Original Article

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Management of Phalanges of Hand

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Abstract

Background: Due to their peripheral location, hand fractures are a common occurrence. The majority of phalangeal and metacarpal fractures are repaired conservatively. Open fractures, Multiple fractures, and intraarticular fractures all require operative reduction and stabilisation in order to achieve the best possible position for bone healing and early mobility. Objectives: A study of management of fractures of phalanges of hand with universal mini external fixator. **Subjects and Methods:** A total of 45 Patients with metacarpal and phalanges fracture of hand were included and fixed with UMEX. Every month, all cases are followed up on for up to 6 months. After adequate fracture healing, the implant is removed under local anesthetic. **Results:** Male predominance was seen with 84% and females were 16%. The male: female ratio was 5.42:1. around 58% had proximal phalanx fractures, metacarpal fractures was seen in 27% of the cases and middle phalanx fracture was seen in 16% of the cases. Type II fractures was reported in 20% of the cases and type I fracture was reported in 13% of the cases. Duration of UMEX fixator in situ was 3 to 5 weeks in 82% of the cases and 5 to 8 weeks in 17.77% cases. Complications were seen in 64% of the cases. The outcomes based on range of motion were excellent in 40% of the cases, good in 31% of the cases, Fair in 22% of the cases and poor in 7% of the cases. **Conclusion:** UMEX is an effective treatment option for open, intra-articular, and multiple unstable phalangeal and metacarpal fractures. It is straightforward to use, has a low complication rate, and may be utilised. The learning curve is rather short. It makes post-operative treatment of both injured finger and limb easier. It enables for early mobilisation, which helps to reduce joint stiffness.

Keywords: UMEX, Phalanges, Metacarpals, Range of motion.

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Introduction

The hand is the most susceptible portion of the body, particularly in road traffic accidents, falls, blunt trauma, and sports injuries that result in fractures of the phalanges and metacarpals, which can be open or closed fractures.[1]

Fractures of the metacarpals and phalanges are the most prevalent among upper limb bone injuries, accounting for around 10% of overall fractures. Fractures of the outer rays are prevalent.[2] The proximal phalanx of the finger is the most often damaged phalanx. Displacement and deformity are visible in proximal phalangeal fractures. The majority of fractures are stable and may be managed without surgery. When treated with protective splintage and early mobilisation, the outcome is better. Closed treatment, however, has a poor prognosis because to comorbidities such as malunion, stiffness, and related soft tissue damage.[3] Open reduction and internal fixation are required for proximal phalangeal fractures with angulations larger than 20 degrees in the AP view and greater than 15 degrees in the lateral view, rotational deformity, less than 50% bone contact, collapse, and multiple fractures.[4] The use of surgical fixation must be done correctly. The treatment option is determined by the fracture shape, location, deformity, and fracture stability, as well as whether the fracture is closed or open.

Fractures of the metacarpal and phalangeal bones are more prevalent in males, with a peak occurrence between the ages of 10 and 40.[5] Fractures of the proximal phalanx (PP) are more common than those of the middle or distal phalanx. When the proximal phalanx is fractured, the displacement with significant deformity is typical.

Hand fractures are a prevalent complication in hand surgery. Since bone pieces are tiny and comminuted, reduction is difficult to achieve. Injury to the tendons, ligaments, and articular capsule are only a few of the elements that influence therapy. Anatomical reduction, stable fixation, and early mobilisation are the guiding principles in treating this kind of fracture.

Non-surgical and surgery treatment options are available for hand fractures. Splinting, buddy strapping, and slab application are non-operative therapies. Using k-wire, plates, and screws, for example, to operate causes more injury to the soft tissues, stiffness in the joints, and a delay in rehabilitation.[6]

The majority of these fractures can be treated conservatively, but operative treatment is required in a small number of patients with unstable fractures. Internal fixation, as defined by the AO, and external fixation, which is reserved for a select group of patients with open unstable fractures or severe soft-tissue injuries.[7] The use of an external device helps to

prevent further damage to the delicate soft tissues and bone, as well as wound care and early finger joint exercise. There have been few reports of these injuries being treated with external fixation.

For hand fractures, external fixation allows for fracture reduction while maintaining normal bone length and providing stiff external support. Mobilization of joints proximal and distal to the fracture is possible with external fixation.[8] As an alternative to internal fixation, external equipment is utilised. It has a number of advantages, including the ability to simplify surgery by being both quick and easy to use, maintaining alignment, avoiding internal dissection, and causing less soft tissue injury enabling for quicker mobilisation.

