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Fractures of the Olecranon and Coronoid Process

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Table of Contents

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I. INTRODUCTION

Fractures of the proximal ulna present a challenge to the orthopedic surgeon. Fractures of the olecranon process are common and many classification systems and treatment options have been described. Conversely, fractures of the coronoid process are relatively rare, especially in isolation, and management is often dependent on the concomitant injury. In all fractures of the proximal ulna, the fracture pattern and concomitant injuries play a major role in surgical decision making and prognosis. The guiding principle in treating these fractures is to restore articular congruity and stability in order to begin a program of early active motion.

II. FRACTURES OF THE OLECRANON

A. **History of treatment techniques**
   1. Prior to the 19th century, olecranon fractures were treated with immobilization in extension, which resulted in considerable stiffness and loss of function.[1]
   2. To achieve a better functional result, early limited motion was attempted, which required rigid internal fixation of the fracture fragments. In 1883, Joseph Lister pioneered internal fixation for the olecranon using a wire loop.[2]
   3. Since Lister's work, a number of fixation methods have been employed, all with some success.
      a. McAtee device—a longitudinal fixation device[3]
      b. Zuelzer hook plate[4]
      c. Longitudinal intramedullary screws[5–7]
      d. Tension band wiring[6,8–12]
      e. Plate fixation[1,6,8,13,14]
      f. Fragment excision with triceps reattachment for comminuted fractures and for fractures in elderly patients[1,15–19]

B. **Mechanisms of injury**
   1. Direct trauma to the olecranon
   2. A fall on the outstretched hand with eccentric contraction of the triceps during resisted elbow flexion[20]
   3. High-energy trauma
      a. In these cases, additional injury to the elbow joint is often present. Radial head fracture, coronoid fracture, distal humerus fracture, and ligamentous instability are most common.
      b. High-energy olecranon fractures have increased surgical complexity and carry a higher complication rate and poorer prognosis.

C. **Classification systems.** Several systems to describe olecranon fractures exist.
   1. Colton's classification system is based on fracture pattern, comminution, and ligament injury.[21]
   2. The AO classification system is more cumbersome, but it does provide a detailed description according to the rules applied to other articular fractures. It also accounts for concomitant fractures of the proximal radius.[22]
   3. The Mayo classification system (**Table 1**) provides a concise and manageable system that assists in surgical decision making as well as predicting outcome.[1,17,20]

D. **Treatment by Mayo fracture type**
   1. **Mayo type I olecranon fractures** (stable, nondisplaced) (**Figure 1**). These can be treated with casting or splinting and early mobilization.
      a. A long arm cast or posterior splint may be used for comfort and protection, preferably in a position of mid-flexion and neutral forearm rotation.
      b. A dynamic extension splint can also be used for early motion with active flexion and passive extension.[1]
      c. Motion can often begin by 7 days postinjury with weekly radiographs during the first few weeks to follow the fracture and confirm that it remains nondisplaced.[1,17,20]

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