

# Basic Flap Design



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## KEYWORDS

• Local flaps • Advancement flaps • Rotation flaps • Transposition flaps • Interpolated flaps

## KEY POINTS

- Closely restore the basic functions and properties of the surgical flap and adjacent tissue.
- Draw out the flap; never burn any bridges, consider all options (the reconstructive ladder).
- Replace like with like.
- Use the esthetic units of the face to guide the reconstructive effort.
- Remember the donor site must be closed in an esthetic and functional manner.
- Be knowledgeable of normal anatomy, the extent of the defect, and the patient.

## HISTORY

The first documented repair of a complicated nasal defect with a cheek flap occurred in India in 600 BC by Sushruta Samita. These procedures were continued in India, and it was eventually documented in Western medicine in the late 1700s. Tube flaps, delayed flaps, and transfer flaps were used commonly during the 1500s. These techniques were documented by Tagliacozzi. During World War I, Harold Gillies used tube flaps and delayed flaps with a greater emphasis on blood supply during defect reconstruction. These techniques were refined during the 1950s and again in the 1970s, maintaining an emphasis on both cutaneous and vascular blood supply. During the 1950s and 1960s, surgeons utilized flaps with named blood supplies. During the 1970s, flaps with unnamed blood supplies, musculocutaneous flaps, and eventually free tissue transfers were performed. Fasciocutaneous and osteocutaneous flaps began to be used in the 1980s. During the 1990s, perforator flaps based on small vessels arising from larger named vessels traveling through the adjacent muscular tissue

were utilized for reconstruction. Although this article is limited to basic flap design, it is useful to understand the evolution of flaps in reconstructive surgery.

## PHYSIOLOGIC CHARACTERISTICS OF SKIN

The skin functions and properties include (1) protection/anatomic barrier; (2) thermoregulation; (3) protection against excessive fluid loss/evaporation; (4) storage areas (eg, lipids and water) for synthesis; (5) sensation center (heat cold, touch, vibration, pressure, injury); and (6) formation of an aesthetic zone, enhancing nonverbal communication/expression.

Complicated wounds on the head and neck often require advanced techniques for ideal closure. The nature of the wound determines the approach for proper closure. The location, size, adjacent structures, etiology (eg, trauma, malignancy, or cosmetic defect), expected functional outcome, and medical comorbidities should all be considered when selecting a specific technique.

The goal of proper flap design is to closely restore the skin's functions and properties.

Disclosures: None.

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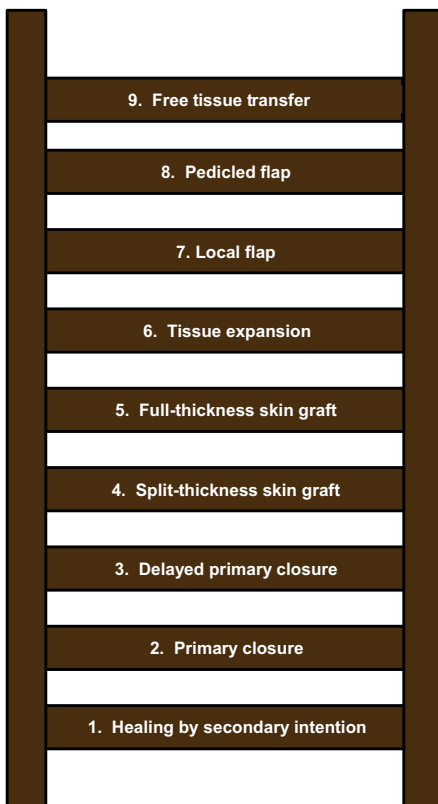
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Obviously, an understanding of proper wound closure, wound healing, relaxed skin tension lines, and the facial esthetic zones is essential in this task. Realistic patient expectations are essential to enhance overall patient satisfaction.

### PREOPERATIVE CONSIDERATIONS

Preoperative considerations should include: (1) evaluation of smoking history, atherosclerosis, peripheral vascular disease, steroid use, diabetes, and previous surgeries; (2) extent of traumatic injury; (3) patient age and skin condition; and (4) defect location.

The ability of the body to heal and adequately perfuse the adjacent tissue and flap is of paramount importance. A patient who presents with deficits in tissue perfusion or in the ability to heal would lead the surgeon toward a less complicated closure of the defect based on the reconstructive ladder (Fig. 1). Therefore, an extensive evaluation of smoking history, atherosclerosis, peripheral vascular disease, steroid use, diabetes, and previous surgeries must be elicited preoperatively. Additionally, evaluation of traumatic injuries must evaluate the size and extent of the wound and

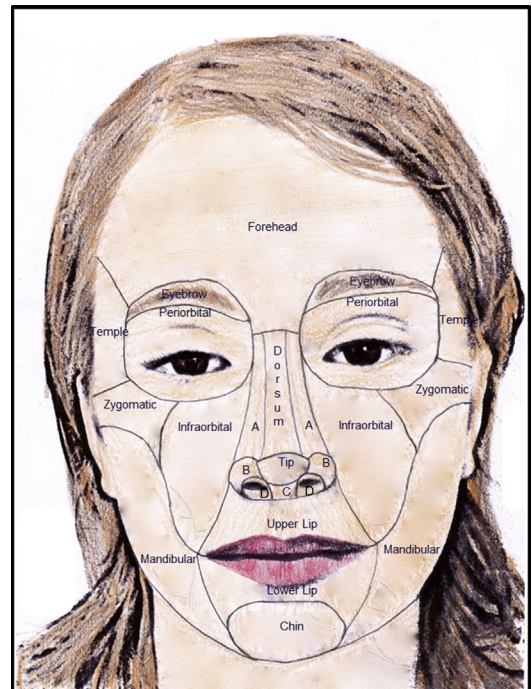


**Fig. 1.** The reconstructive ladder. Complexity increases as the surgeon goes up the ladder.

gauge the underlying defect. Defects with exposed bone or compromised arterial or venous systems will also affect the surgeon's closure design. These types of defects may result in compromises in esthetic or functional outcome during defect closure. These circumstances may require advanced reconstructive techniques.

Increased patient age and accumulated skin damage decrease skin elasticity and moisture content. Even though the quality of skin may decrease with age, wrinkles often conceal scars effectively. Usually wrinkles are found within the relaxed skin tension lines or RSTLs (Fig. 2). RSTLs are determined by the orientation of collagen fibers. These lines are perpendicular to the lines of maximal extensibility. Knowledge of these lines is essential for cosmetic and functional wound closure.

Wound location often increases the complexity of wound closure. The areas that usually cause the greatest concern are the nasal tip/alar complex, eyelids, vermilion border, and the external ear (Box 1). Each of these areas is considered to be within specific esthetic zones of the face (Fig. 3). Typically, the skin in each esthetic zone is considered to have similar qualities of texture, pigmentation, elasticity, and thickness. Ideally, local skin with similar qualities is used to reconstruct facial defects. Flap designs that utilize



**Fig. 2.** Esthetic zones for the face. (A) Lateral nasal wall. (B) Nasal ala. (C) Columella. (D) Anterior nares soft tissue.

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