CASE REPORT

Novel Technique in Coronoid Fracture Fixation—A Case Report

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Abstract

Coronoid process plays a critical role in ulnohumeral stability.[1–3] Coronoid process fractures are rare, and usually occur from avulsion by the brachialis muscle or may be part of a complex injury pattern associated with elbow dislocation.[4–6] Surgical treatment options described includes suture lasso, suture anchors, lag screws, and plating all of which have various merits and demerits.[1,7,8] We describe a minimal anterior incision & percutaneous K-wires to address coronoid process fractures which allowed anatomic reduction and stable internal fixation.

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A 28 year old male presented to the casualty with complaints of pain over his left elbow after a fall on the same day. On examination, the left elbow was swollen, with tenderness at the anteromedial aspect of the joint. Range of movements about the elbow was painful. Xray (Figure 1) showed a small bone fragment lying detached from the anterior aspect of the joint, radiologic picture suggestive of a fracture coronoid.

Fixation of the coronoid fragment was decided upon considering that the fragment was large and more than 50% of the articulating surface. The plan was to fix it with either sutures through brachialis and the fragment, anchored to the proximal ulna, or to use screws. But intraoperatively, an attempt was made to fix the fragment with minimal incision percutaneous K-wires introduced anteriorly. Thin K-wires of size 1.2 mm were introduced from anterior to posterior into the fragment and to the proximal ulna. The anterior arterial pulsation at the cubital fossa was palpated, and followed down to half a centimeter distal to the elbow crease, the likely location of the coronoid. Without removing the finger on the arterial pulse, and through a half centimeter incision, the Kwire was directed into the bone, directing it lateralwards into the coronoid. This lateralward direction after entry medial to the pulse was to prevent impalement of the median nerve, which lies about half a centimeter medial to the brachial artery at this point. The anterior tip of the K-wires were bent and pulled out from the posterior aspect so as to push the coronoid fragment into a reduced position. The tips of the K-wires were left outside posteriorly and the joint was immobilised in a plaster slab with the elbow in 90° flexion. Post Op X-rays (Figure 2) showed very good reduction of the coronoid fragment.

K wires were removed after 3 weeks and follow-up x-rays after removal of the K-wire (Figure 3) showed union of the Coronoid fragment. The functional outcome was good with a full range of painless motion (Figure 4). There was no elbow instability.

Figure 1. Lateral view showing displaced coronoid fragments.

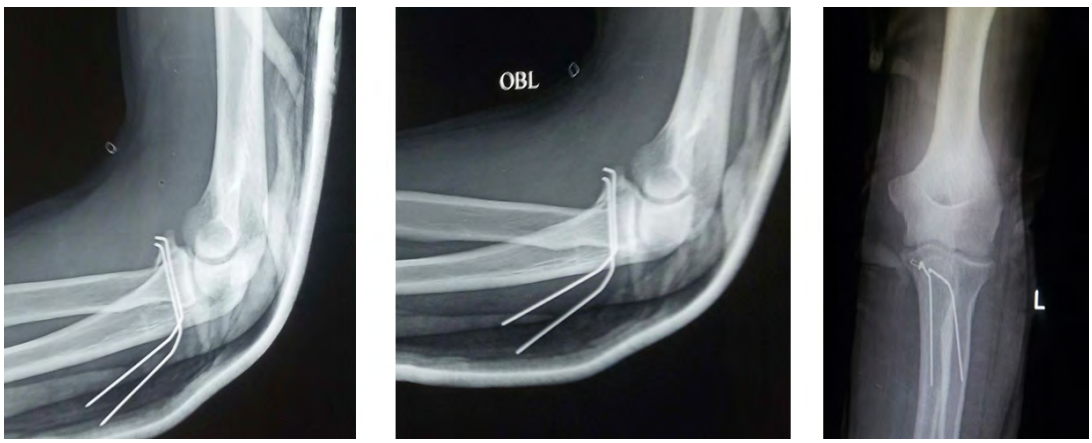

Figure 2. Post OP X-rays showing the coronoid fragment reduced in position by the bend K-wires.

Figure 3. X-rays after removal of K-wires.

Figure 4. Range of movements after removal of K-bands.

