

CLINICAL AND AESTHETIC CRITERIA FOR INDIVIDUALIZED SURGICAL PLANNING IN THE RECONSTRUCTION OF POST-TRAUMATIC MAXILLOFACIAL SOFT TISSUE DEFECTS

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Abstract

Post-traumatic soft tissue defects of the maxillofacial region represent one of the most challenging areas of reconstructive surgery. Because the face is composed of aesthetically critical anatomical units and plays a vital role in facial expression, eyelid function, oral competence, speech, and mastication, reconstruction cannot merely be limited to defect closure; it demands a comprehensive restoration of both form and function. In selecting a surgical approach, alongside the size and depth of the defect, it is essential to consider its anatomical location, relation to facial aesthetic units, skin color and texture, three-dimensional contour, local tissue mobility, functional deficits, and donor site availability.

Keywords: Maxillofacial region, post-traumatic defect, soft tissue, facial reconstruction, individualized surgical planning, aesthetic unit, aesthetic subunit, local flap, perforator flap, free microvascular flap, facial symmetry, clinical and aesthetic criteria.

Introduction

Soft tissue injuries in the maxillofacial region are often associated with severe trauma, tissue crushing, avulsion, burns, mechanical injuries, animal bites, as well as traffic and industrial accidents. In such injuries, soft tissue defects may be accompanied by damage to bone, cartilage, nerves, muscles, and mucous membranes.

The unique challenge of facial reconstruction is that it must fulfill both functional and aesthetic roles simultaneously. Even a relatively minor defect can disrupt the natural contours, light-and-shadow boundaries, and



symmetry of the face, negatively impacting the patient's social and psycho-emotional well-being.

One of the core principles of modern reconstructive surgery is "**like with like**," which entails replacing lost tissue with donor tissue that is morphologically and functionally most similar to it. Because facial skin thickness, color, texture, elasticity, and three-dimensional contour vary across anatomical regions, the selection of donor tissue must be tailored individually.

Furthermore, planning reconstruction by dividing the face into distinct aesthetic units and subunits significantly improves surgical outcomes. The borders of these aesthetic units often coincide with natural lines of light and shadow; therefore, placing scars along these junctions can reduce their visual prominence.

The first stage of individualized surgical planning is a comprehensive morphological characterization of the defect.

Defects can be arbitrarily divided into:

- superficial;
- moderate-depth;
- full-thickness;
- deep and combined

types.

Superficial defects mainly involve the epidermis, dermis, and partially the subcutaneous tissue. For such defects, primary closure or a local flap is often the optimal option if surrounding tissues are sufficient.

Moderate-depth defects may involve the loss of the subcutaneous fat layer and superficial fascial layers. In this case, simply closing the skin may lead to depression or distortion of the facial contour. Therefore, volume-restoring local or regional tissue is required.

Full-thickness defects involve the skin, subcutaneous tissue, and deep anatomical structures. In areas such as the lips, cheeks, nose, and eyelids, such defects are especially critical from a functional standpoint.

Combined defects are characterized by the concurrent loss of bone, cartilage, muscle, mucous membranes, and soft tissue. In these situations, single-stage or staged multi-component reconstruction may be required.

Facial aesthetic units are one of the main criteria in individualized planning.

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In practical terms, the following regions are assessed individually:

- forehead;
- periorbital and eyelid region;
- nose;
- cheek;
- upper and lower lips;
- chin;
- submandibular and cervicofacial region.

Each unit has its own unique skin thickness, elasticity, color, texture, and three-dimensional configuration. For this reason, a reconstructive method that yields good results in one area may be aesthetically unsatisfactory in another.

The principle of aesthetic subunits is particularly important in nasal reconstruction. The nasal dorsum, sidewalls, tip, and alae have distinct morphological characteristics, and the reconstructive technique is selected based on the location and size of the defect.

Some literature indicates that when a defect involves a major portion of an aesthetic subunit, reconstructing the entire subunit may yield a superior aesthetic outcome. This approach allows scars to be hidden along natural anatomical boundaries. Springer

Morphological compatibility of the donor tissue is crucial in post-traumatic facial reconstruction.

An ideal donor tissue should:

- match the facial skin in color;
- be similar in texture;
- have adequate thickness;
- have appropriate elasticity;
- provide the necessary volume; and
- be functionally compatible.

For example, in areas requiring thin and pliable tissue, a radial forearm free flap can be used, whereas an anterolateral thigh flap may be utilized for moderate- to large-volume soft tissue defects. According to current evidence, the anterolateral thigh flap is widely used in facial reconstruction because it can be harvested at variable thicknesses, possesses a long vascular

pedicle, and allows for the inclusion of additional fascial components. Frontiers+1

Thus, the selection of a donor site must address not only the question of "how much tissue is needed?," but also **"what type of tissue is required?."**

The aesthetic outcome of facial reconstruction is not determined solely by the restoration of the skin surface.

The following components of the facial contour must be evaluated:

- projection;
- depth;
- volume;
- convex and concave surfaces;
- bilateral symmetry;
- anatomical landmarks.

Soft tissue loss may result in depression or distortion of the facial contour. In such cases, skin grafting alone may cover the defect, but it is highly unlikely to eliminate the three-dimensional deformity.

Therefore, in complex defects, it is also essential to restore soft tissue volume. In modern reconstructive approaches, three-dimensional assessment and virtual surgical planning capabilities are becoming increasingly vital. PubMed Central (PMC)

Aesthetic outcomes should not be considered in isolation from function.

