38: Technical Aspects of Face Transplantation: Two Options for Total Face Harvesting

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BACKGROUND: Acquired facial deformity can result from trauma, burns, and tumor resection. Conventional techniques such as skin grafts, local flaps, free flaps, tissue expansion, and prosthetic reconstruction provide satisfactory outcomes in most patients in need of facial reconstruction. However, final outcomes remain unsatisfactory in a number of cases, both from a functional and an aesthetic standpoint.[1] Facial transplantation may become a theoretically viable option in the treatment of patients with extensive facial disfigurement.[2] The challenges associated with immunosuppression and the ethical issues surrounding face transplantation are substantial.[3, 4] One of the most significant technical questions that remains to be answered in face transplantation is how a facial allograft should be harvested and what tissues it can include. Two modalities of face harvesting are presented: myocutaneous and osteomyocutaneous.

METHOD: The myocutaneous flap is harvested by dissecting in a subgaleal, sub-SMAS, subplatysmal plane (figure 1). A variety of details of this technique are subject to modification. The osteomyocutaneous flap can be harvested by dissecting in a subperiosteal plane and performing a Le Fort III osteotomy. Thus, the entire soft tissue and bony structure of the face is harvested (figure 2). This flap can then by modified to meet the recipient's specific reconstructive needs prior to insetting. Each of these techniques was performed on fresh human cadavers that had been perfused with latex.

RESULTS: Using each technique, the face was harvested successfully as a bipedicled flap based on the external carotid arteries, the external jugular veins, and the facial veins (figures 3 and 4). The myocutaneous flap appeared to be well perfused by the external carotid system throughout. The osteomyocutaneous flap appeared to be well perfused with the possible exception of a small portion of the bony segment, which, at worst, would function as a nonvascularized bone graft. Preservation of the periosteum in the osteomyocutaneous flap should improve the microvasculature integrity of the flap. These experimental findings are consistent with existing knowledge of vascular anatomy.[5, 6]

CONCLUSION: Several obstacles to total face transplantation remain, the most daunting of which are ethical problems associated with chronic immunosuppression.[7, 8] Two modalities of face harvesting have been proposed. Each has been shown to be technically feasible based on cadaver studies, and tissues appear to be well vascularized as a bipedicled flap. In clinical practice, the face could first be harvested according to one of these standardized techniques, and could then be customized to meet a patient's specific reconstructive needs. A number of details, including insetting of the flap, providing motor function, and avoiding graft-versus-host disease if lymph nodes are included in the flap remain to be explored. Total face transplantation is a realistic possibility, and we believe it will be performed once such additional obstacles have been overcome.

