Editorial Commentary

Defining success and failure in head and neck reconstruction: is flap survival the ultimate measure?

Richard J. Shaw^

Liverpool Head & Neck Centre, University of Liverpool, Liverpool, UK

Correspondence to: Professor Richard J. Shaw, MD, FDS, FRCS. Liverpool Head & Neck Centre, The University of Liverpool Cancer Research Centre, Roy Castle Building, 200 London Road, Liverpool L3 9TA, UK. Email: rjshaw@liv.ac.uk.

Received: 24 October 2020; Accepted: 17 May 2021; Published: 10 December 2021.

doi: 10.21037/fomm-20-69

View this article at: http://dx.doi.org/10.21037/fomm-20-69

Free flap reconstruction is currently the standard of care for many complex head and neck defects, most commonly after oncological resections, and frequently in the oral cavity and adjacent facial skeleton. Without doubt, these techniques entail a huge logistic, financial and training burden for any health system. The outcomes of such reconstructions should therefore remain under scrutiny at systems, institution, team and individual levels. Published data on outcomes of head and neck reconstruction has frequently been retrospective, resulting in uncertainty about the attribution of cause and extent of failures as well as oversimplified binary success/fail outcomes (1-3). As a complex intervention, clinical governance demands that prospective data should be collected, ideally through national or international registries (4). Currently, failing surgeons or teams remain unchecked and technical innovations largely untested, however governance, audit and quality assurance could be effectively implemented through such measures. These outcome measures would ideally recognize the complexity of defect (5,6), status of the patient and well as the specific ambitions and goals of the reconstruction.

Recognizing these shortcomings, Ho *et al*. have devised a simple classification of reconstructive outcomes (7) that is carried out at 4 months following surgery, and initial piloting of this data has been encouraging regarding its utility and value (*Table 1*). This categorization is purposefully simple, and does not aim to reflect functional, aesthetic or other complex outcome measures. This does, however, allow for more discriminating data over and above simple anastomotic patency, now assumed to be 98–100% in established health systems (8). Similarly, in the UK an online national flap registry (4) has been established for all areas of reconstruction, supporting governance across all relevant surgical disciplines and furnishing individual surgeons' benchmarking, appraisal and revalidation processes. This registry has been adopted and supported by all relevant surgical associations and has benefitted from widespread, if not yet universal, participation.

Key issues in determining success address the wider dimensions of outcome beyond the issues of the security of blood supply, and hence viability, of any reconstruction. These issues may in fact appear relatively more important in an era of very high microvascular patency. They will include donor site complications and complications other than flap viability at the recipient site. It also includes the quality of aesthetic result, of occlusion, and more broadly of functional outcomes including mastication, swallowing as well as dependence on tube feeding or tracheostomy.

Donor site morbidity for the most commonly used flaps in head and neck reconstruction is a significant burden, with issues such as skin graft failure, pain and poor aesthetics. The most commonly used donor sites, radial forearm and fibula are both associated with delayed healing in around 20% of cases (9). Making assessments between donor sites is methodologically difficult as some important adverse outcomes are site specific, analogous to comparing 'apples and oranges'. Attempts have been made, for example to compare the functional and donor site outcomes between

^ ORCID: 0000-0002-5157-4042.

Table 1 Categories of outcomes for free tissue transfer (7)

Category	Ho Class		Subcategory & description
Successful reconstruction	1	A	Complete success
		B	Partial failure but no 2nd recon or prosthesis reqd.
Partial failure	2	A	2nd flap needed
		B	Prosthesis used
Complete failure	3	A	2nd flap needed
		B	Prosthesis used
		C	Defect did not require further flap or prosthesis
Failure to establish reconstruction	4	A	Flap harvest abandoned – unfavorable anatomy
		B	Flap harvested but abandoned – failed to perfuse before release or inadequacy of recipient vessels, change in ablative plan
		C	Flap harvested and transferred but perfusion never established

Note 3 A,B,C can be further subclassified i. arterial failure, ii. venous failure, iii. uncertain or other e.g., microcirculatory.

