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To Establish a Predictive Model for Maximum Propeller Fasciocutaneous Flap Dimensions Based on Perforator Characteristics for Leg Defects.

Dr. Sachin Subhash Pawar[1], Dr Chinmay C. Wingkar[2]

[1]MBBS, Dnb GEN. Surgery, Mch Plastic and Reconstructive Surgery Assistant Professor Plastic Surgery, Kimsdu, Kvv, Karad
EMAIL ID: drsachinpawar5@gmail.com Corresponding author:
[2]MBBS, MS GEN. SURGERY, MCH Plastic and Reconstructive Surgery Associate prof. plastic surgery, KIMSDU, KVV, KARAD

ABSTRACT:

Background

Propeller flaps have gained more importance recently and these flaps are being increasingly used for reconstruction of soft tissue defects of different parts of the body, and surgical technique has been refined and well described by several authors. This study is an attempt to define a safe limit of perforator propeller flaps in lower limb reconstruction and feasibility as an alternative to more complex free flap procedures.

Objective

To establish dimensions of propeller fascio-cutaneous flap which can be safely harvested, according to the size and location of perforator in leg and according to dimensions and location of defects, in patients with leg defects.

Method

Patients presenting to Krishna institute of medical sciences between Jan 2022- June 2023, with lower leg defect from knee to heel, where a flap cover was necessary for wound healing were selected for this study. They underwent flap surgery with flap based either on posterior tibial or anterior tibial or peroneal artery perforators according to location of defect and preop marking of the selected perforator. All post operative patients were followed up for results and any complications were recorded and analysed.

Results

30 patients included in study as per inclusion criteria. Mean age was 44.6 yrs. 22 (73.33%) patients were males and remaining 8 (26.66%) patients were females. 16(53.33%) patients were done Posterior Tibial Artery (PTA) perforator flap; 4(13.33%) patients were done Peroneal Artery (PA) perforator flap and 10(33.33%) patients were done Anterior Tibial Artery (ATA) perforator flaps to cover the defects. Average area of flap raised from ATA based flaps was 71 cm2, from PA based perforators was 75.2 cm2 and from PTA based perforators was 60.1cm2. Average length of flap harvested - 13.2 cm and average length of leg was 37.7 cm. Overall mean operative time - 140 min. 15 (50%) patients had postoperative complications. 8 (26.7%) patients had Distal Necrosis (DN)/ Partial Necrosis (PN); out of these three patients had 2cm. distal necrosis, two had 1cm distal necrosis and three had 4cm distal necrosis. Nine (30%) patients had postoperative flap congestion (C). Four (13.33%) patients had Complete Necrosis (CN) of flap. the average length of flap which can safely be harvested on ATA based perforator was 10.25cm, on PTA based perforator was 10.6 cm and PA based perforator was 11.8 cm. It was found that in patients in whom the flap length divided by leg length

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was less than 33%, the chances of flap survival were more as compared to those in whom this percentage was above 33%. In other words there are 5.2 times more chances of flap failure if the flap length is more than 1/3rd of leg length.

Conclusions

This is a simple, versatile technique and is less time consuming with less donor site morbidity. Propeller perforator flaps are best suited in trauma patients with small and medium size leg defects. Peripheral vascular diseases are contraindication for local perforator flaps. The most common complication is venous congestion of the tip or of the entire flap. The average length of flap which can safely be harvested on ATA based perforator is 10.25cm, on PTA based perforator is 10.6 cm and PA based perforator is 11.8 cm. but since the sample size is small, the results need to be verified by a study with larger sample size. These flaps have a limited role in larger defects, degloving injuries especially where the prominent and most near perforator may be within the trauma zone. There are 5.2 times more chances of flap failure if the flap length is ›1/3rd of leg length. This study is an attempt to define safe extent of local perforator fascio-cutaneous flap for lower limb reconstruction based on the size and site of perforators in leg which needs to be substantiated with larger studies.

INTRODUCTION

Perforator Propeller Flaps have revolutionized lower limb reconstruction as they liberate flap design from the constraints of width-to-length ratio, provide flexibility in design, which decrease donor site morbidity.

