

## Pedicled Extended Lateral Arm Fasciocutaneous Flap: Our Experience in BIRDEM

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### Abstract

The aim of this study is to assess the outcome of Pedicled extended Lateral arm flaps (PELAF) for coverage of defects of the hand and forearm. 09 patients were included in this study from January, 2005 to February 2009. Patients with hand defects with or without extension up to the forearm, resurfaced with this flap, were reviewed for this case series. Eight flaps were cross arm, i.e. for defects in the contra lateral hand and 01 was used to cover the cubital fossa of the same limb. Ages of the patients ranged from 23-46 years, 01 female and 08 male. 08 patients were diabetic while 01 was non diabetic. Nine cases were managed by extended lateral arm flap or a standard lateral forearm flap. Post-operative periods of all the patients were uneventful. Then pedicle was divided after 3 weeks for the cross arm flap group. For patients with wounds on the hand, wrist and forearm pedicled lateral and extended lateral arm flap provides an excellent thin, supple and reliable option for coverage. Cross Lateral arm flap is one of the few local options available with good colour and contour match and requires no sacrifice of major blood vessel.

Keywords: Pedicled extended Lateral arm flaps, hand defects, cross arm flap

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### Introduction

Complex injuries in the hand and forearm with exposed important structures such as bone, tendon, blood vessels, and nerves often require a thin pliable flap with good colour match and consistent blood supply<sup>1</sup>. Further aspects for an adequate indication are a relatively short operation time, a constant vessel anatomy and low donor site morbidity. The goal is an optimal reconstruction of form, function and aesthetics.

This case series describes usefulness of cross lateral arm flap for coverage of hand defects with or without extension into the forearm. Numerous variations of the flap were described, as a fascial flap<sup>2,3,4</sup> or partly using a combination of different tissue components as the osteofasciocutaneous flap (with distal humerus corticalis<sup>5,6,7</sup>), sensate flap (posterior brachial cutaneous nerve<sup>8,6,9</sup>), musculotendofasciocutaneous flap 5 using triceps muscle components<sup>10</sup> but we did not find any reference of a cross arm flap in our literature search. The lateral arm flap can also be extended distal to the lateral epicondyle of the elbow<sup>8</sup>. With its variability in applications, the lateral arm flap is an excellent option for defect coverage of small and medium sizes on the hand and forearm. The axis of the flap is marked from the deltoid insertion to the lateral epicondyle. Dimension - Standard flap 15 × 8 cm, extended flap can be quite long however 30X7 cm (6) (30 × 8cm in our series). We have extended into the forearm for about upto 10 cm at the direction of radial styloid. This flap based on profunda brachi (radial collateral) artery in the arm and its anterior branch in the forearm. The donor defect can be primarily closed.

### Materials and Methods

This was a retrospective study, carried out in BIRDEM General Hospital from January 2005 to February 2009, 9 patients, 1 female and 8 male, with hand wound with or

without extension into the forearm were included in the study. Patients with life threatening conditions and septicemia were excluded.

#### Neurovascular Anatomy of flap:

Posterior radial collateral artery, the artery of lateral arm flap, arises from radial collateral artery which in turn is branch of profunda brachii. It runs through the intermuscular septum between triceps posteriorly and brachialis and brachioradialis anteriorly supplying the overlying skin through numerous septocutaneous perforators. At the elbow, it takes a superficial course to join olecranon vascular network which is fed additionally by ulnar collateral arteries from proximally and the radial and ulnar recurrent arteries from distally. Lower lateral coetaneous nerve of arm and posterior coetaneous nerve of forearm lie along pedicle of the flap.

#### Surgical technique:

Flap was designed along an axis extending from the point of deltoid insertion in the arm to lateral epicondyle with the elbow flexed at 90 degrees and rested on the chest wall; the extended flap was designed by extending the axis further down the fore arm towards the radial styloid (figure-1) confirming course of vessel by hand held Doppler.



Figure-1: Flap image.

Anterior and posterior markings were made by pinch test so as to close donor site primarily, preferably. Dissection was performed in tourniquet control with patient supine and arm flexed on abdominal wall. Posterior incision was made first, flap elevated subfascially till inter-muscular septum reached, vessels identified and perforators found running in the septum. Then distal and anterior incisions were made and fascia separated from brachialis and brachioradialis up to inter-muscular septum.

Donor Site Defect, because the width of the lateral arm flap has a maximum of 8 cm, the donor site usually can be closed primarily. In our patients split skin grafting was necessary in those cases where a wide extended flap was used. No patient felt impaired by the donor site morbidity, this reflects the complexity of the surgical procedure in the patients mind and the primary closure of the donor site as well as the satisfaction with the overall result. Because of the donor site scar, Graham et al.<sup>11</sup> prefer the flap in male patients, but describe an excessive hair growth in the recipient site.

