

Open reduction and internal fixation of medial epicondylar fractures in children with K-wires

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Abstract : **[Purpose]** Medial epicondylar fractures of the humerus in children sometimes need open reduction and internal fixation. In these cases, a screw is usually chosen to obtain a good compression as well as to allow the early active motion to avoid limited range of motion of the elbow after operation. We want to use only K-wires as a simple option in fixation of these fractures.

[Study design] K-wires were used for fixation in two cases of incarcerated medial epicondylar fractures. The K-wires were bent, cut and pushed deeply into the deep soft tissue, adjacent to the bone. The stability of the fracture and the range of elbow motion were checked before closing the wound. The patients started the active elbow motion early at the fifth day after operation. The outcomes were assessed with the Mayo Elbow Performance Index.

[Results] The range of elbow flexion and extension was found comparable to the normal contralateral elbow. The outcomes of these two cases were excellent with the Mayo Elbow Performance Index.

[Conclusions] Open reduction and internal fixation with K-wires is a simple but reliable technique in the treatment of medial epicondylar fractures. It can restore a good range of motion which is comparable to the normal elbow. This technique can be considered as an option besides the screw fixation.

[Clinical relevance] Simple fixation with K-wires can be used as an alternate to the screw fixation with comparable results regarding the range of motion restoration and bony fusion.

Introduction

Medial epicondylar fractures of the humerus in children sometimes need open reduction and internal fixation. In these cases, a screw is usually chosen to obtain a good compression as well as to allow the early active motion to avoid limited range of motion of the elbow after operation. We

want to use only K-wires as a simple option in fixation of these fractures.

Methods

K-wires were used for fixation in two cases of incarcerated medial epicondylar fractures. The K-wires were bent, cut and pushed deeply into the deep soft tissue, adjacent to the bone. The

Key words : internal fixation, medial epicondylar fractures, children, K-wires

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A	B
C	D
	E
	F

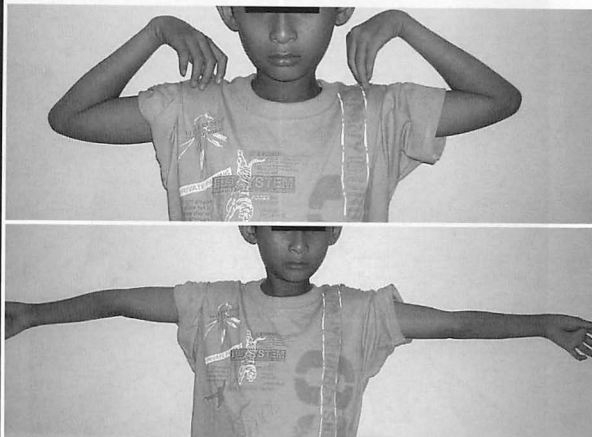


Fig. 1-A and 1-B : The medial epicondylar fragment was incarcerated in the joint shown on preoperative anteroposterior radiograph (Fig. 1-A) and lateral radiograph (Fig. 1-B).

Fig. 1-C and 1-D : The fragment was extracted surgically, reduced and secured with two deeply buried K-wires, close to the bone. Radiographs were taken at 5 months postoperatively.

Fig. 1-E and 1-F : The final flexion/extension range of the left injured elbow is 140-5-0 degrees, compared to that of the normal right elbow 140-0-5 degrees.