DCIA and fibula donor site (10), concluding that long-term morbidity was different but broadly similar in magnitude. How would it be possible to compare the gait abnormality of a DCIA donor site with the upper limb morbidity of a scapula donor site? In terms of donor site aesthetics, when patients are given a choice of multiple possible options they have a preference away from exposed sites such as lower leg and wrist (11), which is noteworthy as these are, paradoxically, the commonest donor sites employed. Complications at the reconstructed site are also very common, particularly delayed healing and infections. In mandibular reconstruction it has been found that 29% have a least one complication at the recipient site serious enough to cause re-admission or re-operation (1).

Attributing functional outcomes of head and neck surgery is possible in several critical domains. Objective assessments of swallowing, for example using the M.D. Anderson Dysphagia Inventory (MDADI) (12) as well as speech, mastication and occlusion are possible. The concern is to decipher what extent any resulting dysfunction reflects the pre-operative status and the site or stage of tumour (therefore the anatomical extent of ablation) rather than the success of the reconstruction. Measures such as quality of life or other patient related outcome measures add in an extra layer of complexity as they set out to be subjective. Are such measures useful in measuring reconstructive success, comparing operations, surgeons or modalities? A patient with an objectively excellent reconstruction with no healing problems and good function may have lower quality of life than another patient with what seems to be a less good outcome. Faced with these difficulties it is understandable that measuring complications of surgery seems simpler, but this is less a measure of success than it is merely the avoidance of failure.

In other important areas of surgery, there are validated outcome measures and minimum datasets that have reached a wider level of acceptance. Such a measure might potentially have the ability to assess outcomes for all aspects of oral reconstruction whether oncologic, trauma or congenital deformity. This might theoretically allow reconstructive 'success' to be objectively scored, potentially allowing uniformity of outcome assessment between different interventions and eras. As an example in breast surgery, a data system [BREAST-Q (13)] was developed to measure outcomes in operations including augmentation, reduction and reconstruction—acknowledging that there are common aims at the core of all such surgery. BREAST-Q has been widely adopted as a research and clinical tool and has enhanced understanding and practice reconstructive breast surgery. Such widely accepted datasets and PROMS have been largely unexplored in reconstructive oral and maxillofacial surgery.

One of the difficulties generated by the lack of objective, valid outcomes measures is in evaluating new technologies or procedures. The biggest recent change in composite reconstruction is in virtual surgical planning. It is however quite difficult to quantitatively measure by how much this technique improves the outcomes, if at all. Outcomes

measures commonly used have included include operating time, intergonial angle distances, accuracy of mirroring of reconstruction, non-union rates and indeed, many others (14-16). These are easily measurable but presumably do not reflect the primary aim which is to reliably produce a more successful reconstruction, however that is measured.

Lastly, the broader context of flap reconstruction must be fully appreciated, that is, usually in the setting of a potentially lethal malignancy and in a sequence of multimodality treatment. By far the most common indication for such surgery is locally advanced squamous cell carcinoma, a very common outcome of which is the patient's early demise. If complications of surgery delay the start of adjuvant radiotherapy, there may be a narrow surgical success, but possibly in the context of a wider treatment failure. In recent large series the median survival for oromandibular composite flap reconstruction for SCC was less than three years (17). The considerable and currently unavoidable toxicities of radiotherapy and chemoradiotherapy might easily outweigh small technical differences in operative approaches to flap reconstruction. There is an imperative on surgeons to objectively measure success and through this to drive technical innovation to improve surgical outcomes. But also, we should correctly view surgery as just one part of a multidisciplinary approach, engaging with wider efforts to drive survival such as clinical trials and basic science research.

In summary, efforts to assure quality in flap-based oral and maxillofacial surgery are currently quite rudimentary, and it seems now important to move on beyond the basic issues around microvascular patency and tissue viability. Currently, we have little valid data to compare techniques, donor sites or treatment centres. Even observational data might be of great value but needs to be collected prospectively and in a uniform manner. Measuring complications is simpler but misses the broader functional aims of reconstruction. We should develop more widely accepted and validated patient reported outcome measures (PROM) that might go some way to meeting these challenges.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the Guest Editor (Michael Ho) for the series "Head and Neck Reconstruction" published in *Frontiers of Oral and Maxillofacial Medicine*. The article did not undergo external peer review.

