

An Evaluation Of First Dorsal Metacarpal Artery Flap Finished By Consultants And Residents And Guiding Principle For Improving Result For Beginners

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Abstract

Background: Thumb alone constitutes about 40% of hand function and trauma to distal part of thumb will thus affect the overall hand function. The goals of correction of traumatic deformities of distal thumb are to maintain adequate length and sensation along with giving a supple and stable soft tissue cover. Among other options, first dorsal metacarpal artery (FDMA) flap raised from the dorsum of the proximal part of index finger is a simple and widely used flap.

Methods: We compared the results of FDMA flap done by residents (M.Ch trainees) and consultants in our institute. Residents operated upon a total of 12 patients and consultants operated upon 16 patients.

Results: Among 12 patients operated by residents 3 flaps were lost and 2 flaps had marginal necrosis whereas among the patients operated by consultants 1 flap was lost and 1 had partial necrosis in distal part of the flap.

Conclusions: Although there was no statistical difference between the operating time taken by trainees and consultant specialists but the complication rate is higher among the residents. Sticking with the basics of plastic surgery, FDMA flap is an excellent technique for thumb reconstruction and results are excellent as and when more experience is gained.

1. Introduction

John Napier was right when he said that the hand without a thumb is at worst nothing but an animated fish-slice, and at best a pair of forceps whose points do not meet

properly.¹ This gives an idea of how important is thumb to one's hand and how necessary is to reconstruct and restore its length. Daily tasks involving pinch, grip, grasp and precision handling are more easily accomplished with an opposable thumb. [2] The most common cause of injury to distal part of thumb are blunt trauma, mostly machinery trauma and road side accidents. Treatment involves restoration of thumb length as much as possible and giving a soft and pliable cover to the exposed bone or tendon. The various options for these injuries are Palmar advancement flap (Moberg), cross finger flap, neurovascular island flap (Littler) and the 1st dorsal metacarpal artery flap. [3] Besides these microsurgical free tissue transfer from first or second toes are also described but it requires good technical expertise and sensory nerve coaptation with the recipient area. These factors do not always guarantee success in this kind of flaps. [4] The first dorsal metacarpal artery flap was first described by Hilgenfeldt refined by Hollevich and later modified as a pure island flap by Foucher and Braun.⁵⁻⁷ This is a simple regional flap from proximal part of index finger which has the advantage of being used as innervated flap with variable size and pliability with minimal donor site morbidity. [8] This study is about the comparison of results of FDMA flap done in a tertiary care center by the resident doctors and consultants. The basic purpose of this study was to compare the duration of surgery and post-operative results between resident

doctors and consultants and to suggest few guidelines for the beginners.

2. Methods

This was a retrospective study done in our institute from Jan 2014 to July 2016, in which FDMA flaps done for thumb amputations by resident doctors and consultants were compared. All patients presenting to accident and emergency department with trauma to distal part of thumb with either amputation (volar/dorsal oblique) of distal phalanx or loss of tissue with exposed bone or tendon were taken for debridement and flap cover. Patients in whom moberg flap was not a good option were treated by FDMA flap from dorsum of proximal phalanx of the index finger.



Figure 1: Preoperative image with soft tissue thumb defect.

A total of 30 patients were operated during this period in which two patients were lost to follow up. Among these 12 patients were operated by resident doctors under supervision of consultants and 16 patients primarily by consultants. After thorough debridement and preparation of recipient site over thumb, flap was marked on the dorsal surface of proximal phalanx of index finger. Flap was raised from distal to proximal and from ulnar to radial side till we reached MP joint. Care was taken not to injure paratenon of extensor tendon. Dorsal vein and radial sensory nerve along with FDMA were harvested along with the flap and to make sure not to injure the pedicle, the fascia of first dorsal interosseous was taken along

with. After raising the pedicle till the base of second metacarpal, dissection was stopped and tourniquet released to assess the flap vascularity. A subcutaneous tunnel was made to the defect and flap passed through it in 5 cases done by residents and 2 cases done by consultants, in rest of the cases tunnel was split and the pedicle carrying the flap was covered by STSG. Figures 1-5 demonstrate one full series of images in one of the patients.



Figure 2: FDMA flap dissection started after proper marking.



Figure 3: Flap has been dissected on the pedicle.



Figure 4: FDMA flap inset given on the defect, with STSG of pedicle and donor site.



Figure 5: Follow up picture of the patient with well settled flap.

Table 1: Table showing comparison of FDMA Flap reconstruction by consultants and residents.

