

# Synostosis of proximal phalangeal bases for loss of distal metacarpal

Pankaj Jindal

## ABSTRACT

A finger rendered unstable due to loss of metacarpal head can be stabilized by creating a synostosis at the base of the proximal phalanx of the affected finger with the adjacent normal finger. A cortico cancellous graft bridges the two adjacent proximal phalanges at their bases which are temporarily stabilized with an external fixator. The procedure can be done for, recurrence of giant cell tumor of metacarpal and for traumatic metacarpal loss. The procedure and long term follow up of one patient is presented who had giant cell tumor. This option should be considered before offering ray amputation. There is no micro vascular surgery involved, nor is there any donor site morbidity. The graft heals well without any absorption. The affected finger shows excellent function in the long term followup.

**Key words:** External fixator, giant cell tumor, metacarpal loss, synostosis, proximal phalanx

**MeSH terms:** Phalanges of finger, synostosis, hand, metacarpal bones, giant cell tumors

## INTRODUCTION

Metacarpal loss renders a finger flail. The phalanx of the affected unstable finger is fused with the adjacent normal phalanx using a bone graft. An imminent amputation is avoided.

## CASE REPORT

A 35 years old male patient presented with a lump on the dorsum of the right hand of 8 months duration. The swelling recurred twice after the previous excision. The histopathological diagnosis was a giant cell tumor. After the second recurrence, he was offered amputation, through the wrist by the first surgeon and an onco surgeon as well. Patient sought online consultation in the USA and the UK. The suggestion was for ray amputation. On presentation,

there was swelling on the dorsum of the hand [Figure 1]. X-ray showed a thin shadow of subchondral bony rim of the third metacarpal head [Figure 2].

The tumor consisting of soft tissue between the adjacent second and fourth metacarpal was excised. The cartilaginous shell of the head of the third metacarpal was excised as well. This exposed the base of the proximal phalanx of the affected middle finger [Figure 3]. A corticocancellous bone graft was interposed between the remaining unstable proximal phalanx and the adjacent proximal phalanx of the ring finger [Figure 4]. Kirschner wires are passed through adjacent proximal phalanges [Figure 5]. The wires were clamped with an external fixator. The wires in the second metacarpal were for added stability only [Figures 5 and 6].

The proximal half of the proximal phalanges is normally within the skin of the web spaces [Figure 4]. The graft is placed within this skin pocket of the web. Flexion at the metacarpophalangeal joint of the connecting rod of the spanning fixator prevented stiffness at the joint [Figure 6].

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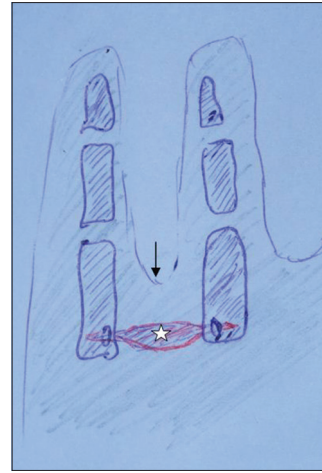
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**Figure 1:** Clinical photograph dorsal aspect of hand at presentation showing swelling, dilated veins along 3<sup>rd</sup> ray metacarpal



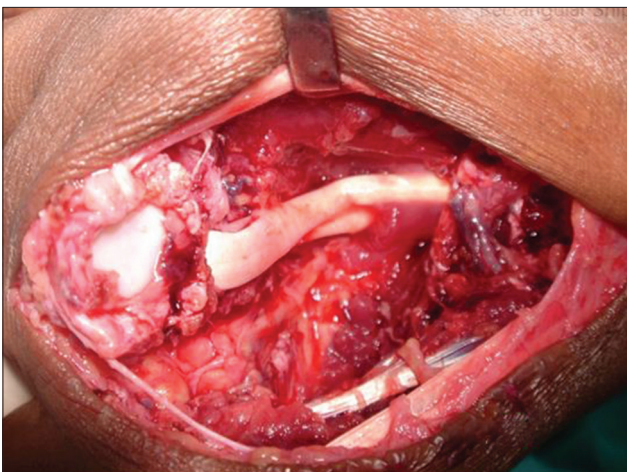
**Figure 4:** Diagrammatic representation of the procedure. Web margin shown by arrow. Graft placement shown by star



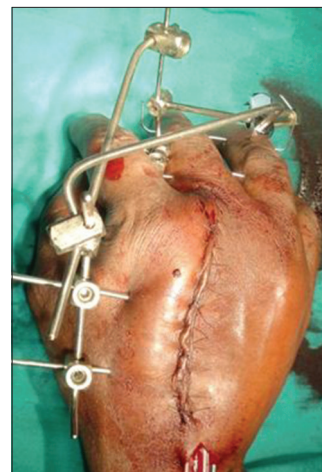
**Figure 2:** X-ray of hand anteroposterior and oblique views at presentation showing involvement of whole of 3<sup>rd</sup> metacarpal



**Figure 5:** Postoperative x-ray of same patient showing external fixator holding the affected digit in place together with the ring finger. Bone graft is marked with an arrow and seen across the base of the proximal phalanges of ring and long finger



**Figure 3:** Intraoperative photograph showing the base of the proximal phalanx is round and glistening white. The flexor tendon is seen in the depth



**Figure 6:** Postoperative photograph dorsum of hand showing three Kirschner wires across proximal and middle phalanx. External fixators spanning across to the second metacarpal to prevent loosening

