



IFSSH Scientific Committee on Bone and Joint Injuries: Hand Fracture and Dislocation

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Treatment of Fracture Dislocations of the Proximal Interphalangeal Joint

Introduction

This injury often occurs in sportsmen. It is purported to occur in 10 per 100,000 patients. Kang and Stern called it a common injury although in our experience it is not that common. In the Hand Unit at the Chris Hani Baragwanath Hospital in Johannesburg, which has an annual patient load of 10,000, there were only two cases seen for surgery over a period of two years. There is often a delayed presentation of between two and four weeks and is often misdiagnosed as a “jammed finger”

Classification

Fracture-dislocations of the proximal interphalangeal joint (PIPJ) can be classified into three groups depending on the morphology (Kang and Stern 2002).

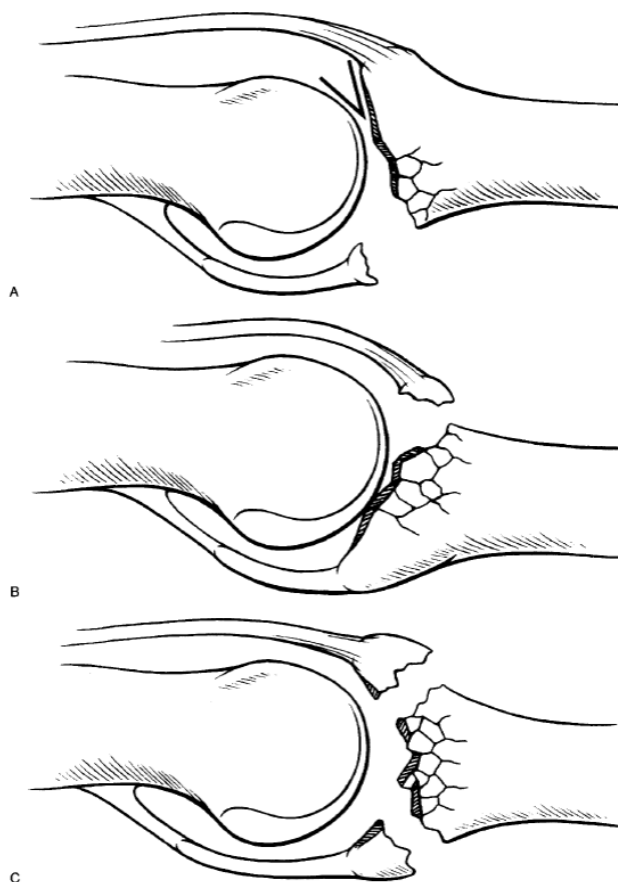


Figure 1: A. Volar lip fractures; B. Dorsal lip fractures; C. Pilon fractures.

In our experience fractures are usually due to a combination of forces rather than a pure unidirectional impact. Fractures of the volar lip are usually associated with a combination of axial and extensor forces resulting in dorsal dislocations of the PIPJ. Those involving the dorsal lip are associated with axial and flexor forces and result in a tendency towards volar instability. Pilon fractures involve compression with depression of the middle phalangeal articular fragments, are comminuted, with multi-planar instability. Of these the volar lip fractures are most common.

Fractures with minimal displacement or less than 30% of the articular surface involvement result in good functional results whereas those with gross architectural disturbance create havoc and present the treating surgeon with an immense challenge, hence the plethora of techniques described in the past. The long term results may be mediocre with loss of motion and pain frequently compromising function.

However the common themes that are found in all articles is that a stable concentric reduction and early mobilization leads to the best results.

Historical Background

Injuries with minimal displacement and bony damage or instability respond well to a short period of splinting and early mobilisation with buddy splinting.

More severe injuries require more intense measures. Many complicated and intriguing devices were designed to provide continuous traction such as the Suzuki frame (1994) or blocked extension. [Fig 2, Fig 3] (Khan Fahmy 2006; Johnson et al 2004)

