



A New Prototype of Dynamic External Fixator for the Metacarpophalangeal Joint



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1 - INTRODUCTION AND OBJECTIVES

- > The complex periarticular fractures of the metacarpophalangeal joint (MCPJ) are often challenging to treat. Conservative or operative treatment are often burdened to stiffness, loss of function and poor clinical outcome.
- > The aim of this study was to develop a new external dynamic fixator for the MCPJ to obtain a good healing of the fractures and allowing an early active movement.
- > It has been hypothesized that it was possible to obtain a constant distraction during movement creating a route similar to the metacarpal's head profile.

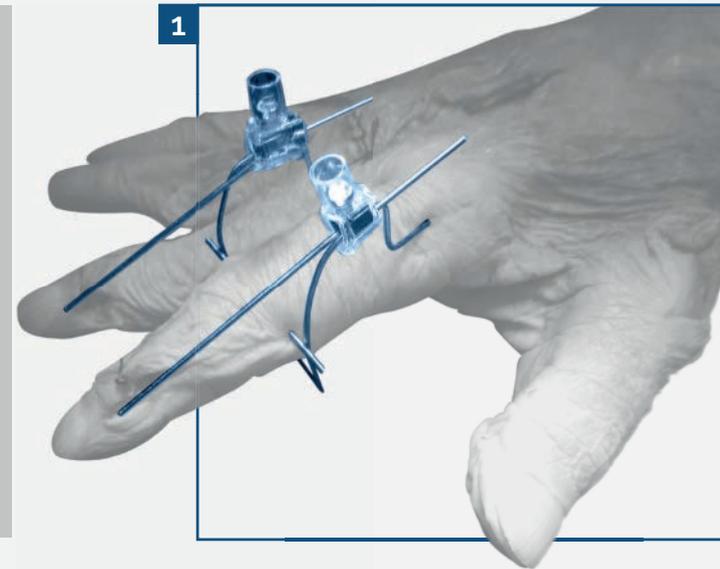


Figure 2:
The aspect of the device

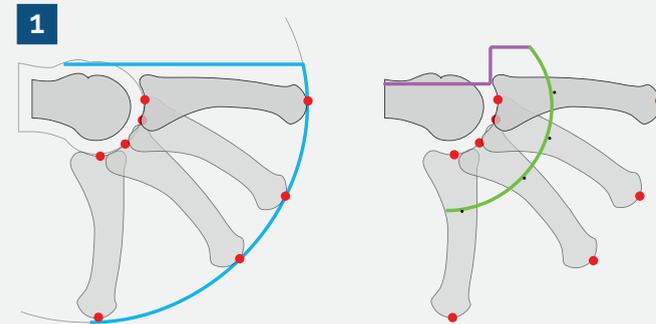


Figure 1:
The different markers of the phalanx run along parallel tracks with different radius during the movement. The paths of the markers of the phalanx were drawn on paper and they looked exactly like the metacarpal's head profile. This curvature allowed a constant distraction during the movement of flexion and extension.

2 - METHODS

- > The device was implanted in three fresh cadavers hand model studying different conditions: physiological condition, complex fracture of the base of P1, fracture of the metacarpal neck.
- > The AROM was simulated by the traction of flexor and extensor tendons.
- > The results were assessed both radiologically and clinically.

3 - RESULTS

- > 3 specimens:
 - 1 physiological condition
 - 1 complex fracture of the base of P1
 - 1 fracture of metacarpal neck
- > Mean AROM: 45°
- > Mean articular interline: 2 mm
- > No secondary displacement

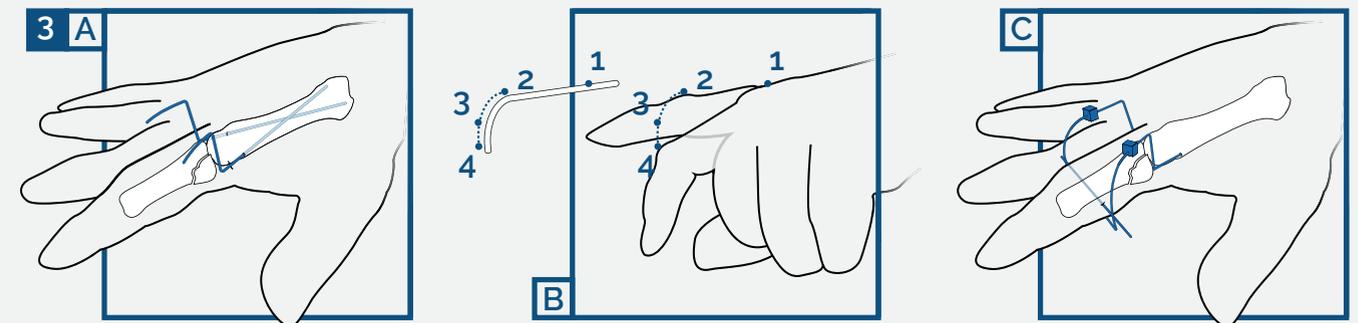


Figure 3:
Surgical technique:
(Picture A) The first step is to implant two intramedullary criss crossed K wires. The entry point is extraarticular. The part of the wires out of the skin is bent in Z shape.
(Picture B) Placing the non fractured finger in three different positions, the markers are drawn as in the figure (the point 1 is the metacarpophalangeal joint, while points 2,3 and 4 are then drawn considering the proximal interphalangeal joint in different positions). These markers provide the exact curvature to bend a third K wire following the metacarpal's head shape.
(Picture C) The last step is to fix a fourth K wire transverse to P1. Then the first three K wires are connected and provide the distraction force applied to the fourth K wire.

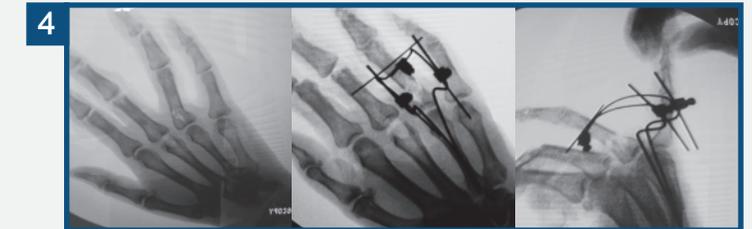


Figure 4:
Radiological results in the specimen with complex fracture of the base of the first phalanx.

4 - CONCLUSIONS

- > Possible option for the treatment of the periarticular fractures of the metacarpophalangeal joint
- > The device is cheap, simple and fast to implant; even for less experienced surgeons
- > The device could allow immediate early active motion to prevent stiffness
- > Further clinical studies are necessary