Fixation of phalangeal and metacarpal fractures by composite wiring sutures

Thesis
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Abstract

Objective: To evaluate the results of using composite wiring sutures technique in treatment of phalangeal and metacarpal fractures regarding union, functional outcome and complications.

Background: Fractures of the hand constitute 10% of all fractures. The majority of these fractures are amenable to conservative treatment with good outcomes. The management of unstable digital fractures is difficult and the results are not always satisfactory.

Methods: Twenty four patients with 27 metacarpals and phalangeal fractures were managed by open reduction and internal fixation using composite wiring sutures technique from October 2014 to December 2015.

Results: The mean radiological union time was 8.88 weeks. The mean final total active flexion was 245.92 degrees. Total active motion was excellent in 16 digits, good in 10 digits and fair in 1 digit. Secondary procedures were done in 6 patients. Complications were encountered in 7 patients. All patients returned to their pre-injurious jobs and activities.

Keywords: Composite wiring sutures, metacarpal fractures, phalangeal fractures


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List of abbreviations

AROM	Active range of motion
ASSH	American society for surgery of the hand
CMC	Carpo-metacarpal
DIP	Distal interphalangeal
EDC	Extensor digitorum comminis
EDM	Extensor digitorum minimis
IP	Interphalangeal
MCP	Metacarpo-phalangeal
P1	Proximal phalanx
P2	Middle phalanx
P3	Distal phalanx
PIP	Proximal interphalangeal
ROM	Range of motion
TAM	Total active motion
TAF	Total active flexion

Introduction

Fractures of the hand constitute 10% of all skeletal fractures. Metacarpal fractures represent 30 to 40 % of all hand fractures.

Border metacarpals (1st and 5th) are more commonly involved, the base being more commonly involved in the former and neck in the latter[1]. The small finger ray accounts for 38% of all hand fractures, with a relatively even distribution across the remaining four rays[2]. The neck is the weakest point in metacarpals, so neck fracture is the most common metacarpal fracture which known as fighter's or boxer's fracture[3].

The distal exposed portion of the finger is most vulnerable to injury, with fractures at the distal phalanx level accounting for 50% of hand fractures[4].

The majority of these fractures are amenable to conservative treatment with good outcomes. The management of unstable digital fractures is difficult and the results are not always satisfactory and there is still controversy as to the best treatment of even the simplest ones[5].

Aim of work

The aim of this study is to evaluate the results of using composite wiring sutures technique in treatment of phalangeal and metacarpal fractures regarding union, functional outcome and complications.

Anatomy

Metacarpal bones have a concavo-convex prismoid body and two extremities. The base is cuboidal, and broader posteriorly. The head is convex, broader volarly, and longer antero-posteriorly[6]. This makes the collaterals relaxed in extension and stretched in flexion[1].

First metacarpal is the shortest with dorsally flattened broad body. Its head is less convex and broader from side to side. Second metacarpal is the longest and its base has four facets (fig 1). Third metacarpal is smaller. Its base has the styloid process dorsally. Fourth metacarpal is shorter and smaller than the third. Its base is small and quadrilateral. Fifth metacarpal has a base with one facet[6].

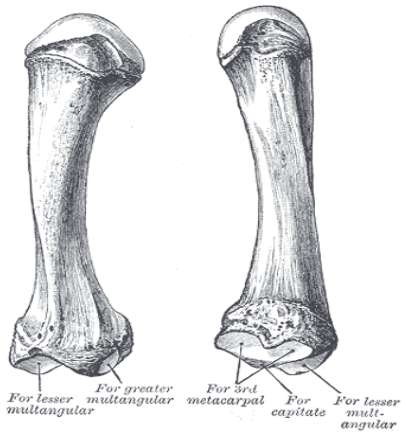

Figure 1 The second metacarpal[6].

Phalanges have a concavo-convex tapered body and two extremities. The distal phalanx (P3) is convex dorsally and flat volarly. The base of the proximal phalanx (P1) has oval, concave articular surface. The base of middle phalanx (P2) and distal phalanx (P3) has a double concavity separated by a median ridge. The head has two

condyles separated by a shallow groove; the articular surface extends volarly (Fig 2)[6].

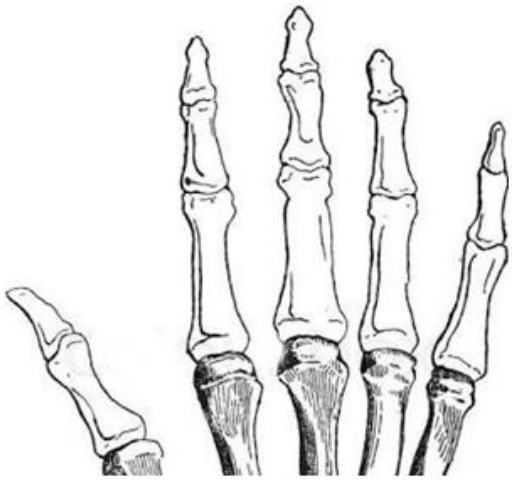

Figure 2 Phalanges of the hand[6].

The extensor digitorum comminis (EDC) tendons are inserted into the P2 and P3. At the metacarpophalangeal (MCP) joints, tendons are bound by fasciculi to the collateral ligaments. It spreads out into a broad aponeurosis covering the dorsum of P1 and is reinforced by tendons of interossei and lumbricals. Extensor indicis and extensor digiti minimi (EDM) join the extensor expansion[6].

At the proximal interphalangeal (PIP) joint, the aponeurosis divides into three slips; an intermediate and two laterals: the former is inserted into P2 base; and the two laterals are inserted into P3 dorsum. The lateral bands, spiraling from the PIP joint to become conjoined dorsally and distally over P2, have the risk of adhering to fracture callus, or becoming impaled with pins and screws[6].

The first carpometacarpal (CMC) joint has wide range of motion on account of its saddle-shape. Other CMC joints are arthrodial.