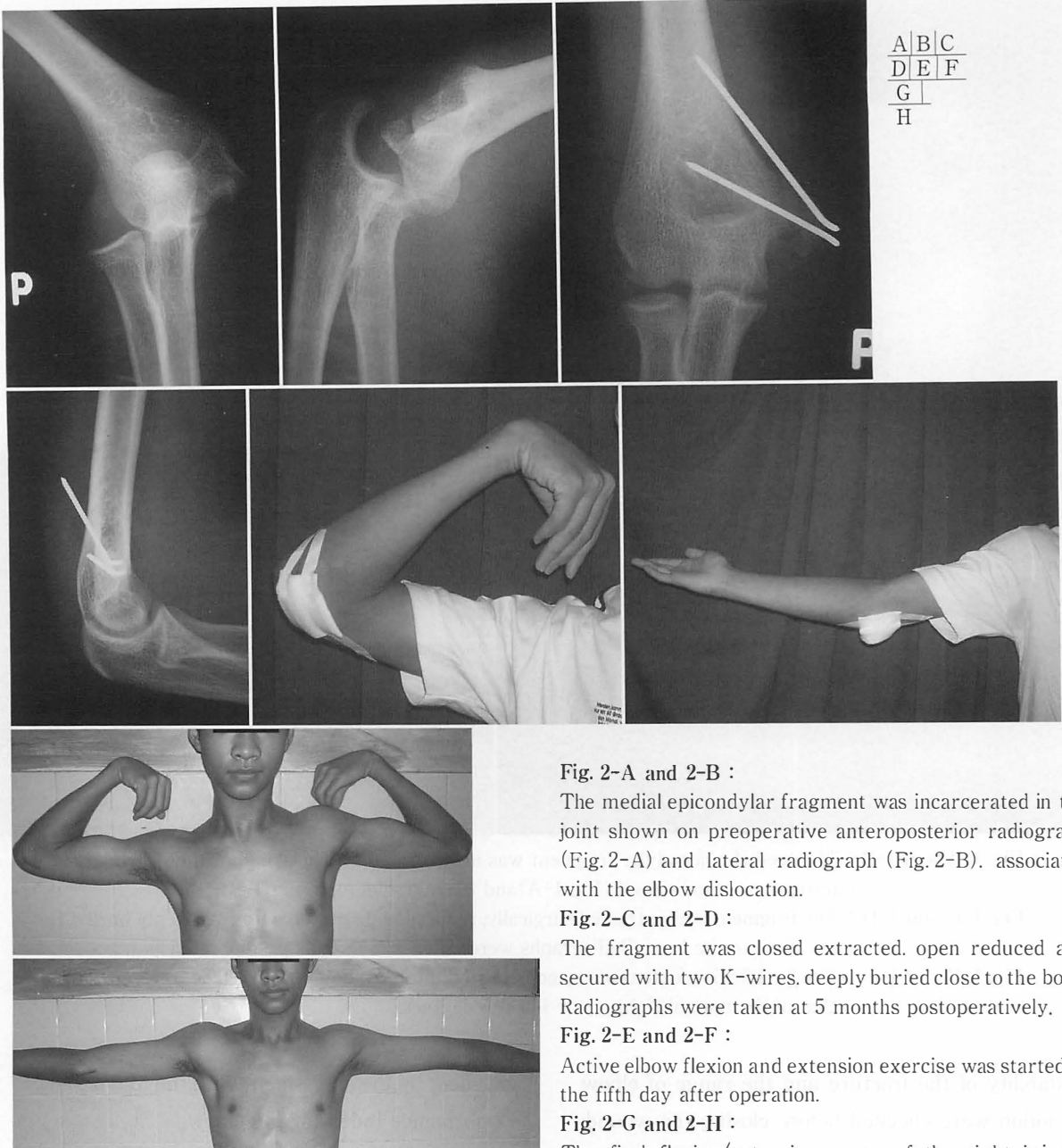
stability of the fracture and the range of elbow motion were checked before closing the wound. The patients started the active elbow motion early at the fifth day after operation. The outcomes were assessed with the Mayo Clinic Elbow Performance Index, which has 45 points for pain, 10 points for stability, 20 points for range of motion, and 25 points for activities of daily living¹⁾.

Results

The range of elbow flexion and extension was found comparable to the normal contralateral elbow. The outcomes of these two cases were

excellent by the assessment with the Mayo Clinic Performance Index for the elbow.

Case 1 (Fig. 1-A through 1-F) : A boy of twelve years old fell over his outstretched hand. On clinical examination, he had a swollen and painful elbow without neurovascular injury. There was no suggestion of a reduced elbow dislocation from the history. The radiographs revealed the medial epicondylar fragment which was incarcerated in the joint. The patient was brought to the operating room three days after the injury for the surgical extraction of the fragment and internal fixation with two deeply buried K-wires close to the bone. Active flexion



A	B	C
D	E	F
G	H	

Fig. 2-A and 2-B :

The medial epicondylar fragment was incarcerated in the joint shown on preoperative anteroposterior radiograph (Fig. 2-A) and lateral radiograph (Fig. 2-B). associated with the elbow dislocation.

Fig. 2-C and 2-D :

The fragment was closed extracted, open reduced and secured with two K-wires, deeply buried close to the bone. Radiographs were taken at 5 months postoperatively.

Fig. 2-E and 2-F :

Active elbow flexion and extension exercise was started at the fifth day after operation.