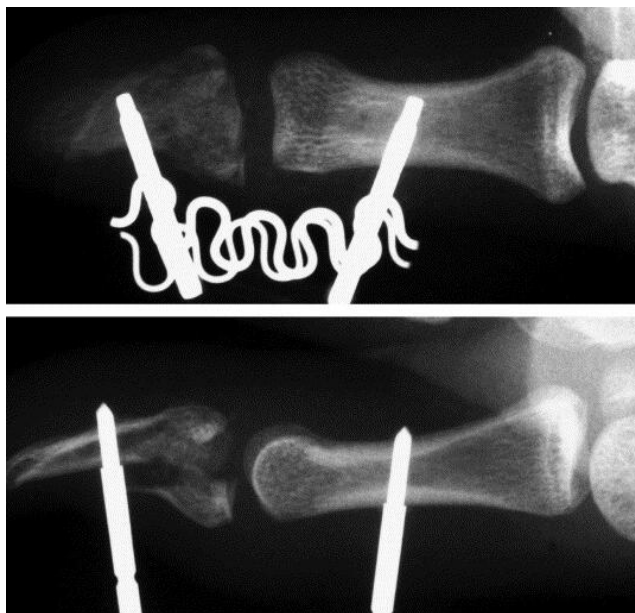


Figure 2: Khan and Fahmy

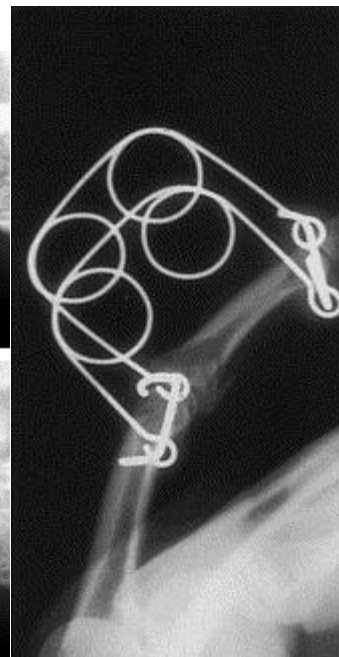


Figure 3: Johnson et al

In cases with no loss of bony support these contraptions may have been effective. Cases with loss of bony support, for instance where the cancellous bone constituting the base of

the middle phalanx has been impacted and distorted, no amount of traction will restore normal bony architecture.

These cases require open reduction and internal fixation. When the dorsal or volar lip fracture is of sufficient size an interfragmentary screw fixation technique would be indicated. [Fig 4] (Lee and Teoh)



Figure 4: Lee and Teoh

However many fracture-dislocations do not fall into this category. Comminution and impaction are common and there may be no sizable fragment to accept a screw. In more chronic cases where the volar bony defect is severe the lost volar lip and buttress needs to be substituted in some way. Eaton in 1980 described his operation where the detached volar plate is advanced distally and reattached to the base of the middle phalanx to fill the defect.

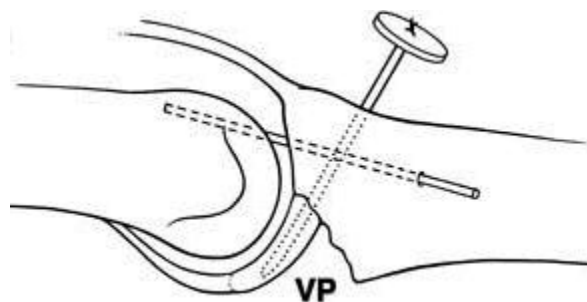


Figure 5: Eaton and Malerich

Unfortunately dorsal subluxation often recurred. A more solid and substantial tissue was required. In 1999 Hastings et al described a technique where the condyle of the hamate that articulates with the base of the 5th metacarpal is used to replace the volar

lip. This avascular cartilage-covered segment of bone is fixed into position using screws [Fig 6].

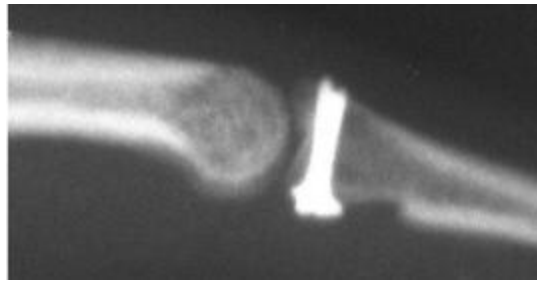


Figure 6: Hastings et al

More recently, these cases have been found to be adequately fixed using a buttress plate and screws. (Biddulph; Chew)

