Autologous Reconstruction of a Face Transplant Candidate

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Abstract

Keywords

- autologous reconstruction
- conventional reconstruction
- facial reconstruction
- face transplant

Since 2005, facial transplantation has emerged as a viable reconstructive option for the most severe defects not amenable to conventional reconstructive techniques, with promising aesthetic and functional outcomes to date. Key facial subunits and midface structures such as the eyelids, lips, and nose are now able to be successfully replaced rather than reconstructed, enabling adequate functional outcomes in even the most extensive defects. However, even in cases of severe facial disfigurement, the decision to proceed with transplantation versus autologous reconstruction remains a source of debate, with no current consensus regarding precise indications and inclusion/exclusion criteria. This report details the case of a candidate referred for face transplantation who ultimately underwent autologous facial reconstruction. Through this representative case, our objective is to clarify the criteria that make a patient a suitable face transplant candidate, as well as to demonstrate the outcomes achievable with a conventional autologous reconstruction, using a methodically planned, multistaged approach.

The advent of microsurgical free tissue transfer in the 1980s¹ revolutionized the approach to facial reconstruction, allowing the repair of large, complex defects with composite bone and soft-tissue flaps. However, since 2005, facial transplantation has emerged as a viable reconstructive option for the most severe defects not amenable to these conventional reconstruction techniques. Promising aesthetic and functional results have been achieved in the over 40 procedures performed to date.² Key facial subunits and central structures such as the eyelids, lips, and nose can now successfully be replaced rather than reconstructed, and—most importantly—adequate functional outcomes can be attained in even the most extensive defects.³

However, even in cases of severe facial disfigurement, the decision to proceed with transplantation versus autologous reconstruction remains a source of debate. Currently, there is

no consensus regarding precise indications or inclusion/exclusion criteria.⁴ Instead, decisions appear to be made primarily on a case-by-case basis. This decision depends on a variety of patient-specific factors, including the extent of the defect, patient age, and availability of autologous tissue options. Many candidates end up being referred by non-plastic surgery colleagues involved in other aspects of their postinjury care, or are self-referred after being exposed to media coverage of prior recipients; however, ultimately most of these referred patients do not undergo transplantation.⁵ Thus, there remains a need to provide clarification regarding the patient-specific criteria that make someone an appropriate candidate for facial transplantation. This report details the case of a patient initially presenting as a candidate for facial transplantation who ultimately underwent autologous facial reconstruction. Through this representative case, we hope to provide knowledge and

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clarification of the criteria that the senior author (E.D.R.) believes make a patient a suitable face transplant candidate. In addition, we hope to demonstrate the outcomes achievable with a methodically planned, multistaged autologous reconstructive approach utilizing a combination of composite free-tissue transfer and local/regional flaps.

Case Report

A 34-year-old male was referred for consideration for facial transplantation 7 months after sustaining a high velocity, self-inflicted ballistic injury to the face with composite tissue defects of the midface and lower face. He suffered severe facial avulsion, resulting in composite full-thickness loss of the nose, as well as the anterior tongue, hard palate, maxilla, and majority of the mandible (►Fig. 1a). While presenting as a possible candidate for facial transplantation, initial evalua-

tion revealed that the majority of both the upper and lower lips were present, although severely scarred and tethered. It was felt that enough of the subunit remained to recreate the oral sphincter and restore oral competence, and the decision was made to proceed with multistaged autologous reconstruction rather than transplantation.

The first operation utilized computerized surgical planning (CSP) for mandibular reconstruction with a microvascular free fibula flap with intra- and extraoral skin paddles (►Fig. 2a), as well as complex vestibuloplasty and tissue rearrangements of the tongue, floor of mouth, and lower lip (►Fig. 1b). Six months later, he underwent the second phase of his reconstructive plan (►Fig. 2b), consisting of complex tissue rearrangement of the upper lip, closure and repair of oronasal and oromaxillary fistulas, segmental maxillary osteotomies, left maxillectomy including extraction of three posterior teeth, and midface/maxillary reconstruction with a

Fig. 1 Preoperative (a) and postoperative patient photographs following free fibula flaps to the mandible (b) and maxilla (c), ulnar forearm flap for nasal lining reconstruction and tissue expander placement (d), upper lip rotation advancement, skin paddle deepithelialization, and chin skin advancement (e), and 7 months post-paramedian forehead flap inset (f). (Printed with permission and copyrights retained by E.D.R.).

