Posterior intrafocal pinning for reduction of oblique, extension supracondylar humeral fractures in children: a technical note

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ABSTRACT

A closed reduction technique using a posteriorly inserted intrafocal Kirschner wire for unstable Gartland type-III supracondylar humeral fractures in children is described. This surgical technique has been used in 7 patients. None had neurovascular complications, and all achieved bone union and had good or excellent functional and cosmetic results.

Key words: bone wires; humeral fractures

INTRODUCTION

Supracondylar humeral fractures are common in children and account for 30% of extremity fractures. For displaced fractures, manipulation under anaesthesia with percutaneous wire fixation remains the mainstay of treatment. The difficulty of closed reduction varies depending on the fracture configuration and the stability provided by intact soft-tissue structures and periosteum. Most such fractures are of the extension type. Some have an oblique fracture configuration in the sagittal plane; this makes reduction more difficult than when the fractures are of the transverse type. Maintaining the reduction during insertion of the Kirschner wires is often difficult owing to the unstable fracture pattern. This may necessitate open reduction, but it is associated with longer union time, reduced range of motion of the elbow, poorer functional outcomes, and a poor cosmetic result because of hypertrophic scar tissue of the skin. We describe a closed reduction technique using a posteriorly inserted intrafocal Kirschner wire for unstable Gartland type-III supracondylar humeral fractures in children.

SURGICAL TECHNIQUE

For Gartland type-III supracondylar humeral fractures with an oblique orientation in the sagittal plane and/or a rotatory component (Fig. a), closed reduction should be attempted first with longitudinal traction of the upper limb before reducing medial or
lateral translation of the distal fragment. Extension of the distal fragment is then reduced with flexion of the elbow, and the forearm can be pronated or supinated depending on whether the predominant instability is medial or lateral. Direct pressure is applied dorsally over the distal fragment. At this point, maintaining a reduction is difficult (Fig. b) while inserting the first Kirschner wire to align the anterior humeral cortex with the capitellum under imaging control.

According to the Kapandji technique, a stab incision is made dorsally near the fracture site, and a 2-mm Kirschner wire is inserted in the sagittal plane to lever the intact dorsal cortex of the distal fragment under image guidance (Fig. c). The tip of the wire should not pass beyond the anterior cortex of the humerus, to avoid damaging the neurovascular structures. Care should be taken, as the dorsal cortex of the distal fragment is usually thinnest. Once reduction is achieved, the wire is advanced into the humeral shaft in a proximal and anterior direction through the anterior cortex. This intrafocal wire is often enough to maintain reduction while 2 crossed (lateral and then medial) wires are inserted for definitive fixation with the ulnar nerve being protected. In more comminuted fractures, a lateral wire is added to strengthen the configuration (Fig. d). The intrafocal wire is then removed, and the elbow is immobilised in a dorsal above-elbow slab in slight

Figure  (a) An open Gartland type-III supracondylar humeral fracture, (b) the reduction is difficult to maintain, (c) the use of a posterior intrafocal Kirschner wire to lever the distal fragment, (d) fixation with 2 lateral and one medial Kirschner wires, (e) an above-elbow cast with the forearm supinated and elbow flexed at one-week follow-up, and (f) bone union at 4-month follow-up.
flexion. At week 1, the slab is changed to an above-elbow cast, with the forearm supinated and elbow flexed in a comfortable position (Fig. e). At week 4, the percutaneous wires are removed. Physiotherapy is then started.

This surgical technique has been used in 7 patients. None had neurovascular complications, and all achieved bone union (Fig. f) and had good or excellent functional and cosmetic results.

**DISCUSSION**

A posterior pin leverage technique for closed reduction of severely displaced supracondylar humeral fractures in children has been reported. A specially designed Steinmann pin with its tip ground to a wider and blunter shape was used to minimise soft-tissue injury. Posterior intrafocal wires have been used as a component of fixation in addition to medial and/or lateral wires, but potential neurovascular injuries can be caused by migration of in situ wires that may breach the anterior cortex of the distal humerus.

This posterior intrafocal wire technique is indicated when closed manipulation fails to reduce and maintain the fracture in a satisfactory position. It has minimal risks and preserves the soft tissues and avoids open reduction. The technique is contraindicated in fractures with posterior cortex comminution, in which purchase of the distal fragment for reduction is difficult. In addition, in fractures with neurological deficit in which the nerve may be trapped in the fracture site, open reduction and nerve exploration is preferred.

**DISCLOSURE**

No conflicts of interest were declared by the authors.

**REFERENCES**