EAS Journal of Orthopaedic and Physiotherapy
Abbreviated Key Title: EAS J Orthop Physiother
ISSN 2663-0974 (Print) | ISSN 2663-8320 (Online)
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-6 | Issue-6 | Nov-Dec, 2024 | DOI: https://doi.org/10.36349/easjop.2024.v06i06.001

Original Research Article

Contribution of Iselin Pinning in the Management of 1st Metacarpal Base Fractures

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Article History
Received: 03.10.2024
Accepted: 08.11.2024
Published: 14.11.2024

Journal homepage:
https://www.easpublisher.com

Quick Response Code

Abstract: Joint fractures of the base of the fifth metacarpal are rare injuries but they can cause serious complications if poorly managed, such as weak grip strength and wrist extension, decreased range of motion, osteoarthritis, tendon rupture, and carpal instability. We focus on two entities, Bennett and Rolando fractures regarding their mechanisms and tendency to instability. Their treatment remains a controversial subject. Through a series of 13 joint fractures of the base of the fifth metacarpal collected between December 2022 and June 2023 treated in the Orthopedic Department of Ibn Sina Hospital in Rabat, and a review of the literature, we review the data on anatomy, biomechanics, pathophysiology, diagnostic and therapeutic means and the prognosis of Bennett fractures by showing the benefit of osteosynthesis by Iselin double intermetacarpal pinning.

Keywords: Hand-Fracture-Iselin-Metacarp.

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INTRODUCTION

Bennett's fracture is an articular fracture of the upper medial part of the base of the first metacarpal. The supero-internal corner remains united and does not move due to the intermetacarpal ligament connecting the first and second metacarpals. On the other hand, under the traction of the abductor longus, the metacarpal tends to subluxate upwards and outwards. This explains the absolute necessity of anatomical reduction of this fracture and fixation. There are many means of fixation: in Morocco, the most used technique is that of intermetacarpal pinning using 2 pins, in the Iselin style. Untreated or poorly treated, this fracture constantly evolves into post-traumatic rhizarthrosis.



Figure 1: X-Ray of a Benett Fracture

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MATERIEL AND METHODS

This is a retrospective study of 13 cases of joint fractures of the base of the fifth metacarpal between December 2022 and June 2023. The average age of our patients was 31 (extremes: 20–48), with a male predominance (8 males and 5 females). The right side was affected in 7 cases and the left side in 6 cases. One patient had an associated fracture of the fifth metacarpal neck treated by L-thread insertion of Vives. The mechanism by punch against a hard plane, represented the most frequent etiology (8 cases), followed by public road accidents (three cases) with a damage mechanism difficult to appreciate, and falls of stairs (two cases). All fractures were closed. Initial clinical examination found localized pain at the base of the first metacarpal with edema.

The vascular examination was unremarkable. A radiological examination with standard x-rays of the hand and wrist, both in profile and oblique, allowed us to study the lesions by objectifying the fracture and eliminating an associated hamato-metacarpal dislocation. The treatment was surgical in all our patients after closed reduction by pressure maneuver on the dorsal and proximal part of the base of the metacarpal by the index and median with extension of the metacarpal by the thumb, followed by a transcutaneous transverse intermetacarpal insertion in all our patients, one of which was associated with an L-shaped Vives insertion for the fracture of the fifth metacarpal neck. Radiological monitoring was satisfactory. An immobilization by antebrachiopalmar splint in intrinsic position plus the fourth and fifth rays, was placed for a duration of four weeks. The pins were removed two weeks after the cast was removed. A wrist and finger rehabilitation was undertaken.

