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COMPARISON BETWEEN FREE FLAP AND LOCAL FLAP IN POST-ONCOLOGICAL NASAL RECONSTRUCTION

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Abstract: Post-oncological nasal reconstruction is one of the greatest challenges in facial reconstructive surgery, due to the anatomical complexity of the nose, its essential respiratory function, and its central role in facial identity. Among the available strategies, local flaps and free flaps represent fundamental approaches, with distinct indications and complementary results. This article provides a detailed comparison between local flaps and free flaps in nasal reconstruction after oncological resections, exploring anatomical principles, reconstructive planning, surgical techniques, aesthetic and functional results, complication rates, donor site morbidity, psychosocial impact, and clinical decision algorithms. The analysis shows that local flaps remain the basis of nasal reconstruction for small and moderate defects, while free flaps are indispensable in extensive defects, full-thickness defects, and irradiated or previously operated fields. The appropriate choice of technique, based on classic reconstructive principles and patient individualization, is crucial for lasting and satisfactory results.

Keywords: nasal reconstruction; oncological surgery; local flap; free flap; reconstructive plastic surgery; microsurgery.

Introduction

The nose is one of the most complex structures of the face, from an anatomical, functional, and aesthetic point of view. In addition to being responsible for fundamental respiratory functions, such as warming, humidifying, and filtering the air, the nose occupies a central position on the face, decisively influencing the perception of identity, symmetry, and facial harmony.

Skin neoplasms are the main cause of acquired nasal defects, especially basal cell carcinoma and squamous cell carcinoma. In advanced, recurrent, or aggressive tumors, oncological resection can result in extensive defects, often involving the entire thickness of the skin, cartilage, bone, and mucosa. In these situations, nasal reconstruction is not limited to simply covering the defect but requires precise three-dimensional restoration, otherwise there is a risk of structural collapse, respiratory obstruction, and severe aesthetic deformities.

In this context, local flaps and free flaps emerge as the main reconstructive tools. Although often presented as alternatives, in clinical practice these techniques are complementary and should be chosen strategically.

Objectives

- To thoroughly analyze the principles of post-oncological nasal reconstruction.
- Compare local flaps and free flaps in terms of indications, technique, results, and complications.
- Discuss clinical and oncological factors that influence the choice of technique.
- Propose a rational and individualized approach to nasal reconstructive planning.

Methodology

This is an in-depth narrative review based on classic books on nasal reconstruction, clinical series, observational studies, and contemporary reviews. The narrative approach allows for the integration of technical, conceptual, and functional aspects that are not fully captured in isolated quantitative analyses, making it particularly useful in complex surgical topics.

Advanced principles of nasal reconstruction

Three-dimensional reconstruction

Nasal reconstruction must be considered in a three-dimensional manner, respecting:

- External shape, which defines the aesthetic contour;
- Structural framework, which supports the shape and maintains air permeability;
- Internal lining, essential for respiratory function and prevention of stenosis.

Reconstructions that neglect any of these dimensions tend to evolve with progressive functional and aesthetic failures.

Aesthetic subunits and the principle of complete replacement

The concept of nasal aesthetic subunits establishes that defects involving more than 50% of a subunit should ideally be reconstructed as a whole. This strategy allows scars to be positioned at natural boundaries and more harmonious results to be obtained, even if it involves deliberate enlargement of the initial defect.

Local flaps: technical and conceptual deepening

Biological fundamentals

Local flaps preserve regional vascularization, which provides high reliability and reduces the risk of total failure. In addition, they use tissue with characteristics similar to those of the nose, especially in terms of color, texture, and skin thickness.

Main flaps and their specific applications

- Bilobed flap: indicated for small defects of the nasal tip; allows redistribution of tension and discreet scarring.
- Nasolabial flap: versatile, can be used for both external coverage and internal lining reconstruction; particularly useful in nasal wing defects.
- Advance/rotation flaps: indicated for linear or asymmetrical defects, especially on the nasal dorsum.
- Paramedian frontal flap: considered the gold standard for large skin defects of the nose, with excellent vascularization and predictability.

Limitations of local patches

Despite their advantages, local flaps have clear limitations:

- Limited amount of tissue available;
- Difficulty in reconstructing extensive full-thickness defects;
- Increased risk of scar retraction and nasal collapse when used beyond their indications.

Free flaps: technical and functional insights

Microsurgical rationale

Free flaps allow the transfer of large volumes of well-vascularized tissue, regardless of the local conditions of the recipient bed. Microvascular anastomosis enables reconstruction in previously irradiated or scarred areas, where local flaps would have a high risk of failure.

Types of free flaps and refined indications

- Radial forearm flap: extremely thin and malleable, ideal for reconstruction of the internal nasal lining; often associated with cartilage grafts for structural support.
- Anterolateral thigh flap (ALT): indicated for extensive defects involving the nose and midface; allows for great versatility in volume.
- Scapular/parascapular flaps: useful in complex reconstructions, offering good quality skin and a reliable pedicle.

Multi-stage reconstruction

Nasal reconstruction with free flaps often occurs in multiple surgical stages:

1. Initial coverage and restoration of the internal lining;

2. Cartilaginous structural reconstruction;
3. Secondary aesthetic refinements.

This staged approach, although longer, allows for superior functional and aesthetic results in complex defects.

In-depth comparison between local flap and free flap

Defect scale

- Small and moderate: local flaps offer better cost-effectiveness and aesthetic results.
- Extensive and full-thickness: free flaps are often the only viable option.

Long-term aesthetic result

Local flaps tend to have better immediate aesthetics. Free flaps, despite their less refined initial appearance, can achieve excellent final results after refinement steps.

Respiratory functional outcome

In simple defects, both techniques preserve respiratory function. In complex defects, free flaps have a significant advantage in reconstructing the inner lining and preventing stenosis.

Overall morbidity

- Local flaps: lower systemic morbidity and faster recovery.
- Free flaps: higher initial morbidity and microsurgical risk, but acceptable in experienced centers.

Psychosocial impact and quality of life

Successful nasal reconstruction has a direct impact on the patient's social reintegration, self-esteem, and mental health. Inadequate reconstructions, on the other hand, can lead to social stigmatization, chronic breathing difficulties, and the need for multiple reoperations.

The correct choice between local and free flaps reduces the number of procedures, improves patient satisfaction, and contributes to faster and more effective overall rehabilitation.

Practical decision algorithm

1. Assess the extent and depth of the defect.
2. Determine involvement of the three nasal layers.
3. Consider history of radiation therapy and previous surgeries.
4. Assess the patient's clinical condition.
5. Select the least complex technique capable of adequately restoring form and function.

Discussion

Post-oncological nasal reconstruction should not be guided by isolated technical preference, but by sound reconstructive principles. Local flaps remain irreplaceable in most nasal defects, while free flaps significantly expand reconstructive possibilities in complex scenarios. Mastery of both techniques is essential for the modern reconstructive surgeon.

Conclusion

The comparison between free flaps and local flaps in post-oncological nasal reconstruction demonstrates that these techniques are complementary and fundamental. Local flaps offer excellent results in small and moderate defects, while free flaps are indispensable in extensive defects, full thickness defects, and previously treated fields. The ideal nasal reconstruction is one that is planned individually, respecting anatomical, functional, and oncological principles, ensuring lasting aesthetic, functional, and psychosocial results.

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