The "propeller flap" term was introduced in 1991 by Hyakusoku et al [1] to describe an adipocutaneous flap, based on random subcutaneous pedicle, with skin island of length, largely exceeding its width, made of two portions (blades of the propeller), on either side of the pedicle. The flap was rotated 90° on the central pedicle, like a propeller, to resurface burn scar contractures at the elbow and axilla. Subsequently, Hallock [2] used the term propeller to define a fascio-cutaneous flap that he raised over the adductor compartment of the posterior thigh. The flap was similar in shape to the shape described in Hyakusoku et al [1] study, but in Hyakusoku study, it was based on a skeletonized perforating vessel and the skin island was rotated 180°. By doing this, a part of the flap (the larger blade) was used to resurface the defect, and the other part of the flap (the minor blade) was positioned over the donor site of the larger blade facilitating direct closure.

The propeller flaps gained great popularity; flaps have been increasingly used for reconstruction of soft tissue defects of different parts of the body, and surgical technique has been refined and well described by several authors. Perforator propeller flaps have a reliable vascular pedicle and can undergo wide mobilization and rotation; their harvest is fast and easy and does not require microsurgery; however, accurate patient selection, preoperative planning and dissection technique are mandatory to prevent complications.

The use of local perforator-based flaps for reconstruction of soft tissue defects of the lower extremity is simple and safe alternative to the more complex and time-consuming microsurgical reconstructions. This has been made possible through better understanding of the cutaneous circulation and local vascular anatomy and innovations in flap design. [3] Free flaps are considered to be good options for lower limb defects, the obvious drawbacks are that it needs considerable expertise and generally one of the two major vessels is used for anastomosis. There has been a considerable stress to find out local flap coverage for these defects, a flap which would be technically easier than the free flaps, which would not lead to loss of function of any muscle or muscle groups, can be used in all parts of the leg, have minimum donor site morbidity, and is reliable. Perforator flaps are the nearest to the above-mentioned criteria. There are no studies to define safe limit of the perforator flap in lower extremity reconstruction. [4] This study is an attempt to define the safe extent of local perforator based propeller fascio-cutaneous flap for lower limb reconstruction. Although propeller flaps are a reliable option to address lower extremity defects, they have a long learning curve and require a good amount of experience and perforator dissection skills to reduce the probability of flap failure and so, residents should be adequately trained in this procedure to ensure optimal outcome delivery [5]. The 180-degree propeller flap is an elegant and versatile method to achieve soft tissue

coverage with local tissue in defects of the distal leg [6]. The perforator-plus flap is a new concept for lower extremity reconstruction. It combines a perforator flap with a traditional skin rotation flap. It can be another option for lower extremity soft tissue defects since the flap has an augmented blood supply. The ability to detect cutaneous perforators has improved with the Duplex scan imaging technique[7].

AIMS AND OBJECTIVES OF THE STUDY

To establish safe dimensions of propeller fascio-cutaneous flap to be harvested, according to the size and location of perforator in leg, in patients with leg defects.

METHODOLOGY

SOURCE OF DATA:

1. Patients presenting to Krishna institute of medical sciences, with lower leg defect from knee to heel, where a flap cover was necessary were selected for this study.

2. 30 patients with such leg defects were studied.

3. Patients were informed about the study in all respects. A written and informed consent was obtained.

4. Period of study - Jan 2022 to June 2023.

5. Follow up period was 2 weeks, 1 month and 3 months post-operatively as well as telephonic conversation whenever needed.

METHOD OF DATA COLLECTION:

- By History
- By clinical examination
- By Laboratory investigations

INCLUSION CRITERIA:

1. A patient diagnosed with leg defects from knee to heel which require a flap cover for wound healing.

2. Patients fit for surgery.

EXCLUSION CRITERIA:

1. Patients with co-morbidities like Peripheral Vascular Disease, Hypertension, Diabetes mellitus, or Hyperlipidemia.

2. Patients who had not given written consent for surgery.

SELECTION METHOD:

- Patients with leg defects fulfilling inclusion criterias were selected for study.
- Follow up assessment was performed using clinical assessment.
- Proforma specially made for the study was used.

STATISTICAL ANALYSIS:

• Results obtained in this study were compared and analyzed with similar studies for Statistical significance. Various tests for significance like Chi-square test, Z-test, T-test were used as and when necessary.

SAMPLE SIZE:

• A total of 30 cases with leg defects were selected.

INVESTIGATIONS AND INTERVENTIONS REQUIRED FOR THE STUDY:

1. Complete haemogram

2. Urine - Routine examination

3. 3. Routine blood tests like: Blood Glucose level, RFTs, S. electrolytes, BT, Clotting Time, Blood group, Liver function tests.