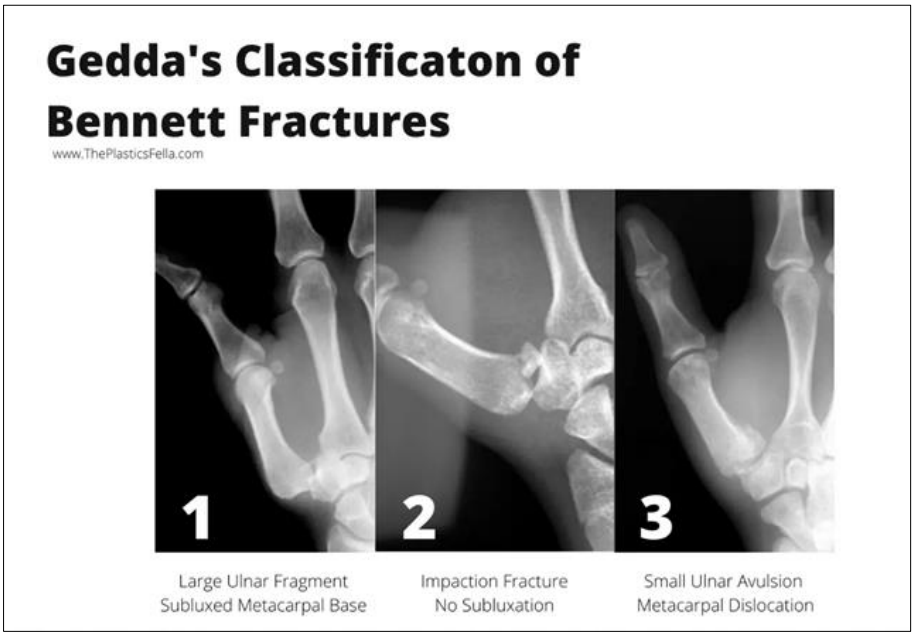


Figure 2 : Gedda's Classification of Bennett Fractures

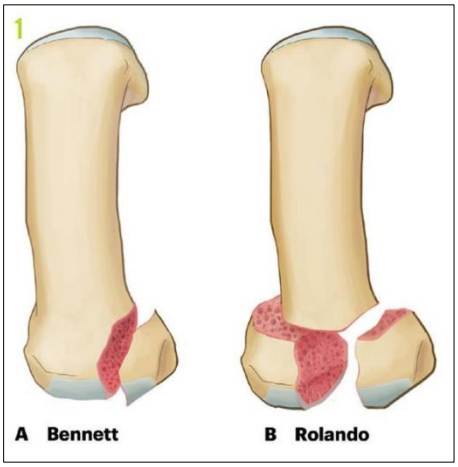


Figure 3: Difference between Bennett Fracture and Rolando Fracture

RESULTS

After an average of 15 months, only 10 patients were able to be followed up in consultation. The evaluation of results was based on clinical criteria including pain, finger flexion-extension mobility, subjective clamping force and a radiological assessment including face and profile radiographs, centered on the carpo-metacarpal region. Pain was studied in five stages: zero, climatic, occasional, frequent and disabling. Out of 13 patients, 8 reported no pain, two experienced pain during weather and intense exertion. The force measurement with the hydraulic dynamometer of the Jamar ® hand was not systematic enough to allow data to be exploited. The grip force was subjectively correlated with the healthy side, judged to be identical, slightly decreased, or very decreased. It was normal in 8 patients (63%), slightly decreased in 2 patients (15%) and significantly decreased in 1 patient (27%). The mobility of the fingers after the removal of the pins was satisfactory in all our patients. Bone consolidation of fracture was achieved for all patients within an average of 45 days. The quality of surgical reduction was maintained and no cases of hamato-metacarpal osteoarthritis were reported.

Niechajev–Kjaer-Peterson *et al*., classification adopted (group A is an equivalent of the Bennett fracture with carpo-metacarpal subluxation - group B includes single fragment fractures - group C includes bicondylar fractures, T or Y-shaped fractures and group D are fractures with one or more intermediate fragments). The initial radiological assessment allowed us to note the following different types of fractures.

Overall results were satisfactory, apart from two patients who reported intermittent pain in the event of weather changes and intense use of the hand and a case of postoperative algodystrophic syndrome that delayed recovery with persistence of pain and functional discomfort to six months, the patient then stopped seeing.

DISCUSSION

The trapeziometacarpal is a synovial joint in the saddle, with a great mobility essential to the opposing thumb movement on other fingers long. In addition to respecting the joint surfaces, its function requires stability which requires integrity capsular ligaments and especially the palmar ligament which connects the palmar beak from the first metacarpal to transverse carpal ligament.

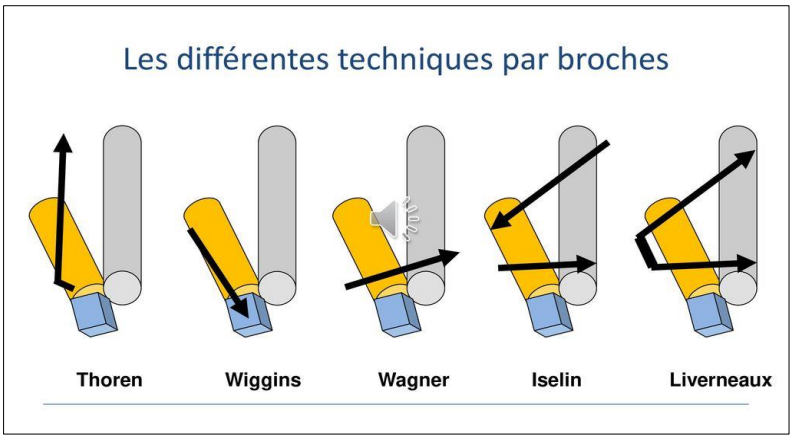


Figure 4: Principles of the different pinning techniques



Figure 5: Iselin pinning

The joint physiology and tending to to reduce the opening of the first commissure which long-term exposure to rhizarthrosis and post-traumatic commissural stress retraction.

