Perioperative Management of Face Transplantation: A Survey

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BACKGROUND: Since the first facial allograft transplantation was reported in France in 2005, 18 cases have been performed in 4 countries and the rate is increasing.
METHODS: We have devised a survey to assess anesthesia-related management and rationale of facial allograft transplantation. It was sent to the lead anesthesiologists of the first 14 face transplants performed worldwide.
RESULTS: Responses were received corresponding to 13 face transplants. The median duration of surgery and anesthesia was 19 hours (95% confidence interval 15–23 hours). The surgical preparation and dissection of multiple small anatomical structures of the recipient was time-consuming for 11 cases. Blood loss was considerable. All patients received packed red blood cells (median 20 U, 95% confidence interval 5–28 U). A median of 13 L of crystalloid was administered (95% confidence interval 10–18 L).
CONCLUSIONS: During facial allograft transplantation, the anesthesiologist must be prepared for a long anesthetic with rapid blood loss after reperfusion of the graft. (Anesth Analg 2012;X: ●●●–●●●)

Facial allograft transplantation was first described in 2005. Since then, 18 cases of partial or full-face transplantation have been performed worldwide. Only a few centers have performed more than 1 face transplant and the perioperative management is still evolving. Our survey summarizes experiences with the first 14 face transplants.

METHODS

A questionnaire was designed to assess perioperative management focusing on items relevant to anesthesia care. The IRB of Brigham and Women's Hospital approved the study and waived the requirement for written consent. Informed consent was implied by voluntary completion of the survey.

Using media reports and medical publications, the lead anesthesiologist corresponding to each known face transplant that was performed before May 2011 was contacted via phone or e-mail. All received an informational form indicating approval of the IRB and an invitation to participate in the survey.

The questionnaire that was sent to the lead anesthesiologist of each case required quantitative information such as "number of blood products transfused," as well as open-ended questions such as "What was your rationale for the choice of vascular access?" Statistical analysis was performed on the deidentified data using Stata 12 (StataCorp LP, College Station, TX). A binomial method ("centile") was used to determine conservative confidence intervals for the median values presented.

RESULTS

Responses were obtained for 13 of 14 patients, corresponding to 6 of 7 centers that had performed the procedure. Table 1 lists a subset of the questions in the questionnaire with results.

The median duration of surgery and anesthesia was 19 hours (95% confidence interval 15–23 hours). The surgical preparation and dissection of multiple small anatomical structures of the recipient was time-consuming for 11 cases.

Blood loss was considerable. All patients received packed red blood cells (median 20 U, 95% confidence interval 5–28 U). Other blood products administered included fresh frozen plasma (FFP) and platelets. Confidence intervals are listed in Table 1. A median of 13 L of crystalloid was administered (95% confidence interval 10–18 L).

Table 1 also summarizes factors influencing assessment of blood loss, use of catecholamines, airway management, and vascular access as well as complications.

DISCUSSION

Face transplantation is a novel procedure that has been performed for patients with debilitating facial injuries caused by burns, blast injuries, and animal bites as well as disfiguring diseases such as neurofibromatosis.

Two significant findings of this survey were the long duration of surgery and anesthesia (median 19 hours) as well as the high blood loss. A median of 20 U of packed red blood cells, 13 U of FFP, 2 platelet units, and 13 L of crystalloid was administered.

Most cases followed a similar course: The procedure began with several surgical teams working in parallel while performing microsurgical dissection of the recipient's facial

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Table 1. Selected Elements of Survey and Responses Received for 13 Cases of Face Transplantation