Conflicts of Interest: The author has completed the ICMJE uniform disclosure form (available at https://fomm.amegroups.com/article/view/10.21037/fomm-20-69/coif). The series "Head and Neck Reconstruction" was commissioned by the editorial office without any funding or sponsorship. The author has no other conflicts of interest to declare.

Ethical Statement: The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

1. Shaw RJ, Kanatas AN, Lowe D, et al. Comparison of miniplates and reconstruction plates in mandibular reconstruction. Head Neck 2004;26:456-63.
2. Frederick JW, Sweeny L, Carroll WR, et al. Outcomes in head and neck reconstruction by surgical site and donor site. Laryngoscope 2013;123:1612-7.
3. Crawley MB, Sweeny L, Ravipati P, et al. Factors Associated with Free Flap Failures in Head and Neck Reconstruction. Otolaryngol Head Neck Surg 2019;161:598-604.
4. Hazari A, Walton P. The UK National Flap Registry (UKNFR): A National Database for all pedicled and free flaps in the UK. J Plast Reconstr Aesthet Surg 2015;68:1633-6.
5. Brown JS, Shaw RJ. Reconstruction of the maxilla and midface: introducing a new classification. Lancet Oncol 2010;11:1001-8.
6. Brown JS, Barry C, Ho M, et al. A new classification for mandibular defects after oncological resection. Lancet

Oncol 2016;17:e23-30.
7. Ho MW, Nugent M, Puglia F, et al. Results of flap reconstruction: categorisation to reflect outcomes and process in the management of head and neck defects. Br J Oral Maxillofac Surg 2019;57:935-7.
8. Van Genechten ML, Batstone MD. The relative survival of composite free flaps in head and neck reconstruction. Int J Oral Maxillofac Surg 2016;45:163-6.
9. Kearns M, Ermogenous P, Myers S, et al. Osteocutaneous flaps for head and neck reconstruction: A focused evaluation of donor site morbidity and patient reported outcome measures in different reconstruction options. Arch Plast Surg 2018;45:495-503.
10. Rogers SN, Lakshmiah SR, Narayan B, et al. A comparison of the long-term morbidity following deep circumflex iliac and fibula free flaps for reconstruction following head and neck cancer. Plast Reconstr Surg 2003;112:1517-25; discussion 26-7.
11. Brown JS, Thomas S, Chakrabati A, et al. Patient preference in placement of the donor-site scar in head and neck cancer reconstruction. Plast Reconstr Surg 2008;122:20e-2e.
12. Chen AY, Frankowski R, Bishop-Leone J, et al. The development and validation of a dysphagia-specific quality-of-life questionnaire for patients with head and neck cancer: the M. D. Anderson dysphagia inventory. Arch Otolaryngol Head Neck Surg 2001;127:870-6.
13. Pusic AL, Klassen AF, Scott AM, et al. Development of a new patient-reported outcome measure for breast surgery: the BREAST-Q. Plast Reconstr Surg 2009;124:345-53.
14. Chang EI. Long-Term Operative Outcomes of Preoperative Computed Tomography-Guided Virtual Surgical Planning for Osteocutaneous Free Flap Mandible Reconstruction. Plast Reconstr Surg 2016;138:559e-60e.
15. Ren W, Gao L, Li S, et al. Virtual Planning and 3D printing modeling for mandibular reconstruction with fibula free flap. Med Oral Patol Oral Cir Bucal 2018;23:e359-66.
16. Toto JM, Chang EI, Agag R, et al. Improved operative efficiency of free fibula flap mandible reconstruction with patient-specific, computer-guided preoperative planning. Head Neck 2015;37:1660-4.
17. Rogers SN, Brown JS, Woolgar JA, et al. Survival following primary surgery for oral cancer. Oral Oncol 2009;45:201-11.

doi: 10.21037/fomm-20-69
Cite this article as: Shaw RJ. Defining success and failure in head and neck reconstruction: is flap survival the ultimate measure? Front Oral Maxillofac Med 2021;3:32.

