Methods and Pitfalls in Treatment of Fractures in the Digits

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KEYWORDS

• Phalangeal fracture • Tuft fracture • Mallet finger • Condylar fracture
• Intraarticular fracture dislocation • Internal fixation • External fixator • Early active finger motion

KEY POINTS

- Stable reduction and joint alignment are the key tenants to fracture fixation.
- In the presence of severe soft-tissue (eg, skin, nerve, tendon, nail) injury, the outcome of phalangeal fractures can be difficult to optimize.
- Early joint motion needs to be initiated with a good balance with a stable construct; this is especially true of phalangeal fractures around the proximal interphalangeal (PIP) joint.
- The fractures involving the PIP joint are often associated with dislocation of the joint and are particularly difficult to treat.
- Early digital motion with severe soft-tissue damage, high velocity or blast, multidigit or severe fracture communition is often compromised.
- Postinjury rehabilitation plays a critical role and is an integral part of treatment.

INTRODUCTION

The phalanges of the hand are tubular structures. Proximal and distal interphalangeal (DIP) joints allow for predominantly flexion and extension. The collateral ligaments stabilize the joints and restrain their lateral motion. The volar plate and extensor apparatus further stabilize these joints.

During the last 20 years, although many conventional methods are still used for treatment of phalangeal fractures, one has seen the evolution of much lower-profile plate and screw implants, which improved outcomes. In addition, most surgeons favor less-invasive operative approaches. However, there are ongoing debates with regard to plate superiority over simpler, less-invasive methods of fixation, given the potential for adhesions.[1] Exciting new fixation capabilities are emerging, such as percutaneous compression wire fixation and bioabsorbable implants for plate and screw fixation.[2–5] Novel methods for managing common problems have been described, such as the bone peg for distal phalangeal nonunions[6] and the potential use of bone graft substitutes.[7–9] Aggressive early motion has been an important focal point for management of problematic injuries as well.[10,11]

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EVALUATION AND SELECTION OF TREATMENT OPTIONS

The history and physical examination are necessary for management decision making. Special attention should be paid to the mechanism, handedness, smoking history, comorbid disease precluding surgery, premorbid functionality of the patient, occupation, hobbies, and the ability to comply with the intended treatment program. A minor traumatic event resulting in a significant fracture should raise the suspicion of a potential pathologic condition such as a tumor or osteoporosis (**Fig. 1**).

Patients with a significant smoking history are more likely to have delayed union or nonunion than nonsmokers. Patients with severe dementia and a displaced phalanx fracture may benefit from conservative intervention. Their functional demands and compliance with complex hand therapy often is suboptimal. Finally, the noncompliant patient does a disservice to both themselves and the surgery performed. Although it may be impossible to predict, a careful history or past experience may guide the surgeon in fixation method or choice in this difficult population.

Fig. 1. Pathologic fracture in the proximal phalanx of the little finger caused by enchondroma.

Indications for conservative treatment include the following:

1. Closed (or open) stable fracture patterns with adequate reduction
2. Fractures with suboptimal reduction, good longitudinal alignment, with or without some shortening, but the fractures do not involve the joint and there is no rotational deformity.
3. Patients unable to comply with surgical treatment because of their age or systemic or local wound conditions, or patients with much lower functional demands
4. Noncompliant patients

Indications for surgical treatment include the following:

1. Fractures that are persistently unstable after reduction. These fractures possess unacceptable shortening, rotation, angulation, or articular step-off
2. Inability to obtain satisfactory fracture reduction with unacceptable shortening rotation, angulation, or articular step-off (>1 mm)
3. Open fractures with severe soft-tissue injuries, and the fractures are unstable
4. Fractures with displaced articular surface involvement, especially with multiple fragments, which cannot be reduced adequately

TREATMENT OF PHALANGEAL FRACTURES: GENERAL GUIDELINES

Fractures in Adults

Nonoperative treatment

Nonoperative treatment of phalangeal fractures is often managed with cast or splint immobilization for up to 4 weeks. Distal phalangeal fractures can be managed with Alumafoam (Hartmann, Rock Hill, SC) or custom Orthoplast (Patterson Medical, Warrenville, IL) splints. Elderly patients may need more prolonged immobilization, but stiffness easily develops. For nondisplaced fractures or stable fractures, buddy taping is an alternative method. Buddy taping can also be applied to those patients who have been treated with splint or cast fixation for the initial 2 weeks. Buddy taping allows for finger motion, which decreases the likelihood of joint stiffness.

Operative treatment

For displaced and unstable fractures, we prefer closed reduction and percutaneous fixation with 2 crossing Kirschner wires (K-wires). The closed K-wire placement does not involve periosteal stripping and decreases the chance of associated tendon adherence and damage to bone vascularity. If adequate reduction and stabilization is