A Modification of the K-wiring Technique for Treatment of Supracondylar Humeral Fractures in Children

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Abstract: Supracondylar fractures of the humerus in children can be one of the most technically challenging of fractures to deal with, often being associated with complications such as malreduction. We present a simple technique, which has substantially improved our ability to reduce these fractures closed, resulting in an anatomic reduction. The technique is illustrated by a typically challenging case.

Key Words: supracondylar humeral fracture, children, technical tip

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The supracondylar fracture of the distal humerus is considered one of the most challenging and difficult fractures to manage in children. It is the second most common fracture type in children (16.9%), being more common under the age of 7 years.1 Rang1 stated “Pity the surgeon whose first case is a fracture around the elbow,” and although written many years ago, these words still ring true because at every stage, these fractures present difficulties from diagnosis and neurovascular compromise to reduction, maintenance of position in cast, malunion, and stiffness. This case is an excellent summary of this notorious fracture, and those who treat these welcome techniques designed to improve management and outcome.

Treatment can be particularly challenging for those fractures that fall into the Gartland type II or III categories, which will be angulated or completely displaced.3 The displaced Gartland type III will often be very difficult to reduce closed even with the assistance of modern wiring techniques and the use of fluoroscopy. Open reduction may be the default when reduction proves illusive but ironically this may be more challenging as the stabilizing effect of the soft tissue envelope is lost and the risk of complications will increase. It is now widely accepted that closed reduction and Kirschner-wiring (K-wire) will produce the best functional result, 93% versus 71% in 1 study, and should be the preferred technique where possible, with some arguing that this will also shorten hospital stay and reduce morbidity.4,5

Using anatomic principles of elbow arthroscopy, we describe a simple but valuable technique to augment the prospect of closed reduction, thereby reducing trauma to both patient and surgeon alike.

CASE REPORT

An 8-year-old boy presented after a fall from monkey bars with an injury to his right elbow. He was otherwise fit. He had a reduced radial pulse but no neurological compromise. The x-rays revealed a displaced Gartland type III supracondylar humeral fracture (Figs. 1, 2).

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FIGURE 1. Fracture anteroposterior view.
TECHNIQUE

The anesthetized patient was positioned supine on the operating table with the injured arm outstretched on a radio-opaque arm board. The surgeon is positioned at the end of the arm board at the distal end of the injured arm, and the image intensifier is swept around the arm at right angles to the axis of the limb (Fig. 3). With the forearm in varying degrees of pronation and supination, axial traction is applied to the forearm, with counter traction being applied by an unscrubbed assistant to the upper arm from the opposite side of the patient. Reduction is then monitored fluoroscopically. In this case, the posteriorly displaced fragment was not fully reduced and we considered open reduction. However, we acknowledged that during elbow arthroscopy, it is safe to place an instrument, or port, into the olecranon fossa through a posterior portal.6,7 The line of supracondylar fracture will usually cross the fossa transversely. Utilizing this portal, we therefore placed a blunt instrument, the Macdonald dissector (Fig. 4), into the fracture site through the olecranon fossa. While monitoring this fluoroscopically and with very gentle pressure, we were able to lever the fragment into an anatomic position, thereby obviating the need for open dissection with its attendant risks (Figs. 5–8). Once reduced, it is the seniors authors’ practice (S.M.H.) to place a lateral wire across the fracture site, with the elbow in flexion, engaging the humeral cortex, and then a second orthogonally placed wire from the medial epicondyle (Figs. 7, 8). It is essential that the ulna nerve is identified and protected when placing the second wire. The wires are then buried and the

FIGURE 2. Fracture lateral view.

FIGURE 4. Macdonald dissector.

FIGURE 3. Theater setup.

FIGURE 5. Fracture reduction anteroposterior.
elbow is supported in plaster. Wire removal is carried out after healing usually at approximately 6 weeks. In our case, anatomic reduction was maintained and full movement recovered by 2 months after fracture (Figs. 9, 10).

**DISCUSSION**

Closed reduction of supracondylar fractures offers many benefits—there is a reduced hospital stay, decreased complication rate, and better long-term functional outcome. This, however, is only applicable if the reduction achieved is correct in the first instance. O’Hara et al found that if their guidelines
of an experienced surgeon being involved in the initial management, closed or open anatomic reduction, and use of adequate thickness of crossed K-wire fixation were followed, there was an improvement in outcomes for type IIb and III fractures (Wilkins modification of Gartland). However, biomechanical studies do not support the use of crossed K-wire fixation as a stable approach to fixation of these fractures.9

The supracondylar fracture can be notoriously difficult and infuriating to reduce closed but a laudable goal if achievable as shown by O’Hara and colleagues. We present this as a simple and safe technique using a blunt instrument, which is both commonplace and familiar. It is a valuable technique for use where reduction is proving impossible to achieve and incorporates a safe channel borrowed from the realms of elbow arthroscopy. For those familiar with the sometime infuriating challenge of closed reduction of supracondylar humeral fractures, we wholeheartedly recommend the technique (Figs. 11, 12).

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