	No. of cases	Duration (average)	Flaps lost	Marginal necrosis	Donor site morbidity
Resident	15	60 Mnts	2	1	1
Consultant	12	50Mnts	2	2	1
Total	27		4	3	2

3. Discussion

Thumb injury following trauma presents a much more significant influence on daily living than do injuries to the other digits.⁹ Management of thumb injuries ranges from grafting to flap cover, which may be local, regional, distant or free. To restore sensate non-tender thumb tip, stable thumb joints, adequate grip strength, correct posture and positioning of the thumb with a wide first web space and mobility of the carpometacarpal joint with the intrinsic muscles to aid prehension are the main goals of thumb reconstruction. [10]

The FDMA flap includes first dorsal metacarpal artery and its associated vein and a branch of superficial radial nerve. It is harvested from dorsal aspect of the proximal part of index finger with low donor site morbidity. It shows good functional and aesthetic results. Results of any surgical procedure will depend upon the surgical expertise of the operating surgeon and so is the case with this flap. These flaps are mostly done by residents of plastic surgery in emergency settings in most of the centers in India. We wanted to observe difference in the outcome if the patient is operated by the consultants and what are the keys to success, if any for After giving the inset of the flap to the defect, donor site was covered with the thick split thickness graft. Fluffy dressing was done and portion of flap was kept exposed for monitoring. Primary dressing was done on post-operative day five. Patients were followed up for a period of two months to assess the results.

4. Results

Results were notified in terms of duration of surgery and post-operative complications (Table 1). The mean duration of surgery by resident doctors was 60 min. while as it was 50 min. by consultants. Among 27 operated patients we lost four flaps and had marginal necrosis in 2 flaps. Three (20%) of the 12 patients operated by residents lost the flap while as one (6.20%) out of the 15 patients operated by consultants had flap necrosis. Donor site morbidity with total graft loss occurred in one patient operated by resident doctor. residents. We could not find a study in literature to compare the results of this flap done by consultants and resident doctors. We compared the results of this flap done by consultants and residents and found that complication rate was less in patients operated by consultants. Consultants operated upon 16 patients and lost one flap. This patient was a case of high tension electrical burn and possibly had micro vascular damage to

the first dorsal metacarpal artery. Marginal necrosis occurred in another patient done by consultants. Residents did 12 cases, lost 3 flaps and had marginal necrosis in two patients. Among the three flaps lost, subcutaneous tunnel was used in two patients who were probably too narrow and resulted in venous congestion of the flaps with subsequent loss. Another flap was lost due to infection. Donor site morbidity occurring in one patient operated by resident was probably because of usage of FTSG in that patient without taking adequate precautions. Better results in patients operated by consultants may be because of their experience, better working conditions and better assistance. Most of the cases done by residents were in emergency theaters and also number of cases previously done by resident doctors was less than consultants which may be one factor for their inferior results. Volume of cases is required for efficiency and this will be acquired with time.

The recommendations we make for beginners to achieve better results are as follows;

- Thorough debridement of wound and fully defining the defect is the first prerequisite.
- Marking the donor site with proper ink so that mistakes are not made while raising the flap.
- It is preferable to go 2 mm volar to the radial mid lateral line in order to be sure not to injure the nerve and the vessel.
- Paratenon is to be saved for graft take.
- Use of surgical loupe is recommended strongly for better results.
- Beginners are advised to avoid using subcutaneous tunnels.
- Inset should be tension free to avoid marginal necrosis.
- Beginners are advised to avoid using full thickness grafts.

- Proper immobilization in the post-operative period with limb elevation.

The caveat to success for the beginner is to avoid heroics and stick to the basics.

5. References

- [1]. Hands NJ. Princeton, NJ, Princeton University Press; 1993.
- [2]. Tränkle M, Sauerbier M, Heitmann C, Germann G. Restoration of thumb sensibility with the innervated first dorsal metacarpal artery island flap. *J Hand Surg.* 2003;28A:758-66.
- [3]. Lai CH, Lai CS, Huang SH, Lin SD, Chang KP. Free medial plantar artery perforator flaps for resurfacing of thumb defects. *Ann Plast Surg.* 2010;65(6):535-40.
- [4]. Hietmann C, Levin LS. Alternatives to thumb reimplantation. *Plast Reconstr Surg.* 2002;110(6):1492-503.
- [5]. Makkar RM, Naemm W, Naeem J, Nabil TM. The Innervated 1st dorsal metacarpal artery island flap for reconstruction of post-traumatic thumb defect. *Egypt. J Plast Reconstr Surg.* 2012;36(2):147-52.
- [6]. Ray E, Sherman R, Stevanovic M. Immediate reconstruction of a nonreplantable thumb amputation by great toe transfer: *Plast Reconstr Surg.* 2009;123(1):259-67.
- [7]. Karaca K, Etöz A, Akın S. Racked-shaped kite flap. *Eur J Gen Med.* 2005;2(2):138-9.
- [8]. Arakaki A, Tsai TM. Thumb replantation: Survival factors and re-exploration in 122 cases. *J Hand Surg.* 1993;18B:152
- [9]. Hilgenfeldt O. *Operativer daumenersatz.* Stuttgart: Enke-Verlag; 1950.
- [10]. Holevich J. A new method of restoring sensibility to the thumb. *J Bone Joint Surg.* 1963;45B:496-502.

[11]. Foucher G, Braun J-B. A new island flap transfer from the dorsum of the index to the thumb. *Plast Reconstr Surg.* 1979;63:344-9.