International Journal of scientific research and management (IJSRM)
||Volume||2||Issue||11||Pages||1599-1603||2014||
Website: www.ijsrm.in ISSN (e): 2321-3418

Medial Arm Perforator Flaps – A Cadaveric Study

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ABSTRACT

The goal of any reconstructive surgery is to resurface the defects with a pliable and cosmetically similar tissue thatwill allow accurate function. Perforator flaps can be tailored to accurately reconstruct the defect, including flapthinning for resurfacing shallow defects. They offer reliable blood supply just like musculocutaneous flapsas well asreduced donor-site morbidity. Medial surface of distal arm has been described as a potential donor site for theperforator flaps because of its excellent color and fine texture. The territory of medial arm is relatively unexploredregion. Data providing information regarding consistent site of perforator, main source vessel supplying it, totalnumber of perforators as well as location of perforators in relation to fixed bony landmarks in the region of medialsurface of arm is sparse. This cadaveric study showed that the brachial artery (BA) is the main source vessel (71.4%cases) supplying most of the perforators of medial arm region. Also, consistent site of perforator was describedwithin region of 115.8 mm proximal and 16.8 mm medial to the medial epicondyle within a circle of 23.8 mm. Theseobservations are useful to use the medial surface of the arm as donor site area in reconstructive surgery procedures.

Key words: reconstructive; perforator; medial arm; flaps; fasciocutaneous

INTRODUCTION

In any reconstructive surgery, choice of composite tissue transfer is governed by two paramount factors, resemblance of donor tissue as closely as possible to the recipient site and minimum donor site morbidity due to flap harvesting. The goal of any reconstructive surgery is to resurface the defects with the original skin or with a pliable, sensitive, and cosmetically similar tissue that will allow adequate function.Soft tissue coverage of various areas of face and head and neck, with considerations of colour, texture match and sensations has always been a challenge to the reconstructive surgeons.Harvesting skin flaps based on small perforating vessels without dissecting upto the source vessel to reduce donor site morbidity has led to the concept of "perforator flaps". Taylor and Palmer in 1987, found that there were 374 cutaneous perforators of more than 0.5 mm diameter which were theoretically capable of serving as pedicles for numerous free flaps (1).Nowadays, surgeons are preferreing the perforator flaps because of minimal donor site morbidity, color, texture, and flap thickness (2 - 4). Perforator Flaps offer variousadvantages like longer pedicle than is achievable with the parent musculocutaneous flap,greater length to width ratio as deep fascia is included. Moreover, perforator flapscan be tailored to accurately reconstruct the defect, including flap thinning for

resurfacing shallow defects.Also, they offer reliable blood supply just like musculocutaneous flaps andreduced donor site morbidity.Perforators can be classified into various types based on their caliber as well as their direction in relation to muscle fibres. Suitable perforators are the ones, whose diameter is more than 0.5 mm.Large perforators have diameter of about 1.0 mm, while ideal perforators have diameter more than 1mm and they run parallel to the muscle fibers and with no large muscular branches (5). Medial surface of distal arm has been described as a potential donor site for the perforator flaps because of its excellent color, fine texture and ideal thickness (6). The territory of medial arm is relatively unexplored.Data providing information regarding total number of perforators as well as location of perforators in relation to fixed bony landmarksmain source vessel supplying them and consistent site of perforators in the region of medial surface of arm is sparse. To best of our knowledge, we could not find any data on medial arm perforators in North West Indian region. Medial arm region offers well hidden donor site,thin, pliable, light colouredandnon hairy skin, which may be an ideal match for reconstruction of various areas of face, head and neck and also elbow region for various defects like elbow contractures etc.

MATERIAL & METHODS:

This prospective observational study was undertaken in departments of Anatomy,PGIMER, Chandigarh, Indiain collaboration with department of Plastic and Reconstructive Surgery, PGIMER, Chandigarh, India. In this study, 14 upper limbs of formalized cadavers, with no scars over area under study were included. Coloured latex dye (10 cc) was injected in the brachial artery (BA).Dissections were performed 48 hours after the injection. Long incision was given extending over anterolateral aspect from tip of acromion process to the point between two epicondyles. Afterwards, the flap was raised by incising the margins of the stained skin, to visualize the stained medial arm perforators. Our objectives were to evaluate the total number of perforators,their diameter and mean length, main source vessel supplying them, their location in relation to standard bony landmarks and to identify the consistent site of perforators on the medial arm region.

RESULTS:

Number of perforators on medial arm varied from 1 to4 (Figure 1).

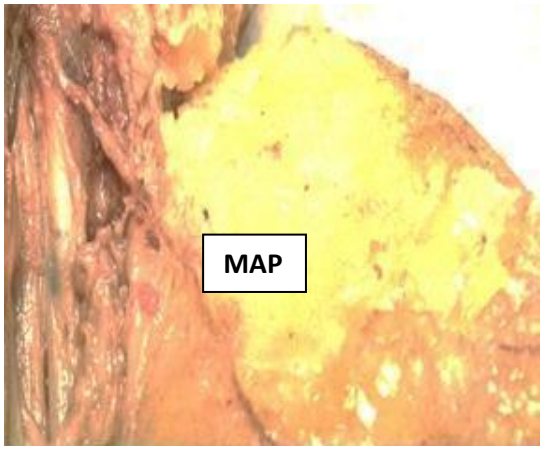

Figure1. Figure showing perforators (MAP)supplying overlying fascia and skin of medial arm region

Maximum concentration of perforators was observed in the region of lower one third of arm in 85.7% of the cases, while in rest of the cases perforators were observed atmiddle one third of medial surface of arm(14.3%). In 71.4% cases, main source vessel supplying perforators was observed to be brachial artery (BA), while in rest of the casessuperior ulnar collateral artery (SUCA) was observed to be supplying the perforators as main source vessel (Figure 2).

