

# The Birmingham Hook Plate Treatment Of Irreducible Displaced Mallet Avulsion Fractures: A Technical Note

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## Citation

S Tan, D Power. *The Birmingham Hook Plate Treatment Of Irreducible Displaced Mallet Avulsion Fractures: A Technical Note*. The Internet Journal of Hand Surgery. 2006 Volume 1 Number 1.

## Abstract

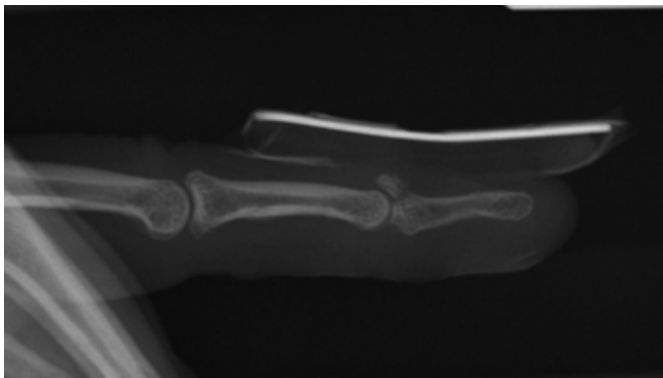
A new technique is described for reduction and fixation of intra-articular mallet avulsion fractures from the base of the distal phalanx.

## INTRODUCTION

Mallet injuries are extremely common and may represent a true extensor tendon avulsion from its insertion, a rupture of the distal tendon or an avulsion fracture from the base of the distal phalanx. The majority of these injuries can be managed with closed reduction and the Stack splint, custom thermoplastic splints or Zimmer™ splintage may be used to hold the reduction with the distal interphalangeal joint (DIPJ) in a degree of hyperextension (Figure 1).

### Figure 1

Figure 1



When a fresh avulsion fracture is identified by radiographs, the reduction can usually be accomplished in the same way as long as the avulsed articular fragment is less than 50% of the articular surface. Greater than 50% often renders the DIPJ unstable and the distal phalanx may sublux volarwards. If the position is not satisfactory then Kirschner wires (K wires) may be used to operatively gain reduction without necessarily opening the fracture.

When these fractures present late (after 3 days) the fracture

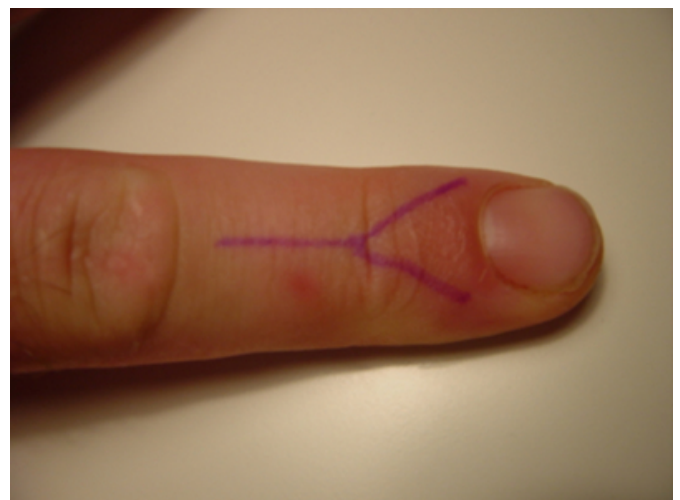
haematoma begins to organise and reduction may prove impossible. These fractures should be opened and the fracture site cleared of debris. The avulsed fragment may then be reduced and fixed in a number of ways. A popular technique is to use a mini-fragment 1mm lag screw. In my unit this technique is favoured but should the fragment be too small or split with attempts at fixation, rather than K wiring the DIP joint to gain a reduction we have devised a new plating technique which has proved extremely useful.

## TECHNICAL NOTE

A dorsal “Y” shaped incision is made over the DIPJ with the two limbs distal and extending towards but not across the nail fold (Figure 2).

