A,B) Bilateral advancement flaps of the forehead.
Fig. 4.4 (C) Defect of the forehead. (D) Forehead defect after closure. (E) Healed forehead advancement flaps.
Defects located near or adjacent to the hairline can be repaired with bilateral rotation flaps in an A-to-T fashion; this places one closure line in the hairline (Fig. 4.5). This flap design can also be used along the eyebrow (Fig. 4.6). The deep plane of dissection is just superficial to the frontalis muscle in the forehead and just superficial to the galea at and posterior to the hairline. If the defect extends deep to the galea, then the entire flap can be elevated deep to this layer. Care must be taken beyond the hairline to preserve the hair follicles. Deepithelializing a few millimeters of the scalp at the pretrichal region and beveling the flap incision will usually result in hair growing through the incision for better scar camouflage.

Single rotation flaps can also be used centrally (Fig. 4.7). A large cutback may be necessary to facilitate closure of small to medium defects secondary to the lack of tissue elasticity in the forehead skin.
Fig. 4.5 (A,B) A-to-T repair at the hairline.
Fig. 4.6 (A) A-to-T flap at the eyebrow. (B) A-to-T flap closure at the eyebrow.
Fig. 4.7 (A) Central forehead defect. (B) Large rotation flap elevated in the subgaleal plane. (C) Large rotation flap closure using the eyebrow as camouflage for the inferior flap border. (D) Early flap result.
Single or double transposition flaps are useful in the temple, either to close smaller defects with the aesthetic subunit or to recruit tissue from the more lax cheek area for larger defects (Fig. 4.8). Bilobed flap designs are valuable when the donor site of a single transposition flap cannot be closed primarily. Bilobed flaps can be designed with the base oriented either anteriorly or posteriorly (Fig. 4.9). Flaps are raised in the subcutaneous level, and attention should be paid to the course of the temporal branch of the facial nerve to avoid injury.

A final consideration in the temporal forehead and in the central forehead near the hairline or in the glabellar concavity is the possibility of allowing wounds to heal by secondary intention. The wound is treated with a moist occlusive dressing during the healing phase. In many cases, lesions within the concave portion of the lateral forehead and close to the hairline will heal in a few weeks with acceptable scars.

Massive defects of the forehead can be addressed with a variety of techniques, including tissue expansion or skin grafting with later serial excision. If the patient is willing to allow the bed of the wound to granulate for 3 to 4 weeks, full-thickness skin grafts may be used with adequate results.
Fig. 4.8 Rhombic flap of the temple.
Fig. 4.9 (A) Anteriorly based bilobed flap of the temple.
Fig. 4.9 (B) Posteriorly based bilobed flap of the temple.
Suggested Reading
