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Free tissue transfer for necrotizing fasciitis reconstruction: A case series

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ABSTRACT

Background: Necrotizing fasciitis (NF) is a life-threatening infection requiring extensive debridement that may necessitate amputation. Free tissue transfer (FTT) is an option for reconstruction in difficult cases. Currently, only case reports have described FTT in the setting of NF, and comprehensive evidence on flap outcomes is lacking. The present study characterizes outcomes in patients with FTT following NF.
Methods: All patients admitted with NF between January 1, 2005 and December 31, 2011 to our level 1 burns/trauma referral center were retrospectively reviewed.
Results: No significant difference was found in patient demographics between FTT (n=12) and no FTT (n=212). Both groups had the same number of operations, same length of ICU stay, and length of hospitalization. The flaps used were 10 anterolateral thigh, 1 latissimus dorsi and 1 radial forearm. Recipient sites included: upper extremities (6), lower extremities (4), head/neck (1), and genitalia (1). No flap failures and no take-back operations were required. Upper extremities comprised 58.3% of FTT patients compared to 18.9% (p=0.004) in non-FTT patients. Flap operations occurred a mean of 11.6 days post-admission with 1.1 operations prior to FTT. Mean FTT size was 213 cm^2. Flap complications included seroma (n=1), hematoma (n=1). Donor site complications included hematoma (n=1), exposed tendon (n=1) and necrosis (n=1).
Conclusions: This study demonstrates that FTT provides a promising reconstructive option in the setting of NF without adversely affecting patient outcome.

1. Introduction

Necrotizing fasciitis (NF) is part of a spectrum of rapidly progressive soft tissue infections that can occur as a consequence of minor trauma or surgery [1]. All parts of the body can be affected, with the extremities being most common [2,3]. The disease may rapidly progress from local infection to widespread fascial involvement, ultimately leading to death if early and aggressive surgical debridement is not undertaken. In recent studies, mortality rates have

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been reported as high as 33% [4–6] and amputation rates up to 23.5% [7–10].

Reconstruction of the resulting soft tissue defects post debridement primarily consists of skin grafting on vascular wound beds. However, some wounds with compromised vascularity of the wound bed may lead to functionally poor outcomes due to prolonged secondary healing. This is especially a problem in defects of the upper extremity, with exposed tendons, or bones, where reconstruction with free tissue transfer (FTT) for early definitive coverage may be indicated. FTT offers a single-stage procedure that has the potential to reduce inpatient length of hospital stay [11], permits functional rehabilitation [12,13] and may reduce the requirement for amputation when soft tissue coverage is lacking.

However, use of FTT in NF is not without risk. First, there is a question of the optimal timing. A flap that is placed too early, before the wound is clean enough and the bacterial load removed, may lead to further infection, flap failure and increased morbidity for the patient. Further, the potential for vascular compromise secondary to the infection may increase the risk of flap failure. The use of FTT necessitates the creation of a new donor site in an already compromised individual, with the potential for additional donor site morbidity. Additionally, the patient population who develop NF have a significant number of comorbidities, some of which can increase flap failure [3,14]. Thus, there is a question about the success rate and the potentially increased resources associated with FTT use in patients with NF.

To date, there are only case reports describing FTT in the NF population in the literature. Loscar et al. [15] described successful bilateral latissimus dorsi free myocutaneous flaps for full thickness abdominal wall defect for post-hysterectomy NF in one patient. Barbosa et al. [16] used latissimus dorsi for a full thickness chest wall defect in post-traumatic NF. More recently, Hankins and Southern [17] reconstructed a dorsal hand defect with exposed tendon due to post-traumatic NF with an anterolateral thigh flap. There is no study reviewing all FTT for NF at an institution describing the complication rate, resources used, and examining the impact of FTT on the number of operations and length of stay in patients with NF.

Co-morbid conditions have been previously described as having a negative effect on FTT success [18]. At our institution, the most common comorbidities among NF patients were diabetes mellitus (33.8%), hypertension (33.1%), and history of smoking (24.6%) [3], with a proportion of these patients having 2 or more of these co-morbidities as well as other co-morbidities, such as substance abuse or morbid obesity. Although no individual factor alone, such as smoking [19], advanced age [20], or BMI (body mass index) >30 has been consistently associated with increasing complications or flap failures, there is convincing evidence that higher American Society of Anesthesiologists (ASA) physical status classification system scores [21] are associated with higher risk of FTT complications and length of hospitalization [22,23]. Given that there are an increased number of co-morbidities that may be associated with adverse FTT outcomes in patients with NF, it is important to assess the recipients of FTT in NF and review the outcomes to determine if this is reasonable option that can be safely performed.

The present study aims to answer whether soft tissue coverage with FTT in the medically complicated NF patient population can be safely performed without adversely impacting patient outcomes and without significantly increasing the resources needed to care for the patient. The course of hospitalization in NF patients with FTT will be compared to NF patients without FTT.

2. Hypotheses

1. Use of FTT in reconstruction of NF wounds can be performed without significant complications (e.g. flap failures or reoperations).
2. FTT can be safely used for coverage in complex wounds following debridement for NF without significantly increasing the resources needed (e.g. the length of stay, number of operations).

3. Methods

3.1. *Patient population*

Following institutional Human Research Ethics Board approval, NF cases were identified from health records using methodology previously reported by our group [23]. The following International Classification of Disease (ICD)-10-CM codes were used: NF (M72.6), Fournier's Gangrene (male/female: N49.3/N76.88) as well as myositis (M60). For cases earlier than 2009, ICD-9 CM codes were used for Fournier's (608.83), NF (728.86) and myositis 729.1. All medical charts were reviewed. Confirmation of NF diagnosis was based on evidence of necrotic fascia reported by the surgeon the time of surgical debridement. FTT was identified from the medical chart and confirmed by comparing with a clinical registry of all FTT at our institution.

The following de-identified patient data was recorded:

1) Demographic: age, sex.
2) Surgical: type of free flap, size of flap, hospital admission days before flap surgery, number of surgeries before flap, length of flap surgery, number of flap complications, number of flap take-back operations, number of flap failures, length of stay in hospital and/or intensive care unit.
3) NF-specific: Percentage of total body surface area affected, location of anatomical site(s), precipitating injury type, likely causative infectious organism based on positive cultures, physical co-morbidities. Physical comorbidities examined in this study are: (1) age >50 year, (2) history of smoking, (3) diabetes mellitus, (4) hypertension and/or dyslipidemia (defined as patient prescribed a lipid-lowering agent) or (5) morbidly obese (defined as body mass index >35 kg/m^2).

3.2. *Data analysis*

Patient information was entered into a database created using FileMaker Pro 11 software (Apple, Cupertino, CA, USA) and

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