



ASSESSMENT OF PROFUNDA FEMORIS ARTERY PERFORATORS FOR POSTEROMEDIAL THIGH FLAP - AN ANATOMICAL STUDY.

Dr. Kumari Ayushree*	Assistant Professor, Dept. of Anatomy, Topiwala National Medical College and BYL Charitable hospital, Mumbai. *Corresponding Author
Dr. Prasad K Waghmare	Assistant Professor, Dept. of Anatomy, Topiwala National Medical College and BYL Charitable hospital, Mumbai.
Dr. Jayanta Biswas	Junior resident, Dept. of Anatomy, Topiwala National Medical College and BYL Charitable hospital, Mumbai.

ABSTRACT **Introduction:** The posterior thigh flap was first described in 1980 by Hurwitz. It was transferred as a free flap as well as pedicle flap. Despite early descriptions about the rich vascularity of the posteromedial thigh region, it has not gained popularity. This study was conducted to assess the merits of the posteromedial thigh flap, so that it will help surgeons to achieve new flaps for future use.

Material And Methods: This study was carried out from May 2017- May 2019 at Topiwala National Medical College on 30 non-embalmed cadavers. Total of 60 PMT (Postero Medial Thigh) flaps were dissected and assess following parameters - number of perforators, length of perforators, type of perforators and pedicle length.

Result: The mean thigh length was noted to be about 47.93 cms. Standard size of each flap dissected on each thigh was 20x8 cms. It was noted that PAP (Profunda artery perforator flap) had a mean number of 1.72 perforators. Mean lengths of perforators were (first perforator-A) 4.47cms and (second perforator-B) 3.28cms. The PAP flap had 58.3% musculocutaneous perforators and 41.7% septocutaneous perforators. Mean pedicle length of PAP flap was approximately 9.98cms.

Conclusion: The location of donor site of posteromedial flap can have a cosmetic advantage over ALT (Anterolateral thigh) flaps. More number of septocutaneous perforators also favour the ease of dissection of posteromedial flaps. Though the posteromedial flaps have not been used widely in the past, due to limitations of clinico-anatomical studies, this study, along with future studies can explore the possibilities of using it more widely in the clinical settings.

KEYWORDS : Posteromedial thigh flap, perforators, pedicle length

INTRODUCTION

Reconstruction of soft tissue defects following burns, trauma or tumor removal, using flaps, helps to restore the normal appearance and function of tissue. A flap is a piece of tissue which is surgically raised and transferred from one location in the body to another whilst maintaining its blood supply, which enters at the base (pedicle) of the flap when it is transplanted.¹

In 1980s, micro-dissection techniques were developed which showed that branches of vessels supplying the skin passed through muscles, fasciae or both. These were called perforators. This initiated several studies which essentially focused on perforator flaps.²

The direct cutaneous perforator which is derived from the main arterial trunk and has its course in subcutaneous fat parallel to the skin surface and is confined to certain areas of the body. The musculocutaneous perforators arising from intra-muscular vasculature pass through the surface of muscle and pierce the overlying deep fascia, to reach the skin by spreading out in subcutaneous tissue.

The septocutaneous perforator consists of perforating branches from deeply located vessels which pass along intermuscular septae and then fan out at the level of deep fascia, to reach the skin.²

Perforator flaps have been used locally as pedicle flaps or at a distant location as free flaps. The local perforator flap is located adjacent to the wound or defect. When used locally, perforator flaps have all the advantages of local tissue, including good skin colour, texture and thickness match.²

Hip and thigh have an average of 50 arterial perforators each, out of which perforators that supply the skin over the posteromedial and posterolateral thigh regions are derived from the profunda femoris and the popliteal arteries. The posterior thigh flap was first described in 1980 by Hurwitz.² It was transferred as a free flap by Song in 1984 and it has been used as a pedicle flap by Palleta.³

Despite early descriptions about the rich vascularity of the posteromedial thigh region, it has not gained popularity. This study was conducted to assess the merits of the posteromedial thigh flap, so that surgeons achieve new flaps for future use.

Aims And Objectives Of The Study

- To count the number of posteromedial thigh perforators
- To Measure the length of each perforator
- To observe the nature of perforators (musculocutaneous or septocutaneous)
- To measure the pedicle length in posteromedial thigh flaps

MATERIALS AND METHODS

Present study was conducted on 30 fresh cadavers in the anatomy dissection hall of Topiwala National Medical College over a period of 18 months. Total 60 PAP flaps were dissected of 30 cadavers. Cadavers with lower limb trauma and infection were excluded. Both male and female cadavers were included. Dissection for flap harvest was done with 3.5x loupe magnification (figure-1) and a metal measuring scale was used for the measurements.

