Microvascular Reconstruction
Evidence-Based Procedures

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KEYWORDS

• Free flap • Reconstruction • Functional outcome • Monitoring • Mandible

KEY POINTS

- The goal of evidence-based medicine is to evaluate outcomes to provide improved care to patients.
- In the field of microvascular reconstruction, the level of evidence is mediocre.
- Monitoring of free flaps has allowed for improved outcomes and lower revision rates.
- Reconstruction with bony flaps for the lateral mandibular defect has proven to be efficacious.
- A collaborative, multiinstitutional study should be able to improve the level of evidence that exists.

INTRODUCTION

Evidence-based medicine integrates research, clinical expertise, and patient values.[1] It attempts to evaluate scientific evidence and clinical care experiences to provide a rationale for decision making in the care of patients. This contrasts with the tradition of treating patients as was learned in residency or fellowship. It strives to bring a rationale to the decision-making process as opposed to the commonly quoted, "In my experience." Finding good literature to make evidence-based decisions when it comes to operative procedures is difficult. Randomized, controlled studies, considered the best modality to amass evidence, are almost impossible to perform when comparing 2 different operative procedures, or across modalities of treatment focused on low volume-disease, such as head and neck cancer.[2] For a variety of reasons, we are often left with comparing different procedures as they have evolved in a single institution or with comparing results between institutions. Still, it is possible to use this broad-based information if we recognize the selection biases and the limitations of the data.

In this article, we present 3 areas in the field of microvascular reconstruction where data exist that allows one to make an evidence-based decision on clinical care. The first is postoperative monitoring of free tissue transfer. Although it seems logical and empiric that monitoring is a good thing to do, little clear-cut evidence exists as to its efficacy. Second, the reconstruction of lateral mandibular defects can be performed in a number of ways. Few comparative studies have been performed, yet some evidence does exist. Finally, functional outcomes are reported to be improved with free tissue transfer. Analysis of the individual surgeon or institutional evidence reveals superiority of free tissue over regional or local transfer, yet functional outcome reporting is inconsistent with most reports using nonvalidated instruments or custom designed assessment tools. Thus, this review sought to define the state of

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reporting for functional outcomes in head and neck reconstruction studies suggesting they provide function information, and assess quality of life (QOL) data between 2002 and 2012.

MONITORING FREE TISSUE TRANSFER

The ability to transfer successfully tissue from 1 part of the body to another is related to patient factors and the technical ability of the microvascular reconstructive surgeon. Total failure of the flap is a rare and devastating complication that is usually secondary to vascular anastomotic failure. This results in thrombosis of the anastomosis and death of the tissue. The need to reexplore microvascular anastomosis is consistently reported at between 10% and 12%[3–6] (level 4 evidence). When flaps are explored in a timely manner, successful revascularization is reported it up to 70% to 80% of cases. This led to a belief that monitoring of the tissue in the postoperative period should be intensive. Routines have involved clinical monitoring the flap hourly by medical personnel. The advent of resident duty-hour restrictions and improved technology has changed the paradigm so that nursing personnel primarily monitors the flap with medical input on a less frequent basis.

Clinical Monitoring Involving Evaluation of the Flap by Physical Examination

Looking for color, turgor, and warmth has been the mainstay of physical examination for many decades (**Fig. 1**). Even with this modality, the incidence of flap revision and ultimately survival has not changed[3,5,7–9] (level 4 evidence). This led to the desire to find technological methodologies to supplement the clinical examination. By far the most common method used is the placement of an intraoperative Doppler monitor[7,10,11] (level 4 evidence).

Fig. 1. Flap with signs of vascular compromise. It is blue, turgid, and was very swollen. Notice the dark blood at the needle prick site.

The Doppler can be placed in a sheath around the artery or it can be used as part of an implantable coupling device (**Fig. 2**). Schmulder and colleagues in 2011[10] compared 259 patients monitored with the implantable Doppler and compared them with 289 patients monitored using clinical measures only (Level 3 Evidence). The patients monitored with the implantable Doppler had an overall survival rate that was significantly higher than those monitored clinically. The reexploration rate was also higher in the flaps with implantable Dopplers. The surgical salvage rate improved from 40% to 95% and the success rate improve from 84% to 95%. False positives occurred in 3 of 36 patients. In 2 of these, the patient was explored and the Doppler wire was dislodged. There were no false negatives. Most authors suggest that, when the Doppler suggests compromise and the clinical examination suggests a viable flap, careful and intensive observation can be performed after trouble shooting the device.

Wax[7] evaluated 1142 patients who had a Doppler placed in the intraoperative setting. They determined that 10% of patients develop intraoperative vascular problems that were successfully revised. Compared with contemporary literature with a reexploration rate of 10% to 14%, their postoperative revision rate was 7%. The majority of revisions were after 12 hours, in contradiction to the literature in which the majority of revisions are within the first 12 hours. They felt that use of the Doppler in the intraoperative setting allowed them to detect issues with the vascular anastomosis that would have been undetected until the patient was in the recovery room or on the ward. They also demonstrated that the patients who had intraoperative vascular issues were more likely to suffer postoperative issues with a lower salvage rate.

Overall, this seems to indicate that monitoring of free flaps for vascular compromise in the intraoperative and postoperative setting is beneficial to patient care. The detection of vascular compromise allows for an active intervention with salvage in a significant number of patients (level 4 evidence).

LATERAL MANDIBULAR DEFECT

Reconstruction of the mandible continues to be a challenging problem faced by reconstructive surgeons. Techniques have evolved over the last century. The mandibular swing was the standard operation with adequate, although improvable, healing and functional outcomes. The cosmetic outcomes were poor and dental rehabilitation was not possible (**Fig. 3**). The introduction of rigid