

Elbow – Open Reduction Internal Fixation

Surgical Indications and Considerations

Anatomical Considerations: The elbow is composed of 3 articulations; humeroulnar, humeroradial, and the proximal radioulnar joint. The distal radioulnar joint is thought to be a part of the elbow complex due to the fact that its function is directly related to the proximal radio ulnar joint. The two major collateral ligaments and the joint capsule along with the surrounding muscles provide the strength and support to the joint. The radial head is more susceptible to fractures because of the 15° angle between the neck and the shaft of the radius.

Pathogenesis: Elbow fractures are classified as distal humeral fractures, proximal radial fractures, and proximal ulnar fractures. Most elbow fractures are a result of direct trauma or a fall onto an outstretched hand. (FOOSH) With the forearm in pronation and the elbow extended, the valgus (lateral) stress causes the elbow joint to be a vulnerable position. Approximately 60% of the body weight is forced onto the elbow joint during a fall, and especially to the radial head. Other medical factors such as arthritis, puts the patient at a higher risk to fracture the elbow joint.

The Mason classification system is most commonly used to classify and to treat the fractures.

Class I – Non-displaced

- ~ generally small, hairline fractures (easily missed)
- ~ may not be visible on X-rays (visible if X-ray is taken 3 weeks post injury)
- ~ can displace if too much movement occurs.

Class II – Marginal head fracture

- ~ splinting for 1 – 2 weeks
- ~ slightly displaced and involves a larger portion of the bone
- ~ may need surgical removal of small fragments
- ~ if fragments are larger, surgical procedures with pins and screws.
- ~ for geriatric patients, the surgeon generally removes the broken piece or entire even the entire radial head.

Class III - Comminuted

- ~ more than 3 fragments of bone
- ~ significant damage to joint and ligaments
- ~ surgery is required to remove fragments and repair soft-tissue damage
- ~ prosthesis can be used to prevent deformity

Class IV – With elbow dislocation

- ~ the dislocations are treated first, then the fracture
- ~ usually other complications involved such as ligament tear or other elbow fractures.

Epidemiology: Elbow fractures are not as common as other fractures of the body, accounting for 7% of all elbow trauma. The most common fractures of the elbow vary with the mechanism of injury and patient's age. Supracondylar fractures are more common in children and radial head fractures are most common in adults, occurring more frequently in women than men.

Diagnosis

- ~ Patient will report of a fall on outstretched arm (FOOSH) or a direct trauma to the elbow
- ~ Joint effusion and ecchymosis near the elbow may be present
- ~ Point tenderness at the radial head
- ~ Pain with ROM, especially with pronation and supination of the forearm

Non-operative Versus Operative Management:

Class I and some Class II fractures (non-displaced and non-comminuted fractures) are typically treated conservatively with immobilization. Open reduction and internal fixation is indicated for displaced fractures like Class II(displaced), Class III, and Class IV fractures. Ring et al. suggest that fractures involving the whole radial head should be treated with radial head arthroplasty rather than open reduction internal fixation. Open reduction and internal fixation is best reserved for minimally comminuted fractures with three or less articular fragments (Mason Type II fractures).

Surgical Procedures:

The surgical approach depends on the structures that are involved. If the ulna or medial side of the elbow needs to be accessed, a posterior approach is used for the incision. If the radial head alone needs to be accessed, a lateral incision is made. Exposure of the radial head varies according to the approaches used, however will involve the anconeus, extensor carpi ulnaris, and the supinator muscles. Miniature screws of different depths, a Herbert screw (headless screw), small Kirschner wires, and/or bioabsorbable pins may be used if the fracture does not involve the radial neck. However if the radial neck is involved, then a small plate is indicated. An autogenous bone graft is applied taken either from the lateral epicondyle or the olecranon if necessary. When applying the screws, the angle of placement is taken into consideration not to obstruct the radioulnar articulation for movement of pronation and supination. Any other damage (i.e. ligament tear) is then surgically repaired and the incision is sutured.

Preoperative Rehabilitation

- ~ Further injury protection using a splint or cast
- ~ Go over post-operative rehabilitation plan with the patient

POSTOPERATIVE REHABILITATION

Protection: Day 1-7

Immobilized in a splint* (90° flexion, neutral rotation) - about 3 days

*(Splint is removed for exercise but put back on after exercise and worn at night for several weeks)

Elevation – prevent or minimize edema

Phase I: Weeks 1 - 4

Goals: Pain and edema control

Protect surgical repair site

PROM progress to AROM

Independent home exercise program

Intervention:

Modalities for pain control

Gentle active and active-assisted range-of-motion exercises

Teach patient self ROM exercises and HEP

Phase II: Weeks 5 – 8

Goals: Increase upper extremity strength

Increase/progress range of motion

Implement function

Intervention:

Modalities for pain control

Gentle – mod stretching

Active: Flexion, Extension, Pronation, Supination exercises

Mobilization to increase range of motion (Grades I – II)

Phase III: Weeks 9 – 12

Goals: Normal functional use for ADL's

Limit scar tissue adhesions

Full ROM

Improve strength of elbow muscles

Improve cardiovascular and muscular endurance

Intervention:

Progressive resistance exercises – to all weak elbow musculature

Soft tissue mobilization to hypomobile tissue near surgery site

Joint mobilization (Grades III – IV)

Functional use for light ADL's

References:

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