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A prospective randomized cost billing comparison of local fasciocutaneous perforator versus free Gracilis flap reconstruction for lower limb in a developing economy

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KEYWORDS

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Summary Distal half leg complex wounds are usually a formidable problem that necessitates either local or free flap coverage. The aim of this study was to compare cost billing charges in free Gracilis flap (fGF) and local fasciocutaneous perforator flap (LFPF) in reconstructing complex soft tissue leg and foot defects.

Patients and methods: Thirty consecutive adult (>15-year-old) patients with soft tissue defects in the leg and/or foot requiring tissue coverage with a flap in the period between 2012 and 2015 were randomly assigned (block randomization) to either an fGF or LFPF procedure. The outcome measures addressed were total billed charges costs, perioperative billed charges cost, partial or complete flap loss, length of hospital stay, inpatient postsurgical care duration, complications, operating time and number of operative scrub staff.

Results: One patient suffered from complete flap loss in each group. Reconstruction with LFPF showed total lower billed charges costs by 62% (2509 USD) ($p < 0.001$) and perioperative billed charges cost by 54% (779 USD) ($p < 0.001$), and shorter total hospital stay (36.5 days;

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$p < 0.001$), inpatient postsurgical care duration (6.4 days; $p < 0.001$), operating time (4.3 h; $p < 0.001$) and fewer scrub staff (2.2 persons; $p < 0.001$).

Conclusion: These results suggest that neither flap is totally superior to the other; the choice should instead be based on the outcome sought and logistics. LPF requires lower billed charges cost and resource use and saves operative time and personnel and reduces length of hospital stay. Our approach changed towards using perforator flaps in medium-sized defects, keeping the free flap option for larger defects.

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Introduction

Lower limb complex traumatic wounds are usually a challenging problem to solve and frequently necessitate a multidisciplinary approach. Coverage should not be the only aim of treating posttraumatic open wounds; it should allow early mobilization and ambulation of the patient as well. The innovation of microvascular surgery in the 1970s provided a reliable and robust solution for lower limb reconstruction, especially the distal half of the leg and foot.¹

The free Gracilis flap (fGF) has certain advantages that favour its use in leg and foot reconstruction. The harvest of the Gracilis muscle flap is associated with minimal donor-site morbidity, with most patients only complaining of an unsightly scar.²

At the beginning of the 21st century, following the introduction of microvascular surgery, perforator flaps were introduced. These are axial flaps pedicled only on their perforator vessels and could be effectively rotated, advanced, or trans-positioned to close a nearby defect. Almost all the tissues of an angiosome can be harvested based on a perforator of a specific artery. Particular to the lower limb are the posterior tibial and peroneal arteries.^{3,4}

Posterior tibial artery perforator flaps are consistently the largest and easiest to dissect, enabling reconstruction of a variety of lower limb defects.⁵ However, an anatomical study of the fibula osteoseptocutaneous flap showed that the peroneal artery perforator flap was more adaptable because it supplies a wider area and has a constant arterial anatomy. The Perforators are usually located in the distal part of the intermuscular septum between the superficial calf and the deep muscle compartments.⁶

Microsurgical free transfer, particularly of well-vascularized muscle tissue, can, especially in cases of chronic wounds, induce angiogenesis and improve wound healing even in a hypovascularized wound. It assures a good blood supply of its own, independent of the vascular injury to the surrounding tissue.² Local skin flaps seem to be more adaptable, easy to perform and match perfectly with the neighbouring wound.

Therefore, this study was designed to compare cost billing charges in free tissue transfer of Gracilis muscle and local perforator flaps of the lower limb to propose the best choice in a developing economy as the primary procedure

for reconstruction of complex wounds of the distal half of the leg and foot.

Patients and methods

This study was carried out as a prospective, randomized, controlled study at the Suez Canal University Hospital after approval by the ethical and research committee during the period between December 2012 and May 2015. This study was compatible with the Declaration of Helsinki 2008 except that the trial registration was done retrospectively in a publicly accessible database. The trial registration unique number is PACTR201511001343882, which could be accessed online: www.pactr.org/. Thirty-six patients met the inclusion criteria: age >15 years, presenting with soft tissue defects <50 cm² of the leg and/or foot that needed coverage with a flap were included in the study. Six patients with systemic vascular diseases such as atherosclerosis or vasculitis with peripheral ischaemia (ankle-brachial index <0.7)⁷ were excluded.

Patients presenting with a soft tissue defect larger than 50 cm² were not included in the study, as those types of defects would require different methods of reconstruction such as anterolateral thigh (ALT) free flap⁸ or a local muscle flap.

Epidemiological data were gathered from the patients regarding their age, sex, smoking status, presence of hypertension, site and extension of tissue loss as well as the time elapsed since injury. An x-ray was done for all patients pre- and postoperatively to assess underlying bone condition, fractures and osteomyelitis.⁹ Bone biopsy with bacterial culture was taken in cases where osteomyelitis was suspected.⁹ All patients presenting with Gustillo III B open fractures had external bone fixation by means of an external fixator. We followed this policy because an external fixation technique has been shown to be superior to internal fixation in Gustillo IIIB fractures.¹⁰

Many patients in this study were referred from other hospitals or departments after treatment failure such as failed primary reconstruction or exposed plate after orthopaedic operation, which in many cases resulted in a long time period until the final reconstruction. The patients were categorized according to whether the reconstruction

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