4. Lipid Profile

5. Serological tests- HIV, HCV, HBsAg

6. X-rays leg and foot, CXR-PA view, ECG

7. 7. Doppler study of lower limb if required.

8. 8.Hand held Doppler study of lower limb

METHOD:

After obtaining clearance and approval from institutional ethical committee, the patients fulfilling inclusion criteria and giving informed-written consent were included in the study. Preoperative work-up needed for fitness of patients for undergoing surgery were done. Also pre-operative perforator identification by hand-held Doppler with an 8MHz probe was done in all the patients. All the perforators along the surface markings which were closer to the wound were marked and the axis of the flap was marked in between the perforators. Pre-op data collection including the length of leg from the tip of lateral malleolus to knee joint level was measured in all patients.

Usually Spinal anesthesia and sometimes general anesthesia was used depending on anaesthetist's preference. Debridement and flap incision and elevation was done under tourniquet control. While inflating the tourniquet, the popliteal veins were blocked so as to prevent complete venous exsanguination of the limb. This kind of venous stasis helps in perforator identification and dissection. Once the debridement was completed, flap markings were done. One edge of the future flap was incised and this incision was planned for possible alternative flap, whenever a suitable perforator wasn't found. The incision was made up to or deep to the deep fascia, a vicryl 3-0 sutures were taken between deep fascia and dermis to prevent sheering force over perforators in the flap. The subfascial dissection was continued under magnification (4x Loupe magnification) and all the identified perforators were preserved. At this stage, the flap was attached to the leg by the perforators only, 3–5 in number. All the extra perforators were clamped with micro-clamps. The tourniquet was released at this stage and the viability of the flap as shown by refilling of vessels and bleeding from the flap, was observed. If viability was judged to be good, the clamped perforators were ligated and cut. Thus the best perforator was chosen, according to its location, size and suitability to sustain the flap, number of venae comitantes, course and orientation. The definitive design of the flap was accomplished. A reliable perforator is one that sprouts from carrier muscles or septum and has a visible pulsation. It has the peculiar ability to overcome the angiosome barrier through subdermal network. During this whole dissection, the perforators were irrigated by lignocaine and saline solution to prevent vessel spasm, the long axis of the flap was orientated according to the long axis of the leg. 1 cm length was added to distance between the perforator and the distal edge of the defect and the resulting value is transposed proximally to the skin which will cover the defect, sp as to ensure the flap's comfortable inset, without any tension on the pedicle. Similarly, 0.5-1 cm was added to the width of the defect to allow the closure without tension. The incision around the flap was done and the harvesting was completed. Dissection of perforator was done in such a way to ensure that it is completely mobilized. The perforator dissection to their origin from the donor vessel was not done in all cases. After dissection, the flap is an island attached only by its pivot perforator artery and its venae comitantes. The length of perforator dissected was measured in cm and noted down. Also the external diameter of the perforator was measured by a Vernier calipers and the same was noted down. The flap was rotated on perforator axis up to 180 degrees to cover the defect. The flap was rotated in a clockwise or counter-clockwise direction, depending on the right rotational direction to avoid kinking of the vessels. After rotation of flap the dermal bleed was confirmed again. Inset of flap was given by Ethilon 3-0. A simple tube drain was kept under the flap to avoid haematoma collection. The donor site was closed primarily in some cases. If primary closure wasn't possible, the donor-site was partially directly sutured and the remaining defect skin grafted. Light dressings given over the flap, which can be monitored easily for any change in color. A posterior POP slab kept the leg extended and immobilized for 10-12 days postoperatively. The foot was kept elevated on one or two pillows during this period.

Important things to remember:

- Bloodless field by use of tourniquet for dissection.
- Loupe magnification for proper dissection.
- To prevent vessel spasm, use constant irrigation with lignocaine and saline.
- Thin rim of fat can be left around the perforator for additional support so that kinking of pedicle is prevented.
- Before transection of the extra perforators, the mos t dominant perforator is to be identified by clamping the other perforators.
- Tensionless inset of the flap.

