



Irreducible anteromedial radial head dislocation in a child caused by interposing brachialis tendons: a case report



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Traumatic anteromedial radial head dislocation is a rare injury in children. In most cases, the radial head is dislocated anterolaterally, presenting as part of the Monteggia injury.¹¹ Closed reduction is usually successful with ulnar bone correction. However, even after correction of the ulnar deformity, irreducible dislocation remains due to interposed soft tissue in the radiocapitellar joint, leading to the need for operative reduction.

A rare case of an irreducible anteromedial radial head dislocation caused by brachialis tendon interposition in a 7-year-old girl is presented.

A written, informed consent was obtained from the parents of the patient for publication of this case report and accompanying images.

Case report

A 7-year-old girl landed on the ground and twisted her right forearm with her right elbow hyperextended when she was performing a cartwheel on the floor during gymnastics. She was diagnosed with an anterior radial head dislocation at her local clinic. She presented to our hospital on the same day of the injury. Physical examination showed elbow swelling, pain, and severe functional limitation in elbow flexion and forearm pronation. She remained neurovascularly intact. On X-ray examination, anteromedial radial head dislocation with minimal plastic deformation

of the ulna was seen (Fig. 1). Closed reduction by repetitive flexion-extension and pronation-supination under X-ray fluoroscopic control was attempted under procedural sedation. However, it quickly re-dislocated, showing a soft-tissue block with an elastic sling on palpation. Magnetic resonance imaging (MRI) showed that the radial head buttonholed through the brachialis tendons (Fig. 2 and Video 1); therefore, it was decided to perform an open reduction under general anesthesia in the operating room.

Because it was difficult to clearly recognize why the dislocation of the elbow joint could not be reduced manually and to make an operative plan after MRI examination, open reduction of the elbow through Kaplan's approach in the supine position was performed eight days after the injury. The radial head was displaced anteromedially and secured just onto the ulnar bone. The superficial head of the brachialis tendon, which appeared at first likely to be the biceps tendon, was wrapped around the radial neck and interposed between the radial head and radiocapitellar joint as 'buttonholing'. The radial head could not be reduced to the correct anatomic position even with the elbow hyperextended and forced passive pronation-supination. The clinging tendon was untied from the radial neck using a small elevator and corrected into the anatomic position away from the lateral edge of the brachialis muscle easily. The radial head was then stable in anatomical joint congruency without correcting the plastic deformation of the ulna. The annular ligament and the joint capsule were repaired. The elbow joint was immobilized with an above-elbow plaster cast at a position of 90 degrees of elbow flexion and slight forearm supination for four weeks. The cast was removed, and progressive elbow joint and forearm motion exercises were started.

Six months after the surgery, the patient had a pain-free, fully active and passive range of motion of the elbow and forearm

Institutional Review Board approval was not required for this case report.

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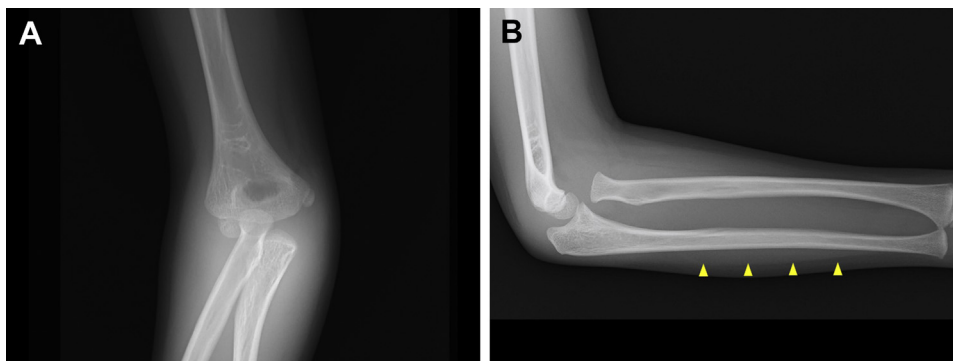


Figure 1 (A) Anteroposterior and (B) lateral radiographs of the *Right* elbow at the time of injury. The radial head is dislocated anteromedially with minimal plastic deformation of the ulna (arrow heads).

