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Daphne Beingessner, BMath, BSc, MSc, MD, FRCSC: Radiographs presented here demonstrate a fracture-dislocation of the elbow with a radial head fracture and a coronoid fracture, known as a terrible triad of the elbow. After completing a history, I would perform a physical examination of the extremity to evaluate the condition of the soft tissues, a neurologic examination of the extremity, and vascular perfusion of the limb. I would then proceed with closed reduction using conscious sedation and would splint the extremity in the position of maximal stability, which would likely be 90° of elbow flexion with the forearm in pronation. Postreduction radiographs would be obtained to better assess the radial head and coronoid and to ensure that the elbow is in an acceptable position.

This injury will require operative intervention to restore stability to the elbow. I typically do not obtain further imaging since I will be seeing all components of the injury during the surgical approach. My plan would be for fixation of the coronoid with sutures or screws (depending on the size of the fragment), radial head fixation or arthroplasty, and repair of the lateral ligaments. Consent would be obtained for possible external fixation if stability is unable to be restored, although this would be unusual in my practice.

The patient would be brought urgently (but not emergently) to the operating room.

A 63-year-old, right-hand-dominant woman sustained a fracture of the elbow. Anteroposterior (A) and lateral (B) radiographs of the elbow are provided. What would you do?
In the current patient given the bone quality, I would perform the radial neck osteotomy and place supine on the operating table with an arm table. A posterior midline incision curved slightly lateral over the tip of the olecranon would be made. The superficial fascia is often intact, and an incision would be made through Kocher’s interval. Usually, once the fascial incision is made, the deep dissection is already complete secondary to the injury, including avulsion of the lateral ligament complex from the lateral epicondyle.

I would first evaluate the radial head. If it is able to be fixed, I would carefully retract the fragments out of the way and evaluate the coronoid. If it is unable to be reliably fixed, which I suspect is the case in the current patient given the bone quality, I would perform the neck cut for the arthroplasty and then evaluate the coronoid. If the coronoid fragment is large enough, I would reduce and fix it with 1 or more 2-mm screws from posterior to anterior. If it is small, I would place a drill hole through the coronoid base from the dorsal surface of the ulna and suture the coronoid with a small amount of anterior capsule. The suture is tied at the same time as the ligament repair so it is not torn during further work on the radial head. The radial head would then either be repaired or replaced, and then, with the elbow reduced and the forearm pronated, the lateral collateral ligament complex would be repaired with suture anchors to the lateral epicondyle.

At this point, stability of the elbow would be tested and likely would demonstrate a stable joint through full flexion and extension. I let gravity assist extension so I am not holding the elbow reduced and getting a false sense of stability. I do not force terminal extension to protect the coronoid repair, but the elbow should be stable to at least 10° to 20° of extension. If it is not, then I would proceed with repair of the medial collateral ligament and possible placement of an external fixator; however, it is extremely uncommon to need these 2 steps in most injuries of this nature.

The elbow would be splinted in neutral to pronation at 90° flexion for 48 hours. At that point, active and active-assisted range of motion with the elbow at the side, avoiding varus stress, would be initiated. A lateral ligament protective protocol would be used to include full flexion and extension with the forearm pronated and supination at 90° of flexion or greater for approximately 3 to 4 weeks postoperatively. Avoidance of terminal extension for the first 3 weeks postoperatively provides protection to the coronoid repair, particularly if done with sutures. Heavier lifting and more aggressive stretching can be started at 6 weeks postoperatively.

Derek Donegan, MD: In the injury radiographs, a radial head fracture is seen in addition to elbow dislocation. The initial concern based on these radiographs is that this is a terrible triad injury of the elbow. Although nonsurgical management has been described, the majority of these injuries are treated surgically. Therefore, preoperative planning should begin from the initial consultation.

On initial presentation, it is paramount to obtain a good physical examination. A thorough inspection of the soft tissue around the elbow should be performed to ensure that this is not an open injury. In addition, a good neurovascular examination should be performed and documented. Once examined, a closed reduction should be attempted. Postreduction radiographs should be performed. Due to the complex anatomy around the elbow, advance imaging, typically in the form of a computed tomography scan, should be obtained to further define the injury pattern and assist in preoperative planning.

From a surgical perspective, preparation is key to success. All components of the injury need to be addressed in a stepwise fashion. I plan to have all fixation options available for use because many of the decisions are made intraoperatively. The lateral and medial aspects of the elbow should be easily accessible during surgery. This can be performed by a posterior-based incision, raising flaps laterally and medially as necessary, or by 2 separate lateral and medial incisions, if necessary.

I typically perform the deep lateral approach first to determine whether the radial head is fixable. If the radial head is not fixable, I perform the radial neck osteotomy and prepare the radial canal for an arthroplasty. I subsequently evaluate the coronoid to determine whether it is fixable from the lateral approach. If it is, I work from the inside out. If not, a medial approach should be performed. The coronoid should then be fixed. If the coronoid is too small for plate or screw fixation, I perform a lasso technique by passing sutures around the coronoid fragment into the anterior capsule and tying them down through bone tunnels into the olecranon. Often, I will use an anterior cruciate ligament guide to assure accuracy in my tunnel placement.

Once the coronoid is addressed, I fix or replace the radial head. Subsequently, the lateral collateral ligament is repaired through the use of suture anchors or bone tunnels. I tend to incorporate the extensor mass in the lateral collateral ligament repair to facilitate a more robust repair. Once these 3 components are fixed, I test the elbow stability. If the elbow is stable, then I begin to close. If the elbow is still unstable, then I perform a medial collateral ligament repair. I reevaluate elbow stability, and if the elbow is stable, then closure is performed. If the elbow is still unstable, then I will apply a static external fixator.

The postoperative rehabilitation protocol for this complex injury must balance elbow stability and early mobilization. Because immobilization of the elbow more than 4 weeks leads to consistently poor outcomes, I would immobilize this patient for no
more than 5 to 7 days. At first follow-up examination, I will place her in a hinged elbow brace and allow range of motion from full flexion to 30° of extension in full pronation, full supination, or neutral forearm rotation depending on ligament reconstruction with physical therapy. In addition, I allow full supination and pronation with the elbow flexed to 90°. Although its use has yet to be validated in the literature, I routinely prescribe indomethacin for 4 weeks for prophylaxis against heterotopic ossification.

REFERENCES

The authors have no relevant financial relationships to disclose.
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