World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

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Surgical treatment and functional results of different types of phalangeal fractures

Y. EL QADIRI *, MCE BEROUAG, D. BENNOUNA, O EL ADAOUI, Y. EL ANDALOUSSI, AR. HADDOUN and M. FADILI

Department of Orthopaedic Traumatology Wing 4 CHU Ibn Rochd Casablanca, Morocco.

World Journal of Advanced Research and Reviews, 2024, 22(01), 580–585

Publication history: Received on 28 February 2024; revised on 07 April 2024; accepted on 09 April 2024

Article DOI: https://doi.org/10.30574/wjarr.2024.22.1.1087

Abstract

Fractures of the phalanges can occur at any age, often neglected and considered as minor lesions by patients, often caused by a direct mechanism following assaults and road accidents, can be responsible for joint stiffness impairing the function of the fingers, their treatment depends on the degree of instability and associated lesions, surgical modalities are numerous and vary according to the type of fractures: simple or complex, closed or open. Functional outcome is assessed using the QuickDash score, with good results in the medium and long term.

Keywords: Fractures; Phalanx; Osteosynthesis; Results.

1. Introduction

Fractures of the phalanges of the fingers are often neglected and underestimated, leading to joint stiffness and loss of finger function. Fractures can be treated either orthopaedically or surgically, the aim being to ensure stable fixation, allowing early rehabilitation and consolidation in an anatomical position, in order to prevent complications.

The aim of this study is to determine the frequency and the anatomical-clinical variants of phalangeal fractures, and to describe the different surgical methods and their functional results.

2. Material and method

This is a retrospective, multicentre study of 58 cases presenting with fractures of the recent phalanges, closed or open, isolated or associated with other lesions and treated surgically, excluding fractures treated orthopaedically, neglected or pathological; collated in the orthopaedic trauma department wing 4 at the CHI Ibn Rochd in Casablanca between January 2018 and April 2020.

3. Results

- -The mean age was 37 years with extremes between 18 and 65 years associated with a male predominance in 43 patients or 73% of cases. The right side was dominant in 61% of cases, with 10% of cases being bilateral.
- -Assaults and accidents at work were the main causes, accounting for 59% and 33% respectively, which explains the predominance of the direct mechanism, with a rate of 95%

* Corresponding author: Y. EL QADIRI

Figure 1 Closed trauma to the right 5th finger following an assault.

- -The majority of fractures were simple in 51 cases, while complex fractures occurred in 7 cases and were life-threatening and functionally compromising.
- -As regards the characteristics of the fracture, the transverse line was dominant in 42 cases, and the diaphysis was most affected in 74% of cases, with a clear predominance of involvement of the 2nd phalanx.
    - 65% of the fractures were open with associated lesions (tendon+++), 9 of which were serious traumas, including 4 amputations with a TRC time of >3sec, cold and total anaesthesia.
    - All patients had a radiograph of the hand: face - 3 /4, allowing a complete analysis of the fracture.

Figure 2 X-ray of the hand face and 3 /4 showing a comminuted fracture of P2 of the 5th right finger

All our patients underwent surgical treatment with osteosynthesis within 3 hours to 4 days.

- The different treatment modalities were applied according to the type of fracture: simple or complex, closed or open..

Figure 3 Open fracture of the 5th finger of the right hand

- For open fractures, 25 cases were treated by pinning and 13 cases by a homemade Suzuki external fixator. Closed fractures were treated with mini screws in 9 cases and mini plates in 11 cases.

Figure 4 Osteosynthesis using a Suzuki-type external fixator

Figure 5 Osteosynthesis using a mini plate

Figure 6 Osteosynthesis by pinning

- Associated lesions most often involved extensor tendons, with a percentage of 31%, compared with flexor tendons, which accounted for only 13%. The latter were treated by direct suture.

Figure 7 Intraoperative trimming of the extensor tendon

- Severe trauma with loss of substance was treated with cover flaps: thenar flaps or Huston flaps.

- Post-operative radiographs of the fracture sites were deemed satisfactory.

- The post-operative immobilisation period was 4 to 6 weeks, and active mobilisation was requested: 38 of the 58 patients underwent self-rehabilitation.

- Applying the Quick Dash score, the functional results of 58 patients gave a score of 29/55. Half of the results of the surgical treatment were satisfactory or very satisfactory. However, the remainder were considered poor.