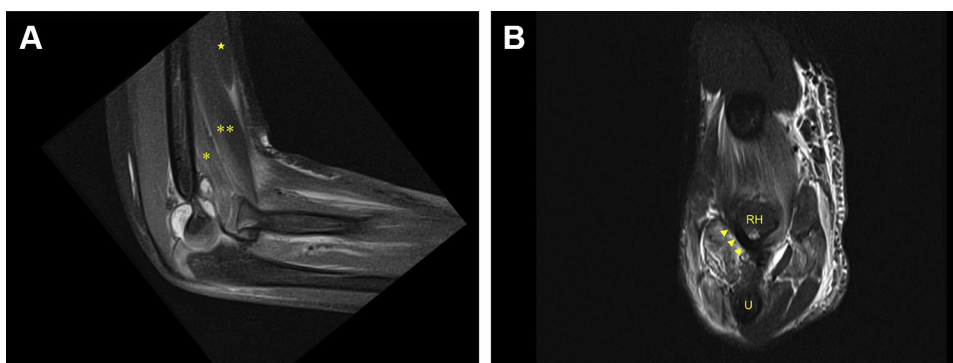


Figure 2 (A) Sagittal magnetic resonance image of the *Right* elbow showing the dislocated radial head, biceps muscle (star), superficial head of the brachialis muscle (double asterisks), and deep head of the brachialis muscle (single asterisk). The superficial head of the brachialis tendon is wrapped around the radial head, and the brachialis tendon acts as a suspensory sling. (B) Coronal magnetic resonance image of the *Left* elbow showing the dislocated radial head (RH) anterior to the ulnar bone (U). Note that the radial head is buttonholed through the brachialis muscle. The superficial head of the brachialis tendon is wrapped around the radial head (arrow heads).

without instability. At 3.5 years after the surgery, the patient had a fully active and passive range of motion of the elbow and forearm as well. Radiographic examination showed correct elbow joint congruency without heterotopic ossification.

Discussion

The radial head usually dislocates anterolaterally, whereas anteromedial dislocation is quite rare. For clinical cases requiring open operative intervention for the radial head dislocation, the most noted block to anatomic reduction was the annular ligament.¹⁰ To date, some authors have reported rare cases of irreducible anteromedial radial head dislocation in children caused by the biceps^{1,2,5,9,11,12} and brachialis tendons.^{3,4,8} These authors showed that the pathology causing an irreducible anteromedial radial head dislocation was either the biceps or the brachialis tendon ‘clinging’ to or ‘wrapping’ the radial head. Interestingly, Leonello et al.⁶ described two heads to the brachialis in their anatomic study. The smaller, deep head originates from the anterior distal third of the humerus and inserts broadly on the ulna just distal to the coronoid in the sagittal plane. The larger, superficial head originates from the middle third of the humerus and inserts distal to the deep head on the ulnar tuberosity in a more concise manner. The superficial head of the brachialis closely resembles the biceps tendon in both size and insertion site. Along with this study, Cates et al.⁴ and O’Driscoll et al.⁷ indicated that the biceps tendon, which the previous reports described as

‘clinging’ to or ‘wrapping’, had likely been mistaken for the superficial head of the brachialis tendon on cadaveric examination. We agree with their view. In fact, it was very difficult to identify whether the clinging tendon was the biceps or the brachialis tendon with the small surgical window. In the present case, the pathology could be confirmed as a ‘buttonholing’ brachialis tendon based on the preoperative MRI findings.