Subjects and Methods

Type of Study: Random Prospective study
Setting: Orthopaedics Department, Bhaskar Medical College.
Sample size: 45 Patients with metacarpal and phalanges fracture of hand

Inclusion Criteria:
- Unstable fractures of Hand.
- Intra and Juxta articular fractures
- Open and multiple Fractures.

Exclusion Criteria
- Severely crushed Hand Injuries
- Fractures associated with Tendon Injuries
- Fractures with associated neurovascular injuries

Investigations
- Basic Investigations
- Serological Markers
- Plain X ray of the relevant part in Antero posterior and Oblique Views

Insertion technique

Each piece should have at least two pins. However, because the middle and terminal phalanx are tiny, and it may not be able to feed two wires through each fragment, just one wire was utilised in each fragment. For driving the K wires into the bone, a low-speed, high-torque motorised drill is utilized. Hand drills have a tendency to wobble a lot, which results in a wider hole in the bone thank wires.

A dorsolateral or dorso-oblique placement is required in the core digits, however lateral pin insertion can be utilized in the border fingers. The structure of the hand prevents any other arrangement in the metacarpals except dorso-oblique pins in the third and fourth digits, while lateral placement is conceivable in the border metacarpals. Unilateral frames are more stiff than co-planar frames.

Follow up:
- All cases are followed up to 6 months every monthly
- After satisfactory fracture healing, the implant is removed under local anesthesia.

Statistical analysis

The statistical analysis was done by SPSS 22 software. The data was presented in the form of tables and graphs. The chi-square and p-value was calculated. The p-value of <0.005 was considered statistically significant.

Results

Male predominance was seen with 84% and females were 16%. The male: female ratio was 5.42:1. Majority of the patients belonged to the age group of 20 to 30 yrs. with 44% followed by 35.55% in the age group of 31 to 40 yrs. The least belonged to the age group of 41 to 50 yrs age group with 20%. The mean age group was 33 + 8.45 yrs.

Table 1: Distribution based on Gender and age group.

Gender	Frequency	Percentage
Male	38	84.44%
Female	7	15.55%
Age group		
20 - 30	20	44.44%
31 - 40	16	35.55%
41 - 50	9	20%
Total	45	100

Table 2: Distribution based on site of fracture and pattern of fracture

Site of fracture	Frequency	Percentage
Shaft	25	55.55%
Intra Articular	11	24.44%
Juxta articular	9	20%
Grand Total	45	100%
Chi-square	10.13	
p-value	0.006	
Pattern of fracture		
Comminuted	23	51.11%
Intra articular Bicondylar	2	4.44%
Intra -articular avulsion	1	2.22%
Intra articular Uni condylar	4	8.88%
Juxta articular	5	11.11%
Shaft short oblique	9	20%
Shaft transverse	1	2.22%
Total	45	100%
Chi-square	57.2	
p-value	0.660	

In majority of the cases around 56% had shaft fracture, in 24% of the cases Intra articular fractures was reported and in 20% of the cases Juxta articular fracture was reported. The chi-square was 10.13 and the p-value was statistically significant

In 51% of the cases Comminuted pattern of fracture was seen, In 20% of the cases shaft short oblique pattern was seen, in 11% of the cases Juxta articular pattern was seen, Intra articular uni-condylar pattern was reported in 9% of the cases, Intra articular bicondylar was seen in 4% of the cases. Intra-articular avulsion and shaft transverse was seen in 2% of the cases. The chi-square was 57.2 and the p-value was not statistically significant.

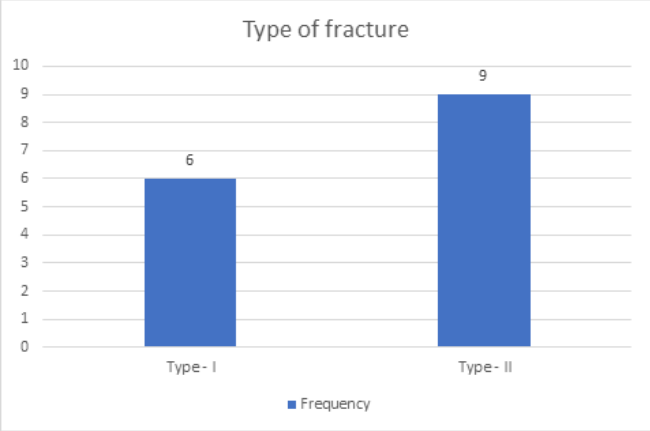

Figure 1: Distribution based on open fractures

Type II fractures was reported in 20% of the cases and type I fracture was reported in 13% of the cases. The chi-square was 0.6 and the p-value was not statistically significant.

