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Comparative study to assess the effect of conservative versus operative management on functional outcome in patients with metacarpal fracture

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Abstract
Introduction: Metacarpal fractures typically occur secondary to a direct blow or fall directly onto the hand. Each choice is more dependent on surgeon preference and skill rather than any particular benefit with the varying approaches. Hence the present study was undertaken with the aim to evaluate and assess healing, functional outcomes and complications of conservatively versus operatively managed metacarpal fractures.
Materials & Methods: A total of 100 patients with the different kind of fractures of metacarpals were included in the study. All of the included patients were either treated conservatively or by surgical management in the department of orthopaedics. The questioner was designed for DASH score was done to assess the ability to perform certain activities. The least disability was scaled as 0 to the most disability was scaled as 100.
Results: The DASH questioner was used to calculate a scale score that ranges from 0 to 100. The more the score the more is the severity. Maximum number of patients had score between 21 to 25 that shows maximum number of patient's satisfaction with the treatment. The next questioner that was used to assess the satisfaction of patients was the Michigan questionnaire.
Discussion & Conclusion: Functional outcome is of paramount importance and restoration to maximum hand function is the primary expectation of patients. Physical therapy and mobilization are key in managing these fractures and form an integral path to recovery. Further studies are required to help establish a definitive treatment algorithm without losing sight of the quality of care provided to our patient and their long term, overall satisfaction.

Keywords: Conservative, fracture, metacarpal, operative, management

Introduction
Metacarpal fractures are among the most common upper extremity injuries in adults, representing 10% of all bony injuries. Metacarpal fractures comprise between 18–44 % of all hand fractures. Non-thumb metacarpals account for around 88 % of all metacarpal fractures, with the fifth finger most commonly involved [1]. The majority of metacarpal fractures are isolated injuries, simple, closed, and stable. The majority (70%) occur within the second and third decades of life. Most fractures are due to either accidental falls or direct blows to another object or individual, with small finger neck fractures and ring-finger shaft fractures among the most common metacarpal fractures [2, 3].
Metacarpal fractures typically occur secondary to a direct blow or fall directly onto the hand. These fractures commonly occur during athletic activities, particularly in contact sports. Almost one-fourth of cases occur during athletic events. Sporting injury is frequently the cause among younger patients, Work-related injuries are often the cause in middle-aged patients, Falls are typically the cause of the elderly, and Fifth metacarpal fractures often occur secondary to punching a wall or other solid object [4, 5].
The key part of the clinical examination is to assess the degree of rotational deformity, and whether there is any soft tissue compromise, including evidence of compound fractures with or without the involvement of a 'fight bite.' This term relates to the high incident of hand fractures secondary to punches and that a number of these involve a punch to an individual's mouth and thus an accidental 'bite' to the skin. Inability to extend at the metacarpophalangeal

joint also correlates to increased need of operative fixation [6]. Fractures of the metacarpal shaft are less forgiving and require surgical management or conservative management is based on the apex dorsal angulation. There is also an inverse variance noted in the same. Due to the mobility of the carpometacarpal (CMC) joints, ring and small fingers can tolerate much greater dorsal angulation than the index and middle finger. Although the MCP joint can hyperextend to accommodate flexion deformity in the metacarpal, this compensation can result in inadequate force at the proximal interphalangeal (PIP) joint, leading to extensor lag, a phenomenon known as pseudo clawing [7].

Indications for operative treatment include displaced intra-articular fractures, polytrauma, severe soft tissue injury, unstable open fractures, segmental bone loss, and multiple hand or wrist fractures [1, 8]. Metacarpal fractures in general can be treated with Kirschner wire (K wire), screws or intra-osseous wiring as well as the use of hand plates. Each choice is more dependent on surgeon preference and skill rather than any particular benefit with the varying approaches. Intra-operative radiography is generally required [6, 9]. Immobilisation for greater than two week is suggested with K wire fixation and this method of fixation is generally believed to be the least invasive technique with maximum long-term function. Hence the present study was undertaken with the aim to evaluate and assess healing, functional outcomes and complications of conservatively versus operatively managed metacarpal fractures.

Materials & Methods

The present study was done at the department of orthopaedics in the associated medical college and hospital. A total of 100 patients with the different kind of fractures of metacarpals were included in the study. All of the included patients were either treated conservatively or by surgical management in the department of orthopaedics. The institutional ethical committee was informed about the nature and the steps of the study, ethical clearance certificate was thus obtained from them.

The patients did first reported to the trauma or the emergency centre wherein they were provided with the supportive care in form of splints and analgesics. Relevant and routine investigations were performed and history was recorded. On the basis of type and nature of fracture the basic radiological examination was carried out. The inclusion criteria were as follows: Closed fracture, extra articular shaft fracture, patients above age of 20 years, patients who signed the consent form. The exclusion criteria were as follows: open fracture with soft tissue injury, neurovascular injury, dislocated fracture, injury of tendon.

The examination of the patients was done for the pain, occupational consideration and also the functional movement limitations. The inspection was done for the deformity, tenderness measurement of the range of movements, abnormal mobility of the affected part. The necessary radiological evaluation was done with the radiological tests; the radiological assessment included the assessment of the joint space, presence of bone deformity, degree of displacement and if required for further evaluation the computed tomography evaluation was also prescribed when required.

