

# Distally Pedicled Posterior Interosseous Artery Flap for the Coverage of Defects on the Wrist and Hand

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## ABSTRACT

**Introduction:** Defect in soft tissue of hand requires early coverage. The present study was done to see the role of Posterior Interosseous Artery flap in reconstruction of various defects of the hand i.e. dorsum of hand, wrist, proximal part of digits, and 1<sup>st</sup> web space and to allow early mobilization and to reduce hospital stay.

**Material and Methods:** This is a prospective study which was conducted in 2 years consisted of 20 patients with early presentation, who had small sized defects in wrist, dorsum of hand and 1<sup>st</sup>web space. Both sexes were selected. Age group of 10 to 50 years were included.

**Results:** Patients age in our study ranged from 12 years to 45 years with a mean age of 28. All patients were Male except 3 Female patients. Volar aspect of wrist is the most common region involving, 2<sup>nd</sup> most common is the dorsum of hand followed by others. Size of defect varied from 3 × 3 cm to the biggest size of flap is 8 × 5 cm. The dominant hand involved in our series is right hand who are manual labourers. Earliest flap cover we could give immediately was on 1<sup>st</sup> and longest was on 10<sup>th</sup> day. The shortest hospital stay was 5 days and longest stay was 35 days. One island flap with complete loss, one case had marginal necrosis which healed with secondary intention, and in one case there was partial graft loss in the flap donor area.

**Conclusion:** It can be concluded that the commonest site for which flap cover was used was volar aspect of wrist. In 90 % of cases the biggest perforator was located just distal to the junction of proximal and middle 3<sup>rd</sup> forearm. Hand held Doppler was used in all cases to identify perforators with exact accuracy.

**Keywords:** Interosseous Artery flap, Electrical burn injuries, Island flap

## INTRODUCTION

Reconstruction of soft tissue defects of the hand requires early cover by a single stage procedure to allow early mobilization, reduce hospital stay, minimize infection, and thus achieve good functional result. If local flaps are insufficient to meet the requirement then regional flaps need to be used. A Septocutaneous island flap based on the Posterior Interosseous Artery raised from the extensor aspect of forearm originally described by Zancolli and Angrigiani in 1985 has wide application in reconstruction of soft tissue defects on the dorsum of hand, wrist and first web space.<sup>1-3</sup> This flap has the advantage over other available flaps in that it does not require sacrifice of any vessel essential for perfusion of hand. In present study role of Posterior Interosseous Artery flap in reconstruction of various defects of the hand i.e. dorsum of hand, wrist, proximal part of digits, and 1<sup>st</sup> web space and to allow early mobilization and to reduce hospital stay was studied.

## MATERIAL AND METHODS

This was a prospective study which was conducted in Osmania

General Hospital, Hyderabad from January 2012 to December 2013 and it consisted of 20 patients who had injury and small sized defects in wrist, dorsum of hand and 1<sup>st</sup> web space coming to department of plastic surgery for treatment. Sample was based on the inclusion and exclusion criteria.

**Inclusion Criteria:** Patients with early presentation, who had small sized defects in wrist, dorsum of hand and 1<sup>st</sup> web space. Both sexes were selected. Age group of 10 to 50 years were included.

**Exclusion Criteria:** Patients with mutilated hand injuries with vascular compromise, multiple injuries, associated fractures of forearms, extremes of age (<10 years and >50 years), comorbid conditions.

Informed consent was taken from the patient. Study was approved by ethical committee.

A thorough preanesthetic evaluation was carried out in all the patients. Haemoglobin estimation, Urine examination including albumin, sugar and microscopic examination, Random blood Sugar, ECG, Chest x-ray, Blood urea were done. All patients were premeditated 15 minutes prior to Posterior Interosseous Artery flap in reconstruction, after surgery complications were noted.

## Before Operation

Careful examination of the upper limb clinically and hearing of perforators by Doppler probe is an essential step in doing a surgical strategy for reconstruction of the upper limb. arrangements are made by orthopaedic surgeon if bone fixation is needed. Incision and dissection needed for fixation is thoroughly discussed in order not to interfere with the proposed flap territory.