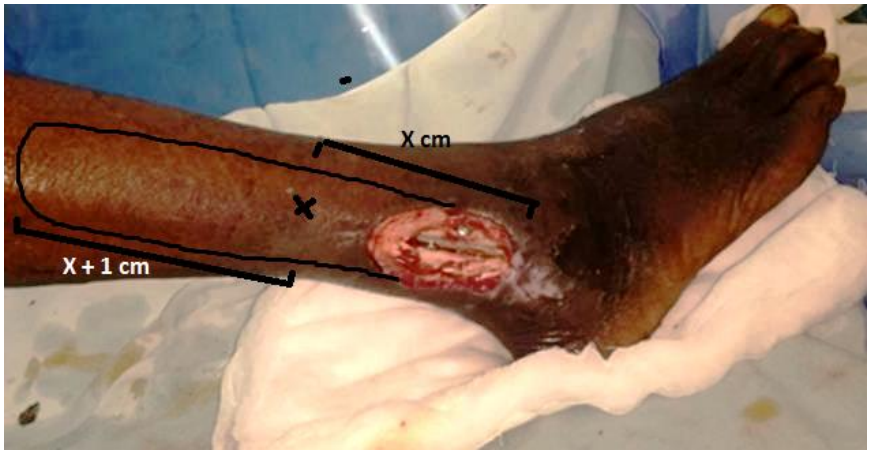

Figure 1- Diagram showing the concept of propeller flaps.

Post-operatively flap monitoring was done for any complications and necessary steps undertaken. In case of venous congestion, a few sutures over the inset were removed. Post-operatively patient was followed up at regular intervals. Sutures removed on 10-14 days.

Figure 2- Defect over Right medial malleolus covered with PTA based perforator propeller flap. a- Lower 1/3rd leg defect over medial malleolar region, b-Propeller flap raised over perforator from PTA, c- Final inset given with SSG for donor area.

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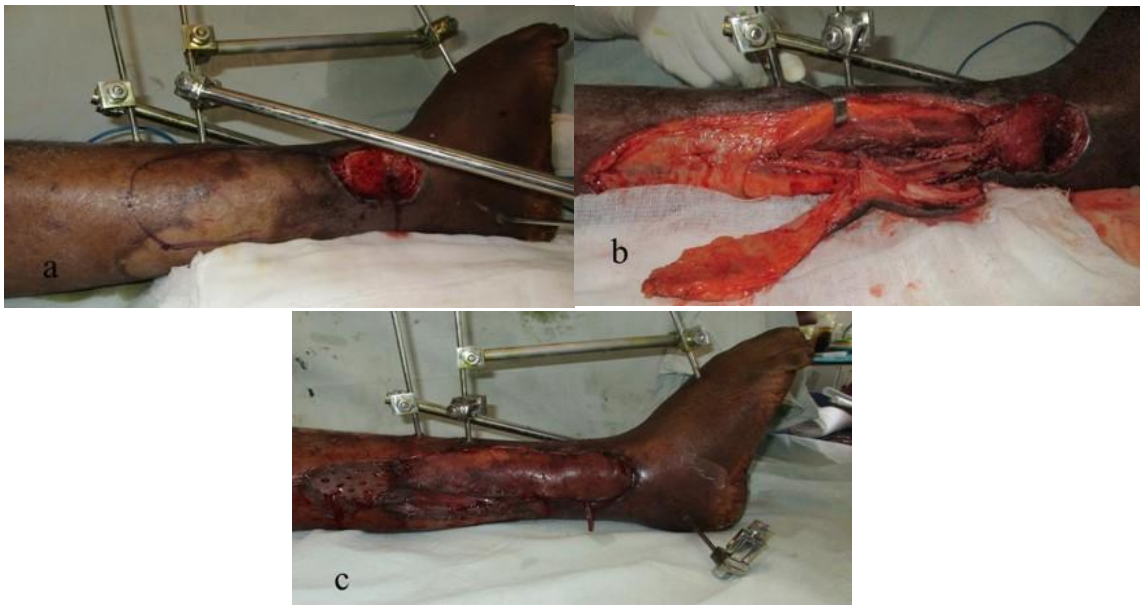

Figure 3- Right leg lateral malleolar defect- PA based perforator propeller flap. a- Right lateral malleolar defect with Preoperative marking, b- Flap raised on perforator from peroneal artery, c-Final inset given with SSG for donor area coverage.

