

FRACTURES OF THE LATERAL CONDYLE OF THE HUMERUS

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INTRODUCTION

Fractures of the lateral humeral condyle represent 20% of pediatric elbow fractures.

It is the second most common pediatric elbow fracture after supracondylar humerus fracture.

It typically occurs in children aged approximately 6 years.

Malgaigne⁵ described lateral humeral condylar fracture in 1847.

Mechanism of Injury

“fall onto the hand while the elbow is flexed or on the inner and posterior portion of the flexed elbow, or forcible adduction of the forearm.”

Push-off and pull-off theories also have been proposed to account for these fractures. The push-off theory

proposed by Milch postulates that these fractures are the result of a force directed upward and outward

along the radius. When the forearm goes into valgus, the radial head pushes off the lateral condyle.

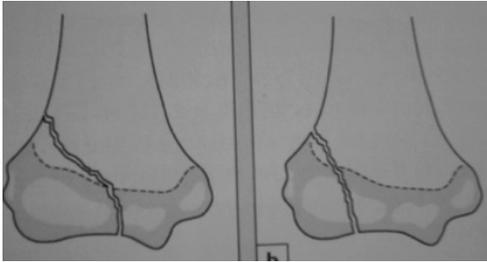
RELEVANT ANATOMY

Ossification centres and its appearance

Capitulum	2 Y
Radial head	4
Inner epicondyle	6
Trochlea	8
Olecranon	9
External epicondyle	10

CLASSIFICATION

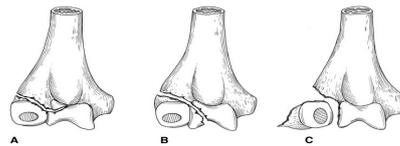
a. Milch



- I The fracture through the ossific nucleus of the capitulum [S-H IV]
- II The fracture is lateral to the ossific nucleus of the capitulum [S-H II]

b. Classification according to displacement

1. Undisplaced
2. 2-4 mm
3. >5 mm Rotation



INVESTIGATIONS

1. X Rays: AP and Lateral

When in doubt: opposite elbow

2. Rarely CT

3. Use of Arthrogram:

When not sure about stability? arthrogram

If any question of stability: arthrogram

Fracture suspected in less than 3 years: -ve X ray = arthrogram

What it shows?

In Lateral condylar fracture:

When hinge is present: can be treated non-operatively as they are stable

What is unstable: Dye showing breach in the cartilage

Any displacement > 2 mm or angulation

TREATMENT

Type I fractures	Cast
Type II fractures	Closed reduction and K wire If anatomic reduction is not obtained: ORIF
Type III	Always open reduction and K wire fixation

Percutaneous pinning or by open reduction and internal fixation have a 95% union rate, making these the preferred methods of treatment.

The nondisplaced, stable fracture does not require surgical treatment; cast immobilization is sufficient. But requires weekly X rays for 3 weeks.

SURGICAL TECHNIQUE

Tourniquet and I.I

Lateral approach than posterolateral

Usually a longitudinal rent in the brachioradialis is present and dissect subperiosteally to expose the fracture. If no rent: dissect between brachioradialis and triceps.

Blood supply of capitellum is posterior: do not dissect.

The periosteum of the proximal fragment, which overhangs the fracture site, may have to be stripped back slightly to remove it from the fracture site.

The distal fragment is rotated up to 90° [Use K wire as a Joy stick] and reduce and hold with reduction clamp

Fragment is larger than expected

Fix the fracture with two K-wires [1.8 mm K wire]

Remove the pins and splint at 4 weeks

It is important to adequately visualize the joint articular surface. In some cases, the fragment is rotated 180°; in these situations, I have found it easier to visualize the fragment by applying a varus movement to the elbow, which reproduces the mechanism of injury and opens the fracture site so that it may be easily seen.

Once the hematoma has been evacuated, the distal fragment is manipulated into position onto the end of the proximal fragment (distal humerus). To accomplish this reduction, the distal fragment is grasped with a bone-holding forceps or a towel clip and rotated back into proper alignment. Flexing the elbow in order to take tension off the distal fragment facilitates the reduction.