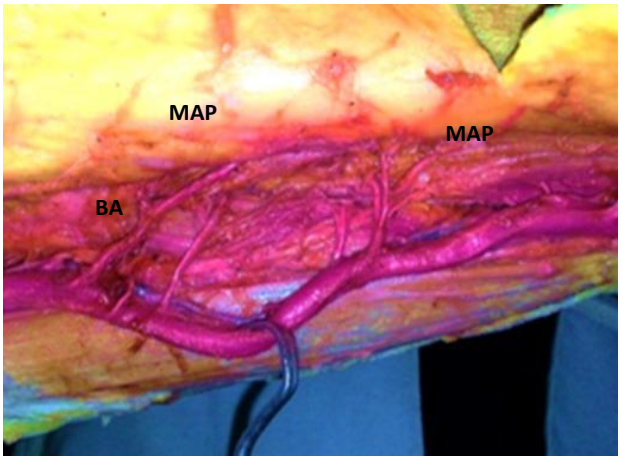

Figure 2. Medial arm perforators (MAP) arising from brachial artery (BA)

Mean length of perforators was found to be 33.7 ± 6.0 mm verying from 8 mm to 60 mm. Thus, very wide range of variation was observed in the length of perforators in medial arm region. Mean diameter of perforators was observed to be 0.93 ± 0.54 mm varying from 0.43 mm to 1.67 mm (Figure 3).

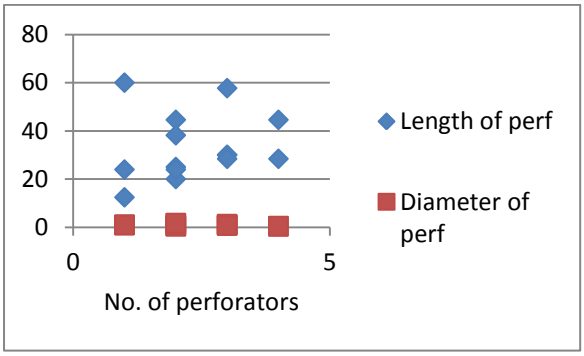

Figure 3 Chart depicting length and diameter (in mm) of perforators

Ideal perforators (whose diameter were more than 1 mm and were found to be running parallel to the muscle fiber) were observed in 21.2% of the cases, out of which in 17.2% of the cases they were observed at the level of lower one third of medial surface of arm. Suitable perforators (diameter more than 0.5 mm) were found in 60.6% of the cases at the level of lower one third of medial arm region. The consistent perforator was found within a circle of 24.3 mm diameter, about 115.8 mm above and 16.8 mm medial to the medial epicondyle of humerus (Figure 4).

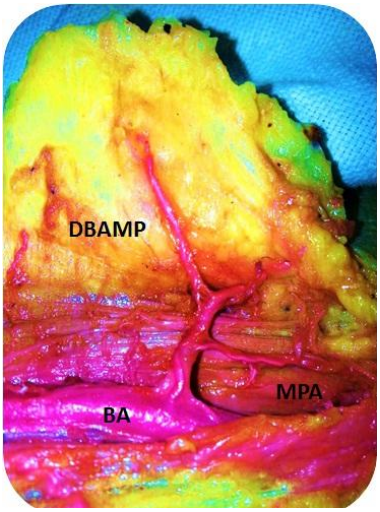

Figure 4 Medial arm perforator (DBAMP) flap supplied by perforators arising from brachial artery (BA)

DISCUSSION

Elbow's contractures and skin defects are commonly seen (7). Skin grafting has been the most widely accepted method, but it often produces a patchy appearance and requires prolonged splinting in order to avoid further recurrence. Local flap, especially the fasciocutaneous flap, when available, facilitates closure of the tissue defectfor elbow region considerably (6, 8).The medial distal arm has been described as a potential donor site for the fasciocutaneous flap because of its excellent color, fine texture, and ideal thickness (9).Previous studiesdescribe perforators of various regions of arm, but the main objective of current study was to explore perforators of medial region of arm as this area offers thin, pliable, light coloured and hairless skin which can be an ideal match for skin of face and head and neck. Thus, it can prove to be a potential flap

for reconstructive surgeries of this region.This cadaveric study showed that the brachial artery (BA) is the main source vessel(71.4% cases) supplying most of the perforators of medial arm region. Also, consistent site of perforator was described within region of 115.8 mm proximal and 16.8 mm medial to the medial epicondyle within a circle of 23.8 mm. We have confirmed as noted by Hwang et al. (10) a constant perforator artery located in a circle, diameter of which was found to be wide enough to be utilized for perforator flap surgeries. The length of perforator pedicle was observed to be 33.7 ± 6 mm, which can allow rotation of perforator flap for defects in elbow like elbow contractures. These observations are useful to use the medial surface of the arm as donor site area in reconstructive surgery procedures. It can prove to be a potential flap for use as a pedicled flap, for coverage of elbow or axilla.Clinical studies are necessary to highlight the real impact of this flap technique.

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