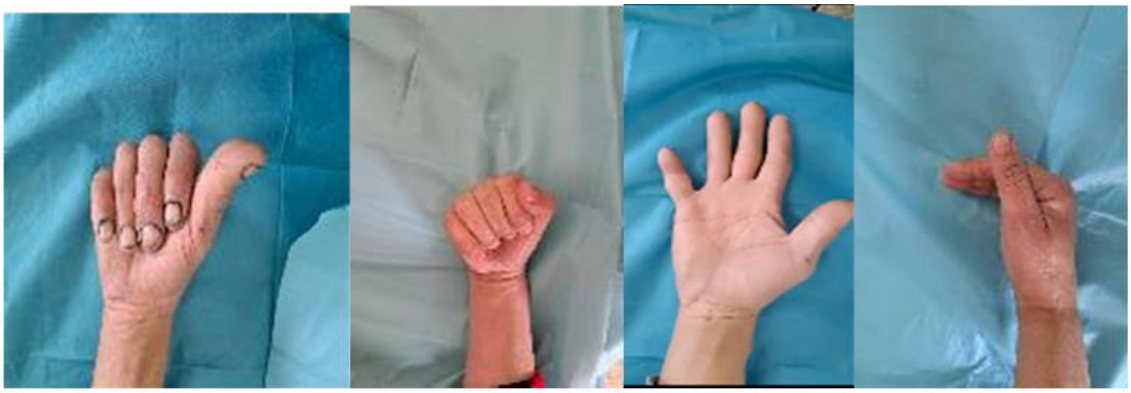

Figure 8 Clinical aspects of the various complications after consolidation

- In all our patients, 3 complications were recorded in the majority of cases, with a frequency distributed as follows: malunion in 17% of cases, stiffness in 14% of patients and chronic pain in 12% of cases.

4. Discussion

-In the literature young males are the most affected, the findings made by Weum in 2016 who found an average age of 34 years, which is the case in our series, with an average age of 37 years. [1]

- Assaults and accidents at work were the main causes in this population, so the mechanism is direct due to the fact that the hand is used either for protection in the event of an assault or for manual work[2].

The predominance of right-sided involvement in our series with a percentage of 61% would be explained by the risk encountered by the right hand, the most handled and exposed in professional and daily life Our results are similar to those of Alhumeid 2019 in Saudi Arabia, showing that 61% of fractures sit in the right hand. [3]

Extensor tendon involvement in our series was 31%. According to the literature, Strickland et al (1982) believe that extensor tendon injuries were less successful than flexor tendon injuries with digital fractures [4].While Huff -èaker et al (1979) state that injuries associated with flexor tendons cause significantly more functional loss than extensor tendon injuries [5].

Orthopaedic treatment, with or without prior reduction, requires immobilisation in a position of minimal hand stiffness, with indications for extra-articular or non-displaced articular fractures.

In our experience, X-pinning for simple closed diaphyseal fractures and centromedullary pinning for open fractures associated with total tendon section in our patients offer remarkable stability, compatible with rapid rehabilitation. In addition, there is a risk of pin migration and infection [6].

Although pin fxation leads to less soft tissue damage, it is not superior in terms of functional results compared to more stable implants such as screw or plate fxation allowing earlier rehabilitation, numerous studies have shown a biomechanical superiority of mini-plates compared to other means of osteosynthesis. [7]

The indication for the suzuki type external fixator in our series is in line with the literature giving satisfactory results in open fractures with a delay of more than 6 H. [8] [9]

-Stiffness is the most common complication and is more difficult to treat than callus, infection and osteoarthritis. When joint stiffness and tendon adhesions are combined, surgical results can be disappointing.

-We have recorded no cases of material displacement in our patients, and 3 main complications vicious callus, stiffness and chronic pain. The literature, according to Brefort [10], shows that 18% of vicious calluses are consistent with our series, 17% most often in ulnar rotation, 28% have presented with clinical and radiological osteoarthritis, and 23% have presented with joint stiffness, compared with 12% in our series, including 8% for extra-articular fractures and 15% for articular fractures. No pseudarthrosis was found in this series, compared with 5% in our series, adding 12% chronic pain to these complications.

-Our evaluation of the surgical treatment of closed and open fractures of the long fingers revealed good recovery of finger mobility. In most cases, Quick Dash scores were good (29/55), residual flexion deficit was good, grip and pinch strength was good compared to the contralateral unaffected finger. Patients were satisfied with the management of their fracture and resumed their professional and recreational activities. The most feared complication was stiffness in the operated finger.

The main complication in our series was malunion. Postoperative radiological evaluation showed complete union of the fracture in all cases.

The functional outcome is further modified by the dominance of the patient's hand, and professional and recreational activities. The index finger plays a major role in fine or lateral grasping, as the most dominant long finger.

A dorsal surgical approach could be a risk factor for post-operative stiffness due to surgically induced adhesions with the extensor tendon. If necessary, a lateral surgical approach is recommended for screw or plate fixation. [11] [12].

-Physiotherapy is considered to be one of the mainstays of treatment in order to guarantee the best functional and morphological results and to avoid complications; it is indicated from the first week, and its early initiation limits the functional consequences.

5. Conclusion

Phalangeal fractures of the hand are still common today. Their management varies in terms of surgical techniques, which are as atraumatic as possible, supplemented by specialised rehabilitation. Nevertheless, functional deficits and troublesome post-operative complications are still observed.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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