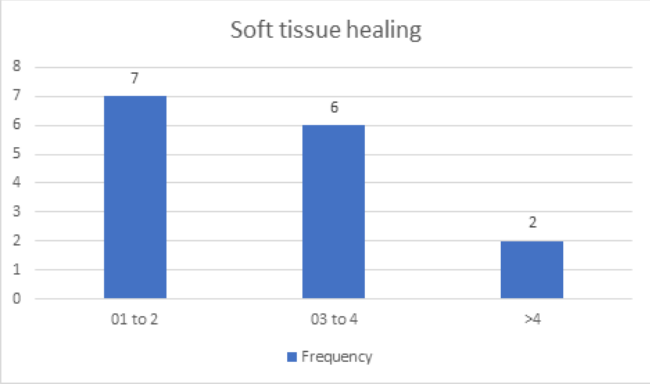

Figure 2: Distribution based on soft tissue healing duration

In 16% of the cases soft tissue heal withing 1 to 2 weeks, in 13% of the cases soft tissue healed within 3 to 4 weeks and in 4.44% of the cases it took >4 weeks for the soft tissue to heal. The chi-square was 2.8 and the p-value was not statistically significant.

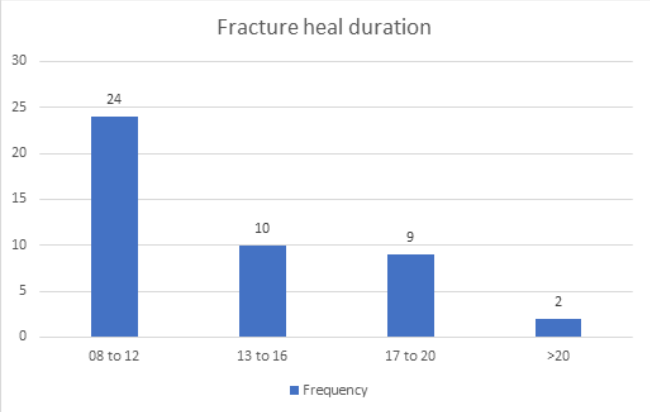

Figure 3: Distribution based on fracture heal duration

In majority of the cases around 53% fractures healed during 8 to 12 weeks duration, In 22% of the cases fractures healed during 13 to 16 weeks, and 17 to 20 weeks in 20% of the cases and in 4% of the cases it took >20 weeks for the fracture to heal. The chi-square was 22.64 and the p-value was statistically significant.

Table 3: Distribution based on UMEX in situ duration

UMEX in situ duration	Frequency	Percentage
3-5	37	82.22%
5-8	8	17.77%
Total	45	100
Chi-square	18.68	
p-value	0.00001	

Duration of UMEX fixator in situ was 3 to 5 weeks in 82% of the cases and 5 to 8 weeks in 17.77% cases. The chi-square was 18.68 and the p-value was statistically significant.

Table 4: Distribution based on complications

Complications	Frequency	Percentage
Mal-Union	2	4.44%
Non- Union	2	4.44%
Osteomyelitis	2	4.44%
Partial stiffness	13	28.88%
Pin Loosening	4	8.88%
Pin Tract Infection	6	13.33%
Total	29	64.44%
Chi-square	19.20	
p-value	0.001	

Out of 45 cases, complications were seen in 64% of the cases of which, partial stiffness was seen in 29% of the cases, pin tract infection in 13% of the cases, pin loosening in 9% of the cases, and Osteomyelitis, non-union and mal union was seen in 4.44% of the cases each. The chi-square was 19.20 and the p-value was statistically significant.

Table 5: Distribution based on UMEX Outcomes

Outcomes	Frequency	Percentage
Excellent	18	40%
Good	14	31.11%
Fair	10	22.22%
Poor	3	6.66%
Total	45	100
Chi-square	10.91	
p-value	0.001	

The outcomes or the end result based on range of motion were excellent in 40% of the cases, good in 31% of the cases, Fair in 22% of the cases and poor in 7% of the cases. The chi-square was 10.91 and the p-value was statistically significant.

Discussion

Phalanx fractures are among the most prevalent fractures in humans. They are frequently reported to be among the most prevalent of all upper extremity fractures and present with a diverse array of post-injury complications, most usually in connection to finger and hand function, irrespective of treatment.

It is imperative to assess soft tissue healing in addition to fracture healing in a hand, since effective results need the

restoration of functional integrity to both tissues. Fractures of the metacarpals and phalanges are the most prevalent among upper limb bone injuries, accounting for around 10% of overall fractures. It is commonly understood that soft tissue scarring has a greater impact on hand function than fracture healing, and joint stiffness is the most common consequence of fractures. Successful hand fracture rehabilitation addresses the requirement to (a) preserve fracture stability for bone repair. (b) Implement soft tissue mobilisation to maintain soft tissue integrity, and (c) rebuild any restricting scar from injury or surgery. The difficulties in treating metacarpal and phalangeal hand injuries are in developing intervention protocols that recognise the need to maintain fracture stability for maximum bone healing while also introducing early, controlled-motion protocols to preserve soft tissue integrity and facilitate scar remodelling. UMEX may perform ligamentotaxis in the treatment of metacarpal and phalangeal fractures (universal mini external fixator).