The fractures of the base of the first metacarpal are relatively frequent injuries, Malgache estimates their 1% of all adult fractures.

The Bennet fracture described in 1881 is indeed a fracture dislocation of the TM with a fracture line dividing vertically the base in two fragments thus isolating one internal triangular fragment of the base of the first metacarpal that gives insertion to the palmar ligament of the TM. This fragment remains in place but the rest of the metacarpal is pulled up and back by the long thumb abductor inserted on the external fragment.

Some authors such as T. Lataste and Gedda-Moberg and Zryouil divide them on volume of a Bennet internal fragment fracture at large, medium and small fragment.

Other authors such as Le Nen et Coll. share the Bennet dislocations fractures in large and small fragment those with medium fragments being assimilated and treated as small fragment Bennet fracture-dislocations in our series we adopted the latter classification.

Rolondo fracture in “y” or “t” described since 1910, much rarer is metaphyseal fracture epiphyseal that detaches the epiphysis from the metaphysis in separating them into two joint fragments, one dorsal and the other palmar. Joint disorganization is limited if the internal fragment is large volume and contains the bulk of the joint fracture.

For these extra-articular fractures, the trait is usually transverse at the metaphyseal level and the most common displacement is an angulation in flexion and retropulsion of the distal part of the metacarpal which causes the closure of the first commissure.

In our series, these fractures are second after Bennet’s dislocated fractures.

The range of therapeutic treatment is very varied:
Gedda reduction is an essential component of treatment for CP fracture although a good reduction.

For Dunaud, the exact anatomical reduction is the condition to avoid a stair walk factor of rapid wear of the cartilage leading to post-traumatic rhizarthrosis.

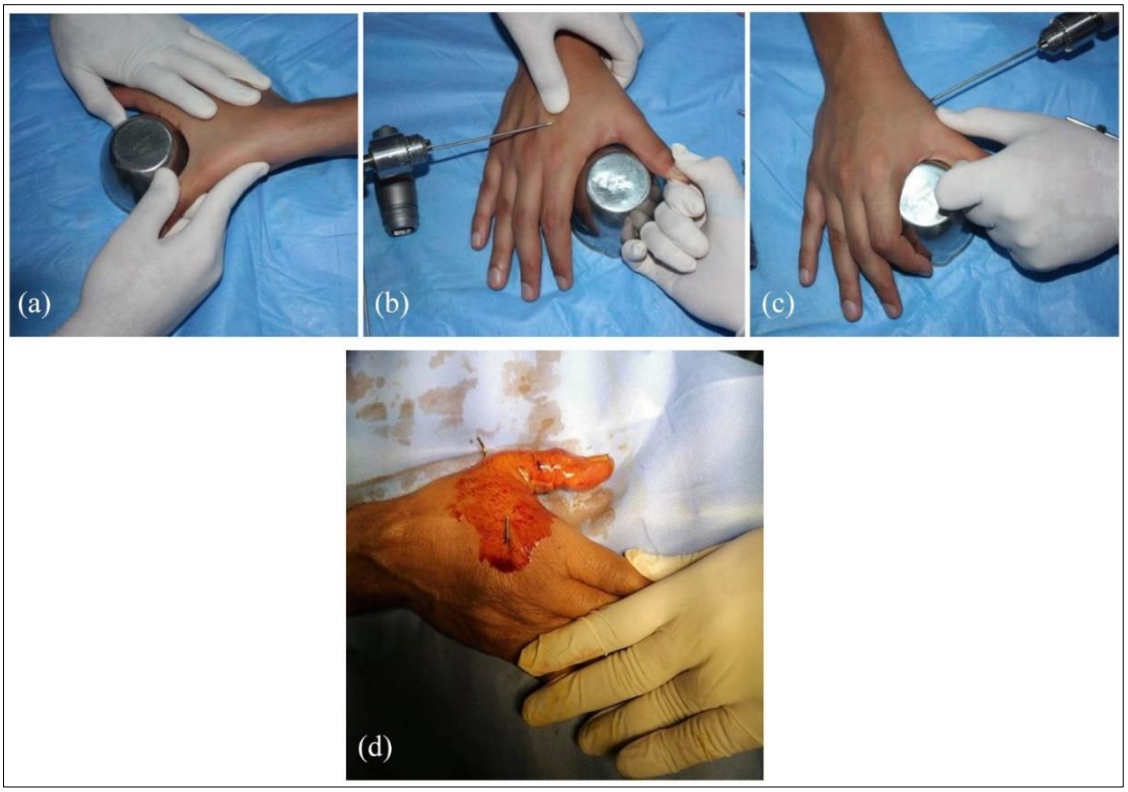


Figure 6: Pinning technique

Trapezometacarpal insertion according to the Wagner or Wiggins method is a direct transfixation of TM but has, according to Iselin, the disadvantage of not maintaining a maximum commissural deviation.