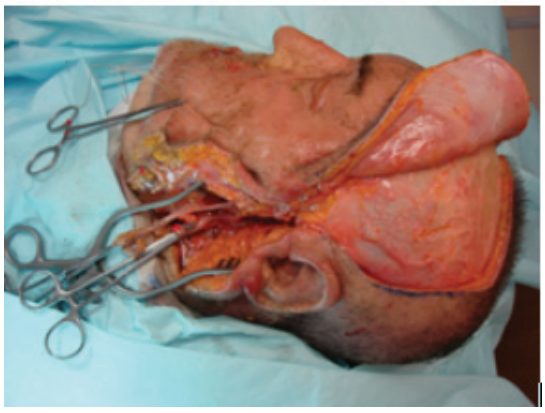

Figure 1. Myocutaneous (sub-SMAS) flap dissection

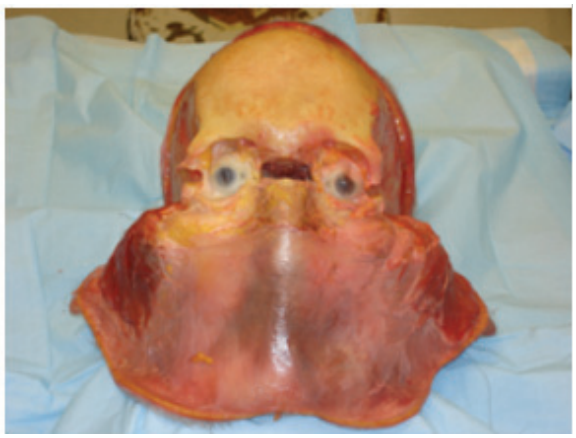

Figure 2. Osteomyocutaneous (subperiosteal Le Fort III) flap dissection

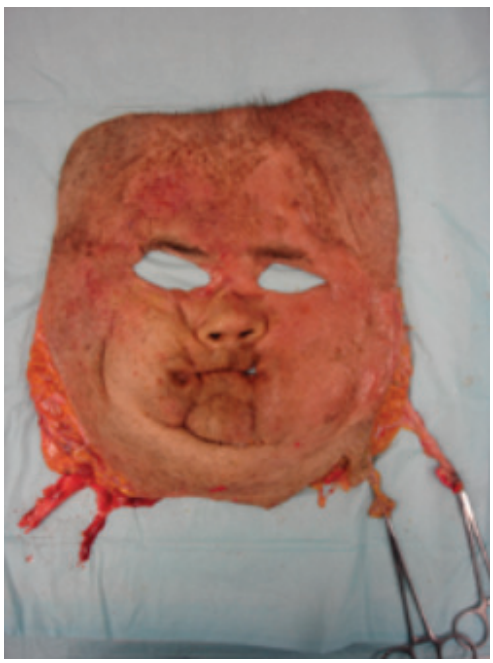

Figure 3. Harvested myocutaneous (sub-SMAS) flap

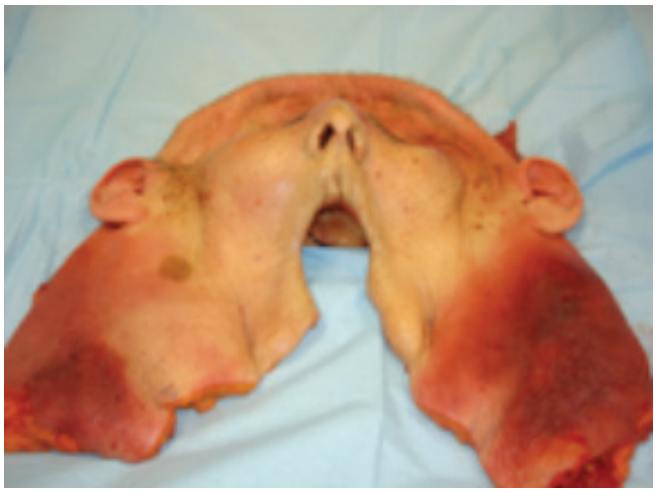

Figure 4. Harvested osteomyocutaneous (subperiosteal Le Fort III) flap

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39: Long Term Survival of Composite Hemiface/Mandible/Tongue Tissue Allograft Permitted by Donor Specific Chimerism

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INTRODUCTION: Extensive head and neck deformities including bone and soft tissue defects are always challenging for reconstructive surgeons (1-3). The purpose of this study was to extend application of the face/scalp transplantation model in rat by incorporation of the vascularized mandible, masseter and tongue, based on the same vascular pedicle, as a new reconstructive option for extensive head and neck deformities with large soft and bone tissue defects (4,5).

METHODS: A total of 12 composite osseomusculocutaneous hemiface/mandible-tongue transplantations were performed in two experimental groups. Group 1 isotransplantation between Lewis rats served as control without treatment (n=6). Group 2 (n=6) composite hemiface/mandible-tongue transplants were performed across MHC barrier between Lewis-Brown Norway (LBN, RT1l+n) donors and Lewis (RT1l) recipients. Hemimandibular bone, masseter muscle, tongue and hemifacial flaps were dissected on the same pedicle of external carotid artery and jugular vein and were transplanted to the donor inguinal region. All allogenic transplant recipients received 16mg/kg/day of CsA monotherapy tapered to 2 mg/kg/day and maintained at this level thereafter. All animals were monitored for signs of rejection such as erythema, edema, hair loss, desquamation. Flap angiography was done at 100th day post transplant by injection of barium sulfate and showed that the main arterial branch supplying the mandible was well-preserved within the flap. CT scan evaluated allograft viability. Flow cytometry assessed donor-specific chimerism for MHC class I- RT1n antigen. The samples of the skin and mandibular bone component of the graft were harvested and fixed in 10% formalin solution and then decalcified in 5% formic acid solution for 3 days. Next the fixed specimens were embedded in paraffin, and 3-µm sections were stained with H&E for bone histology and tested inflammatory response and grade of allograft rejection.

