EVALUATION OF THE ROLE OF PROPELLER FLAP IN RECONSTRUCTION OF LOWER THIRD LEG AND FOOT DEFECTS

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ABSTRACT

Background Coverage of soft tissue defects over the lower third of the leg still a difficult challenge to reconstructive surgeons. Local propeller flaps based on perforator vessels are a good addition to reconstructive surgery of the limbs. These flaps allow efficient coverage of small to medium wounds without the need to sacrifice a major vessel. No need for microvascular anastomosis and allows to replace like with like, the donor site can be partially or in some cases totally closed by the short limb of the flap. The aim of this study was to evaluate the role of propeller flaps in reconstruction of lower third leg and foot defects, and to propose an algorithm for this reconstruction.

Materials and Methods In the current study 30cases of various lower third leg and foot defects were covered by perforator based propeller flaps. Defects were due to Trauma in 21 cases, gunshot injuries in 2 cases, electric burn in 1 case, 4 case of a chronic non healing ulcer and 2 cases with post burn scars. Handheld doppler was used to determine the perforators site.

Results 19 cases healed completely with smooth postoperative course. five cases showed total flap necrosis, 2 cases showed marginal necrosis of the flap, and 2 cases showed partial loss of the dermis and 2 cases showed transient venous congestion. In most cases, the aesthetic result was optimal and patients were fully satisfied.

Conclusion The use of perforator based propeller flaps to cover defects in the lower third leg and foot showed satisfactory results as regards flap viability and providing a suitable cover of various defects. The use of hand held Doppler proved satisfactory in pre operative delineation of the perforators.

Keywords: Lower third - leg defects- foot defects - hand held Doppler- Propeller flap- reconstruction

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ATA	**:**	Anterior tabial artery
ATAP	**:**	Anterior tibial artery perforator
B P	**:**	Blood pressure
CT	**:**	Computer tomography
DIEP	**:**	Deep inferior epigastric perforator
DM	**:**	Diabetusmilletus
DP	**:**	Dorsalispedis
HTN	**:**	Hypertension
I C	**:**	Integument closed
I O	**:**	Integument open
Lt.	**:**	Left.
MHz	**:**	Mega hertz
O R	**:**	Operating room
PA	**:**	Peroneal artery
PAP	**:**	Peroneal artery perforator
PTA	**:**	Posterior tabial artery
PTAP	**:**	Posterior tibial artery perforator
Rt.	**:**	Right.
RTA	**:**	Road traffic accident.
SSG	**:**	Split skin graft.

INTRODUCTION

Leg soft tissue defects with bone or tendon exposure need to be covered with a flap. Various local and free flaps with more or less consistent donor site defects have been described in the past.**(Lu et al.,2011)**

Due to the paucity of local tissue in lower limb, upper limb, head and neck region, plastic surgeons are often challenged with the difficult task of providing stable coverage for these defects. Microsurgical tissue transfer offers the solution for these problems but in developing countries the availability of microsurgical equipments, surgeons with required competence and training still restricts utility of free flaps in most regions of the world. The distal third of the lower extremity remains a challenging area in regard to soft tissue coverage. Due to thin, non-expandable soft tissue and predisposition for massive oedema formation, even small defects may become problematic wounds with exposed bone, tendon or other neurovascular structures. This area has traditionally been addressed with free flaps, as local, random pattern flaps showed high failure rate. Muscle flaps are associated with a loss of function, as well as inadequate reach in the distal aspect of the lower extremity.**(Geddes &Neligan, 2003)**

After the introduction of the perforator-based flap concept, new flaps have also been described for the leg. An evolution and simplification of the perforator flap concepttogetherwith the 'free style' flap harvesting method, are the propeller flaps, i.e. local flaps, based on a perforator vessel, which becomes the pivot point for the skin island that can therefore be rotated up to 180 degrees.Perforator flaps represent the latest descendant in a line of evolution that began with the random pattern flap.**(Geddes &Neligan, 2003)**

The early random pattern flaps were constrained by rigorous length-to-width ratios to ensure viability, until 1970 when Milton revealed that their survival was dependent on the inclusion of a pedicle containing a large vessel.**(Milton,1970)**

The axial pattern flap concept was introduced by McGregor and Jackson in 1972 in their description of the groin flap, and was the anatomical basis for the deltopectoral flap described by Bakamjian**.(McGregor &Morgan,1973)**

In the 1970s, the works of Manchot were discovered and translated, revealing that many axial flaps were based on vessels that he had already described. **(Manchot,1983)**

Musculocutaneous flaps that were introduced by Orticochea rapidly became popular because of their reliability and wide arcs of rotation.**(Orticochea M.1972).**

In 1981, Ponte´n reported that greater length-to-width ratios could beachieved in flaps from the lower leg if the deep fascia was included.(**Ponte´n,1981)**

The anatomical basis for these fasciocutaneous flaps was later described by Haertsch, Barclay et al., and Cormack and Lamberty**.(Cormack&Lamberty,1984).**

Taylor and Palmer published their work defining the vascular territories of source arteries, which they termed angiosomes. Knowledge of these vascular territorieshas proven valuable in flap design**.(Taylor&Palmer,1987)**

The perforator flap era began in 1989, when Koshima and Soeda described an inferior epigastric artery skin flap without rectus abdominis muscle forreconstructionoffloor of the mouth and groin defects, noting that a large flap without muscle could survive on a single muscle perforator**.(Koshim&Soeda,1989)**

Kroll and Rosenfield suggested that perforator flaps combine the reliable blood supply of musculocutaneous flaps with the reduced donor-site morbidity of a skin flap. The reduced donor-site morbidity often leads to fasterrecovery and reduced postoperative pain. Perforator flaps have the additional advantages that they can be tailored to accuratelyreconstruct the defect.Including flapThinning for resurfacing shallow defects, there is freedom of orientation of the pedicle, and a longer pedicle is harvested than with the parent musculocutaneous flap.**(Kroll&Rosenfield,1988)**

There is hyperperfusion of the skin paddle, which may allow the capture of the adjacent two angiosomes, explaining how a single perforator can capture such large territories.**(Rubino&Coscia,2006)**

Over the past few years, the use of propeller flaps has becomeincreasinglypopular. A propeller flap can be defined as an "island flap that reaches the recipient site through an axial rotation" the classification is based on thenourishing pedicle (subcutaneous pedicled propeller flap, perforatorpedicled propeller flap, supercharged propeller flap),the degree of skin island rotation (90-180 degree) and when possible, the artery of origin of the perforator.**(Luet al.,2011)**

The propeller flap is a useful reconstructive tool and is able to give good cosmetic and functional results in different parts of the body.

The propeller flap is comparable to alocal flap in terms of amount and firmness of subcutaneous tissue,skin texture,and the possibility of