Discussion

Coronoid fractures account for less than 1-2% of all elbow fractures[9,10] and occurs in 2% to 15% of patients with dislocation of the elbow.[11] Isolated fractures of the coronoid process are extremely rare.[11,12] The mechanism is usually a fall with the elbow in full extension causing the anterior part of the coronoid process to shear.[13–15] However, other possible mechanisms have been described, either in combination or isolated, such as twisting and flexion, as well as hyperextension[16–20] described in baseball players and athletes.

The most widely used classification of these fractures is that of Reagan and Morrey[5,21] who distinguish type I, II and III fractures according to the percentage of bone detached from the coronoid process. Another classification is that of O'Drischoll[22,23] which subdivides coronoid injuries based on location and number of coronoid fragments. It recognizes anteromedial fractures caused by varus posteromedial rotatory force.

Diagnosis is usually based on plain radiographs, but it is not always easy to determine from which particular part of the elbow the bone fragment originates because images may be superimposed, or to distinguish a loose osteochondral fragment.[24,25] X-ray views described by Tomás such as the Oblique 45° projection with abduction of the arm and the elbow in 90° of flexion and the Oblique 45° lateromedial projection with anterior displacement of the arm and the forearm in full supination, may also be useful in such situations because they allow suitable visualisation of the coronoid process facet.[26,27]

Most authors emphasize the role of coronoid process in stabilising the elbow. This relatively safe and simple technique of fixation of coronoid fragment using K-wires described here can be performed for Regan and Morrey type II and above coronoid fractures.

The major limitation to closed pinning in this area is the presence of brachial artery and its branches anteriorly at the elbow, and the median nerve lying medial to the artery. The biceps tendon is a sure surface landmark, which is palpable. The artery and nerve lie on the anterior aspect of the coronoid, on its medial and lateral parts respectively. The brachial pulsations are also readily palpable at the elbow. The level of the coronoid is about 0.5 to 1 cm distal to the crease. The pulse is felt at this level, and not at the crease. Here, about a centimeter medial to the pulse is the median nerve. This narrow zone should be the intended zone of piercing of the K-wire. Even here, after entering, the K-wire is directed laterally on the bony resistance to minimize chances of median nerve impalement. This is not as yet a described technique. We ourselves developed it by accident in an intraoperative attempt to minimize approach and exposure. The satisfactory reduction on C-arm gave us the confidence to go ahead with the technique, and the anterior bend, intended to push the fragment back, was made on the wire. Vascular injury was not a concern as the pulse is a ready landmark which we would not injure. However, any nerve deficit, despite the anatomically assumed safe zone, was of concern until the patient recovered from anaesthesia. However, there were no signs of postoperative nerve involvement either.

We would like to emphasise that this is a not yet described technique, and that it will need fine tuning and development on methods to minimize chances of nerve involvement. However, the good reduction, and the very good functional outcome are quite encouraging to repeat this method in the future. The only limitation however is the rarity of these injuries.