The vast majority of phalangeal and metacarpal fractures are managed conservatively. Patients with unstable fractures require surgical reduction and stabilisation to provide the best position for bone healing and to allow for early mobility. The fractures in all of the patients were either open or involved the joint surface, or they were numerous fractures that were difficult to manage conservatively. As a result, the UMEX fixing technique was employed in this study to treat the aforementioned fractures while avoiding further harm to the bone and soft tissues.

Shivraj et al found that among 15 proximal phalanx, 2 were excellent, 7 were good, 4 were fair, and 2 were poor. One middle phalanx was excellent, one was good, and one was average. Two of the three metacarpals were excellent, while the third was subpar. The results were found to be excellent in 25% of the cases, good in 25% of the cases, fair in 40% of the cases, and poor in 10% of the fractures.[9]

In a study by Shyam Sundar Bakki et al, 6 of the 18 proximal phalanx fractures were excellent, 5 were good, and the remaining cases were 5 fair and 2 poor. Three of the five middle phalanges were excellent, while the other two were good. Four of the 14 metacarpal fractures had excellent outcomes, eight had good outcomes, and two had fair outcomes.[10]

According to S.K. Venkatesh Gupta et al, out of 15 proximal phalanx fractures, 35.55 were excellent, 37.77 were good, and the remaining cases were 13.33 fair and 13.33 poor. 35.55 were excellent, 35.77 were good, and 13.33 were fair among 14 middle phalanxes. Three metacarpal fractures had excellent outcomes, six had good outcomes, and four had fair outcomes.[11]

Conclusion

Hand fractures are a common occurrence due to their location on the periphery of the body. The majority of phalangeal and metacarpal fractures are treated conservatively. Patients with numerous fractures, open fractures, or intra-articular fractures require surgical reduction and stabilisation to achieve the best position for bone healing and to allow for early mobility.

UMEX is an effective treatment option for open, intra-articular, and multiple unstable phalangeal and metacarpal fractures. It is straightforward to use, has a low complication rate, and may be utilised . The learning curve is rather short. It makes post-operative treatment of both injured finger and limb easier. It enables for early mobilisation, which helps to reduce joint stiffness. Understanding biochemical principles and proper application methods is crucial for making the best use of existing equipment.

References

1. Stern PJ. Factures of metacarpals and phalanges. In: Green DP, Hotchkiss RN, Pederson WC, editors. Green's operative hand surgery. 4th ed., 1. 2.
2. De Jorge JJ, Kingman J, van der Lei B. Klasen HJ. Fractures of metacarpals : A retrospective analysis of incidence and etiology and review of the English language literature. Injury. 1994;25:365-9. 3.
3. Margic K. External fixation of closed metacarpal and phalangeal fractures of digits: A prospective study of one hundred consecutive patients. J Hand surg Br; 206;31:3-40. 4.
4. Lao J, Gu YD, Xu JG. The application of AO micro-plate for treatment of the fractures of hand. Chin J jand surg (Chin) 2002; 18: 66-68. 5.
5. Gu YD. How to manage the fracture of hand, the evaluation for application of AO micro-plate. Chin J Hand surg (Chin) 2002; 18: 65-66. 6.
6. Fred Behrens: General theory and principles of external fixation. Clin Orthopaedics, 1989; 241: 15-23. 7.
7. A B Swanson; C Goran-Hagert; G de Groot Swanson: Evaluation of impairment in upper extremity. The journal of hand surgery 1987;12(5 pt 2):896-926. 8.
8. Freeland AE, Geissler WB, Weiss AP. Surgical treatment of common displaced and unstable fractures of the hand. Instr course Lect 2002; 51: 185- 201.
9. Shivraj, Management of fractures of metacarpals and phalanges of hand with mini external fixator, 2019.
10. Shyam Sundar Bakki, Nageswara Rao Yennapu, Anil Kumar Chollangi, Vamsi Krishna Kurmana, Ravi Teja Kolluru. Stabilisation of metacarpal and phalangeal fractures with JESS fixation. Journal of evidence based medicine and health care 2017 feb;4(12):661-668
11. SK Venkatesh Gupta, Venkaiah M Pavan Nutakki: Management of fractures of metacarpals and phalanges of hand with UMEX (universal mini external fixator).IJO 2015; 28 (4):965-70

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