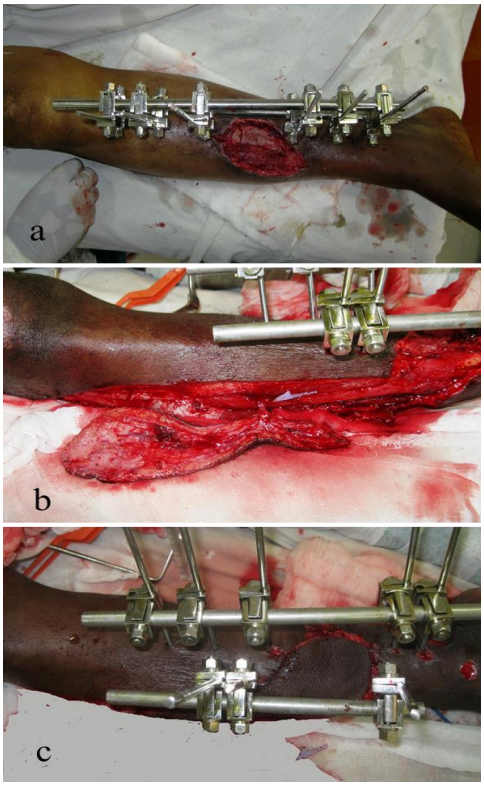

Figure 4- Right middle 1/3rd leg defect covered with ATA based perforator propeller flap. a-pre-op defect over anterior aspect of right leg middle 1/3rd, b- flap raised over perforator from ATA, c- final inset given with SSG for donor area coverage.

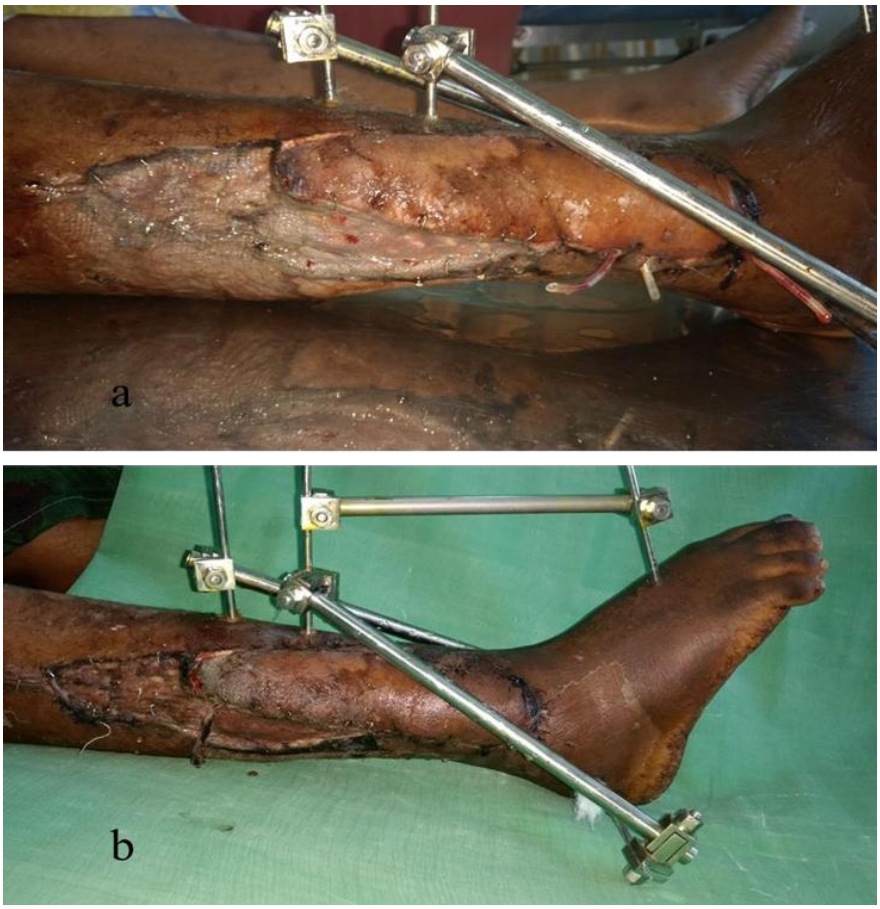

Figure 5- Picture showing mild venous congestion of flap (a), which settled subsequently (b).

Figure 6- picture showing distal necrosis of flap.

RESULTS

In present study, a total of 30 patients were studied. The mean age was 44.6 yrs.

Among the study population maximum patients 11 (36.6%) were from age group 41-50 years (Table 1). Out of 30 patients 22

(73.33%) patients were males and remaining 8 (26.66%) patients were females (Table 2). In present study, maximum patients 26 (86.66%) were of RTA (Road Traffic Accidents); 3(10%) patients had history of fall & only 1(3.33%) patient had A/H/O assault. There were more number of patients with lower 1/3rd leg defects than middle or upper 1/3rd leg defects (table3). Also PTA based propeller flaps were done more than ATA or PA based perforator flaps.