Question in survey	Evaluation of responses with number of cases
Duration of anesthesia (reported as median with 95% confidence interval)	• 19 h (15–23)[a]
Resuscitation required (reported as median with 95% confidence interval)	• pRBCs[a]: 20 (5–28) • Fresh frozen plasma: 13 (0–23) • Platelets[b]: 2 (0–5) • Crystalloid: 13 (10–18) (1 response missing)
Factors influencing blood loss and reason for difficulty assessing blood loss	• Bleeding from arterial and venous anastomoses not controlled optimally after reperfusion, 10 • Poor visualization of surgical site by anesthesia team, 10 • Irregular use of surgical suction, loss of blood into drapes, and difficult to estimate, 8 • Bleeding excessive from osteotomy sites, 2
Were catecholamines used during surgery?	• Use of any catecholamine including intermittent boluses, 7 • Continuous infusion of a catecholamine over >2 h, 6
Describe airway management	• Primary intubation of existing tracheostoma using armored ETT, 7 cases • Surgical enlargement of existing tracheostoma necessary to place ETT, 2 cases • Primary orotracheal intubation, 6 cases • Known difficult intubation, 1 case • Surgery performed entirely without requiring tracheostomy, 2 cases
Location of vascular access	• Femoral venous multilumen catheter, 11 (of these, 4 were with large-bore introducer sheaths) • Subclavian multilumen catheters, 2 • Radial arterial line placed, 6 • Femoral arterial line placed, 8
State rationale for preference of femoral location for venous access	• 9 cited concerns about thrombosis in the internal jugular or subclavian vein with extension into the superior vena cava and obstruction of venous outflow from the face • 5 cited risk of pneumothorax in a long anesthetic with mechanical ventilation
Complications	• Thrombosis in facial veins,[c] 2 • Facial hematomas,[c] 2 • Pneumonia, radiographically consistent with aspiration, 2 • Reversible renal dysfunction,[d] 3

ETT = endotracheal tube; pRBCs = packed red blood cells.

[a] The rank correlation (Spearman correlation) between duration of anesthesia and number of units of pRBCs transfused was low and not significant ($P = 0.37$).

[b] We refer to 1 U of platelets as either collected from 6 whole blood donations or plasmapheresed from 1 donor and containing approximately 3–4 $\times$ 10^{11} platelets.

[c] Required operative revision.

[d] Defined as creatinine >1.3 mg/dL.

structures. Most patients had previously undergone multiple reconstructive procedures. Thus, the vascular structures and nerve supply can be severely distorted, requiring time-consuming planning.

The next stage of surgery included reperfusion of the donor facial graft. This marked the onset of blood loss in most cases. Several factors may have contributed: after 1-sided arterial and/or venous anastomosis of the graft, the contralateral side was often allowed to bleed to allow for graft inflow pressure equilibration, vasodilatation, and discharge of preserving solutions as well as other compounds that may have been used for allograft perfusion (tissue plasminogen activator, heparin, etc). In most cases, 4 vascular anastomoses were completed, which is twice the number of the typical microsurgical reconstructive case, thereby accounting for the long duration of this phase. Anesthesia teams reported that it was difficult to recognize the extent of blood loss during this phase in a timely manner. Factors such as bleeding into folded drapes and poor visibility of the surgical site for the anesthesia team were reported.

In the setting of blood loss and hypotension, vasopressor medications were used. The need to restore perfusion rapidly must be weighed against the risk of overhydration and edema in the facial graft.[1] Traditionally, the use of vasopressor medications has been discouraged in the setting of free flaps, even if used just to temporize. However, this opinion is not supported by data from free flaps.[1] More efficient surgical suction into intraoperative cell salvage machines (cell-savers) and alternative methods of collecting shed blood such as into a sterile collecting bag should be investigated, especially because exposure to allogenic blood increases the risk of immunization[2] and may complicate the necessary, life-long, immunosuppression,[3,4] in addition to presenting an infection risk.[5]

Several teams were concerned about the risk of thrombosis in the facial graft and stated that they avoided use of procoagulants such as FFP and platelets.

Other observations made in this study included relatively uncomplicated airway management: 11 of 13 patients had a tracheostomy by the end of the case. Seven patients had a preexisting tracheostomy. Two of these required surgical enlargement under sedation before cannulation. Only 1 patient required fiberoptic orotracheal intubation for a known difficult airway. Many centers reported that they avoided circumferential neck ties to fasten the airway device because of a concern for neck swelling and subsequent venous outflow obstruction of the facial graft. Because the patients were often turned 180° away from the anesthesiologist for most of these long cases, the anesthesiologist could not easily monitor and adjust the tension of the tie to avoid constriction as tissue edema developed. Most often, an armored endotracheal tube was inserted into the tracheostomy site, bent caudally toward the anesthesiologist, and sutured to the chest wall.

Vascular access was most often achieved via femoral venous and arterial catheterization as indicated in Table 1. Avoiding internal jugular or subclavian veins because of

concern for subsequent thrombosis and subsequent obstruction of venous outflow from the facial graft was cited by several groups. However, few data are available to assess the risk of short-term cannulation in otherwise healthy patients. Little is known about the relative infectious risk of femoral access in these highly immunosuppressed patients.

During facial allograft transplantation, the anesthesiologist must be prepared for a long anesthetic with rapid blood loss after reperfusion of the graft. ■

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DISCLOSURES

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