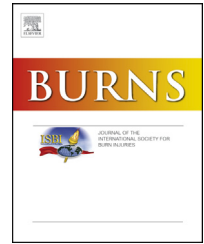


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Review

A systematic review of the applications of free tissue transfer in burns



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ABSTRACT

Introduction: Free tissue transfer is a rarely indicated procedure in burns. However, in well selected cases it may play a pivotal role in optimizing outcomes in both primary and secondary burn reconstruction. We undertook a systematic review, based on the PRISMA statement for systematic reviews, of all published literature relating to the use of free flaps in acute burns and in secondary reconstructive procedures.

Methods: Inclusion and exclusion criteria were defined and Medline, Embase, PubMed and Google Scholar databases were searched from 1980 onwards to May 2013 with the search terms: “free flaps”, “free tissue transfer”, “microvascular”, “burns”, “acute burns”, “primary reconstruction” and “secondary reconstruction”.

Results: A total of 346 studies were retrieved following the search of which 30 studies met the inclusion criteria and were included in the review.

Discussion: We present the indications, timing, complications and failure rates for free flaps in primary and secondary reconstruction based on the available literature. We also provide a list of the various free flap options for the commonest sites undergoing reconstruction following burns. Finally an algorithm to ensure optimal success of free flaps when used in primary and in secondary burn reconstruction is presented.

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1. Introduction

Free tissue transfer is utilized to reconstruct regions of the body where large tissue deficits exist. Most commonly, this occurs following cancer resection (for example head and neck cancer and breast cancer) and in traumatic injuries involving the upper and lower limbs. Burns are another potential field within plastic surgery where free tissue transfer may, in well selected cases, play a pivotal part in optimizing patient outcomes. With the advent of microsurgery in the 1960s, free flap usage within burns was initially limited to secondary reconstruction. As the techniques involved became more widespread and confidence started to build, free flaps were increasingly utilized to provide cover for deep burns in the acute phase. Currently, their use as the preferred option to provide primary cover in deep burns with exposure of bone, nerves, tendons and vessels has meant that they are now more frequently used within this sphere in burns rather than within secondary reconstructive procedures. This is evidenced by the number of articles addressing the topic of free tissue transfer in acute burns.

In the vast majority of situations involving acute burns, following debridement, one may begin at the first step of the reconstructive ladder and apply a split skin graft to the ensuing tissue deficit as long as a bed of well vascularized tissue remains. This could include subcutaneous tissue, adipose tissue, muscle, paratenon or periosteum. If the tissue left behind following debridement is not a viable bed for grafting, then local flaps are the next option on the reconstructive ladder. However, in burns local flaps are not always appropriate as the surrounding tissue maybe involved in the zone of injury. Especially in deep burns involving the extremities, local flaps are not usually possible. Hence, in such circumstances free tissue transfer is the most appropriate option. Free tissue transfers in such situations offer a number of distinct advantages including ability to harvest uninjured tissue from a different site on the body, transfer of well vascularized tissue to bridge deficits in a compromised area as well as the ability to transfer vascularized bone, skin, muscle and nerves as composite flaps in necessary quantities to the site of the defect. Furthermore, free tissue transfer offers a one stage solution to these complex injuries and enables early mobilization as well as considerably reducing hospital stay. The same can be said of secondary reconstructive procedures where free flap transfers may be the only method via which adequate coverage could be achieved following excision of the burn scar.

In this study we aim to systematically review all published literature relating to the use of free flaps in acute burns and in secondary reconstructive procedures following burns. We hope to delineate the indications, timing, pitfalls and failure rates for free flaps in these two situations with the hope of providing an algorithm for the use of free flaps in acute burns and in secondary reconstruction.

2. Methods

Prior to undertaking the search for relevant literature a study protocol was formulated. Inclusion and exclusion criteria were defined for studies to be included in the systematic review (see [Table 1](#)).

A literature search was then carried out on Medline, Embase, CINAHL, Google Scholar and the Cochrane databases from 1980 to May 2013 for studies on the topic of free tissue transfer in acute burns and for secondary reconstruction. The following key words were used: “free flaps”, “free tissue transfer”, “microvascular”, “burns”, “acute burns”, “secondary reconstruction in burns”. The search terms were combined with the Boolean operator “and”. The references of selected studies were also perused for articles that may have been missed via the electronic search.

The title and abstract of all identified studies were examined by two reviewers (SJ and QF). In cases where suitability of a study for inclusion in the review was unclear, the entire article was obtained and assessed for suitability. Eligibility as mentioned above was determined by the criteria listed in [Table 1](#). Any issues pertaining to eligibility of studies was solved via discussion with the senior authors (NEM and PD).

Data was extracted onto a Performa which included the data categories listed in [Table 2](#).

3. Results

A total of 346 studies were retrieved following the search. Removal of duplicates resulted in a remainder of 314 studies. 277 studies were excluded following review of the title and abstract. The entire manuscripts of the remaining 37 articles were reviewed to establish suitability for inclusion. Eight

Table 1 – Inclusion and exclusion criteria for this systematic review.

Inclusion criteria

- Studies involving humans
- English language publication
- Studies published in and from 1980 onwards
- Involves use of free flaps to reconstruct tissue defects in patients with acute burns
- Involves use of free flaps to reconstruct tissue defects in patients having secondary reconstruction of previous burns
- Case series of 3 or more patients

Exclusion criteria

- Free flap usage in injuries where burn injury does not make a significant contribution to injury mechanism
- Articles purely describing technique with no analysis of outcomes such as failure rate or complications
- Purely technical studies involving description of the use of particular free flaps within burns patients

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