ELSEVIER

Operative Techniques in

Sports Medicine

Arthroscopic Management of Elbow Fractures and Dislocations

John T. Heffernan, MD, Michael J. O'Brien, MD, and Felix H. Savoie III, MD

Arthroscopic management of fractures and dislocations of the elbow encompasses a set of evolving techniques that are often advantageous in the treatment of these challenging injuries. The arthroscopic approach allows for direct visualization of fracture patterns and reductions without an open exposure, minimizing soft tissue trauma to a region notorious for complications. Advantages of the arthroscope include accurate assessment of fracture and associated soft tissue injury, debridement of hematoma at the fracture site, visualization of anatomical reduction, and immediate assessment of fixation stability. Arthroscopy of acute injuries is not without risk. The anatomy is altered and neurovascular structures are at risk of iatrogenic injury if not protected. Using a prone position, the arthroscopist may gain access to the medial or lateral elbow and address an array of fractures. Radial head fractures may be reduced and initially stabilized using Kirschner wires followed by percutaneous cannulated screw fixation. Comminuted fractures may be excised arthroscopically. There are multiple techniques to arthroscopically stabilize coronoid fractures—larger fragments are fixed with cannulated screws and smaller fragments may use suture anchors or suture cerclage for fixation. Capitellar fractures may be fixed with headless or buried screws from the articular surface or percutaneous screws from the posterior humerus after arthroscopic reduction. New suture fixation techniques are possible for osteochondral fragments from the capitellum. Common pediatric injuries, lateral condyle, and radial neck fractures, may also benefit from arthroscopically assisted reduction. Combination injuries from severe fracture dislocations may rely on arthroscopy to fully define the injury and systematically address fixation. Additionally, lateral instability resulting from elbow dislocations may be addressed with arthroscopic repair of the lateral ligament complex.

Oper Tech Sports Med ■:■■■-■■■

KEYWORDS elbow arthroscopy, elbow fracture, ARIF

Introduction

Arthroscopic techniques are increasingly used in elbow trauma and intra-articular and periarticular fracture management. Elbow fractures and dislocations are notoriously difficult to treat owing to frequent wound complications, postoperative stiffness, and heterotopic ossification. Instability may be exacerbated or iatrogenically created by open approaches. The arthroscope allows for direct visualization of fracture patterns and reductions without an open exposure. Arthroscopic debridement of fracture debris may increase postoperative elbow range of motion. Superior visualization of fracture fragments and chondral injuries can decrease the need for intraoperative fluoroscopy. Elbow arthroscopy can be employed in combination with indirect reduction techniques to ensure articular congruity or can be used for direct arthroscopic reduction internal fixation (ARIF) with devices passed directly into the joint.

As anatomy may be altered by soft tissue swelling, if there is any concern regarding the anatomy of neurovascular structures, an open or arthroscopic exposure and protection should be performed as the initial part of the procedure. The use of retractors to protect essential structures should be considered mandatory in elbow arthroscopy for fractures. Identification of

Department of Orthopaedic Surgery, Tulane University School of Medicine, New Orleans, LA.

Address reprint requests to Felix H. Savoie III, MD, Department of Orthopaedic Surgery, Tulane University School of Medicine, 1430, Tulane Ave #8632, New Orleans, LA 70112. E-mail: fsavoie@tulane.edu

http://dx.doi.org/10.1053/j.otsm.2017.08.008
1060-1872//

pathology not evident on preoperative imaging allows for appropriate treatment measures and a more accurate prognosis. Adherence to basic principles of arthroscopy and fracture management should allow this tool to be used to maximum effectiveness: speeding recovery and improving results.

Indications

(1) Radial head fractures
  (a) Mason type II fracture ARIF.
  (b) Radial head malunion resection.
  (c) Acute resection of comminuted radial head fracture.
(2) Coronoid fractures
  (d) Regan and Morrey8 type II and III fracture ARIF.
  (e) Type I fracture or fibrous nonunion excision.
(3) Anterior coronal shear capitellar fractures
  (f) Type I fracture ARIF.
  (g) Type II osteochondral excision and microfracture.
  (h) Type II fracture suture fixation.
(4) Radial neck fractures—arthroscopic reduction and percutaneous fixation.
(5) Lateral condyle fractures—arthroscopic reduction and percutaneous fixation.
(6) Intercondylar and supracondylar fractures—ARIF.
(7) Combination injuries (eg, terrible triad injuries).
(8) Recurrent instability.

Contraindications

Relative contraindications include

(1) Severe soft tissue swelling.
(2) Severely displaced intra-articular fractures.
(3) Altered anatomical landmarks in patients with previous ulnar nerve transposition—open nerve exploration may be necessary.
(4) Open fractures (may aid irrigation and debridement and minimize further soft tissue injury).

Absolute contraindications include:

(1) Infection.
(2) Neurovascular injuries.
(3) Polytrauma.
(4) Severely osteoporotic bone.
(5) Radial head fractures with anterior capsular or brachialis penetration—requires open exploration of the posterior interosseous nerve.

Preoperative Planning

Patient History and Physical Examination

(1) Mechanism of the injury—predicts the extent of soft tissue damage.
(2) History of prior injuries or surgeries on the upper extremity.
(3) Inspection of deformity, skin integrity, and neurovascular status.
(4) Evaluation of motion and stability. Aspiration of hemarthrosis and infusion of lidocaine will provide analgesia for motion and stability examination.

Imaging

(1) Anterior-posterior, lateral, and oblique elbow radiographs.
(2) Magnetic resonance imaging will provide further detail regarding ligament integrity in the setting of elbow dislocations.
(3) Computed tomography scan with 3-dimensional reconstruction will further define intra-articular fracture patterns and may be used to determine screw length preoperatively.

Equipment

Equipment required for the surgery are listed in the Table.

Positioning

We prefer the prone position for fracture management with a small bump under the upper arm.[2-5] The shoulder can be internally or externally rotated to allow open access to either

Table Standard arthroscopy equipment useful for arthroscopic management of elbow fractures and dislocations.

4.0 mm, 30° arthroscope	For visualization in most cases
4.0 mm, 70°arthroscope	To visualize the capitellum or radial head from a posterior portal when instrumentation is required from the soft spot portal
Retractors	Switching sticks, interchangeable cannulas, or blunt freer-type dissectors may be used to protect neurovascular structures
3.5 mm, full-radius shaver	For removal of fracture hematoma and debris
Fracture fixation implants	Kirschner wires (K-wires) may be used to assist with reduction and allows for placement of a cannulated screw. Absorbable suture and suture anchors made of PLLA should be available.
Fluoroscopy device	For intraoperative imaging of reduction and fixation
Skin suture	Portals along the lateral side should be closed to minimize prolonged drainage
Wound care	Small drain or incisional negative-pressure wound therapy (NPWT) dressing to reduce swelling and improve healing[1]

PLLA, polylactic acid.