

Antegrade Intramedullary Nailing for Fifth Metacarpal Fracture- Surgical Techniques and Outcomes in 25 Cases

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ABSTRACT

BACKGROUND

Fifth metacarpal neck fractures, also known as Boxer's fractures, commonly occur as a result of axial impact on a clenched fist. It can be managed both operatively and conservatively. We present the results of treatment by antegrade nailing, in 25 consecutive cases of fifth metacarpal neck fractures.

METHODS

We did a follow-up of 25 consecutive cases of fifth metacarpal neck fractures treated with antegrade nailing. Clinical and radiological evaluation was done at 2 weeks, 4 weeks, 6 weeks and 6 months. Total active motion (TAM) of the fifth digit at 6 weeks, radiography and complications if any were noted. Pain score by VAS was done for 5th digit at the end of 6 weeks.

RESULTS

Of 25 cases, there were 23 cases with closed reduction and 2 with open reduction. Radiological union was achieved in 24 cases and remaining 1 was lost to follow up. Good to excellent result was achieved in 100% cases. 3 cases developed bursitis at the K-wire entry site which required K-wire removal. 1 case had K wire migration making TAM less at 6 weeks follow up.

CONCLUSIONS

The technique of flexible antegrade intramedullary nailing of fifth metacarpal neck fractures is simple, safe, soft tissue sparing, minimally invasive technique giving excellent functional and cosmetic results with minimal complications.

KEYWORDS

Boxer's Fracture, Antegrade Nailing, Total Active Motion (TAM), K-Wire

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BACKGROUND

Fractures of the metacarpals are common upper extremity injuries and comprise of 18% of all fractures of the hand and forearm.¹ Fracture neck of 5th metacarpal also referred as 'Boxer's Fracture' commonly encountered in dominant hand and has a male preponderance. It occurs due to axial impact on clenched fist.²⁻⁵ Different modalities of treatment exist for Boxer's fracture ranging from compression bandage, functional splinting to intramedullary wire fixation and open reduction. Universal agreement exists for undisplaced Boxer's fracture that is conservative but varied opinion exist regarding conservative management of displaced Boxer's fracture. Consensus exist over the acceptable volar angulation of less than 30-40° for 4th and 5th metacarpal. Various reports exist that it is almost impossible to hold acceptable reduction by conservative means.⁶⁻⁷

We have conducted a prospective study on 25 cases of Boxer's fracture treated with flexible antegrade intramedullary nailing as described by Foucher. Foucher⁸ described in the French literature a technique of using multiple (three, occasionally two) fine (0.8 mm) blunt-ended Kirchner wires (K-wires) to stabilize fractures of the metacarpal neck. He subsequently reported the results of a series of 68 fractures with good results. Fracture reduction was achieved using the Jahss technique of applying a dorsal force to the distal fragment, with the metacarpophalangeal (MCP) and proximal interphalangeal (IP) joints flexed,⁹ and he then inserted the wires through a small incision at the base of the metacarpal, leaving the fracture hematoma undisturbed. The divergent tips of the wires in the metacarpal head resemble the stems of flowers and thus the term 'bouquet' osteosynthesis was coined for this technique. We have used single to multiple K wires for treatment of Boxer's fracture.

METHODS

25 cases of Boxer's fracture, after proper consent were treated with antegrade intramedullary K wire fixation using single to multiple (3 max) K wires at Burdwan Medical college from 2018-2019. Maximum fractures were due to axial load on clenched fist, Patients were followed up at 2 weeks, 4 weeks, 6 weeks, 8 weeks and 6 months. Immediate range of motion was given for fifth digit after OT. Patients were asked to perform light activities with involved hand. Clinical assessment was done with TAM (total active motion) of 5th digit at 6 weeks. TAM is defined as sum of degree of active movement at MCP, PIPJ and DIP joint.

Surgical Techniques

Pt was positioned supine with arm abducted 90° and hand placed on a radiolucent table. C-Arm machine was positioned. Wrist block was given to all 25 patients. Scrubbing, painting and draping was done up to mid

forearm. Hand was placed on table with dorsum facing up. 1 mm K-wire was used. In few cases 1.5 mm and 2 mm K-wire were used too. Tip was cut bluntly by tip cutter. 2 bends one of 10° at 2 mm and second a gentle bend of 200 at 1 cm. At 5 cm from end K wire was bent 90° for grip.

Entry Point

Postero-lateral aspect of 5th metacarpal near its base a stab incision is made.