Fig. 2-G and 2-H :

The final flexion/extension range of the right injured elbow is 135-5-0 degrees, compared to that of the normal left elbow 140-0-5 degrees.

and extension exercise was started at the fifth day after operation. The flexion/extension range of the left injured elbow is 140-5-0 degrees after 5 months, compared to that of the normal right elbow 140-0-5 degrees. The Mayo Clinic Performance Index for the elbow was 100 points, rating excellent.

Case 2 (Fig. 2-A through 2-H) : A boy of

fifteen years old fell over his outstretched hand. On clinical examination, he had a swollen and painful elbow without neurovascular injury. Clinical and radiographic findings showed a medial epicondylar fracture associated with ipsilateral elbow dislocation. The patient was given a closed reduction of the dislocated elbow joint at emergency room under intra-articular

anesthesia. The elbow was reduced but smooth and full flexion and extension of the elbow could not be obtained. The radiographs confirmed our suspicion of the incarceration of the medial epicondylar fragment in the joint. The patient was brought to the operating room and had a successful closed extraction of the fragment under regional axillary block. Then, the surgery was carried out to bring the osseous fragment back to the humeral shaft and secured with two smooth K-wires. One of the wires went out of the humeral shaft but fortunately did not cause any serious problems. Active elbow flexion and extension exercise was started at the fifth day after operation. The flexion/extension range of the right injured elbow is 135-5-0 degrees after 5 months, compared to that of the normal left elbow 140-0-5 degrees. The Mayo Clinic Performance Index was 100 points, rating excellent.

Discussion

1. The pin fixation provides adequate stability and early motion postoperatively.

Medial epicondylar fractures of the humerus in children sometimes need open reduction and internal fixation²⁾³⁾. A common problem of this injury is loss of the final degrees of elbow extension. A loss of 5% to 10% can be expected to develop in about 20% of these fractures. Prolonged immobilization seems to be the key factor in loss of elbow extension. Therefore early motion is essential to prevent stiffness in this fracture²⁾³⁾. The patient is encouraged to remove the splint and start active motion as soon as 3 to 5 days post injury. The splint is exchanged for a sling as soon as the patient feels he or she no longer needs it for support. The same goes for the sling : it also is discarded when it is no longer

needed²⁾.

When choosing the surgical treatment, the fixation must be stable enough to allow early motion. Some investigators encourage the use of screws because pins provide stability but do not allow early motion²⁾³⁾. Furthermore, a screw is usually chosen because it allows a good compression²⁾³⁾. There were some cases with non-unions as postoperative results. One possible explanation is that the use of K-wires or smooth pins for fixation could not achieve adequate compression in these failed cases. However, this is only a hypothesis from a systematic review in which there was no much access to the raw data from the pooled studies⁴⁾. We suggest that the pins should be inserted into the bone in divergence, maintaining some compression through the fracture site.

Fowles recommended the use of two K-wires for fixation. All cases in which the K-wire was used healed with bony union but some had significant loss of elbow motion. The author did not describe how soon the elbow motion was started postoperatively. Technically, it is not known whether the pin ends were buried deeply in the soft tissue or not³⁾. To obtain the early motion with pin fixation, we bend the pin ends and push the pins deeply into the soft tissue, close to the medial epicondylar fragment to facilitate the elbow motion postoperatively.

About the timing of active motion postoperatively, it is initiated 5 to 10 days postoperatively with the screw fixation³⁾, while it was started at the fifth day after operation in our two cases. Although they started active motion early, both obtained solid bony union without loss of reduction. There were no pin protrusion.

2. Pin fixation can be used for a small medial epicondylar piece

If patients are mature enough, the fragment can be secured with a cannulated 4.0-mm³⁾ or 3.0-mm screw⁶⁾. We think that the guiding K-wires, cannulated drill bits, cannulated screw drivers, cannulated screws should be used for large fragments in mature adolescent patients. When cannulated screws are used, more expensive equipment is required than is needed for pinning. Kobayashi highlighted the significance of the size of the fragment in medial epicondylar fractures, and suggested that conservative treatment is indicated for patients in whom the maximum diameter of bone fragment is 13 mm or less⁷⁾. We used the two 1.25-mm K-wires for the first case with a rather small fragment in a 12-year old small boy.

The biggest limitation in this study is the small number of the cases. We have only two cases. We need to follow-up the results with more patients to see any loss of reduction and other possible problems.

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