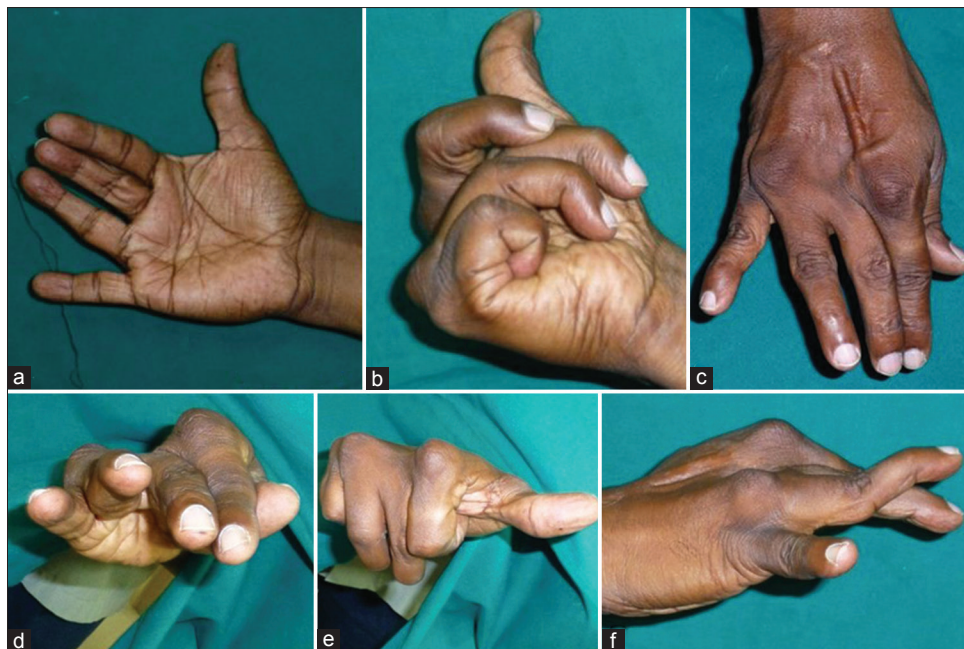
X-ray in the year 2012 [Figure 7a] and in October 2014 [Figure 7b-d], which was 7 years after surgery,

showed graft maturation, integration without absorption. The range of motion (ROM) is shown in Figures 8a-f. The accompanying Tables 1 and 2 show the ROM, grip strength, and pinch strength. He can play cricket, drive car, can do personal care and office work painlessly. Quick DASH score

is 0. Flexion and extension of the proximal phalanges of long and ring fingers at metacarpophalangeal (MP) joints occur together. Similarly, there is ROM of 30°–90° of the affected long finger at the MP joint. Full flexion at the MP joint is noteworthy! Abduction and adduction of the long and ring



**Figure 7:** X-ray anteroposterior and oblique views of hand showing (a) good graft consolidation (in 2012) (b) the absence of graft absorption (in October 2014) (c and d). Two views in an attempt to abduct and adduct the digits showing graft holding the two phalanges



**Figure 8:** Clinical photograph at 7 years followup showing (a) Patient performing active extension (b) Patient performing active flexion (c) At rest, the long and ring finger rest in slight radial deviation (d) End on view with active extension of digits (e) End on view with patient actively flexing the digits (f) Active extension of the digits

**Table 1: The range of motion is documented**

Finger	MCP extension/flexion (degree)			PIP extension/flexion (degree)			DIP extension/flexion (degree)			Tip to DPC (cm)
	Active	Passive	Normal	Active	Passive	Normal	Active	Passive	Normal	
Index	45/100	0/100	0/100	0/70	-/-	0/100	0/35	0/65	0/65	0
Middle	30/90	0/95	0/95	0/60	-/-	0/100	0/45	0/65	0/65	1
Ring	35/100	0/95	0/95	-30/60	-/-	0/100	0/45	0/75	0/75	0
Small	0/85	0/95	0/95	0/90	-/-	0/100	0/75	0/75	0/75	0

PIP=Proximal interphalangeal, MCP=Metacarpophalangeal, DIP=Distal interphalangeal, DPC=Distal palmar crease



**Table 2: The grip strength and pinch strength**

Strength parameter	Affected side (lbs)	Normal side (lbs)
Grip strength	50	80
Pinchometer	14	18

fingers occur together but do not affect his activities. There is radial deviation of the ring finger at the MP joint level. Wider graft would have kept the digits wider apart and may have been more beneficial. There was also inability of the index to actively extend fully, though fully correctable passively.

## DISCUSSION

Several methods of reconstruction of the loss of metacarpal head have been described<sup>1-7</sup> including ray amputation.<sup>8,9</sup> The patient may accept amputation, only if informed about significant morbidity. This, however, may not be accepted very easily. In the current case, the patient continued seeking opinions, even outside the country in spite of being offered ray amputation. This is a situation which exemplifies that no patient would agree for an amputation if salvage is available. A unique method is described, where the metacarpal loss is not replaced. Instead, the adjacent normal finger is used to piggyback the affected finger. The adduction and abduction of the two digits occur together. This is the sole and only apparent limitation. There may be donor site morbidity when metatarsal from the foot is used for reconstruction of the head of the metacarpal. There is no implant used which may have a long term fallout like a foreign body reaction or rejection.

Being in a healthy milieu of well-vascularized tissue, the graft gets well integrated.

The technique has the potential for use in traumatic loss of metacarpal head as well. Further, it is possible to alter

the fixation methods too. Fixator can be replaced with a small low profile plate as long as length and rotation is kept corrected. Adequate stability at the graft site is crucial for graft integration.

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## Conflicts of interest

There are no conflicts of interest.

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