Entry

2.7 drill bit is mounted on T-handle and entry into medullary canal is made under C-Arm. K-wire is then pushed into the canal and progressed towards the distal end under C-Arm. Reduction of fracture is done by Jahss manoeuvre. Then K wire is progressed further into distal fragment under C-Arm till the tip rest on subchondral bone plate. Like this further K wires are entered. Antiseptic dressing is done and pt. is shown full movement of 5th digit.

Post-Op Protocol

Pt. is discharged the same day with T. Amoxiclav and painkiller (aceclofenac-paracetamol). Pt are asked to follow-up at 2 weeks (for wound inspection). 4 weeks (check for union and migration) and 6 weeks (removal). TAM scoring is done at 6 weeks and VAS scoring is done at 8 weeks.

RESULTS

Demography	Results
Total cases (n)	25 (n=25)
Gender	Male =23, female=2
Aetiology	Axial force injury to clenched fist=24 Defence against assault=1 (direct trauma)
Side	Right=21, left=4
Complication	1 (K-wire migration)

Table 1. Patient Demographics

TAM at the End of 6 Weeks	No. of Cases (n=24)
200-250 degrees(excellent)	21
180-200 degrees(good)	2
Less than 180 degrees	1

Table 2. Functional Outcome Data

VAS Score	Total Cases (n=24)
0	21
0-2	3

Table 3. Pain Scoring on VAS at 8 Weeks

DISCUSSION

Displaced metacarpal fractures in general can be treated with K-wire, screws, or intra-osseous wiring as well as the use of hand plates.¹⁰ There have been many reports of problems with using plating for these fractures, mainly in relation to the soft tissue impingement.¹¹ In our study there were 23 male patients and 2 female patients. Most common mode of injury being axial force to clenched fist. Only one case developed complication of K wire migration.

	Figure 1. <i>Pre-Op X-Ray</i>
	Figure 2. <i>Post-Op X-Ray</i>
	Figure 3. <i>2 Weeks Follow-Up</i>
	Figure 4. <i>4 Weeks Follow-Up</i>
	Figure 5. <i>6 Weeks Follow-Up</i>
	Figure 6. <i>6 Months Follow-Up</i>
Case 1. 35 Yrs. Old Male Patient with Right Sided Boxer's Fracture	
	Figure 1. <i>Preop X-Ray</i>

	Figure 2. <i>Intra-Op (Clinical)</i>
	Figure 3. <i>Immediate Post Op</i>
	Figure 4. <i>Post-Op X-Ray</i>
Case 2. 32 Yrs. Old Male Patient with Right Sided Boxer's Fracture	
	Figure 1. <i>Pre-Op X-Ray</i>
	Figure 2. <i>Post-Op X-Ray</i>
	Figure 3. <i>4 Weeks Follow-Up Showing K-Wire Migration</i>
	Figure 4. <i>6 Months Follow-Up</i>
Case 3. 32-Year-Old Male Patient with Right Side Boxer, S Fracture Who Developed Complication	

He developed pain and swelling on post op day 26. K wire was removed at 4 weeks. At 6 months follow-up malunion was evident. 21 cases had excellent TAM at 6 weeks follow-up. VAS score of 21 patients at 8 weeks follow-up was 0. All cases showed union.

Foucher had reported excellent results with the use of 'bouquet' osteosynthesis in the management of displaced small finger metacarpal neck fractures.¹² Using a similar antegrade intramedullary K-wire fixation technique, Kelsch and Ulric reported satisfactory 1-year radiographic and functional results in 35 patients. The fractures were immobilized for 2–6 weeks, depending on patient compliance.¹³ Hopfner and colleagues found significantly decreased motion of the metatarsophalangeal joint in the retrograde cohort. There was decreased shortening of the metacarpal after antegrade fixation, suggesting that intramedullary fixation was preferable, when comparing antegrade intramedullary pinning with transverse K-wire fixation.¹⁴

Winter and associates studied two statistically comparable groups of patients with boxer's fracture treated by transverse K-wires or antegrade intramedullary K-wires and suggested that intramedullary pinning is a particularly efficient procedure for treatment of the Boxer's fracture. Although more demanding, it has shown better results than transverse pinning. The difference between the two techniques in terms of early motion is probably explained by the independent mobility of the two metacarpal bones. Two weeks after removal of the wires, they noted that the difference of total active ROM and total passive ROM between the two groups decreases. However, at 3 months, the functional results remained slightly better in the intramedullary pinning group.¹⁵

CONCLUSIONS

Antegrade intramedullary K-wire fixation in this study showed good functional and radiographic results with fewer complications. With elastic prebent wire acting as a three-point fixation, adequate stability is achieved to commence early mobilization. In addition, this procedure is relatively simple, with reduced operating times, minimal radiation exposure, minimal iatrogenic soft tissue trauma, and can be performed as a day-care procedure.

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