Fig. 2 Microvascular free fibula flaps were used for reconstruction of the mandible (a) and maxilla (b) with the aid of computerized surgical planning (CSP). (c) The fibula with planned osteotomies for the mandibular reconstruction. (Printed with permission and copyrights retained by E.D.R.).

second free fibula flap (→Fig. 1c). The vessels of the first fibula free flap were anastomosed in an end-to-end fashion to the left superior thyroid artery and left external jugular vein. The vessels of the second fibula free flap were anastomosed end-to-end to the right facial artery and vein.

Following these operations, multistage nasal reconstruction was commenced with microvascular repair of the nasal lining using an ulnar forearm flap with placement of a costochondral rib graft for structural support as well as a tissue expander in preparation of a paramedian forehead flap (→Fig. 1d). The ulnar forearm free flap vessels were anastomosed in an end-to-end fashion to the left superficial temporal artery and vein. Subsequently, a rotation advancement of the upper lip was performed to correct a “whistle” deformity, the external mandibular fibula flap skin paddle was deepithelialized, and hair-bearing chin skin was advanced (→Fig. 1e). Finally, the expanded paramedian forehead flap was used for external nasal resurfacing in conjunction with additional costochondral grafting for nasal dorsum, sidewall, and columellar/tip support (→Fig. 1f). Osseointegrated implants were subsequently placed in the maxilla and mandible followed by full dental prosthetic restoration (→Fig. 3).

It is the senior author's (E.D.R.) preference to resort to early debridement and reconstruction following high-energy facial injury. The effectiveness of early facial reconstruction using vascularized bone flaps in achieving superior functional and aesthetic outcomes has previously been described.⁶ The rationale behind this approach is that early debridement allows early excision of necrotic and nonviable tissue, which may

serve to limit soft-tissue contractures as well as the inflammatory response due to tissue injury and decrease the likelihood of infections, which may jeopardize tissues that can be salvaged and utilized during subsequent reconstructive efforts. Furthermore, while patient comorbidities should be evaluated on a case-by-case basis, patients suffering from ballistic facial trauma tend to be young and healthy otherwise.^{4,7–9} The patient described in this case report presented 7 months following injury. In the setting of delayed presentation, the described benefits of early intervention are lost, and it is the preference of the senior author (E.D.R.) to utilize a staged approach when reconstructing extensive defects of the face to allow for a stable period of convalescence following microvascular reconstruction. This approach was appropriate in this patient given the delayed presentation; presentation in the acute injury setting would have warranted consideration for early microvascular reconstruction of both the mandible and maxilla.

Discussion

Individual case reports of candidates who have undergone facial transplantation have been relatively common, with detailed descriptions of surgical technique, short- and long-term outcomes, and other topics. However, there are limited data regarding the initial consult for transplantation in the patient with considerable facial disfigurement. The decision to pursue autologous reconstruction or opt for transplantation has resulted in lively debates at educational meetings.⁴

Fig. 3 Postoperative photograph 3.5 years after initial mandibular reconstruction (*left*) and following prosthetic dental restoration with osseointegrated implants (*right*). (Printed with permission and copyrights retained by E.D.R.).

Interestingly, a consensus is not always reached during these discussions, even among experienced face transplant surgeons. This serves as a reminder that indications and contraindications for facial transplantation are not yet standardized, and surgeon preference may continue to drive these decisions as our approach to care for these patients evolves.

The decision to proceed with autologous reconstruction or face transplantation is not straightforward as demonstrated by the patient described in this case. This patient initially presented for face transplantation, and ultimately underwent autologous reconstruction after detailed evaluation. The standardization of approaches, indications, and contraindications

to face transplantation is a long-term priority for face transplant teams. However, due to the low number of cases performed to date and the paucity of long-term outcome reports, standardization remains elusive. The reality is that indications and contraindications for the procedure remain predominantly center and team specific. This is perhaps most pronounced with regard to face transplantation in blind patients, or following extensive facial oncologic reconstructions.^{10,11}

► **Table 1** illustrates strong indications, strong contraindications, and relative contraindications based on the senior author's (E.D.R.) experience and review of the world experience in face transplantation.