## During Operation

If reasonable Doppler signals are identified on preoperative examination then the procedure is begun by inflating tourniquet without exsanguination. Inclusion of more than one perforator in the pedicle is better than one. Inclusion of as many as veins in the pedicle can minimise venous congestion. Depending on the trauma situation and flap inset without tension more than one perforator acts as a life boat for survival of the flap. Spasm of the perforator avoided by continuous irrigation of perforator

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with xylocain spray (10%).

**Postoperative**

Elevation of the hand and avoidance of pressure on the flap protects the flap from oedema and congestion and reduce hospital stay.

**STATISTICAL ANALYSIS**

Results of the study were based on descriptive statistics. All data is represented as percentages and also diagrammatic presentations is done where ever necessary.

**RESULTS**

Patient’s age in our study ranged from 12 years to 45 years with a mean age of 28 (table-1). All patients were male except 3 female patients (figure-1). Volar aspect of wrist is the most common region involving, 2<sup>nd</sup> most common is the dorsum of hand followed by others (table-2). Size of defect varied from 3 × 3 cm to the biggest size of flap is 8× 5 cm. The dominant hand involved in our series is right hand who are manual labourers (figure-2). Earliest flap cover we could give immediately was on 1<sup>st</sup> and longest was on 10<sup>th</sup> day. The shortest hospital stay was 5 days and longest stay was 35 days. One island flap with complete loss, one case had marginal necrosis which healed with secondary intention, and in one case there was partial graft loss in the flap donor area.

Follow up was not more than 5 months as many of the patients are poor and illiterates.

**DISCUSSION**

The advent of Radial and Ulnar Forearm Flap has described the safety with reliability of local flap but involving sacrificing a major artery of the hand. The Dorso-Ulnar flap has a short pedicle and limited rotation. The Anterior Interosseous Artery flap requires a tedious dissection. In electrical burns most of the times the anastomosis between Anterior Interosseous Artery and Posterior Interosseous Artery is not damaged making distally pedicled Posterior Interosseous Artery flap a suitable means for providing vascularised skin for covering the volar aspect of wrist, 1<sup>st</sup> web space, proximal phalanx of hand and palmar surface. The flap depends on fascial plexus supplying skin from Posterior Interosseous artery and its blood supply and can be used both as proximal or distally based. We have used retrograde Posterior Interosseous Artery flaps on 20 patients over a period of 2 years. The age of patients ranged from 12 to 45 years (Table-1). Males are predominant in present study. (Figure-1).The dominant hand involved in our series is right hand (Figure-2) who are manual labourers where as Dap et al reported use of flap more on left hand as compared to right and Landi et al also noticed mostly on left hand. In our study largest flap was 8×5 cm and smallest flap was 3 ×3 cm. Buchler and Frey<sup>1</sup> used flap sizes which varied from largest 9 × 11 cm and smallest flap was 3 ×3 cm. Dap et al used largest flap up to 15 × 9 cm. In Costa's series<sup>2-4</sup> the skin flap varied in sizes from 4 × 5 cm to 14 × 9 cm. Lt. Lu et al<sup>5</sup> (2004)reported the dimension up to 16×10 cm.

In Balakrishnan's series<sup>6</sup> the smallest flap measured 5×2.5 cm largest flap 21×10 cm. In our series Males are more commonly involved, Other series also showed similar Male dominance like Zancolli and Angrigiani<sup>2,5</sup>, Buchler and Frey<sup>1</sup> Costa et al<sup>2-4</sup> and

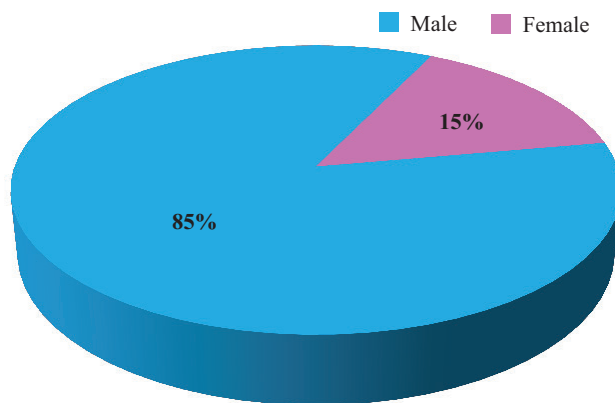


Figure-1: Shows sex distribution.