In the form of gutter and ulnar splint the patients received the conservative management. At the end of the period of 3 weeks, for the presence of pain, parathesia while movements and swelling. After the period of 4 weeks evaluation, the splint was removed and the dynamic splint was given and the grip exercise was instructed to the patients. Finger movements were started immediately to prevent stiffness and swelling. Intravenous antibiotics were given for 2 days and oral antibiotics for 7 days. Pin tract was inspected every weekly for up to 4 weeks. K wires were removed between 3-6 weeks and active assisted ranges of motion exercises were started.

The questioner was designed for DASH score was done to assess the ability to perform certain activities. The least disability was scaled as 0 to the most disability was scaled as 100. It was administered at 12 weeks and/or 24 weeks Michigan hand questionnaire. The MHQ contains six distinct scales (1) overall hand function, (2) activities of daily living (ADLs), (3) pain, (4) work performance, (5) aesthetics, and (6) patient satisfaction with hand function. For the pain scale, the higher score indicated more pain. For the other different scales, the higher the scale indicates better hand performance. An overall MHQ score can be obtained by summing the scores for all six scales after reversing the pain scale (pain=100-pain score) and then dividing by six. It was administered at 12 and 24 weeks.

Results

The present study was done with the aim to evaluate and assess healing, functional outcomes and complications of conservatively versus operatively managed metacarpal fractures. The present study consists of 100 patients. Those who satisfied the inclusion criteria were included in the study. All the patients included in the study were of age of more than 20 years. The maximum numbers of patients were in the age range of 20 – 29 years. There were 38 patients in the group. It was found that maximum incident of the metacarpal fractures were found in young patients. (Table 1)

Table 1: Age range distribution of the patients

Age range	No. of patients
20 – 29	38
30 – 39	34
40 – 49	20
50 – 59	4
> 60	4
Total	100

A total of 100 patients were included, there were 72 males and 28 females in the study. Due to more of the physical exercises, there are more incidents of fractures in the male as compared to females. Owing to the side of injury, on the right side there were more incidents of injury as compared to left side. However when the statistical significant was measure, the difference was not found statistically significant. There were different mode of injury, the fracture due to blunt trauma was seen in 36 patients, fracture due to fall injury was seen in 26 patients and maximum patients had fracture due to road traffic accident; 38 patients were affected.

The DASH questioner was used to calculate a scale score that ranges from 0 to 100. The more the score the more is the severity. Lower score indicates less disability and more is the satisfaction of the patients. Maximum number of patients had score between 21 to 25, which shows more of the patient's satisfaction with the treatment. (table 2) The next questioner that was used to assess the satisfaction of patients was the Michigan questionnaire. The Michigan Hand Questionnaire (MHQ) is one of the most widely utilized, hand-specific surveys that measures health status relevant to patients with acute and chronic hand disorders. (Table 3)

Table 2: Quick DASH score at follow up.

DASH Score	No. of patients
< 20	4
21 – 25	56
26-30	32
> 30	8
Total	100

Table 3: Michigan Hand Questionnaire Score at final follow up.

Michigab questionnaire score	No. of patients
55 – 60	4
61 – 65	4
66 – 70	12
71 – 75	34
76 – 80	32
81 – 85	12
86 - 90	2

Discussion

Metacarpal fractures comprise between 18–44 % of all hand fractures. Non-thumb metacarpals account for around 88 % of all metacarpal fractures, with the fifth finger most commonly involved. The majority of metacarpal fractures are isolated injuries, simple, closed, and stable. While many metacarpal fractures have excellent outcomes without surgery, there is a paucity of literature and persistent controversy to guide the treating physician on the best treatment algorithm [10].

Most cases could be managed with conservative methods after closed reductions, and the indications for accurate open reduction and internal fixation are few, probably less than 5% of all hand fractures [11]. However, when an unacceptable reduction persists or in cases of displaced intra-articular fractures, multiple fractures, open fractures with associated soft tissue damage and bone loss, surgical intervention is mandatory. Among the various surgical options, intramedullary K-wire osteosynthesis of the metacarpal bones is preferable because of the simplicity of the technique, limited operating room time, and minimum soft-tissue dissection and scarring [12].

Trevisan C *et al.* [13] did a lot of work on low-severity metacarpal and phalangeal fractures treated with miniature plates and screws. They retrospectively reviewed 44 patients of a consecutive series with 56 low-severity metacarpal and/or phalangeal fractures. Tavassoli LC *et al* retrospectively evaluated three methods of closed treatment; specifically, we investigated whether the position of immobilization of the metacarpophalangeal joint or the absence of a range of motion of the interphalangeal joints affected the short-term outcome or fracture alignment [14].

Though all patients took both, Quick DASH and Michigan Hand Questionnaire, evaluation, they found the scales being somewhat relative and some parameters not what they really paid attention to or considered, suggesting that these could be further streamlined for more relevance and efficiency. The overall scores of both these evaluative parameters showed that patients who received either treatment protocol, conservative or operative, had good quality of life and restoration of hand function with return to being contributing members of society without any major disabilities within a short period of time.

Conclusion

Metacarpal fractures are common injuries in the hand. Most metacarpal fractures have a good outcome with nonoperative treatment because there is substantial tolerance to angulation and shortening, particularly fractures of the small finger metacarpal shaft and neck. Functional outcome is of paramount importance and restoration to maximum hand function is the primary expectation of patients. Physical therapy and mobilization are key in managing these fractures and form an integral path to recovery. Further studies are required to help establish a definitive treatment algorithm without losing sight of the quality of care provided to our patient and their long term, overall satisfaction.

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