The posterior antebrachial cutaneous nerve often cannot be preserved during preparation of the lateral arm flap. Therefore, in more than 50% of the patients, a hypaesthesia on the forearm skin remains<sup>12</sup>. Only a few patients consider this as impairment<sup>7</sup>.

#### Results

All PELAF survived completely two cases had some epidermal loss which healed conservative management. The largest flap dimension was 30X10 cm and smallest was 10X3.5 cm. In four cases the donor site was closed primarily in other 5 cases it was a combination of closure and split thickness skin grafting (table II).

Table II: Cases.

Case	Age/sex	Injured site	Defect size in cm	Flap dimension in cm	Donor site	Complications
01	24/M	Dorsum and wrist	15x9	16x10	Closure & graft	None
02	35/M	Over wrist joint	13x9	14x9.5	Closure & graft	Superficial loss
03	38/M	Ulnar side of dorsum and palmar surface	9x5	10x6	Primary closure	None
04	23/M	Cubital fossa	20x9	22x10	Closure & graft	None
05	46/M	forearm	29x9	30x10	Closure & graft	Some graft loss
06	32/F	Middle finger	9x3	10x3.5	Primary closure	None
07	28/M	Dorsum wrist and forearm	22x5	23x6	Primary closure	None
08	27/M	Wrist and forearm	18x6	19x7	Closure & graft	None
09	33/M	Palmer surface	12x7	13x8	Primary closure	None

Ages of the patients ranged from 23-46 years, average 31.8 years, and (table-I) 01 female and 08 male patients were included in the study. 08 patients were diabetic while 01 was non diabetic.

Table I: Age distribution of Cases.

Age in years	21 - 30	31 - 40	41 - 50
Number of patients	03	05	01

The cases were managed by extended lateral arm flap. Eight flaps were used to resurface wounds in the opposite limb while one was used to cover the cubital fossa of the same limb. Figure 2a,b and c shows one such case managed by our unit.



Figure: 2 a

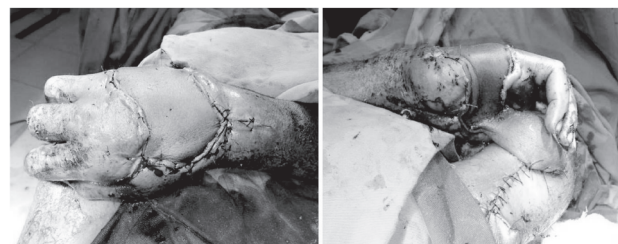


Figure: 2 b



Figure: 2 c

### Discussion

Various options are available for coverage of hand defects. Skin grafts can resurface superficial defects without exposure of vital structures. However, they are prone to further contracture and need prolonged immobilization<sup>11</sup>. Among local flaps, radial forearm flap can be rotated 90-180 degrees; however this procedure involves sacrificing a major artery that can lead to cold sensitivity of the hand<sup>13</sup>. Proximally based interosseous artery flap is suitable for smaller defects but involves tedious dissection of fragile and anatomically variable vessels<sup>14</sup>. Ulnar artery forearm flap involves sacrificing the ulnar artery which is a dominant vessel in 80% of cases<sup>15</sup>. Brachioradialis muscle flap is suited for small defects and should not be sacrificed in the absence of elbow flexors. Lateral arm flap was described by Song and colleagues in 1982<sup>13</sup>, however reverse flap based on radial recurrent was described in a case series of two patients by Maruyama and Takeuchi in 1986<sup>14</sup>. Culbertson et al. in 1987 described another lateral arm flap based on recurrent interosseous artery<sup>18</sup> there are several advantages to this flap. It has a consistent axial pedicle, with relatively easy dissection. There is no associated functional impairment and no major vessel is sacrificed. Flap is harvested in supine position and does not require intra-operative repositioning. Finally it has multiple design variations like V-Y advancement, rotation advancement and complete island flap. Though there are many reports of usefulness of reverse lateral arm flap for elbow coverage. Flap has been used to cover elbow defects due to high voltage electrical injury<sup>4</sup>, olecranon bursitis<sup>5</sup>, avulsion injury<sup>5</sup>, post burn antecubital contractures<sup>12</sup> and posterior elbow defects<sup>17</sup> we did not find any literature regarding its use as a cross-arm flap, while the groin flap and abdominal-chest flaps are a popular choice for hand defects, they require positioning of the hands in anatomically difficult positions and result in bulky flaps that require defatting.

### Conclusion

Standard Lateral arm flap and extended lateral arm flap has a reliable anatomy and should always be considered for defects of the hands and fingers as it provides a thin pliable flap with constant blood supply without sacrificing any

major arteries or leaving behind an unacceptable donor site defect. The only down side is the position of the hand in case of cross arm flap.

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