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Research Article

Boxer's fracture treated by boxer's cast vs. k-wire fixation

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Abstract

Introduction: Despite being one of the most common injuries in orthopaedics, accounting for about 1/10th of all fractures and up to 2/5th of all hand fractures, the treatment modalities of 5th metacarpal head fractures are controversial in the literature, ranging from conservative management in most cases to minimally invasive surgeries using k-wires and screws.

Material and Methods: This comparative study was carried out by assessing patients with fractures of the neck of the 5th metacarpal admitted to D Y Patil Medical College, Hospital and Research Centre from July 2020 to March 2021. 20 patients qualified for the inclusion criteria, 10 being in one group and 10 in the other. K-wire fixation was done for the management of the 5th metacarpal neck fracture in one group while the other group was managed conservatively (boxer's cast). The groups were classified according to age, sex, mechanism of injury etc. The mean time between getting hospitalized and commencement of surgery (in cases of k wire fixation) was 2 days.

Discussion: The most common age group was found to be 31-40 (80%), with a male predominance of 95%, right to left side ratio of 17:3. On tabulating the data, after three months of follow up, we discovered there was no significant difference in the TAM (total active movement) between the affected and unaffected hand when k-wire fixation was used. There was a certain degree of malrotation in patients treated by conservative management. Overall, cases with a neck-shaft angle of more than 40 degrees seemed to show better results when treated by k-wire fixation but when integrated with patient satisfaction, cases with a neck-shaft angle of fewer than 30 degrees yielded good results when treated by boxer's cast.

Conclusion: When the neck-shaft angle is greater than 40-45 degrees, k-wire fixation is a better alternative to a boxer's cast in the treatment of a boxer's fracture.

Keywords: boxer, fracture, 5th metacarpal, k wire, cast

INTRODUCTION

Despite being one of the most common injuries in orthopaedics [1-3], accounting for about 1/10th of all fractures and up to 2/5th of all hand fractures, the treatment modalities of 5th metacarpal head fractures are controversial in the literature, ranging from conservative management in most cases to minimally invasive surgeries using k-wires and screws. The 5th metacarpal neck fracture is the most common metacarpal fracture. It is also referred to as boxer's fracture, brawler's fracture or bar room fracture [4].

MECHANISM OF INJURY

Boxer's fractures are an impaction injury caused by axial loading of the 5th metacarpal caused by a direct punch with a clenched fist on a solid surface. Walls or human faces are frequent solid surfaces, with young adult men (95%) being the most typically afflicted demographic (Figures 1,2).

Fractures of the 4th and 5th metacarpals are more common than those of the 2nd and 3rd metacarpals because normally, boxers punch with proper form, and the knuckles of the 2nd and 3rd metacarpal align linearly with the articulating radius, followed by the humerus, allowing force to travel across joints without injury [5-7].

PATIENTS AND METHODS

PARTICIPANT DEMOGRAPHICS

This comparative study was carried out by assessing patients with fractures of the neck of the 5th metacarpal admitted to D Y Patil Medical College, Hospital and Research Centre from July 2020 to March 2021. A group of these patients were treated conservatively using a Boxer's Cast while the others were treated by k-wire fixation. The decision to use cast or k-wire fixation was random without any age/sex/fracture pattern bias and discussed with patients in detail after taking appropriate consent. Randomization was done with each patient picking a card blindly from a decreasing stack of 20 cards, initially consisting of 10 cards labelled 'K-wire' and 10 cards labelled 'Boxer's Cast'.

INCLUSION CRITERIA

- Age group between 18-50 years
- Unilateral fracture
- Closed fracture
- No history of diabetes, rheumatoid arthritis or gout
- Presenting within 1 week of the injury

EXCLUSION CRITERIA

- Patients with polytrauma, associated fractures of shoulder, elbow wrist
- Patients with severe cardiac and cerebrovascular diseases
- Intra-articular fractures

20 patients qualified for the inclusion criteria, 10 being in one group and 10 in the other. K-wire fixation was done for the management of the 5th metacarpal neck fracture in one group while the other group was managed conservatively (boxer's cast). The groups were classified according to age, sex, mechanism of injury etc. The mean time between getting hospitalized and commencement of surgery (in cases of k wire fixation) was 2 days.

SURGICAL METHOD/ K-WIRE FIXATION (ANTEGRADE)

- The entry point of the k wire, awl, or drill for the 5th metacarpal should be dorso-ulnar at the metacarpal base to avoid injury of the carpometacarpal joints, acknowledging the insertion of the extensor carpi ulnaris tendon [8,9]
- It is of utmost importance to make sure the protruding end of the K wire, bone awl, or drill does not get in the way of the gliding extensor tendon
- K-wire is pre-bent
- K wire's distal tip is bent to around 20 degrees
- The wire is then bent to approximately 10° after about 2 cm
- Fixation with two K wires provides two points of fixation, improving stability and preventing K wire back out from the proximal end (Figures 3,4)

CONSERVATIVE METHOD/ BOXER'S CAST

- Method of reduction: As collateral ligaments are the only remaining connection to the metacarpal head, they must be tightened