As in previous reports, in the present case, the interpositions could be united and reduced easily using small surgical devices. However, some authors noted the inability to maneuver the biceps or the brachialis tendon to the correct anatomic position, especially in delayed cases.^{9,11} They needed to perform a tenotomy of the tendon at the radial neck and then reattach the tendon to the bicipital tuberosity.

Conclusion

A rare case of an irreducible anteromedial radial head dislocation caused by a buttonholing brachialis tendon was presented. It is very difficult to predict the irreducibility of a radial head dislocation. So far, successful closed reduction of anteromedial dislocation has not been reported. In the present case, preoperative MRI was helpful to better understand the buttonholing brachialis tendon. With this in mind, anteromedial dislocation of the radial head should raise suspicion of the interposition of the brachialis tendon, and it may require surgical intervention after the failure of closed reduction.

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Supplementary data

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References

1. Abe M, Kumano H, Kinoshita A, Hirofuji S. Irreducible dislocation of the radial head associated with pediatric Monteggia lesions. *J Am Acad Orthop Surg Glob Res Rev* 2018;2:e035. <https://doi.org/10.5435/JAOSGlobal-D-17-00035>.
2. Armstrong RD, McLaren AC. Biceps tendon blocks reduction of isolated radial head dislocation. *Orthop Rev* 1987;16:104-8.
3. Camp CL, O'Driscoll SW. Transbrachialis buttonholing of the radial head as a cause for irreducible radiocapitellar dislocation: A case report. *J Pediatr Orthop* 2015;35:e67-71. <https://doi.org/10.1097/BPO.0000000000000516>.
4. Cates RA, Steinmann SP, Adams JE. Irreducible anteromedial radial head dislocation caused by the brachialis tendon: a case report. *J Shoulder Elbow Surg* 2016;25:e232-5. <https://doi.org/10.1016/j.jse.2016.04.017>.
5. Climent-peris VJ, Siera-Vercher J, Sanz-Amaro MD. Irreducible anteromedial dislocation of radial head with biceps tendon interposition. *Case Rep Orthop* 2016;2016:5812353. <https://doi.org/10.1155/2016/5812353>.
6. Leonello DT, Galley IJ, Bain GI, Carter CD. Brachialis muscle anatomy-A study in cadavers. *J Bone Joint Surg Am* 2007;89:1293-7. <https://doi.org/10.2106/JBJS.F.00343>.
7. O'Driscoll SW, Shields MN, Camp CL, Bain G. Irreducible anteromedial radial head dislocation due to transbrachialis buttonholing. In: Bain G, Eygendaal D, van Riet R, editors. *Surgical Techniques for Trauma and Sports Related Injuries of the Elbow*. Berlin, Heidelberg: Springer; 2020. p. 353-7.
8. Ozan F, Okur KT, Melez M, Ünlü ÖC, Yamak K. Traumatic anteromedial radial head dislocation in an adult: A case of brachialis tendon entrapment. *Cureus* 2019;11:e3924. <https://doi.org/10.7759/cureus.3924>.
9. Sasaki K, Miura H, Iwamoto Y. Unusual anterior radial head dislocation associated with transposed biceps tendon: A case report. *J Shoulder Elbow Surg* 2006;15:e15-9. <https://doi.org/10.1016/j.jse.2005.08.021>.
10. Upasani VV, Hentzen ER, Meunier MJ, Abrams RA. Anteromedial radial head fracture-dislocation associated with a transposed biceps tendon: A case report. *J Shoulder Elbow Surg* 2011;20:e14-8. <https://doi.org/10.1016/j.jse.2010.11.025>.
11. Veenstra KM, Eyken JW. Irreducible medial dislocation of the radius: A case of biceps tendon interposition. *Acta Orthop Scand* 1993;64:224-5.
12. Yoshihara Y, Shiraishi K, Imamura K. Irreducible anteromedial dislocation of the radial head caused by biceps tendon clinging around the radial neck. *J Trauma* 2002;53:984-6. <https://doi.org/10.1097/00005373-200211000-00028>.