Harvest of the flaps:

- The cadaver was placed in supine frog leg position (figure-2).
- **Landmarks** – Following land mark were identified: pubic tubercle and medial femoral condyle. Dotted line was drawn from pubic tubercle to medial femoral condyle - over the adductor longus. A parallel line was drawn, 3 cm medial to this; this line usually runs between gracilis and adductor magnus. This corresponds to the intermuscular septum between the two muscles and forms the axis of posteromedial thigh flap. An elliptical flap was drawn centralized along this line measuring 20x8cm.
- An incision was taken along the lateral margin of this elliptical flap, and it was reflected medially in the subfascial plane (figure-3). After elevating in the subfascial plane (figure-4), perforators were identified to see whether they were piercing the fascia i.e. septum between gracilis and adductor magnus (Septocutaneous) (figure-5) or the adductor magnus muscle (musculocutaneous) (figure-6) and their course was traced distally up to the skin. The perforator located closest to the pubic tubercle was named Perforator A and distal to that was named perforator B (figure-7). The **length of the perforators** was measured from the point of piercing the muscle/fascia (point Y) to their termination in the skin (point X) i.e. XY (figure-8).
- This perforator was dissected proximally up to its point of origin from the profunda femoris artery (point Z) and the distance YZ was measured between the origin from profunda femoris artery to

its point of piercing the fascia / muscle. XY and YZ were added to obtain the pedicle length. A medial incision along the medial border of elliptical flap was taken and the flap was lifted thus completing the flap dissection.

- The various parameters were assessed (number of perforators, length of the pedicle and nature of perforators- musculocutaneous or septocutaneous. All the measurements and observations were recorded and tabulated (table-1).



Figure 1: Loupe Magnifier



Figure 2: Supine Frog Leg Positions



Figure 3: Lateral Incision For Posteromedial Thigh Flap

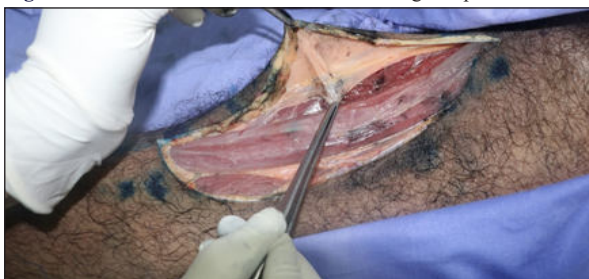


Figure 4: Showing Reflection Of Skin, Subcutaneous Tissue And Fascia

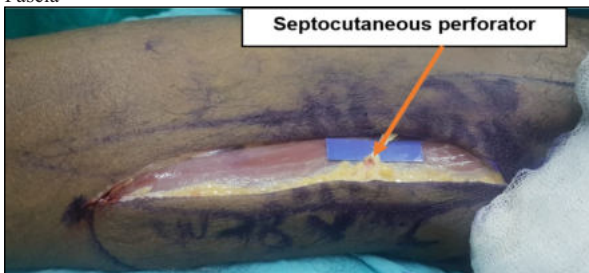


Figure 5: Showing Perforator Piercing The Fascia

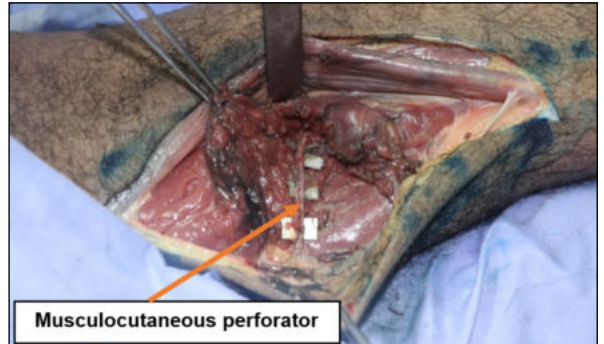


Figure 6: Showing Musculocutaneous Perforator Passing Through Adductor Magnus

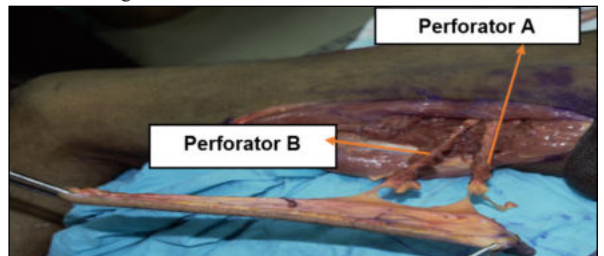


Figure 7: Showing Posteromedial Thigh Flap With Perforator

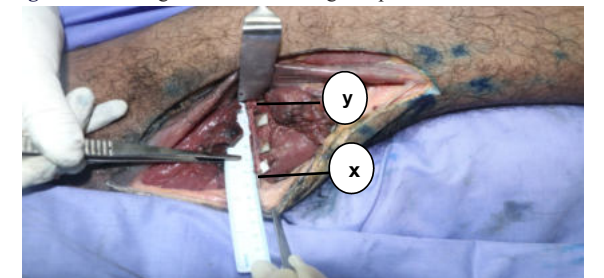


Figure 8: Measurement Of Length Of Perforator

Statistics

Statistical analysis was done using SPSS 16.0. All measurements are expressed as mean \pm SD. Continuous variables are compared using Student's t-test. A p value of < 0.05 is considered statistically significant.