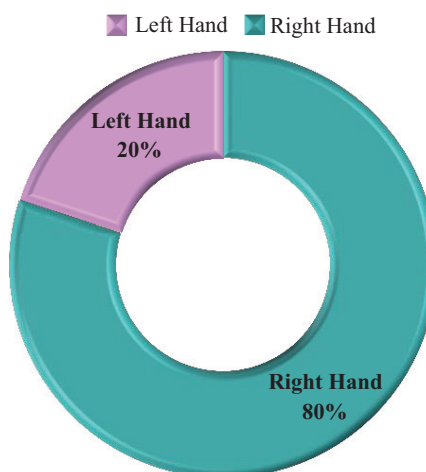


Figure-2: Shows hand predominance

Age (years)	No. of Patients	Percentage
10 to 19	4	20 %
20 to 29	6	30 %
30 to 39	7	35 %
40 to 49	3	15 %

Table-1: Shows age distribution.

Defect	Number of patients
Volar aspect of wrist	11
Dorsum of hand	4
1 <sup>st</sup> webspace	2
Others	3
Complications	
Total flap loss	1
Marginal necrosis	1
Partial graft loss	1

Table-2: Defects and complications in study

Dap et al. In our study one patient (5 %) had total loss. The flap was lost due to arterial insufficiency because there were no perforators. Landi et al<sup>3</sup> also not able to identify pedicle vessels in two patients. Buchler and Frey<sup>13</sup> found vessels missing in two cases. Angrigiani et al<sup>7,8</sup> noted absence of continuity of Posterior Interosseous Artery in two cases. Lt. Lu et al<sup>5</sup> reported loss of one flap out of 90 because of vascular deficiency. Chen H et al<sup>9</sup> (1998) reported failure rate of 21. % (3 out of 14 flaps). Jones reported acute ischemia of ipsilateral hand after harvest of free radial forearm flap. Whereas no vascular

ischemia was seen in our series. In our study three (3) donor defect was closed primarily and all were covered with split skin graft. The secondary defect was more acceptable than that of radial forearm flap skin graft takes well on exposed muscles, final appearance was satisfactory. Dap et al performed primary closure in four patients and in 19 cases split skin graft were placed. Costa, Gracia et al<sup>2</sup> reported direct closure of donor sites smaller than 7 × 6 cm where as larger defects were covered with split skin graft. At time of final evaluation all recipient flap sites has healed. The final appearance of hand defects covered with Posterior Interosseous Artery flap were found to be acceptable because of its thinness, reliability and versatility. Zancoli<sup>7,8</sup> also reported the same. Donor site morbidity was magnificent from cosmetic and functional point of view in smaller flaps. In larger flaps there was some cosmetic disfigurement but this improved with time and fore arm was quite acceptable. The flap is hairless and has an excellent texture for skin resurfacing. It offers the benefit of being single stage reliable with minimal donor site morbidity. This flap is composed of less fat as compared with lateral arm, radial artery forearm flap, so that debulking of the flap is not necessary. In conclusion we find distally based<sup>10</sup> Posterior Interosseous Artery flap has proven to be reliable and very useful for reconstruction of 1<sup>st</sup> web space, dorsal aspect of hand, palmar aspect, proximal aspect of phalanx and volar aspect of wrist.

## CONCLUSION

It can be concluded that the commonest site for which flap cover was used was volar aspect of wrist. In 90 % of cases the biggest perforator was located just distal to the junction of proximal and middle 3<sup>rd</sup> forearm. Hand held Doppler was used in all cases to identify perforators with exact accuracy. All the cases were done in Trauma defects of hand including electrical burn injuries.

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