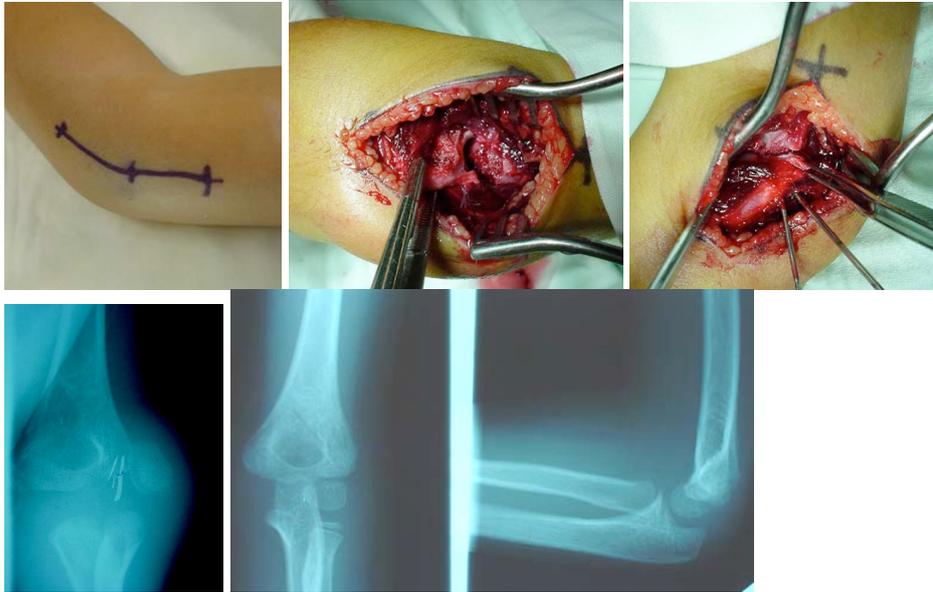


K-wires are simple, efficient, inexpensive, and effective. In most of these patients, a 0.62-in K-wire is sufficient. In a very small child, I recommend 0.45-in K-wires.

I prefer convergent pins placed through the lateral condyle and up into the shaft of the humerus. A second pin is placed transversely across the fracture line through the metaphyseal fragment. This provides good stability and divergence of the pins. Parallel pins or diverging pins are more stable than converging pins. What is to be avoided is having the pins converge at the fracture site because this is a less stable construct.

In children younger than age 6 or 7 years, an additional 2 weeks of immobilization is recommended, although 3 weeks or more of immobilization is preferred after a cast application, giving a total of 4 weeks of immobilization

At 4 weeks, anteroposterior and lateral radiographs are obtained. If there is new bone formation indicating the early stage of healing, the K-wires are removed. Beyond 12 weeks, I would consider the fracture to be nonunited and would



proceed with bone grafting.

COMPLICATIONS

1. **Non-union:** Flynn⁷ reviewed 23 cases of nonunion following lateral condylar fracture with initial displacement measuring <2 mm. In 12 cases, late fracture displacement resulted in nonunion. Although no strict time limit defines nonunion, little or no fracture callus formation and a persistent fracture line >8 weeks after injury are cause for concern.
2. **Malunion, lateral growth arrest, and cubitus valgus.** More than 20% of patients with lateral condyle fractures develop some degree of cubitus varus deformity and $>10\%$ develop valgus deformity. Valgus deformity is more problematic.
3. **Growth disturbance:** Lateral humeral condylar fractures are often Salter-Harris type IV fractures. In most cases, the fracture is intra-articular, with a fracture line that extends through the metaphysis, physis, and epiphysis. However, these fractures seldom involve the ossific

nucleus; therefore, the risk of growth arrest is minimal. Only 20% of humeral growth occurs at the distal physis.

4. Tardy ulnar nerve palsy: Management with anterior ulnar nerve transposition has yielded good results.

5. Aseptic necrosis: observe. Debride when necessary

6. Stiffness

Nonunion of the lateral condyle can result in cubitus valgus deformity and in tardy ulnar nerve palsy. If the fracture is not united in a patient who presents between 6 and 12 weeks, the standard surgical approach described is recommended.

In the established nonunion, the fracture site is separated from the proximal fragment with sharp dissection with a scalpel or a small osteotome. Once the two fragments are separated, curets are used to remove the reactive fibrous tissue, taking care to dissect the distal fragment as minimally as possible. The surfaces of the proximal and distal fragments must be cleaned of this fibrous tissue. Once this is achieved, I try to obtain as near an anatomic reduction as possible. There are no good anatomic landmarks at this point, and achieving anatomic reduction is more difficult than in an acute case.

Once the anatomic position is determined, the fracture fragments are reduced with a towel clip and pins are inserted. There are bone graft substitutes available that may be equally effective.

With an established nonunion, I prefer internal fixation and bone graft, followed by 6 weeks of cast immobilization. Most fractures in my experience have united with this treatment at 6 to 12 weeks.

Patients may present with established nonunions that are in an older age group. The treatment can be successful by means of open reduction, cleaning the bony surfaces, inserting a cancellous screw, and making use of bone grafting. With

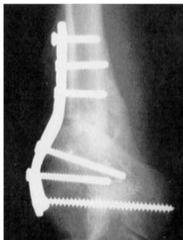
surgical intervention, the stability of the elbow is improved, and the risk of cubitus valgus is reduced.

I Stage correction: For non-union without valgus



II 2 stage operation: For nonunion with valgus

II stage correction



Stage I: In the initial procedure, the ulnar nerve is transposed and the lateral condyle is grafted and fixed in situ. Screw fixation in older children as lower end has only 20% growth

Stage II: Once healed and range of motion (ROM) has returned, a corrective osteotomy is completed

Informed consent:

Warn the family preoperatively of potential complications, including nonunion, cubitus varus, osteonecrosis, and protuberance of the lateral condyle.

Protuberance of the lateral condyle is the most common

Clinical series report that up to half of cases of lateral condyle fracture has a lateral protuberance.

Although there is no functional disability from the protuberance and no surgical treatment is required, it is disconcerting to parents to see the deformity, so it is best to have warned them preoperatively. Although the exact cause is not known, it is thought that dissection of the periosteum may increase the likelihood of this

result. For this reason, dissection should be limited to that necessary to expose the fracture site.

References

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4. Flynn JC: An update. *J Pediatr Orthop* 1989;9(6):691-696.