Table 1 Summary of indications and contraindications to facial transplantation based on single-surgeon experience

	Facial transplantation		
Category	Strong indications	Strong contraindications	Relative contraindications
Surgical/ Anatomical	Extensive defects involving the majority of the surface area of the face	Sufficient tissue of the central face subunits (upper/lower eyelids, upper/lower lips, nose) to complete autologous reconstruction	
	Extensive damage to or loss of the central face subunits (upper/lower eyelids, upper/lower lips, nose)	Adequate autologous tissue donor sites	
	Lack of autologous reconstructive options		
Nonsurgical	Adequate support system	Inadequate support system	History of malignancy
	No active psychiatric disorders	History of poor compliance	Blindness
		Active psychiatric disorder	Immunocompromised
		Active malignancy	Immunosensitized
		End-organ dysfunction	

Note: It is important to note that this table is likely to change with increasing global facial transplantation experience, and with evidence provided by long-term outcome reports.

Decisions to proceed with transplantation are often made by multidisciplinary teams with complementary expertise, and patients with disfigurements amenable to transplantation have been denied transplantation for reasons ranging from psychosocial factors, history of malignancy, lack of insurance coverage, and/or a low likelihood of adequate follow-up care. A comprehensive analysis of patients screened for facial transplantation at an experienced center revealed that approximately one-sixth of physician-referred patients underwent transplantation.⁵ This highlights the need to communicate with our reconstructive colleagues regarding the definition of a “good candidate,” from the point of view of surgical *and* nonsurgical factors. Patients may also be referred by trauma and burn care providers, and relationships with these sister specialties must be strengthened to ensure candidate referrals⁵; effective education and outreach may increase the likelihood of a successful referral.

In the experience of the senior author (E.D.R.), all patients who have undergone transplantation have been self-referred. Understandably, these patients often view transplantation as a last resort. The patient presented here was referred by another physician, but the decision to pursue autologous reconstruction was based in large part on a critical evaluation of the patient’s defect, remaining tissues, and availability of bone and soft tissues for free flap reconstruction. This highlights the importance of educating providers on the characteristics of an appropriate face transplant candidate. The patient’s initial presentation did show severe disfigurement (►Fig. 1), and transplantation can indeed be considered. However, detailed examination showed sufficient viable tissues in the upper and lower lip subunits; the absence of these tissues would otherwise present considerable reconstructive difficulty. This shifted the preferred therapeutic plan toward a multistage microsurgical reconstruction of the mandible, maxilla, and nasal subunit, once adequate donor tissues were identified. While this plan may appear lengthy compared with transplantation, the duration of the facial transplant process would be just as lengthy, especially after planned and unexpected revision surgeries are performed.^{12,13} Like transplantation, a multidisciplinary team approach is preferred when planning these complex reconstructions. Craniofacial and microsurgery expertise can and should be complemented with evaluation by oral and maxillofacial surgery, and maxillofacial prosthodontics whenever applicable for long-term dental rehabilitation. Importantly, full dental rehabilitation should remain a priority when possible, as it can elevate an already excellent surgical result by providing another critical level of functionality to the patient.

In the end, judicious patient selection remains the top priority in these challenging situations, and patient education is paramount to managing expectations and ensuring proper commitment to either of these long-term therapeutic choices. This is particularly important given the risks associated with face transplantation, which is considered by many to be an elective procedure.¹⁴ Patients receiving facial allografts require mandatory lifelong immunosuppression, which increases their risk of developing infections, renal failure, as

well as neoplasms.^{15–17} Transplant teams must also be ready to address the devastating consequences of allograft rejection and subsequent failure,^{18,19} which have resulted in explantation and death. Nevertheless, a recent face retransplantation may offer an alternative for patients with chronic allograft rejection requiring explantation.²⁰ With these issues in mind, we believe that when the risks of immunosuppression can be avoided in a young, otherwise healthy patient with sufficient autologous tissues that can be leveraged to obtain adequate functional and aesthetic improvement, transplant teams should opt against transplantation and perform autologous reconstruction. Going forward, advances in immunosuppression may alter the current risk–benefit ratio and allow expansion of indications for transplantation to a larger portion of patients with lesser facial reconstructive needs. We hope this report outlines the approach and considerations when evaluating for an alternative to facial transplantation after devastating and complex facial injury.

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