

Surgical-Allogeneic Facial Reconstruction: Facial Transplants

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Abstract

Several factors including cancer, malformations and traumas may cause large facial mutilation. These functional and aesthetic deformities negatively affect the psychological perspectives and quality of life of the mutilated patient. Conventional treatments are prone to fail aesthetically and functionally. The recent introduction of the composite tissue allotransplantation (CTA), which uses transplanted facial tissues of healthy donors to recover the damaged or non-existent facial tissue of mutilated patients, resulted in greater clinical results. Therefore, the present study aims to conduct a literature review on the relevance and effectiveness of facial transplants in mutilated subjects. It was observed that the facial transplants recovered both the aesthetics and function of these patients and consequently improved their quality of life.

Key Words: Composite Tissue Allotransplantation; Facial Transplantation; Microsurgery; Rehabilitation

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INTRODUCTION

Facial deformities and mutilations may be caused by malignancies, congenital malformations and traumas. Because the appearance is essential in the subjects' personality and social life, such defects result in functional and psychosocial problems [1-6].

Conventional treatments such as plastic surgery, allograft and maxillofacial prostheses may not provide appropriated functional and aesthetic results [7-10]. In case of large facial tissue loss with consequent anatomical reference loss, the rehabilitation of the subject is a

great challenge for the professional [2,3]. When the eyelids, nose and mouth are affected by the mutilation, the aesthetics of the facial expression are compromised, and even after conventional rehabilitation the patient may present asymmetry and a typical mask appearance [1-11].

During the past years, many advances in surgical treatment of facial defects have been achieved. The complex anatomy of the facial area has been unveiled, and the deformities and mutilations have been better understood. The recent introduction of composite tissue

allotransplantation (CTA) in the form of healthy and well-vascularized facial tissue transplant can solve several limitations of the conventional treatments. The possibility of replacing damaged or missing tissue might be a great promise [11,12].

Therefore, the objective of the current study was to conduct a literature review on the relevance and effectiveness of facial transplants in mutilated subjects.

CASE REPORT

A literature review in the Medline database was performed using the following keywords: “composite tissue allotransplantation”, “facial transplantation”, and “facial rehabilitation”. In vitro studies, case reports and literature reviews published from 1963 and 2011 were included in the current study. Non-English language articles and those articles not dealing with the surgical-allogeneic technique of facial rehabilitation were excluded.

DISCUSSION

Limitations of the conventional treatment

The increase desire to restore both the aesthetics and function of the compromised human face led to the development of different surgical and alloplastic techniques such as skin graft, local flaps, free tissue transfer and maxillofacial prostheses. However, those techniques presented several limitations [13-15]. These limitations were directly related to the complexity of the face anatomy, in which the inclusion of soft tissue and underlying muscles are necessary during face reconstruction so that the function could be recovered [16,17]. In addition, the compatibility of skin texture, color and thickness are required to obtain an aesthetic restoration; and when possible, the resulting scars should be placed in shadow areas in order to ensure smooth and uniform facial appearance.

A deformity resulting from contractions in the interface between the graft tissue and skin is another limitation of the surgical technique.

New grafts are normally performed to repair the deformity; but this can lead to incompatibility of the adjacent tissues giving a “flap appearance” of the rehabilitated area [8]. In order to reduce this risk and increase the aesthetics, many professionals combine the surgical techniques with maxillofacial prostheses [1,11,17]. Nevertheless, several patients are reluctant against the use of prostheses, because even when the prostheses are implant-retained, they are still removable and cause insecurity and promote social discomfort.

Therefore, to overcome the limitations of the conventional techniques, an alternative treatment has been developed to treat patients with facial deformities and mutilations. The facial transplants emerged to restore not only the patients’ aesthetics, but their function, and consequently to promote their re-insertion in the society. The successful hand transplant was the most important contribution to the introduction of facial transplants. In 1963, a team of surgeons in Ecuador performed the first human hand transplant, prior to the development of immunosuppressive drugs and, therefore, that transplant was not successful (Table 1). The high immunogenicity of the skin tissue did not allow this type of transplantation without the use of immunosuppressive drugs [18]. With the development of effective immunosuppressive drugs, another transplant was performed in 1998 in France [19-21]. Clinical success was observed after 2 years of evaluation and a significant return of sensation and function of the transplanted organ was noted. The apparent success of the transplanted human hand created the ethical and immunological steps to perform human facial transplantation, and the surgeons were allowed to consider the use of healthy tissues donors for the reconstruction of extensive facial mutilation [19-22].

Based on immunological, psychological and ethical foundations, Thomas et al. [23] reported the reconstruction of thick layers of the facial tissue and the scalp using microsurgical

technique, showing a 100% survival and good functional and aesthetic outcomes (Table 1). The facial function return was observed in patients with facial transplants. Dubernard et al. [24], in 2007, observed an increase in the patient's facial sensitivity to light touch after 6 months of facial transplant (Table 1). On the other hand, the motor recovery was slower, with gradual improvement of speech and mastication. After 18 months, the patient was able to recover some of the facial expressions [25]. Lantieri et al. [26] also noted facial sensitivity recovery after 3 months of surgery, and significant improvements were observed after 12 months. The surgical techniques have been improved; the ethical, immunological and psychological bases have been well-defined and the facial transplantation became a clinical reality for mutilated patients. The recent introduction of composite tissue allotransplantation (CTA) for facial tissue transplantation emerged to solve several limitations of the conventional treatments [7,27].

Composite tissue allotransplantation (CTA)

CTA involves simultaneous transplantation of the skin, muscle, nerves, bones, cartilage and blood vessels. When compared to the conventional technique that uses autologous tissue transfer, the CTA provides greater advantages to the severely mutilated patient, providing complete anatomic restitution, recovering the skin sensitivity with satisfactory functional and aesthetic outcomes [15].