References

1. Reichel LM, Milam GS, Reitman CA. Anterior approach for operative fixation of coronoid fractures in complex elbow instability. Tech Hand Up Extrem Surg. 2012 Jun;16(2):98–104.
2. Bone & Joint [Internet]. [cited 2016 Oct 9]. Available from: http://www.boneandjoint.org.uk/content/further-opinion/contribution-coronoid-and-radial-head-stability-elbow.
3. Wells J, Ablove RH. Coronoid Fractures of the Elbow. Clin Med Res. 2008 May;6(1):40–4.
4. Gadgil A, Roach R, Neal N, Maffulli N. Isolated avulsion fracture of the coronoid process requiring open reduction in a paediatric patient: a case report. Acta Orthop Belg. 2002 Oct;68(4):396–8.
5. Regan W, Morrey BF. Classification and treatment of coronoid process fractures. Orthopedics. 1992 Jul;15(7):845–8.
6. v13i3p296.pdf [Internet]. [cited 2016 Oct 9]. Available from: http://www.josonline.org/pdf/v13i3p296.pdf.
7. Pai V, Pai V. Use of suture anchors for coronoid fractures in the terrible triad of the elbow. J Orthop Surg Hong Kong. 2009 Apr;17(1):31–5.
8. Lee SK, Kim HY, Kim KJ, Yang DS, Choy WS. Coronoid plate fixation of type II and III coronoid process fractures: outcome and prognostic factors. Eur J Orthop Surg Traumatol. 2011 Jun 18;22(3):213–9.
9. Copy of Coronoid Fractures [Internet]. prezi.com. [cited 2016 Oct 9]. Available from: https://prezi.com/dzlu-n9yy2gx/copy-of-coronoid-fractures/.
10. Wells J, Ablove RH. Coronoid Fractures of the Elbow. Clin Med Res. 2008 May;6(1):40–4.
11. 18-Gsmez Navalsn et al.pdf [Internet]. [cited 2016 Oct 9]. Available from: http://www.actaorthopaedica.be/acta/download/2005-5/18-Gsmez%20Navalsn%20et%20al.pdf.
12. A014140105.pdf [Internet]. [cited 2016 Oct 9]. Available from: http://www.iosrjournals.org/iosr-jdms/papers/Vol14-issue1/Version-4/A014140105.pdf.
13. Ring D, Jupiter JB, Zilberfarb J. Posterior dislocation of the elbow with fractures of the radial head and coronoid. J Bone Joint Surg Am. 2002 Apr;84–A(4):547–51.
14. Josefsson PO, Johnell O, Wendeberg B. Ligamentous injuries in dislocations of the elbow joint. Clin Orthop. 1987 Aug;(221):221–5.
15. Josefsson PO, Gentz CF, Johnell O, Wendeberg B. Dislocations of the elbow and intraarticular fractures. Clin Orthop. 1989 Sep;(246):126–30.

16. Doornberg JN, van Duijn J, Ring D. Coronoid fracture height in terrible-triad injuries. J Hand Surg. 2006 Jun;31(5):794–7.
17. O'Driscoll SW, Morrey BF, Korinek S, An KN. Elbow subluxation and dislocation. A spectrum of instability. Clin Orthop. 1992 Jul;(280):186–97.
18. Doria A, Gil E, Delgado E, Alonso-Llames M. Recurrent dislocation of the elbow. Int Orthop. 1990;14(1):41–5.
19. Doornberg JN, Ring D. Coronoid fracture patterns. J Hand Surg. 2006 Jan;31(1):45–52.
20. Sanchez-Sotelo J, O'Driscoll SW, Morrey BF. Anteromedial fracture of the coronoid process of the ulna. J Shoulder Elb Surg Am Shoulder Elb Surg Al. 2006 Oct;15(5):e5-8.
21. Regan W, Morrey B. Fractures of the coronoid process of the ulna. J Bone Joint Surg Am. 1989 Oct;71(9):1348–54.
22. Park S-M, Lee JS, Jung JY, Kim JY, Song K-S. How should anteromedial coronoid facet fracture be managed? A surgical strategy based on O'Driscoll classification and ligament injury. J Shoulder Elb Surg Am Shoulder Elb Surg Al. 2015 Jan;24(1):74–82.
23. O'Driscoll SW, Jupiter JB, Cohen MS, Ring D, McKee MD. Difficult elbow fractures: pearls and pitfalls. Instr Course Lect. 2003;52:113–34.
24. McKee MD, Pugh DMW, Wild LM, Schemitsch EH, King GJW. Standard surgical protocol to treat elbow dislocations with radial head and coronoid fractures. Surgical technique. J Bone Joint Surg Am. 2005 Mar;87 Suppl 1(Pt 1):22–32.
25. McGinley JC, Roach N, Hopgood BC, Kozin SH. Nondisplaced elbow fractures: A commonly occurring and difficult diagnosis. Am J Emerg Med. 2006 Sep;24(5):560–6.
26. Imaging of Elbow Fractures and Dislocations in Adults: Overview, Radiography, Computed Tomography. 2016 Apr 26 [cited 2016 Oct 11]; Available from: http://emedicine.medscape.com/article/389069-overview.
27. The bends and flexures of forearm and elbow x-ray positioning [Internet]. AuntMinnie.com. [cited 2016 Oct 11]. Available from: http://www.auntminnie.com/index.aspx?sec=ser&sub=def&pag=dis&itemid=56736.