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# DISPLACED SUPRACONDYLAR HUMERUS FRACTURES REDUCED WITH CLOSED REDUCTION AND PERCUTANEOUS PINNING USING THE ARM BOARD TECHNIQUE IN CHILDREN.

**Orthopaedics**

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## ABSTRACT

**Introduction:** Closed reduction percutaneous pinning is the current gold standard of treatment for displaced supracondylar fractures of the humerus in children (CRPP). A simple CRPP process using a radiolucent arm board and simpler C-arm handling is described in this methodology. This method yields reproducible results and is easy to copy. It may also be used to any standard operating table.

## KEYWORDS

arm board procedure, closed reduction percutaneous pinning, and pediatric supracondylar humeral fractures.

## INTRODUCTION

The most frequent elbow fracture in children is a supracondylar humeral fracture (SCH), which has been further divided by Gartland [3] into four types: Type 1 (undisplaced), Type 2 (displaced but with an intact posterior cortex), Type 3 (completely displaced, posteromedially or posterolaterally), and Type 4. SCHs account for 97-99% of elbow fractures in children and are most frequently of the extension type (associated with circumferential periosteal disruption and multidirectional instability). Closed reduction percutaneous pinning (CRPP) is currently the gold standard for treating Types 2 and 3 displaced fractures [4, 5].

For CRPP of these fractures, many authors have reported various approaches [6, 7, 8, 9, 10]. The senior author developed a straightforward and distinctive approach of positioning the elbow/arm that facilitates fracture reduction and pinning more quickly and easily based on the aforementioned perceived inadequacies of the existing techniques outlined in textbooks and scholarly papers. There is no need for a second helper, and the approach has been used.

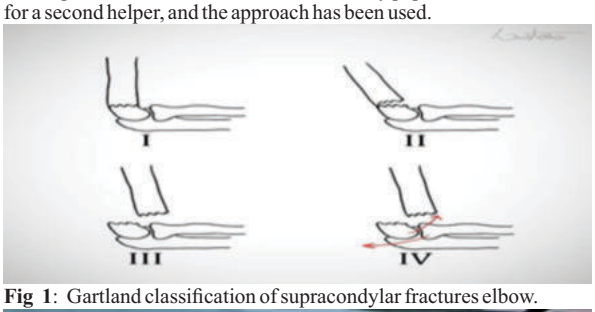


**Fig 1**: Gartland classification of supracondylar fractures elbow.

**Fig 2:** Radiolucent arm board

**Fig 3:** Board tied to arm using adhesive bandage.

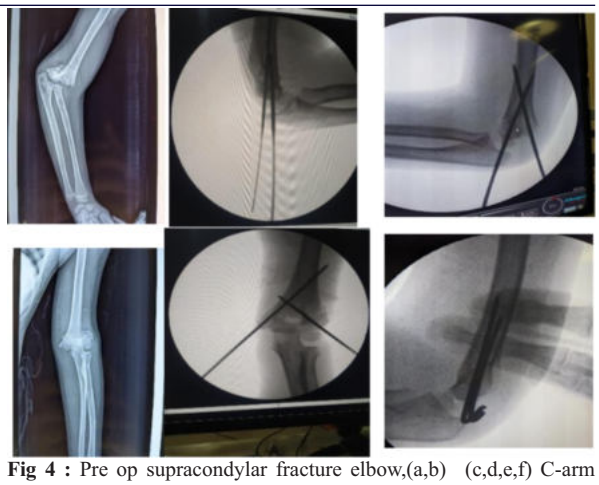

**Fig 4 :** Pre op supracondylar fracture elbow,(a,b) (c,d,e,f) C-arm images showing reduction achieved and maintained with percutaneous pinning.

### Placement and Technique

The patient is lying supine with the afflicted limb abducted to 90 degrees while under general anesthesia. The arm is mounted on a specially made radiolucent arm board with customizable length. To support the arm close to the fracture site, the board is adjusted. To make fracture reduction and pinning easier, the elbow and the distal portion of the leg are fully free. To stabilize the proximal fragment, that is, the portion closest to the fracture site, the proximal arm is fastened to the board with a wide hypoallergenic adhesive tape. For ease of reduction and pinning, the distal fragment is left loose. For convenient picture viewing, the image intensifier is placed parallel to the foot end of the table, on the same side as the wounded limb and surgeon, and the monitor is placed on the opposite side, across from the surgeon.

### Reduction

To determine if the fracture is out to length, the elbow is stretched and the C-arm is employed. The surgeon grasps the forearm, gives light longitudinal tension, and then uses pressure from the thumb to flex the distal fragment in order to achieve reduction. The proximal limb segment is immobilized to the board, therefore aided countertraction is not required.