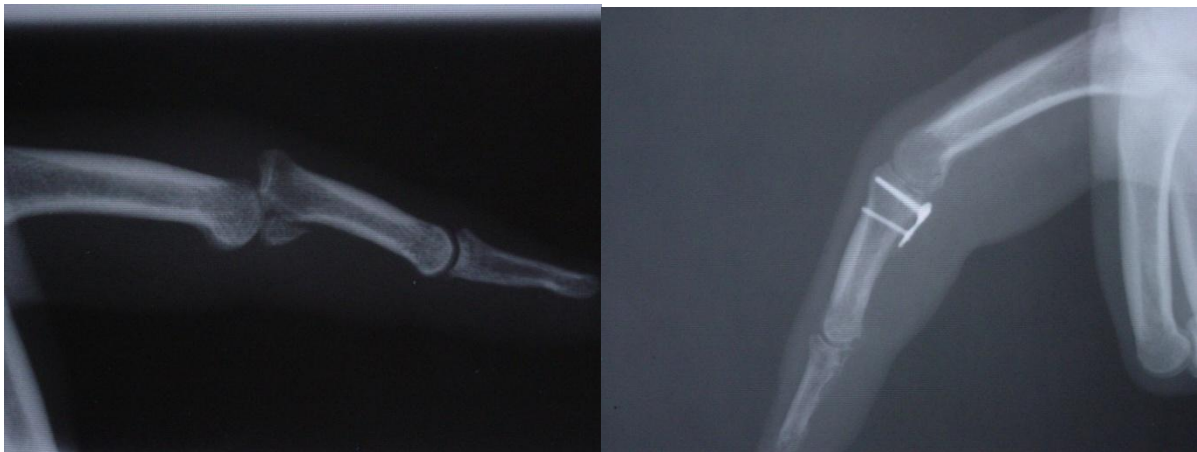


Figure 7: Biddulph 2007

Technique

A closed reduction of the joint is performed and if it is unstable it can be fixed using one or two K-wires. The k-wire should be inserted with the joint reduced but under some distraction to allow room for replacement of the fragments.

For a volar lip fracture the joint is exposed via a volar Brunner approach. The flexor sheath over the base of the middle phalanx is sacrificed (A3 and C2 pulleys). The Flexor Digitorum Profundus is retracted and the volar plate and the fracture site are exposed between the two slips of Flexor Digitorum Superficialis.

The various fragments are reduced, often facilitated by windowing the volar plate to see the articular surface especially if elevation of the central fragment is required. Adequate reduction restores stable bony architecture allowing concentric movement of the joint.

Fixation is accomplished by use of a low profile plate and locking screws which serve as a buttress plate, akin to volar plating of Barton fractures of the distal end of the radius.

The screws find purchase in the dorsal cortex of the phalanx. If K-wires are used to maintain reduction of the joint they are removed approximately two weeks later and mobilisation commenced with.

This technique has been used successfully in cases up to 4 months post injury although the ideal timing is immediately after the injury. Late cases may require more extensive dissection in order to achieve a successful reduction.

Accurate placement of the volar fragment may then also be difficult or even impossible. An inadequate reduction may still be preferable to a bone graft. These delayed cases usually have a poor prognosis.

In cases with dorsal impaction and volar dislocation, a dorsal exposure and plating is performed. The plate is placed over the central slip insertion to buttress the dorsal fragment. It is prudent to reinforce the central slip attachment with a suture around the plate.

In severe cases with substantial bone fragmentation and instability, it may not be possible to achieve perfect reduction. However, it is imperative to restore bony architecture. These patients may develop secondary arthritis in later years. In those patients who become candidates for an arthroplasty, it is advantageous to have good bone stock and near normal anatomy on which to perform the procedure.

References

1. Biddulph SL. 2007 Presentation at the IFFSH congress. Sydney, Australia.
2. Chew YC, Cheah AE. Volar plate and screw fixation for dorsal fracture-dislocation of the proximal interphalangeal joint. Case Report Journal of Hand Surgery 2010; 35A:928-930
3. Eaton RG, Malerich MM. Volar plate arthroplasty for the proximal interphalangeal joint: a ten year review. J Hand Surg 1980; 5:260-268.
4. Hastings H, Capo J, Steinberg B, Stern P. Hemicondylar hamate replacement arthroplasty for proximal interphalangeal joint fractures/dislocations (abstr). Presented at the 54th Annual Meeting of the American Society for Surgery of the Hand, Boston, MA, 1999.
5. Johnson D, Tiernan AM, Richards AM, Cole RP. Dynamic external fixation for complex intra-articular phalangeal fractures. Journal of Hand Surgery 2004; 29B; 1:76-81
6. Kang R, Stern PJ. Fracture-dislocations of the proximal interphalangeal joint. Journal of the American Society for Surgery of the Hand 2002; 2; 2:47-59
7. Khan W, Fahmy N. The S-Quattro in the management of acute intra-articular phalangeal fractures of the hand. The Journal of Hand Surgery 2006; 31B:79-92

8. Lee JYL, Teoh LC. Dorsal fracture dislocation of the proximal interphalangeal joint treated by open reduction and interfragmentary screw fixation; Indications, approaches and results. *Journal of Hand Surgery* 2006; 31B; 2:138-146
9. Suzuki Y, Matsunaga, T, Sato S, Yokoi T. The pins and rubbers traction system for treatment of comminuted intraarticular fractures and fracture-dislocations in the hand. *Journal of Hand Surgery* 1994; 19B; 1:98-107

This report is dedicated to my teacher – Alfred B. Swanson.

Syd Biddulph