Age group in years	No. of patients	Percentage (%)
20-30	06	20
31-40	04	13.3
41-50	11	36.6
51-60	07	23.33
>61	02	6.66

Table 1- Age wise distribution of patients

Gender of patient	No. of patients	Percentage (%)
Male	22	73.33
Female	08	26.66

Table 2- Distribution of patients according to gender

Leg defect	Total	ATA	PA	PTA
Upper 1/3	02	01	00	01
Middle 1/3	10	03	00	07
Lower 1/3	18	06	04	08

Table 3- Distribution of leg defects

Source vessel of perforators	n =30	Percentage (%)
PTA	16	53.33
PA	04	13.33
ATA	10	33.33

Table 4- Source vessel of perforators

In present study, 16(53.33%) patients were done Posterior Tibial Artery (PTA) perforator flap; 4(13.33%) patients were done Peroneal Artery (PA) perforator flap and 10(33.33%) patients were done Anterior Tibial Artery (ATA) perforator flaps to cover the defects (Table 4).

Perforator	Average area of flap (in cm^2)	Standard Deviation	Standard Error
ATA	71	20.42	6.4
PA	75.2	55.2	27.6
PTA	60.1	17.8	4.4

Table 5- Average area of flap

Average area of flap raised from ATA based flaps was 71 cm^2, from PA based perforators was 75.2 cm^2 and fron PTA based perforators was 60.1cm^2. Average length of flap harvested - 13.2 cm and average length of leg was 37.7 cm (Table 5). There is no statistical difference between operative times of cases of ATA, PTA or PA based propeller flaps. Overall mean operative time - 140 min (Table 6).

In present study, 15 (50%) patients out of 30 had postoperative complications. 8 (26.7%) patients had Distal Necrosis (DN)/ Partial Necrosis (PN); out of these three patients had 2cm. distal necrosis, two had 1cm distal necrosis and three had 4cm distal necrosis. Nine (30%) patients had postoperative flap congestion (C). Four (13.33%) patients had Complete Necrosis (CN) of flap(Table 7).

In long term follow-up of these patients there were no further complications related to flap and all patients had a stable wound cover.

Type of Perforator flap used	n =30	Mean operative time (min)	Standard deviation	Standard Error
PTA	16	136	14.36	3.6
PA	04	148	18.48	9.2
ATA	10	144	23.2	7.3

Table 6- Mean operative time

Type of complications	n=30	Percentage (%)
Distal Necrosis/ Partial necrosis	08	26.7
Congestion	09	30
Complete Necrosis	04	13.33

Table 7- Types of complications in post-operative period

Flap length/limb length in %	No. of flaps	Necrosis	%	No Necrosis seen	%
<33%	17	04	23.5	13	77.5
>33%	13	08	61.5	05	38.5
Total	30	12	40	18	60

Table 8- Postoperative flap Necrosis

Relative risk is 2.6154 Odds ratio-5.2 P value

In present series it was found that in patients in whom the flap length divided by leg length was less than 33%, the chances of flap survival were more as compared to those in whom this percentage was above 33%. Also the relative risk was 2.6154 and odds ratio was 5.2. In other words there are 5.2 times more chances of flap failure if the flap length is more than 1/3rd of leg length. In such cases an alternative plan is suggested to avoid complications.

Source of perforator	ATA		PTA		PA	
Size of perforator	0.8 mm	1 mm	0.8 mm	1 mm	0.8 mm	1 mm
No. of flaps	04	06	01	15	01	03
Average length of flap (cm)	14.75	13.6	12	12	9	16.7
Average length of flap which survived (cm)	10.5	10	12	9.2	9	14.6
Percentage of flap length which survived	71.1%	73.5%	100%	76.7%	100%	87%
Average length of flap which survived (cm)	10.25		10.6		11.8	
Average total area of flap (cm^2)	74.7	68.5	48	60.9	36	88.3
Average total area of flap which survived (cm^2)	54.5	51.5	48	48	36	77.6
Average area of flap which survived (cm^2)	53		48		56.8	

Table 9- Comparison of different source vessel perforator of different diameters with flap survival

In ATA propeller flaps the average length of flap which survived on 0.8 mm perforator was 10.5 cm with average area of flap survival 54.5 cm^2.