The following are evaluated prior to surgery:

- eyelid closure;
- globe protection;
- nasal breathing;
- oral competence;
- lip mobility;
- mouth opening;
- mastication;
- speech;
- facial muscle function;
- sensation.

Particularly in the periorbital and perioral areas, even a minor anatomical error can result in major functional consequences. Therefore, in these

regions, the primary criterion of the reconstructive plan must prioritize functional safety over aesthetic appearance.

In complex facial trauma, the primary goal of reconstruction, along with facial form, is to restore oral competence, speech, swallowing, breathing, eyelid protection, and facial mimicry as much as possible.

Taking clinical and aesthetic criteria into account, it is advisable to select reconstructive methods in the following order:

Small defects:

- primary closure;
- local transposition flap;
- rotation flap;
- V-Y plasty;
- Z-plasty.

Moderate-sized defects:

- local perforator flaps;
- regional flaps;
- full-thickness skin grafting;
- tissue expansion in selected cases.

Large and deep defects:

- regional fasciocutaneous or myocutaneous flaps;
- free microvascular flaps;
- multicomponent reconstruction.

Massive and combined defects:

- staged reconstruction;
- free microvascular flaps;
- simultaneous reconstruction of bone, cartilage, and mucosa where necessary.

In complex facial trauma, reconstruction is often performed in multiple stages. Initially, vital and anatomically critical structures are protected and stable soft-tissue coverage is established, while subsequent stages allow for

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the refinement of contour, symmetry, and aesthetic details. PubMed Central (PMC) +1

Based on the reviewed literature, the clinical and aesthetic criteria for individualized surgical planning can be summarized as follows: **(Table 1)**

Criterion	Clinical significance	Impact on reconstruction
Defect size	Determines tissue requirements	Selection of flap type
Defect depth	Indicates which anatomical layer is missing	Single- or multi-layer reconstruction
Aesthetic unit	Helps preserve natural facial contours	Reconstruction by subunit
Skin color and texture	Determines aesthetic match	Selection of donor site
Local tissue quality	Determines the feasibility of reconstruction	Local flap or alternative method
Functional impairment	Determines the primary goal of surgery	Functional reconstruction
Facial contour	Determines the three-dimensional aesthetic outcome	Volumetric tissue selection
Donor site	Determines tissue quality and surgical risk	Selection of flap type
Patient's needs	Influences the subjective evaluation of the final outcome	Individualized planning

Analysis shows that an approach based solely on the surface area of the defect is insufficient. For instance, if two defects of identical size are located in different anatomical regions, their functional and aesthetic requirements may differ entirely.

Furthermore, in modern free flap reconstruction, flap viability is no longer considered the sole criterion of success. Contour, sensation, facial animation, oral competence, donor-site morbidity, and the patient's quality of life are also integral components of the final outcome. Frontiers

Individual surgical planning in the reconstruction of post-traumatic soft tissue defects of the maxillofacial region should be based on a **comprehensive evaluation of clinical, morphological, functional, and aesthetic criteria.**



The following criteria are prioritized when selecting a reconstructive strategy:

1. size and depth of the defect;
2. anatomical location;
3. relationship to facial aesthetic units and subunits;
4. quality and mobility of adjacent tissues;
5. distortion of facial contour and symmetry;
6. presence of functional impairment;
7. donor tissue match regarding color, texture, thickness, and volume;
8. the patient's individual aesthetic and functional needs.

Local plastic techniques for small and superficial defects, regional and perforator flaps for moderate defects, and free microvascular flaps for large and deep defects constitute the primary reconstructive options.

Thus, the success of post-traumatic facial reconstruction is determined not only by the anatomical closure of the defect, but also by **the harmonious restoration of natural facial contour, symmetry, function, skin color, and texture, as well as the patient's quality of life.** The use of an individualized clinical-aesthetic algorithm enables a well-founded selection of the reconstructive method and improves long-term functional and aesthetic outcomes.

References

1. Izaddoost S.A., Hollier L.H. Facial Soft Tissue Trauma. Seminars in Plastic Surgery. 2012;26 (4):199–207. PubMed Central (PMC)
2. Maricevich R.S., et al. Soft Tissue Management in Facial Trauma. Seminars in Plastic Surgery. 2017;31 (1):73–79. PubMed Central (PMC)
3. Menick F.J. Facial reconstruction with local and distant tissue: the interface of aesthetic and reconstructive surgery. Plastic and Reconstructive Surgery. 1998. PubMed
4. Ogino A. Reconstruction of Facial Skin and Soft Tissue Defects with Consideration of Unit Morphology. Toho Journal of Medicine. 2025;11 (3):42–46. J-STAGE
5. Contemporary reconstruction after complex facial trauma. Burns & Trauma. 2020. PubMed Central (PMC) +1

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ISSN (E): 2836-3612

6. Pang J., Cash H., Futran N. Free tissue reconstruction of massive facial trauma – review of the literature and considerations to implement aesthetic and functional outcome. Plastic and Aesthetic Research. 2021;8:49. OAE Publishing
7. Free Flap Selection Strategies and Advances in Facial Soft Tissue Defect Reconstruction. Frontiers in Surgery. 2026. Frontiers
8. Treatment of Post-traumatic Facial Deformities. Seminars in Plastic Surgery. 2023. PubMed Central (PMC)
9. Reconstruction of the Nose: Management of Nasal Cutaneous Defects According to Aesthetic Subunit and Defect Size. A Review. 2020. PubMed Central (PMC)
10. Soft Tissue Reconstruction of the Maxillofacial Region. Springer Nature. 2020. Springer