The histological rejection pattern of the skin was graded as described in the literature; grade 0, normal epidermal appearance without evidence of rejection; grade 1, focal mononuclear cell infiltration; grade 2, suprabasal bulla formation; and grade 3, vasculitis and complete skin necrosis with dermo-epidermal junction separation (6).

Three-color flow cytometry analysis was performed to evaluate chimerism level in the peripheral blood of Lewis recipients during observation time at day 7, 21, 63, 100 and 125 days post-transplant.

RESULTS: Isograft controls survived indefinitely. All six hemiface/mandible-tongue allotransplants survived up to 100 days (still under observation). Flap angiography demonstrated

intact vascular supply pedicle and supply to the bone. No signs of rejection and no flap loss were noted. CT scan and bone histology confirmed viability of bone components of the composite allografts. Viability of tongue was confirmed by pink color, bleeding after puncture and histology. H+E staining determined the presence of viable bone marrow cells within transplanted mandible. This was accompanied by presence of the donor-specific chimerism at day 100 posttransplant T-cell (2.7% CD4/RT1n, 1.2% CD8/RT1n) and B-cell (11.5% CD45RA/RT1n) population (Figure 1).

CONCLUSIONS: We have introduced a new model of composite osseomusculocutaneous hemiface/mandible-tongue allograft transplant. Long-term allograft acceptance was accompanied by donor specific chimerism supported by vascularized bone marrow transplant of the mandibular component. This model may serve as a new reconstructive option for coverage of extensive head and neck deformities involving large bone and soft tissue defects performed in one surgical procedure.

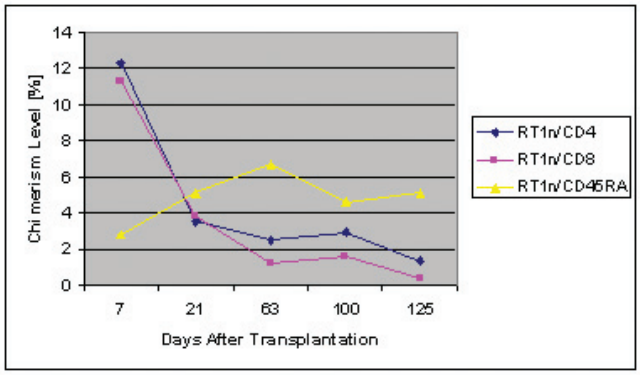

Figure 1. Chimerisim levels after transplantation.

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40: The Transverse Cervical Vessels as Recipients in Difficult Head and Neck Microsurgical Reconstructions

Miroslav S. Gilardino, MD, MSc; Tassos Dionisopoulos, MD; Beth R. Mizerny, MD; Martin J. Black, MD; M. Lucie Lessard, MD

INTRODUCTION: Availability of adequate recipient vessels for microsurgical reconstruction of head and neck cancer in recurrent or previously treated settings can be limited. While the external carotid artery or one of its branches are used most commonly as recipient vessels, there is a need for other options when these are unavailable or unsuitable. The transverse cervical vessels (TCVs) have been described as potential recipients in such difficult reconstructive cases. To that end, the purpose of the present study was to: 1) to determine the anatomic reliability, landmarks and characteristics of the TCVs for use as free flap recipients in challenging cases, and 2) review our clinical experience using the TCVs as recipient vessels over a 10 year period at the McGill University Health Center.

METHODS: The anatomical characteristics of the TCVs were studied in 16 fresh cadaver dissections. The clinical portion of this study involved a review of all free flap head and neck reconstructions using the TCVs as recipients over a ten year period at the McGill University Head and Neck Surgery Clinic.