The intermetacarpal insertion of Iselin consists in forming with two non-parallel pins an undeformable couple fixing the first metacarpal to the second in the

desired position with maximum spacing of the first in antepulsion.

The Tubiana method, very similar to that of Iselin is used in case of large fragment, the proximal pin in this method passes into the fracture focus. We have preferred the Iselin method because of its simplicity, reliability and generally satisfactory overall results.

This method preserves the trapezometacarpal joint and ensures a good commissural opening of the first space. Alieu and Caudal point out that the Iselin technique does not always result in a perfect reduction of the fracture focus, especially since this reduction requiring not only maximum abduction but also strong longitudinal traction, often insufficient condition in case of Bennet fracture.

The continuous traction orthopaedic reduction recommended by Lars Thoren is currently abandoned. For Massart, this method sacrifices the restoration of the osteo-articular anatomy by freeing the commissure, thus allowing an early mobilization without being effective on the reduction of the fracture focus.

Open-focus osteosynthesis uses miniaturized material for small fragments according to Heim two first ways are possible: the radiopalmar first of Gedda and Moberg or the dorsal radio first.

The advantage of the surgical first is the perfection achieved and the strength of the internal restraint allowing an early mobilisation of the thumb.

Its disadvantage is that it remains a relatively heavy intervention, in addition to the difficulty of realization on very small fragments.

The external fixator according to Ignacio and Nonnemacher has the advantage of maintaining the reduction obtained without compromising the commissural function thanks to the taxis ligament and allows early mobilization of other uninjured joints.

External fixation is best indicated in cases of skin opening and severe soft tissue damage. Its disadvantage is mainly related to its high cost of realization.

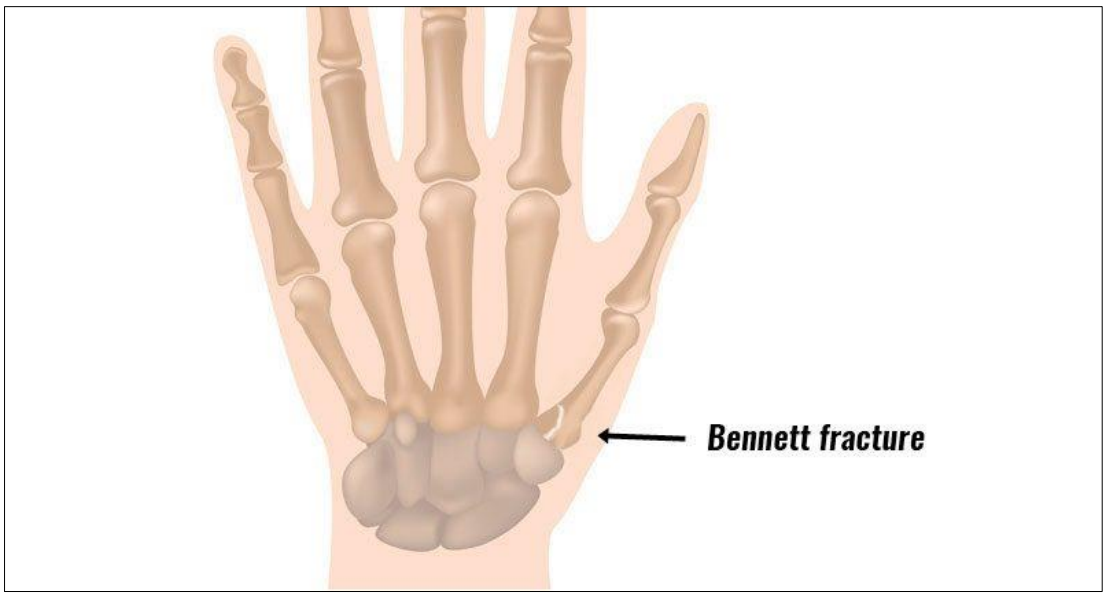


Figure 7 : Bennett Fracture

CONCLUSION

Fractures of the base of the first metacarpal are serious injuries due to their functional complications. They expose to rhizarthrosis. Therapeutic management aims to restore the anatomy and physiology of the first column of the hand.

The Iselin attachment is simple and ensures good position consolidation, consistent with normal thumb function. The surgical first of this fracture allows an anatomical reduction, but it remains difficult to achieve and requires an adapted osteosynthesis equipment. External fixation is best indicated in cases of skin opening and soft tissue lesions.

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Citation: A. Antar, O. Aguenaou, MR. Fekhaoui, MJ. Mekkaoui, M. Bouffetal, RA. Bassir, M. Kharmaz, MO. Lamrani (2024). Contribution of Iselin Pinning in the Management of 1st Metacarpal Base Fractures. *EAS J Orthop Physiother, 6*(6): 92-97.