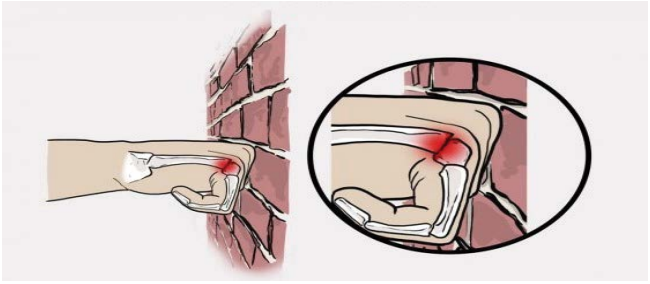

Fig. 1. Mechanism of Injury

Fig. 2. Clinical presentation

Fig.3. Entry point

to control the distal fragment and accomplish reduction. The Metacarpo Phalangeal (MP) joint is flexed to 90 degrees to cause the MP collateral ligaments to constrict. The flexed metacarpal is oriented dorsally, affecting the reduction of the metacarpal head due to volar angulation correction

- Regardless of the casting procedure chosen, the little and ring fingers must be "buddy taped" (with an intervening layer of cast padding) to prevent fracture malrotation [10] (Figure 5)

FOLLOW UP

The patients were followed up on postoperative weeks 3, 8 and 12

- TAM (Total Active Movement) was observed at the metacarpophalyngeal and interphalyngeal joints during each follow-up
- Total active movement=total active flexion-total extension deficit

Fig. 4. Two point fixation with 2 k wires

- Pre-op, rotation deformity was noted at the neck-shaft angle, and post-op, the percentage of angular rectification was evaluated and compared to conservative management (Figure 6)

RESULTS

Results are mentioned in Tables 1-5.

DISCUSSION

In our study, 20 patients with a fracture of the neck of the 5th Metacarpal were assessed at D Y Patil Medical College from July 2020 to March 2021. The most common age group was found to be 31-40 (80%), with a male predominance of 95%, right to left side ratio being 17:3. On tabulating the data, after three months of follow up:

Mean Total Active Movement (TAM) of the affected side was 280 and the mean Total Active Movement (TAM) of the unaffected side was 284 in the case of k-wire fixation.

Mean Total Active Movement (TAM) of the affected side was 263 and the mean Total Active Movement (TAM) of the unaffected side was 286 in the case of the boxer's cast.

Mean improvement of neck-shaft angle, calculated by the difference of mean pre-op neck-shaft angle (63 degrees) and mean post-op neck-shaft angle (20 degrees) was 37 degrees in the case of k-wire fixation.

Mean improvement of neck-shaft angle, calculated by the difference of mean pre-op neck-shaft angle (45 degrees) and mean post-op neck-shaft angle (32 degrees) was 13 degrees in the case of boxer's cast.

Hence, there was no significant difference in the TAM (Total Active Movement) between the affected and unaffected hand and a considerable improvement in neck-shaft angle when k-wire fixation was used.

Fig. 5. Boxer's Cast

Fig. 6. Post op oblique view of right hand on day 0 and day 21 respectively showing considerable neck shaft angle improvement after using boxer's cast

Table 1. Age Distribution

Age in years	Cases	Percentage
<20	1	5%
20-30	1	5%
31-40	16	80%
>40	2	10%

Table 2. Sex Distribution

Sex	Cases	Percentage
Male	19	95%
Female	1	5%

Table 3. Side

Side	Cases	Percentage
Right	17	85%
Left	3	15%

Table 4. Treatment using K-wire fixation

S.No	TAM of affected side on previous follow up	TAM of unaffected side on previous follow up	Neck shaft angle (pre-op)	Neck shaft angle (post-op)
1	275	280	60	25
2	260	265	66	18
3	300	300	62	16
4	285	290	68	20
5	275	280	70	22
6	290	295	54	18
7	270	275	58	22
8	280	285	65	24
9	300	305	61	15
10	265	265	68	18
MEAN	**280**	**284**	**63**	**20**

Table 5. Treatment using Boxer's Cast

S.No	TAM of affected side on previous follow up	TAM of unaffected side on previous follow up	Neck shaft angle (pre-op)	Neck shaft angle (post-op)
1	250	278	66	57
2	265	282	67	51
3	255	272	32	27
4	250	278	47	37
5	270	296	37	27
6	265	286	37	22
7	285	304	35	24
8	266	288	66	52
9	272	298	32	26
10	255	276	32	20
MEAN	**263**	**286**	**45**	**32**

There was a certain degree of malrotation in patients treated by conservative management. Overall, cases with a neck-shaft angle more than 40 degrees seemed to show better results when treated by k-wire fixation but when integrated with patient satisfaction, cases with a neck-shaft angle less than 30 degrees yielded good results when treated by boxer's cast.

LIMITATIONS

Limitations of this study include patient compliance as one of the patients managed by boxer's cast was unable to maintain appropriate immobilization by constantly trying to remove the cast every week leading to discrepancies in the ideal result and data for that patient.

CONCLUSION

Boxer's fracture or Neck of 5th Metacarpal fracture is more commonly seen in young male adults. Although most patients prefer the prospect of conservative management, it is associated with a certain degree of malrotation and shortening, especially when the neck-shaft angle is more than 40 degrees. 2-point fixation after using 2 Kirschner wires increases the stability when using a surgical approach. When the neck-shaft angle is greater than 40-45 degrees, k-wire fixation is a better alternative to boxer's cast in the treatment of boxer's fracture

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