Improving Outcomes in Aesthetic Facial Reconstruction

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Facial reconstruction has mesmerized surgeons and the general public alike for many centuries. The earliest descriptions are of cheek flaps and later forehead flaps for nasal reconstruction done in ancient India.[1] The pioneering reconstructive work of Esser,[2] who at the beginning of the twentieth century was the first to have an understanding of vascularization in "arterial flaps," was fascinating. Current concepts of aesthetic facial reconstruction have again improved with the development of the aesthetic facial unit principle. The latest frontier in facial aesthetic reconstruction through facial transplantation is currently being challenged.

The focus of facial reconstruction has obviously always been restoration of function. With regard to aesthetics, however, facial reconstruction was considered successful when a hole was closed with a flap. Modern facial reconstruction has evolved with the help of detailed anatomic knowledge, which has made tissue transfer from local and distant sites very reliable. In recent decades, the concept of aesthetic facial reconstruction has been popularized. This concept honors the aesthetic facial units, the borders of which are made up of the transitional areas of light and shadow on the face as the facial surface changes from concave to convex (**Fig. 1**). These borders are the ideal locations to place scars. Central aesthetic facial units, such as nose or lips, can be subdivided into subunits to further refine facial reconstruction.[3] The central facial subunits (ie. nose, eyes, and lips) are ideally replaced in their entirety, if feasible, when most of the unit is lost so as to have one inconspicuous reconstructed surface.

One of the cornerstones of aesthetic facial reconstruction is meticulous defect analysis. This holds true for all reconstructive surgery in which a restoration of function is sought. In aesthetic facial reconstruction, however, additional emphasis is placed on the different aesthetic units involved as well as the quality of the tissues and the possible structural support needed by those tissues. This analysis leads to the use of the reconstructive "elevator" rather than the reconstructive "ladder," in which the flap or combination of flaps are chosen that will give the most aesthetically pleasing as well as functional outcome.[4]

From an aesthetic viewpoint, one can consider donor-site morbidity to be a result of improper scar positioning. This is largely preventable by positioning scars in the borders of the aesthetic units. For instance, when looking at a person's face, the gaze is fixed on the eyes, cheekbones, nose, and mouth. Scars on the forehead or lateral to a vertical line through the lateral canthus are less conspicuous, and therefore also have less aesthetic donor-site morbidity, even if they run through an aesthetic unit. From the functional

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Fig. 1. Schematic representation of aesthetic units of the face.

perspective, the use of perforator flaps has greatly diminished donor-site morbidity because they save muscle function in those areas in which muscle was harvested previously to incorporate the blood supply that perfuses the overlying skin.

Aesthetic facial reconstruction is challenging and artistic. Reproducible and good outcomes can only be achieved by the use of detailed preoperative plans with possible back-up options. Proper planning is key to any good outcome. In many cases, consecutive stages need to be performed as part of the initial plan or as part of touch-ups. A perfect result will often need more than a single operation. This paper provides insight on how to prevent undesirable functional and aesthetic outcomes in facial reconstruction and gives solutions for the enhancement of functional and aesthetic outcomes using secondary procedures.

DEFECT ANALYSIS

Facial reconstruction is well beyond the period in which filling the hole or covering up the surface was a measure of success. Aesthetic facial reconstruction is only successful if normalcy and, if affected, symmetry are restored. Successful aesthetic facial reconstruction is largely dependent on the proper analysis of the defect. To properly analyze the defect, a list of the issues involved in functional impairment and the missing tissues from involved aesthetic units needs to be made. When all the requirements of the reconstruction have been identified, a plan can be made. Reconstruction of function should be the basis from which to start, after which the aesthetics of the reconstruction come in. As a general rule, aesthetic units should be reconstructed individually. For instance, a forehead flap used for nasal reconstruction should not be used to reconstruct part of a cheek because the cheek defect needs to be reconstructed separately from the nose.

FUNCTIONAL AND AESTHETIC OUTCOME ENHANCEMENT BY REGION

Forehead and Scalp

Forehead and scalp reconstruction first aims to cover exposed underlying skull bone or contents. Following successful defect coverage, the main focus of the reconstruction becomes one of a more an aesthetic nature. Successful coverage will not always result in good aesthetic outcome. Small- to medium-sized defects can be reconstructed satisfactorily using local scalp flaps (**Fig. 2**). In large defects, local tissue will not be of sufficient size to provide coverage, and free-tissue transfer will be required. The main concerns here generally are: (1) coverage that is too bulky or too thin, (2) incorrect skin color, (3) lack of hair, and (4) suboptimal scarring. In addition, sometimes a contour deficiency caused by missing bone may exist. There are a number of solutions to deal with these issues.

Suboptimal flap selection will usually result in excessive bulk after coverage of the forehead or scalp. Musculocutaneous flaps and thick fasciocutaneous flaps can result in bulky coverage. Skin on the forehead and scalp and related subcutaneous tissues are generally thinner than in most standard skin flap areas. Excising the skin paddle of a musculocutaneous flap and skin grafting the underlying muscle can thin excessive bulk of skin and subcutis. Alternatively, resection or liposuction of subcutaneous fat can further thin a flap.

When using a muscle flap with skin graft for coverage, the muscle will thin over time because it is no longer innervated. On the scalp, this will usually not be a major concern. These flaps, however, are less resilient to friction and can present with small areas of skin graft breakdown over time. On the forehead, thinning of a muscle flap can result in a skeletonized appearance, which accentuates the contour of the skull.