

# Controversies in Microvascular Maxillofacial Reconstruction



Adam P. Fagin, DMD, MD, Daniel Petrisor, DMD, MD, FACS\*

## KEYWORDS

• Microvascular • Postoperative monitoring • Anticoagulant • Vasoconstrictor • Implantable Doppler

## KEY POINTS

- Postoperative monitoring of free flaps with an implantable Doppler probe increases overall flap survival rates and flap salvage rates compared with clinical examination.
- Intraoperative use of vasopressors, ephedrine and phenylephrine, is not associated with an increase in free flap complication rates.
- Postoperative use of norepinephrine or dopamine does not compromise free flap perfusion or increase free flap complication rates, but norepinephrine is associated with less tachycardia.
- The use of anticoagulants, dextran, prostaglandin E<sub>1</sub>, aspirin, low-molecular-weight heparin, and unfractionated heparin in the postoperative period does not improve flap survival as compared with no anticoagulant.

## INTRODUCTION

The effectiveness and reliability of microvascular reconstruction for large defects in the head and neck is no longer disputed. Many large cohort studies have reported overall success rates greater than 95%.<sup>1-4</sup> However, many controversies still persist in the ideal perioperative management of patients undergoing free tissue transfer. The authors selected three controversial issues that have recently received significant attention in the literature: (1) the optimal method of postoperative monitoring, (2) the use of vasoconstrictors in the perioperative period, and (3) the use of anticoagulants in the postoperative period. Recommendations on each of these controversies based on a review of the current literature are discussed.

## POSTOPERATIVE MONITORING

### *Introduction*

Free tissue transfer with microvascular anastomosis is now an established and reliable reconstructive option for major tissue defects. Success rates of large samples are routinely reported more than 95%.<sup>1-4</sup> An integral part of this level of reliability is postoperative monitoring. Take back rates reported in the literature range from 6% to 15% with salvage rates once revision occurs ranging from 46% to 94%.<sup>1-8</sup> The most common cause of flap failure in the early postoperative setting is vascular compromise, typically as a result of venous or arterial thrombosis, compression secondary to hematoma, or kinking of the pedicle. In most cases these mechanical failures are surgically reversible if the compromise is noted

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Department of Oral and Maxillofacial Surgery, Oregon Health & Science University, 3181 Southwest Sam Jackson Park Road, Portland, OR 97239, USA

\* Corresponding author.

E-mail address: [petrisor@ohsu.edu](mailto:petrisor@ohsu.edu)

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in a timely fashion and the patient is taken back to the operating room for re-exploration and revision. The time sensitive nature of the issue is why postoperative monitoring is such an important aspect of microvascular reconstruction.

### **Methods of Monitoring**

The original monitoring strategy is the clinical examination, which classically involves several subjective measures including flap color, capillary refill, turgidity, pin pick, and external Doppler. This method also relies heavily on the expertise of the examiner and the ability of the examiner to visualize the flap. In the modern medical system with resident duty hour restrictions, it is no longer feasible to conduct hourly examinations of the flap by physicians at many institutions. This leaves these critical inspections to be primarily performed by nursing staff who then decide to notify the resident, fellow, or attending surgeon if warning signs are present. Additionally, in head and neck reconstruction flaps are often partially or completely buried, which increases the difficulty or prohibits this form of monitoring entirely.

Other forms of monitoring have been proposed, which can fundamentally be broken down into two strategies: monitoring of flow into or out of the pedicle, or monitoring of metabolites or oxygen content of the pedicle itself.<sup>8-12</sup> The most widely used alternative to conventional monitoring is the Cook-Swartz Doppler probe, which is capable of measuring flow through an individual vessel. The device is implanted during surgery and attached to the venous anastomosis, arterial anastomosis, or both. The implantable Doppler helps address the two biggest shortcomings of the clinical examination: it provides an objective measure and it is capable of surveilling buried flaps. As with any device, one of its biggest pitfalls is the potential for it

to malfunction, providing false-positive or false-negative information. The ideal form of postoperative monitoring would be inexpensive, objective, implantable, and reliably performed by a wide range of personnel.

### **Implantable Doppler**

The implantable Cook-Swartz Doppler was first described in 1988 by Swartz and colleagues.<sup>10</sup> It consists of a 20-MHz ultrasonic probe mounted on a silicone cuff. The cuff is adjustable based on vessel size and can accommodate vessels ranging from 1 mm to 4 mm. The cuff is seated onto the desired vessel during surgery and the ultrasonic probe then lies against the vessel wall. A wire attached to the probe then exits the cuff and the patient. This wire is then attached to another disposable wire, which plugs into the ultrasonic device monitor. Removal of the device is done externally by pulling on the implanted wire, which releases from the retained silicone cuff. This can be done anytime during the postoperative period without risk of damaging the vessel or anastomosis. As a result, the inadvertent removal of these probes can occur even when care is taken to secure them, which can lead to an erroneous absence of signal. In the authors experience the inadvertent removal of these devices is prevented by leaving sufficient slack in the primary wire and the application of appropriate dressing to secure the wire postoperatively.

Since its inception many studies have evaluated the effectiveness of monitoring with the Cook-Swartz Doppler.<sup>1-3,5,6</sup> In the last 8 years studies evaluating greater than 150 anastomoses either exclusively in the head and neck<sup>1,3,6</sup> or including the head and neck<sup>2</sup> are summarized in **Table 1**. These studies reported sensitivities between 65% and 100% and specificities between 98%

**Table 1**  
Summary of sensitivity, specificity, re-exploration rate, salvage success rate, and overall flap survival rate for flaps undergoing monitoring with implantable Doppler

Study	# Anastomoses	Probe Location	Sensitivity (%)	Specificity (%)	Re-exploration Rate (%)	Salvage Success Rate (%)	Overall Flap Survival Rate (%)
Guillemaud et al, <sup>3</sup> 2008	369	Arterial/ venous	65.80	98.20	12.50	81.60	98.10
Paydar et al, <sup>46</sup> 2014	169	Venous	100	98.70	11.20	94.70	98.20
Schmulder et al, <sup>2</sup> 2011	259	Venous	100	98.70	13.90	87.88	96.14
Wax, <sup>1</sup> 2014	1142	Arterial	87	99	6.10	61	97.60

Data from Refs.<sup>1-3</sup>

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