RESULTS: The transverse cervical artery (TCA) was found to be present above the clavicle in the posterior triangle of the neck in 98% of the dissections, with a usable pedicle length between 40-70mm and an average diameter of 2.7mm. Its origin was consistently 1-2cm under the lateral border of the sternocleidomastoid muscle, 3cm from the midline. Suitable size recipient veins were also identified in 85% of the dissections. Clinically, we report fourteen cases where the TCA was used as a recipient. All but one patient had received preoperative radiation therapy. The TCA was found to be virtually free of fibrosis or atherosclerotic disease in all specimens (clinical and cadaveric) that had received radiation treatment, while the corresponding carotid system was significantly affected. There were no flap failures.

CONCLUSION: Our anatomic study confirms that the TCVs are reliably present with adequate size and length to serve as recipients for free flap reconstruction. In addition, pedicle identification is facilitated by the provided landmarks. The position of the TCA in the posterior triangle of the neck also appears to spare it from surgical manipulation and radiation, thus rendering it particularly useful in salvage surgery and recurrences. This conclusion is supported by the results of our clinical study, demonstrating a 100% flap success rate in previously radiated and difficult reconstructive head and neck cancer cases where the TCA was employed as a recipient.

41: Panel Discussion — Reconstruction of a Cosmetic Nightmare

Moderator: Gregory R.D. Evans, MD, Orange, CA
A. Lee Dellon, MD, Baltimore, MD
Neil A. Fine, MD, Chicago, IL
Foad Nahai, MD, Atlanta, GA
Malcolm D. Paul, MD, Newport Beach, CA

OBJECTIVE: To educate participants regarding options for correcting difficult problems encountered in cosmetic surgery, and provide information for avoiding pitfalls for cosmetic surgical problems.

NOTES

42: Panel Discussion — Sternal Wounds: Do Plastic Surgeons Have a Role?

Moderator: Dennis P. Orgill, MD, PhD, Boston, MA
William G. Austen, MD, Boston, MA
Norman H. Schulman, MD, New York, NY
David H. Song, MD, Chicago, IL

OBJECTIVE: To provide state-of-the-art information on the role of flaps versus secondary closure methods and the necessary role of plastic surgeons in treatment of sternal wounds.

NOTES

43: Panel Discussion — Fresh Faces, Real Cases: A Complications Survival Guide

Moderator: Adam D. Lowenstein, MD, Lafayette, CO
Jeffrey E. Janis, MD, Dallas, TX
Susan E. MacLennan, MD, Colchester, VT
David Schnur, MD, Denver, CO
Joseph J. Disa, MD, New York, NY
Gregory R.D. Evans, MD, Orange, CA
Foad Nahai, MD, Atlanta, GA
Thomas Ray Stevenson, MD, Sacramento, CA
Jane S. Weston, MD, Atherton, CA

OBJECTIVE: Back by popular demand, we are pleased to present a selection of clinical cases from young surgeons. Panelists will present real complications from their practices, what went wrong, and how they managed it. Patient safety, mediolegal, and ethical issues will be discussed. Audience participation and debate is encouraged. See how you would handle these situations and what our senior panelists would do. Participants will be able to better recognize and treat a variety of complications in every day plastic surgical cases.

NOTES

44: Panel Discussion — ASPS/ASPSN Joint Patient Safety Panel: Collective Collaboration: A Team Approach

Moderator: James H. Wells, MD, Long Beach, CA
Tracey Hotta, RN, BScN, CPSN, Toronto, Ontario, Canada
Barbara B. Weber, RN, CPSN, Duluth, GA

OBJECTIVE: To discuss the collaboration of the physician, nurse and office staff to ensure that all risk factors are identified and that the client is adequately informed about their surgical experience; to identify the collaborative efforts of the physician, anesthesiologist and nursing team in the operating room to ensure a safe and positive surgical experience, and; to explain the importance of communication and collaboration of the health care team from the office to the operating room.

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