The elbow is then flexed to 120 degrees after any rotational, mediolateral, and varus malalignments have been fixed. The C-arm is rotated 180 degrees without moving the limb in order to verify the acceptability of the decrease in anteroposterior and lateral views. The limb is prepped, draped with pediatric O-sheet, and kept in this posture.

**Pinning**

After draping, the C-arm is used to verify the reduction's acceptability, and the reduction procedure is repeated as necessary. The olecranon fossa pin, which has tetra cortical purchase going from the lateral condyle across the olecranon fossa to contact the medial cortex, is the first lateral pin (1.6mm Kirchner wire for a younger children; 2.0mm for a elder children) . To see the fixation in anteroposterior, medial, and lateral oblique views after the first pin, the C-arm is rotated 180 degrees. The second lateral pin is a bi cortical lateral pillar pin that is positioned either parallel to or divergent from the first pin . After the second pin, the adhesive tape's laxity enables imaging verification of the integrity of the fracture by gently moving the shoulder both externally and internally. A third K-wire is then placed parallel to the previous two pins laterally or in a cross pattern medially if the stability is insufficient, which typically happens in comminuted fractures.

**Medial Percutaneous Pinning**

In cases of rotational instability or medial oblique fractures with a bigger medial fragment, a medial pin may be recommended. The medial epicondyle is palpated for medial entrance pins, and the ulnar nerve is felt by gently rolling it between the finger and the bone . The pin is driven from the medial epicondyle in an anteromedial to posterolateral manner, pushing it posteriorly with the thumb and the elbow slightly flexed to engage the lateral cortex . The wires are cut about 2 cm from the skin with a bend of roughly 100°.

**Use of the Above Elbow Cast**

Around the wires, sterile gauze and iodine ointment are put; caustic bleeding is applied from the axle to the heart. metacarpophalangeal joints, then an above-elbow fiberglass or plaster of Paris cast with the elbow flexed 90 degrees and the forearm in neutral rotation. By checking to see if the hand is warm, pink, and has a healthy capillary refill, the circulation in the hand can be determined to be adequate. If there is a significant amount of preoperative edema, the cast is cut on the operating table.

**Post Surgery Care**

To help the children recover from anesthesia, they are nursed in the recovery area for roughly an hour. To guarantee adequate perfusion, a pulse oximeter probe is fastened to the thumb of the operated limb. Then radiographs from after the operation are taken. The youngster is kept in the hospital overnight for pain management and routine assessments of the hand's neurocirculatory state before being sent home the next day.

Check radiographs are taken 3 weeks after surgery. Normally, the fracture would have healed by that point. In the outpatient department, the cast and pins are removed without the use of anesthetic. After four-six weeks, child's pins and cast are removed. Then, active elbow range-of-motion exercises are started.

## DISCUSSIONS

Different surgeons use various traditional CRPP procedures for supracondylar humerus fractures. In order to give countertraction when the surgeon applies it during fracture reduction, Mubarak and Davids advise positioning a bed sheet around the patient's torso. The drawback of this is that if the anesthetist is distracted, counter traction could compromise the airway. In a different method by Tolo et al., the surgeon applies traction while his helper pushes against the patient's axilla to generate countertraction [7]. A surgical assistance is required in this situation. Some surgeons place the wounded arm on the image intensifier's receiving arm (i.e., "elbow on the tube") as a makeshift table [8]. The fluoroscopy unit cannot be moved for lateral images due to this technique; as a result, the limb must be rotated to obtain lateral film, which could result in a drop in reduction due to the maneuvering. Sharp items, liquids, and power tools could also unintentionally harm the receiver. When pinning the child (i.e., "elbow on the table"), Jayakumar and Ramachandran employed a typical radiolucent arm board with a little folded towel under the child's elbow [8]. However, because the board doesn't allow enough room for the posterior elbow, it frequently gets in the way and makes manipulating and piercing the Kirschner wire challenging. When treating SCH fractures, Guler et al. found that supine positioning required less time under anesthesia than prone positioning [9]. In order to reduce the fracture, a second surgical assistant was needed and the patient was positioned using the traditional approach. For the purpose of treating the SCH fractures, Vuillermin et al. placed the injured arm on the fluoroscopic detector or hand table [10].

Our method eliminates the requirement for a second assistant to provide countertraction by using a locally made, low-tech radiolucent arm board on which the arm is stabilized using hypoallergenic adhesive tape. With this method, we may move the C-arm around easily to see how the fracture is fixed from the anteroposterior, lateral, medial, and lateral oblique views. By moving the arm board to support the forearm and allow an unimpeded anterior approach to the elbow, the technique also enables conversion of the surgery to open reduction.

## CONCLUSION

Our method uses a locally made, low-tech radiolucent arm board that can be fitted to any common surgical table. The senior author has utilized this revolutionary and cutting-edge approach for many years with great success. It is secure, efficient, and simple for orthopedic surgeons to repeat when treating pediatric fractures.

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