### Figure 2

Figure 2



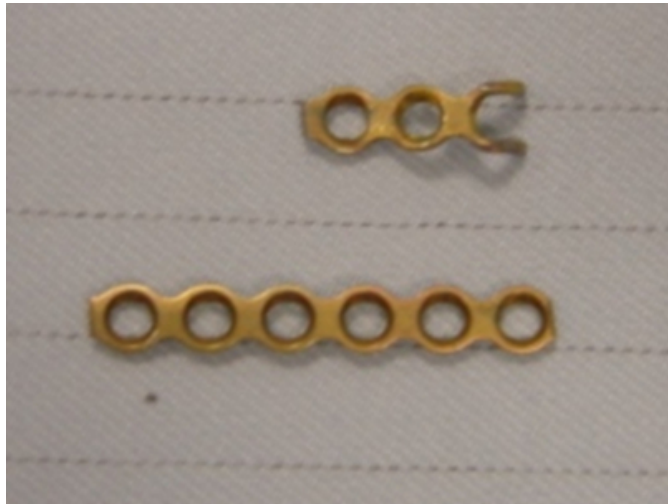
Full thickness flaps including paratenon are elevated to show the avulsed fragment which is reflected proximally to reveal

the fracture site. This is cleaned with a pick and the fragment is reduced. The germinal matrix is elevated from the base of the distal phalanx in continuity with the periosteum for a distance of approximately 3mm. This exposes the dorsum of the distal phalanx distal to the fracture but leaves most of the germinal matrix undisturbed to avoid disturbance of subsequent nail growth.

A three hole off-cut from a 1.5mm mini-fragment reconstruction plate left over from plate shortening in previous fixations is used to fashion a hook plate. One hole is cut across at the end of the plate and the two hooks created are separated and rotated 90 degrees. The junction between the two holes is bent to create approximately 15 degrees of extension contouring of the plate (Figure 3).

**Figure 3**

Figure 3a



**Figure 4**

Figure 3b



The distal extensor tendon is grasped with the hooks

proximal to any comminuted fracture fragments and advanced so that the intact hole lies distally and is fixed with a single 1.5mm screw to the distal phalanx at the previously prepared area at the proximal end of the germinal matrix (Figure 4).

**Figure 5**

Figure 4



The matrix is replaced and the reduction checked with the image intensifier. The skin is closed with interrupted nylon and a light dressing with finger plaster in extension is applied. At one week the wound is inspected and a custom thermoplastic extension splint is fashioned to maintain DIPJ extension and allow proximal interphalangeal joint movements. At two weeks the sutures are removed and the patient commences a simple flexion exercise program to start DIPJ movements but protect the finger with the splint when not exercising. The splint is worn for a total of six weeks including night use. A check radiograph is performed at six weeks to assess union (figure 5).

**Figure 6**  
Figure 5a



**Figure 7**  
Figure 5b



### **DISCUSSION**

The dorsal approach offers good exposure to the germinal matrix and the fracture fragment. Should the treatment fail it can be used later for a “Y to V” DIPJ tenodesis or a DIPJ arthrodesis to salvage the chronic mallet deformity. The hook plate technique allows secure fixation of complicated comminuted fractures or small fragments that are not

amenable to lag screw fixation. The use of off-cuts from previous fixations that would normally be discarded means that the only real cost to this technique is the single screw that would already be used if the single lag screw technique were to be used. The benefit of this technique is that the DIPJ may be mobilised earlier than with other techniques and in our experience this helps to prevent the DIPJ lag that it often seen with other techniques. The technique does not appear to disturb future nail growth so long as the dissection is limited to that necessary for fixation. The shortest 1mm titanium screw is 6mm and so in small fingers the screw must be inserted obliquely and directed proximally to avoid prominence of the tip in the pulp.

## **CONCLUSION**

The Birmingham hook plate technique is a cheap and effective solution for complex mallet avulsion fractures that are not reduceable by closed manipulation and splintage. It is a useful technique when the avulsion fracture is small or becomes comminuted by attempts at lag screw fixation.

## **References**

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