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CONSERVATIVE MANAGEMENT OF SPIRAL/LONG OBLIQUE FRACTURES OF THE METACARPAL SHAFT OF THE FINGERS USING A PALMAR WRIST SPLINT AND IMMEDIATE MOBILISATION OF THE FINGERS.

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ABSTRACT Conservative treatment of spiral/long oblique fractures of the metacarpal shaft nearly always results in shortening, which is why these fractures are known for causing extension lag and decreased grip strength. In a prospective research, 56 patients with 62 fractures were given a palmar wrist splint and quick movement of all finger joints. All of the fractures united. Extension lag in fractured fingers was initially observed in all fingers, but it subsequently resolved. Grip strength gradually increased, reaching a mean of 94% of the contralateral hand by one year after injury.

KEYWORDS : metacarpal, spial fracture, splint.

INTRODUCTION

The majority of transverse fractures of the metacarpal shaft are minimally displaced and treated conservatively(1-4). However, conservative therapy of spiral/long oblique fractures of the metacarpal shaft nearly always ends in shortening, and these fractures are known for causing extension lag (at the metacarpophalangeal joint) and diminished grip strength.(5-9) We present a prospective study that examined the outcome of conservative care of spiral/long oblique fractures of the metacarpal shaft of the fingers using a palmar wrist splint and prompt finger mobilisation.

MATERIALS & METHOD

A prospective study was conducted on all adult patients aged 22 to 55 with spiral/long oblique metacarpal shaft fractures of the fingers who were treated conservatively with a palmar wrist splint between 2023 and 2024. Patients who were lost to follow-up before six weeks were eliminated from the analysis. The following information was recorded: age, gender, cause of injury, fracture location, complications, and outcome. All patients were requested to come for follow-up at the following intervals after injury. Two weeks, six weeks, three months, six months, nine months, and one year. At each follow-up visit, the following parameters were documented: fracture healing clinically (tenderness at the fracture site) and radiologically, extension lag at the metacarpophalangeal joint (tested with the wrist extended to avoid the tenodesis effect of wrist flexion), and total active motion (TAM = active flexion of the metacarpophalangeal and interphalangeal joints minus the extension deficit in these joints). TAM ¼ 2601 indicates a full range of motion relative to the contralateral hand.

Patient Selection, Splinting Technique And Mobilisation

A wrist plaster splint was used to immobilise the wrist in a 20 to 30 degree extension, leaving all finger joints open for quick mobility. No formal physiotherapy was provided, and the patients were instructed to perform active and passive exercises on all finger joints. The splint was removed two weeks after the incident, and wrist exercises began.

RESULTS

A total of 56 patients were treated, but only 45 had a minimum follow-up of 6 weeks to qualify for this study. There were 35 men and 10 women, with an average age of 31 (range 20-48) years. 14 individuals suffered double finger fractures (usually involving adjacent fingers), therefore a total of 59 fingers were evaluated. Falls (18 cases), fights (25) and car accidents (13 incidents) all resulted in injuries. At the 6-week visit, all fractures were clinically healed (little or no discomfort at the fracture site), and radiographs revealed early callus.

There were no non-union cases or splint-related problems. 38 patients were students or office workers, and all returned to work within two to six weeks of their visits. The remaining seven cases involved manual workers who returned to work 6 to 8 weeks following their injuries. Extension lag of broken fingers was reported in all fingers at the 2- and 6-week visits, in 50% of fingers at 3 months, and in 8% of fingers at 6 months, with no extension lag detected. TAM gradually increased, and all patients achieved complete range of motion at 6 months post-injury. Grip strength gradually increased, reaching a mean of 94% of the contralateral hand after one year.

DISCUSSION

A number of authors indicated unequivocally that for spiral/long oblique fractures of the metacarpals, shortening of more than 2 to 4 mm is an absolute indication for open reduction and internal fixation. This was later challenged by Eglseder et al. (1997)(10), who demonstrated in cadaveric research that an intact deep transverse metacarpal ligament stabilized the metacarpals. As a result, no substantial further shortening at the fracture site is noticed clinically in single spiral/long oblique metacarpal fractures treated conservatively. Recent research has demonstrated that conservative therapy of certain metacarpal shaft fractures can result in excellent functional recovery (Debnath et al., 2004)(11). Severe angulation, failure of complete reduction, and malalignment are absolute indications for surgery for long oblique fractures of the metacarpals. Marked shortening is uncommon in isolated metacarpal fractures, but can occur in multiple fractures. In our center, extended oblique and spiral fractures of the metacarpal shaft are indicated by rotational malalignment and'significant' displacement. Even if there is no clinical scissoring of the broken finger, this can result in loss of bone-to-bone contact and significant dorsal angulation. In our center. We had many examples of fractures of the border (index and little finger) metacarpals that were treated conservatively; we found no evidence that these fractured metacarpals shortened. Fractures in the central metacarpals are more stable than those in the border metacarpals.

Several authors have used different casts/splints for conservative management of fractures of the shaft of the metacarpals, such as Jahss' casting technique(12), Goldberg's "cast and vice" apparatus(13), Viegas' "Galveston brace,(14)" Konradsen's "functional cast,(15)" Jones' "custom brace,(16)" Barton's "short hand cast(17)," and the "ulnar gutter splint." The latter two splinting techniques are similar. Barton's "short hand cast" is most suited for metacarpal fractures that require reduction. An elastoplast bandage is wrapped around the hand, leaving the wrist and fingers free. Three felt pads are put to the fractured metacarpal to help reduce the fracture. A plaster is then put over the elastoplast, and three-point pressure is applied to the three pads. Debnath et al. has demonstrated the efficiency of Barton's cast in sustaining reduced metacarpal shaft fractures. Several authors have utilized the ulnar gutter splint to treat shaft fractures of the ulnar and second metacarpal bones. The traditional ulnar gutter immobilizes the wrist in modest extension, the metacarpophalangeal joint in 70-degree flexion, and the interphalangeal joints in nearly complete extension. Many surgeons have adjusted splinting procedures and joint placements in a variety of ways. Tavassoli et al. has demonstrated that there are no significant differences in final range of motion between three different splinting procedures for extraarticular metacarpal fractures.

In the current study, we used a palmar wrist splint to keep the wrist joint in 20° to 30° extension while leaving all finger joints free for mobility.

We believe that this basic splint is appropriate for spiral oblique metacarpal fractures that do not require fracture reduction, as it is unlikely to maintain fracture reduction in reduced fractures. Instead, in our cases, the palmar wrist splint serves three functions: the splint's moulding in the palm provides some support to the fracture site and helps sustain the metacarpal arch; it retains the wrist in extension; and the splint reminds the patient that this is an injured hand and should not be used for carrying things. The effect of metacarpal shortening on interosseous muscle function was studied experimentally. The interosseous muscles have a large fibre-to-muscle length ratio. This ratio suggests that these muscles perform best over a short range of length.

In a cadaveric study, Meunier et al.(18) found a consistent linear decline in interosseous power with metacarpal shortening. It is worth noting that in both our study and Eglseder et al.'s investigation, all patients had a lower final grip strength than the contralateral uninjured hand. Finally, Strauch et al.(19) investigated the influence of metacarpal shortening on extension lag at the metacarpophalangeal joint after spiral/long oblique fractures in cadavers. They discovered that each 2 mm of metacarpal shaft shortening resulted in 71 degrees of extension lag at the metacarpophalangeal joint. Our clinical analysis shows that the initial extension lag resolves in all patients, which is most likely due to musculotendinous adaptation and the metacarpophalangeal joint's ability to support active hyperextension.

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