In ATA propeller flaps the average length of flap which survived on 1 mm perforator was 10 cm with average area of flap survival 51.5 cm^2

In PTA propeller flaps the average length of flap which survived on 0.8 mm perforator was 12 cm with average area of flap survival 48 cm^2.

In PTA propeller flaps the average length of flap which survived on 1 mm perforator was 9.2 cm with average area of

flap survival 48 cm^2

In PA propeller flaps the average length of flap which survived on 0.8 mm perforator was 9 cm with average area of flap survival 36 cm^2.

In PA propeller flaps the average length of flap which survived on 0.8 mm perforator was 14.6 cm with average area of flap survival 77.6 cm^2

According to above table, the average length of flap which can safely be harvested on ATA based perforator was 10.25cm, on PTA based perforator was 10.6 cm and PA based perforator was 11.8 cm.

DISCUSSION

In Panse et al [4] the average age of patients was 32 yrs, in Burhan O Zalp et al [8] which included only paediatric patients, the average age of patients was 6.7 yrs. In Jason K. F. et al [9] the mean age was 48 yrs (4-88 yrs.). In Lifeng Shen et al [10] the mean age of patients was 39.7 years. In this study, mean age was 47.93 yrs. In present series there were more number of male patients as compared to female patients. According to Peddi Manjunath et al [11] all their defects were in lower $1/3^{rd}$ of leg. According to Panse et al [4], out of 30 patients 2 had upper $1/3^{rd}$ defect, 10 had middle and 23 had lower 1/3 defects.likewise, in this series there were more patients with lower $1/3^{rd}$ defects, a total of 18 patients, while 10 patients had middle $1/3^{rd}$ defect and 2 patients had upper $1/3^{rd}$ defect.

According to M A Mateev [12] et al the average area of flap was 52 cm^2. According to Burhan O Zalp et al [8] the average area of flap was 34.5cm^2.According to Lifeng Shen et al [10] the average area of defect was 43.8 cm^2 and average area of flap was 152.2 cm^2. According to present study the average area of defect was 23.4 cm^2 and average area of flap was 65.7 cm^2. The average flap length was 13.2 cm and average leg length was 37.7 cm. In Panse et al [4], Peddi Manjunath et al [11] and Yasir M et al [13] there were higher number of cases based on PTA perforator. In Yasir M [13] one case each of superior gluteal artery perforator and superior genicular artery perforator were also done.

According to Panse et al [4] there was complete flap loss in 3 patients and partial flap loss in 7 patients. One patient each with osteomyelitic sinus and graft loss. All the flaps were lost due to congestion. Leech application was given to one flap with congestion but it failed. Cross leg flap was done in one patient of complete flap loss. Inferolaterally based fasciocutaneous flaps were done for two patients with marginal flap necrosis. STSG was done for another patient with marginal flap loss. The remaining four patients with marginal flap necrosis healed secondarily with any further intervention. According to Marco Pignatti et al [14] there was no complete flap loss, tip loss was seen in 1 patient and congestion of flap was seen in 2 patients.In present study, 15 (50%) patients had some form of postoperative complications. Nine (30%) patients had postoperative flap congestion (C) which was managed conservatively by rest, limb elevation and anti-inflammatory agents. Eight (26.7%) patients had Distal Necrosis (DN)/ Partial Necrosis (PN); out of these three patients had 2cm. distal necrosis, two had 1cm distal necrosis and three had 4cm distal necrosis. Four (13.33%) patients had Complete Necrosis (CN) of flap. All patients of partial necrosis were managed by wound debridement, NPWT and STSG. Two patients of complete flap loss were lost to In PTA propeller flaps the average length of flap which survived on 0.8 mm perforator was 12 cm with average area of flap survival 48 cm^2.In PTA propeller flaps the average length of flap which survived on 1 mm perforator was 9.2 cm with average area of flap survival 48 cm^2

In PA propeller flaps the average length of flap which survived on 0.8 mm perforator was 9 cm with average area of flap survival 36 cm^2. In PA propeller flaps the average length of flap which survived on 0.8 mm perforator was 14.6 cm with average area of flap survival 77.6 cm^2

So according to above findings, the average length of flap which can safely be harvested on ATA based perforator is 10.25cm, on PTA based perforator is 10.6 cm and PA based perforator is 11.8 cm. but since the sample size is small, the results need to be verified by a study with larger sample size.