RESULTS

Total of 60 PMT (Postero Medial Thigh) flaps were dissected and assess for following parameters. (table 1)

- In our study , it was noted that mean number of perforators in PAP flap was 1.72.
- Mean lengths of perforators in PAP flap was 4.47cms (table 1)
- Mean pedicle length of PAP flap was about 9.98cms. (table 1)
- PAP Flap had 58.3% musculocutaneous perforators and 41.7% septocutaneous perforators. (table 1)

Table 1- Various Parameters Related To Posteromedial Thigh Flap

Sr No	Parameter	Mean
1	Number of perforator	1.72
2	Length of perforator	4.47 cm
3	Length of pedicle	9.98 cm
4	Nature of perforator	MC (58.3%) SC (41.7%)

(MC-Musculocutaneous, SC-Septocutaneous)

DISCUSSION

In the last few decades, Plastic surgery has evolved immensely as a reconstructive, restorative and cosmetic surgical branch. Soft tissue reconstruction is done by flaps and the use of perforator flap has become popular in reconstructive and restorative microsurgery. The perforator flaps allow the transfer of large amounts of soft tissue including skin, fascia, muscle, or a combination of these for the reconstruction of complex defects. In the thigh region ALT flap is a well-known flap, based on the descending branch of lateral circumflex

femoral artery and has been in use since the 1980s. However, there are a few demerits with the use of the anterolateral thigh flap. They are - a conspicuous scar, contour deformity over the anterolateral thigh region and paraesthesia over the region due to damage to lateral cutaneous nerve of the thigh.

The posterior thigh flap was first described in 1980 by Hurwitz.² It was transferred as a free flap by Song³ et al. in 1984, and it has been used as a pedicled flap⁴, a pedicled island flap,⁵ and a free flap.^{2,5} Despite early descriptions about the rich vascularity of the posteromedial thigh region, it has not gained popularity. The limited clinical application of flaps in this area may be attributed to the conflicting anatomical descriptions. This study was thus conducted to assess the merits of the posteromedial thigh flap and to evaluate if it could be used to overcome the latter's demerits.

For a good perforator flap, the number, length and nature of perforators, along with the pedicle length is of paramount importance.

For posteromedial thigh flap, **DeLong MR et al (2014)**⁶ observed at least two perforators in each thigh, **Scaglioni et al (2015)**⁷ 1.7, **Wu JC et al (2016)**⁸ 2, **Ito Ret al (2016)**⁹ 1.9 perforators. The present study showed an average of 1.72 perforators in each thigh. Though a single perforator is sufficient for survival of flap, multiple perforators enhance the blood supply. Each perforator artery runs along with venae comitantes, which improves venous drainage and boosts flap circulation.

The length of the perforators was measured from the point of piercing the muscle/ fascia to their termination in the skin. The mean length observed by **Satake T et al (2014)**¹⁰ was 3.9 cm as compared to the present study which was 4.47 cm.

Septocutaneous perforator pierces the intermuscular septum to reach the skin, while musculocutaneous perforator pierces the muscle to reach the skin. Intramuscular dissection of the musculocutaneous perforator is more tedious and time consuming as compared to the dissection of septocutaneous perforator which is easier and faster. Hence septocutaneous perforators are preferred by the plastic surgeons. The posteromedial thigh flap had more septocutaneous perforators though the musculocutaneous perforators, still outnumbered the septocutaneous ones. This difference in the present study was statistically significant, 58.3% musculocutaneous and 41.7% Septocutaneous and were comparable to the previous study which was done by **Haddock NT et al. (2012)**¹¹ 51.7% musculocutaneous and 48.3% septocutaneous perforators. Only one study by **Ahmadzadeh et al (2007)**¹² showed predominance of septocutaneous 65% over the musculocutaneous one (35%).

The **length of the pedicle** was measured between its point of origin from the profunda femoris to their termination in the skin. For Posteromedial thigh flap **Allen RJ et al.(2012)**¹³ observed the mean pedicle length to be 10 cm, **Ciudad P et al. (2016)**¹⁴ 9 cm, **Ito Ret al. (2016)**⁹ 9.7cm. The mean pedicle length in the present study was 9.97 cm. However, the pedicle length of PMT flap is good, it can still be used to create anastomosis with the nearby recipient vessels. Long pedicle of ALT increases the area of its donor site. It also decides the arc of rotation of flap. Even with their difference in length, both anterolateral thigh flap and posteromedial thigh flap can be rotated up to ASIS, pubic tubercle, lower abdomen and up to the knee. If arc of rotation is not sufficient to close a wound then these flaps can be used as free flaps and anastomose with superficial-seated recipient vessels.

CONCLUSION

It can be concluded that the clinical parameters of the posteromedial thigh flap are as good as, if not better, than the more frequently used anterolateral thigh flap. However the location of the donor site of the posteromedial flap can have a cosmetic advantage over the latter. More number of septocutaneous perforators also favour the ease of dissection of posteromedial flaps. Though the posteromedial flap has not been used widely in the past, due to limitations of the clinico-anatomical studies, this study, along with future studies can explore the possibilities of using it more widely in the clinical settings.

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