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Beard reconstruction: A surgical algorithm



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Summary *Background and aim:* Facial defects with loss of hair-bearing regions can be caused by trauma, infection, tumor excision, or burn injury. The presented analysis evaluates a series of different surgical approaches with a focus on male beard reconstruction, emphasizing the role of tissue expansion of regional and free flaps.

Methods: Locoregional and free flap reconstructions were performed in 11 male patients with 14 facial defects affecting the hair-bearing bucco-mandibular or perioral region. In order to minimize donor-site morbidity and obtain large amounts of thin, pliable, hair-bearing tissue, pre-expansion was performed in five of 14 patients. Eight of 14 patients were treated with locoregional flap reconstructions and six with free flap reconstructions. Algorithms regarding pre- and intraoperative decision making are discussed and long-term (mean follow-up 1.5 years) results analyzed.

Results: Major complications, including tissue expander infection with the need for removal or exchange, partial or full flap loss, occurred in 0% (0/8) of patients with locoregional flaps and in 17% (1/6) of patients undergoing free flap reconstructions. Secondary refinement surgery was performed in 25% (2/8) of locoregional flaps and in 67% (4/6) of free flaps.

Conclusion: Both locoregional and distant tissue transfers play a role in beard reconstruction, while pre-expansion remains an invaluable tool. Paying attention to the presented principles and considering the significance of aesthetic facial subunits, range of motion, aesthetics, and patient satisfaction were improved long term in all our patients while minimizing donor-site morbidity.

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Introduction

Defects in the face can be caused by trauma, infection, tumor excision, or burn injury. The resulting disfigurement may severely limit the patient's social rehabilitation. In the male face, the hair-bearing regions present unique reconstructive challenges, as only a few donor sites fulfill the reconstructive requirements. Adhering to basic plastic surgical principles and as already been described by Gillies and Millard,¹ the ideal reconstruction entails complete scar excision and replacement with tissue of matching quality compared to the remaining face and the surrounding areas, consisting of thin, pliable tissue with a similar color match and hair-bearing quality. While doing so, adhering to the principles of reconstructing entire facial subunits should always be considered.²

Despite recent advancements in facial reconstruction, such as the advent of free tissue transfer, achieving optimal long-term results with high patient satisfaction remains a surgical challenge, however. The technique of pre-expansion of free and regional axial island flaps, has certainly contributed in achieving this goal.^{3,4} Pre-expansion of flaps can provide a larger surface and thinner, more pliable tissue compared to the conventional tissue transfer, which may aid in achieving a more natural contour.⁵

In this article, we focus on the role of pre-expansion of axial and free temporal flaps, as we found them especially suited for beard reconstruction, given the tissue quality and donor-site characteristics.

In the setting of facial reconstruction, while sometimes argued to be time consuming, expensive, and prone to complications, we find that pre-expanded free tissue transfer can still be worth the effort. Similarly, when available, given the ease of harvest and transfer as well as optimal color and texture match, pre-expanded axial (i.e., the temporal island) flaps remain an important tool in the plastic surgeons' armamentarium.

Appropriate patient selection ultimately poses the most critical factor. In an effort to further improve outcomes and considering the recent surgical evolution, we analyzed the surgical decision making and results in beard reconstruction over a 5-year period.

Materials/patients and methods

A retrospective chart review of all patients suffering from defects in the hair-bearing bucco-mandibular or perioral region between 2010 and 2015 treated at a major city hospital was performed. The basic patient demographics (Tables 1 and 2), including age, sex, body mass index (BMI), metabolic abnormalities, smoking status, location of defect, size of flap, and complications, were collected and reviewed.

During the 5-year period, 11 male patients underwent facial reconstruction with either pre-expanded or regular locoregional (8/14) and free flap transfers (6/14; Table 2). The median age of all patients was 31 years (25–71 years), and the mean follow-up was 1.5 years (2 months–3 years). Expansions were performed with tissue expanders (Mentor

Table 1 Patient demographics.

Pat.	Age (yr)	Sex	Pathogenesis	Smoking status	BMI
1	30	m	Burn injury	y	20.1
2	25	m	s/p Cleft lip	y	21.8
3	26	m	Acne inversa	y	25.9
4	71	m	Malignancy	n	24.2
5	26	m	Trauma	n	20.4
6	41	m	Acne inversa	y	24.2
7	28	m	Burn injury	y	26.5
8	42	m	Burn injury	n	23.1
9	73	m	Malignancy	y	20.2
10	41	m	Burn injury	y	20.2
11	26	m	Burn injury	y	22.5

Corporation, Irving, TX, USA, 125 cc). The defect and corresponding flap size ranged from 2 × 1 to 17 × 7 cm.

Case Example 1: Locoregional flap-based mustache reconstruction: A 25-year-old patient with post-bilateral cleft lip repair in infancy presenting with a lack of mustache growth in the central portion of the upper lip. Two-stage reconstruction was performed using an Abbe flap (Figure 1a and b).

Case Example 2: Locoregional flap-based mustache reconstruction: A 71-year-old male patient presenting with a basal cell carcinoma in his philtrum. After tumor excision, the resulting defect in the mustache region, 5 × 3 cm in size, was reconstructed with an ipsilateral pedicled pre-expanded fasciocutaneous temporalis flap (after a weekly pre-expansion for 10 weeks) taking the whole aesthetic subunit into consideration (Figure 2a and b).

Case Example 3: Locoregional flap-based beard reconstruction: A 26-year-old male patient presenting with severe scarring in his bucco-mandibular region s/p acne inversa. Pre-expansion (125-cc expander) of the ipsilateral temporal region has been performed for 12 weeks on a weekly basis (Figure 3a–e).

Case Example 4: Pre-expanded free flap-based mustache reconstruction: A 42-year-old male patient who sustained burn injury 5 years before presenting with severe scarring and hair loss in his perioral region. Due to scarred and rigid bucco-mandibular tissue quality, mustache reconstruction by a free pre-expanded fasciocutaneous temporalis flap was planned. Pre-expansion (125-cc expander) of the left temporal region had been performed for 12 weeks on a weekly basis (Figure 4 a–d).

Results

Overall, 11 male patients underwent reconstruction of 14 hair-bearing bucco-mandibular or perioral regions. There were four defects in the mustache and nine defects in the beard region. Overall, eight of 14 defects were reconstructed by locoregional flaps (3/8 pre-expanded) and six by free flap transfer (2/6 pre-expanded). The mustache defects were reconstructed with either local transposition flaps ($n = 2$, one Abbe and one facial artery pedicled transposition flap), regional flap ($n = 1$, pre-expanded temporalis flap), or free flap transfer ($n = 1$, free pre-

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