According to Davide Lazzeri et al [15], it is still unknown whether size of perforator affects size of flap. There are no precise guidelines on flap size, so the questions regarding the correlation between the sizes of a perforator and the largest volume of tissue that it can be safely harvested still remain unanswered. According to this study, some authors have suggested that the real limitation of the flap size nourished by a single perforator is most likely, its design to allow donor site closure, rather than

concerns about vascularity.

Phanette Gir et all is a systematic review of the PubMed database using search terms to include perforator, pedicled, and propeller flaps in the lower extremity. 15 case series provided 186 cases of pedicled-perforator (propeller) flaps for analysis using Chi-square tests. Most frequently used flaps were based on Peroneal Artery Perforator (PAP) and Posterior Tibial Artery Perforator (PTAP). The overall complication rate was 25.8% , overall failure rate was 1.1%. The most common complications were distal flap loss and venous congestion (11.3 and 8.1%). Accordind to them, Pedicled-perforator flaps are reliable and safe for the coverage soft tissue defects of the lower extremity.[16].

According to Saint-Cyr M et al [17], which studied 40 cadavers and dissected 217 flaps, concluded that each perforator has a unique vascular territory (perforasome). Perforator vascular supply is highly complex. Every clinically significant perforator has the potential to become either a pedicle or free perforator flap.

1) Advantages and disadvantages of perforator propeller flaps

Advantages:

1. It is a relatively easy procedure and less time consuming procedure. Does not require any special setup or training.
2. Provide stable and pliable soft tissue cover.
3. External fixator does not preclude their use. Future surgery can be performed through them.
4. Decreased donor-site morbidity and improved aesthetic outcome as opposed to other flaps like cross-leg flaps or free flaps. Replaces like-with-like by using tissues of similar texture and thickness. This avoids multiple surgical sites.
5. Possibility of complete or partial primary closure of donor area.
6. Shorter operative time as compared to microsurgery.
7. This technique reduces the extra costs associated with micro-vascular free flaps.

Moreover, in case of failure of a local perforator flap, alternative methods can be used, including free flaps.

Disadvantages:

1. In some cases the perforator can be within the zone of injury, which can prejudice the viability of the flap.
2. A significant drawback can be the cosmetic deficit related to the donor site, which formally contraindicates this procedure in women.
3. Variable location of the perforators.

Carol E Soteropulos et al studied thirty-six articles for quantitative analysis. Out of 586 flaps, skeletenization was done in 365 (60.1%) with 58 major complications (9.9%) and 19 minor complications (3.2%).Length to width ratios over 1.75 (OR: 7.52, $p = 0.03$) was increased with skeletonization. Skeletonization caused increased complications in traumatic defects and reduced complications in malignant defects. Thus, this study suggested that skeletonization should be considered when large rotational movements are anticipated and that this can reduce pedicle compression and venous congestion.[18]

CONCLUSIONS

Perforator-based propeller flap adds viable options to the armamentarium of reconstructive surgeons. It is a simple, versatile technique which consumes less time and has less donor site morbidity. Perforator propeller flaps are best suited for small and medium size leg defects in trauma patients. peripheral vascular disease is an obvious contraindication. Venous congestion of the tip or of the entire flap is the most common complication and is due to the insufficient flow in the perforator pedicle, because of an insufficient dissection and clearing of the vascular pedicle, especially around the vein.

In this study, the average length of flap which we could safely harvest on ATA based perforator was 10.25cm, on PTA based perforator was 10.6 cm and on PA based perforator was 11.8 cm. This is a rough guideline, which needs to be considered along with patient and defect characteristics. But since there are not many similar studies done previously and also our sample size being small, the results need to be substantiated by a study with larger sample size. There are 5.2 times more

chances of flap necrosis if the length of flap is more than one-third of length of the leg and it also depends on perforator characteristics. So in cases where the flap length is more than 1/3rd of leg length, an alternative plan for wound coverage should be sought. Because of a specific like to like soft tissue replacement there is better cosmetic and reconstructive outcome. The operative time taken for perforator flaps is not significantly higher than that for other fasciocutaneous flaps.

These flaps have a limited role in larger defects, degloving injuries especially where the prominent and most near perforator may be within the trauma zone and sometimes variable location of the perforators away from the soft tissue defect. Based on above results, we can say that this study is an attempt to define the safe extent of local perforator propeller fascio-cutaneous flap for lower limb reconstruction based mainly on the size and site of perforators in leg which needs to be substantiated with larger studies. Overall, perforator based propeller flap is a safe, simple and versatile procedure to cover small to moderate sized leg defects with decreased donor site morbidity limited to a single body area.

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