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Original article

Articular fracture of the base of the thumb metacarpal: Comparative study between direct open fixation and extrafocal pinning

Fracture articulaire de la base du premier métacarpien : étude comparative entre l'ostéosynthèse directe et l'embrochage extra-focal

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Abstract

The treatment of intra-articular fractures of the base of the first metacarpal bone should aim to anatomically reduce the articular surface, restore the initial length of the first metacarpal and preserve the opening of the first web space. These objectives appear to be achievable with a well-conducted surgical treatment. In a retrospective study, we reviewed a series of 38 cases, which compared open reduction and internal fixation (ORIF) and extrafocal pinning to determine which option provided the best reduction and functional recovery in young, manual workers. Direct fixation was better at restoring the configuration of the joint, regardless of the age and sex of the patients and the fracture type. This complete reduction is associated clinically with better function. Thumb opposition was statistically better in fractures treated by ORIF. Thumb retroposition was better in the cases treated by ORIF, but not significantly. ORIF appears the best technique for treating intra-articular fractures of the base of the first metacarpal, as it results in better functional recovery.

Keywords: Articular fracture; First metacarpal; ORIF

Résumé

Le traitement des fractures articulaires de la base du premier métacarpien devrait comporter une réduction anatomique de la surface, la restauration de la longueur du premier métacarpien et la préservation de l'ouverture de la première commissure. Cet objectif ne semble être réalisable que par un traitement chirurgical. Nous avons souhaité, à travers une étude rétrospective, faire le point sur les données épidémiologiques et les résultats anatomo-cliniques d'une série de 38 cas traités soit par embrochage extrafocal, soit par ostéosynthèse à foyer ouvert. L'analyse statistique a montré la supériorité de l'ostéosynthèse directe, indépendamment de l'âge, du sexe des malades et du type de la fracture, dans la restauration de l'interligne articulaire qui était normal dans 15 cas traités par ostéosynthèse directe contre uniquement 6 cas pris en charge par embrochage. Cette perfection réductionnelle était associée à une meilleure fonction de la main opérée. L'opposition du pouce était statistiquement meilleure pour les fractures traitées par ostéosynthèse directe. La contre-opposition était meilleure dans les cas d'ostéosynthèse directe sans atteindre le seuil de significativité. L'ostéosynthèse directe nous paraît la meilleure technique pour le traitement des fractures articulaires de la base du premier métacarpien, permettant une récupération fonctionnelle optimale.

Mots clés : Fracture articulaire ; Premier métacarpien ; Ostéosynthèse

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1. Introduction

The trapeziometacarpal (TMC) joint acts as a pivot in the thumb column and allows for the execution of simple and complex movements. If a fracture in this area is missed or treated incorrectly, the joint profile will be compromised and the thumb's function altered due to malunion and eventually osteoarthritis. It is imperative that surgical treatment restores the metacarpal articular surface, while maintaining the first web space opening. These two aspects ultimately determine the hand's two primary grasping actions: power grip and precision tip grip. Several treatment options are available. The goal of this study was to compare the anatomical and clinical outcomes of a series of 38 intra-articular fractures of the base of the first metacarpal that were treated by extrafocal pinning (20 cases) or open reduction and internal fixation (ORIF) (18 cases).

2. Material and methods

This was a retrospective study conducted over a three-year period that included all Bennett-type or Rolando-type intra-articular fractures of the base of the first metacarpal. Analysis of patient records revealed that mainly young males suffered these fractures. The right hand was affected in most cases. The fracture primarily occurred after a fall onto the palm of the hand with the thumb abducted. The patients underwent standard A/P and lateral radiographs of the thumb column, which was placed parallel to the antepulsion-retropulsion axis in the A/P view and the flexion-extension axis on the lateral view.

There were 20 Bennett fractures and 18 Rolando fractures in the series. The patients were operated within 48 hours of the injury event. Regional anesthesia was carried out in all patients; 20 patients underwent Iselin-type extrafocal pinning under fluoroscopy control and 18 underwent ORIF through a dorsal approach. Additional immobilization with a cast or brace for 4–6 weeks was essential in our opinion. At the last follow-up (mean of 24 months), the clinical outcomes were determined according to Obry's criteria [1] for pain and grip strength, and then Kapandji's protocol to determine the thumb's mobility in opposition and counter-opposition (reposition). The radiological outcomes were based on specific views of the TMC joint to better evaluate the articular surface [2].

The data were described by their mean and standard deviations values and compared between groups with a Chi^2 test.

3. Results

The patients were divided into two groups, depending on if they had been treated by pinning (Fig. 1) or direct fixation (Fig. 2). The two groups were similar in terms of age, gender, occupation, involved side, fracture type and duration of postoperative immobilization (Table 1). There were no significant differences in the pain, repositioning ability or strength between the two treatment methods. The opposition movement was significantly better in the group that underwent ORIF ($P = 0.03$) (Table 1). All patients were able to return to their pre-injury level of work. Upon review, the trapeziometacarpal joint space appeared normal in more of the patients treated by an open approach. A step-off deformity of the articular surface was observed in 14 of the 20 fractures fixed by extrafocal pinning ($P = 0.042$) (Table 1).

Fig. 1. Extrafocal pinning according to Iselin for a Bennett-type fracture.

4. Discussion

The first column of the hand allows for opposition of the thumb to the fingers thanks to the master joint, the trapeziometacarpal joint. This joint has multiple degrees of freedom that make precise thumb-finger gripping possible.

Intra-articular fractures of the base of the first metacarpal, which make up 1% of all fractures in adults [1], disturb the kinetics of the first column: the displacement eliminates the TMC's pivot action and narrows of the first interosseous space. Initially this narrowing is reducible, but later on it becomes non-reducible due to soft tissue contracture. Given that the goal of treating intra-articular fractures is to anatomically reduce the articular surfaces, conservative (non-surgical) treatment, which is said to provide insufficient reduction, stability or first web space opening, has been rejected by most teams [2–4]. Studies by Heim [5] and Iselin [6] evaluated the medium and long-term functional outcome of intra-articular fractures of the base of the thumb that were treated conservatively. With follow-up of six to 26 years, these authors reported varus angulation and TMC subluxation concomitant with movement restrictions and loss of grip strength. These findings were so common that they recommended surgical treatment, which is now the preferred approach.