However, some obstacles inherent to CTA including immunological, ethical and psychological factors are observed.

There are several controversies over transplantation between humans involving aspects that form the ethical basis of transplants, such as transplanted tissue rejection, availability of donated tissues and the consent of the donor and the recipient.

Nevertheless, in case of facial transplantation, other aspects including the real need to perform facial transplant and the association between the new face and the identity of each subject should also be considered [28-30].

Table 1. Cronological History of CTA Transplants

Author	Year of Publication	Sítio	Long-Term Evaluation	Success
Thomas et al. ²³	1994	Facial tissue and scalp transplants	_____	yes
Devauchelle et al. ¹⁵	2006	Facial transplant	4 months	yes
Guo et al. ⁴⁵	2006	Facial transplat	2 year	yes
Dubernard et al. ²⁴	2007	Facial transplant	18 months	yes
Lantieri et al. ²⁶	2008	Facial transplant	12 months	yes
Siemionow et al. ⁴⁶	2009	Facial transplant	6 months	yes
Pomahac et al. ²⁷	2011	Facial transplant	_____	yes

Different from vital organ transplant (e.g. heart), facial transplants are not performed in order to save lives; additionally, patients are at risk and complications of transplantation, necessity of immunosuppressive therapy throughout their life may decrease their life expectancy by about 10 years [28-31,32].

Therefore, the patient's desire and decision about facial transplantation is the first step to consider before surgery. It is important to recognize that not all disfigured patients want to receive a transplant. On the other hand, many of them are willing to accept the risks of transplantation and immunosuppression to improve their quality of life. Another very important ethical issue is the donor's family, who believes that there is a chance to see the face of the loved subject who recently passed away in another person. However, the bone morphology of the recipient will give a different look to the transplanted facial tissue [32-35]. Facial transplants may also affect the patient's autoimmune response that has to be controlled with standard immunosuppressive drugs. The immunosuppression treatment should be conducted during a long time, and total acceptance of the patient is necessary. This treatment has already been successfully used in transplants of solid organs. Development in immunotherapy of transplants made it possible to reduce the immunosuppression; therefore, CTA could be introduced in the clinical scenario [8,16]. However, the high incidence of infection in facial transplants has been attributed to the high doses of immunosuppressive drugs needed to prevent rejection in the post-surgery acute phase. On the other hand, all infections have been successfully treated with broad spectrum antibiotics and adjusted dosage of immunosuppressants [17-20]. Clinical success was observed in one of the first cases of CTA facial transplant¹⁵ that involved the distal region of the nose, upper and lower lip, chin, and adjacent parts of the cheek (Table 1).

Routine tests, biopsies, physiotherapy and psychological supports were conducted during

the evaluation period. At 20 days of surgery, mild clinical signs of rejection were observed, but these disappeared after increasing the dose of immunosuppressants. The patients also accepted their new face. After 4 months, authors claimed that this type of transplant is clinically viable. However, a long-term evaluation is still necessary to predict the success of this therapy. Siemionow et al. [9] in 2009 described a clinical case of extensive human face transplantation after a severe face trauma (Table 1). After a few days of surgery, routine examination revealed the onset of graft rejection that was managed by increased doses of immunosuppressants. In the first three weeks, the patient had good acceptance of his new face, and an excellent functional outcome was observed after 6 months. The patient was able to breath normally, the smell and taste senses recovered and his speech was partially affected. In addition, the patient could chew solid food and also drink.

In case of complex transplants, psychological acceptance of the graft by the patient is very complicated and it may be considered as a determining factor for the transplantation success [17,20]. Psychological issues are directly related to the patient's desire, the difficulty of re-insertion in the society, non-verbal communication deficits, anxiety, fear and hypervigilance associated with graft failure [5,17]. Nevertheless, in order to understand the psychological implications of facial transplants, psychosocial sequelae of the patients who have suffered facial mutilation should be considered. The importance of the face relies on the individuality of identity, age, gender and ethnicity of each subject³⁶. In addition, it is responsible for communication through facial expressions [37]. The mutilated patients lose their original personality, leading to social isolation, unhappiness, depression, stress and an increased risk of suicide [32,38-40].

Before facial transplantation, a critical psychological evaluation of the patient is necessary.

The patient should present psychological and cognitive abilities to understand the risks and responsibilities, and be aware of the limitations related to the treatment so that the expectations are not higher than the clinical reality [4,41]. Patients who received facial transplants find it difficult to integrate their new face with their personal identity. They should be able to adapt both to the new identity and to people's reactions to the new look. The social reactions may include real or false praise in relation to the aesthetic outcomes after facial transplant, feelings of shame, disgust, surprise and curiosity. Therefore, patients should be prepared for these reactions and should receive psychological support [42,43].

Most of the transplant failures are related to the non-compliance of patients with the immunologic treatments [4]. During the follow-up of the first human hand transplant, [19-21,44] the patient presented psychological problems leading to giving up the treatment with immunosuppressive drugs. Consequently, the transplanted hand was rejected and amputation was necessary. CTA has been a feasible treatment after 5 and 13 years of clinical experience in facial and hand transplants, respectively. Different from solid organ transplant, the incidence of systemic complications in transplants of the face and hands are lower. Generally, for patients taking consistent and controlled immunosuppressive drugs, the survival rate of transplantation was 100% and the aesthetic and functional aspects have been described as satisfactory.

CONCLUSION

The facial transplantation is a feasible option to restore a severely disfigured face when conventional treatment is not able to provide adequate aesthetics and function. In addition, this therapy improves the quality of life of the mutilated patients, recovering their self-esteem and psychological basis, and consequently reinserting the patient in society.

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