An atypical case of medial radial head dislocation

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ABSTRACT

Radial head dislocations are common in children who fall onto outstretched hands. We present a case of medial radial head dislocation without a concomitant ulna fracture in a 14-year-old girl and the long-term sequelae of the injury.

KEYWORDS

Child – Dislocations – Elbow – Synostosis

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Radial head dislocations are a common diagnosis in children who sustain a fall onto outstretched hands. It is well described in the context of a Monteggia fracture, which is divided into four Bado types.

We present the previously unreported case of medial radial head dislocation without a concomitant ulna fracture in a 14-year-old girl and the long term sequelae of such an injury. Both the patient and the patient's mother gave written consent during the patient's final clinic follow-up for her case to be published as a report in the medical literature.

Case presentation

A 14-year-old female sustained a high-energy fall at height from a trampoline onto an outstretched arm, which is likely to have been accompanied by a rotational element. The patient presented to her local district general hospital with pain and fixed flexion at the elbow of 100°, with a 10° arc and her forearm locked in supination. The local hospital performed radiographs, which appeared atypical, with an abnormal radio-capitellar joint; however, no firm diagnosis was made (Fig 1). When her condition failed to improve with conservative measures, computed tomography (CT) was performed, demonstrating the highly unusual diagnosis of medial radial head dislocation across the coronoid process into the medial aspect of the joint. A closed manipulation under anaesthesia was attempted and, when unsuccessful, an opinion was sought from the regional tertiary referral centre.

The distal radio-ulna joint was also noted to be congruent, with no suggestion of the inter-osseous membrane disruption that is found in Essex-Laprest fractures (Fig 2).

Due to the complexity of the diagnosis and the failure of closed reduction, transfer to the tertiary hospital took place 4 weeks post-injury. The patient required an open reduction of the dislocated radial head through an open Kocher's

approach. The surgical team used a Kirshner wire, driven into the radial head, to reduce it over the coronoid (Fig 3). It was noted during her operation that she had complete disruption of the annular and lateral collateral ligaments, which were reconstructed using a triceps graft and a 3.5mm TwinFix anchor (Smith & Nephew, London and Hull, the UK) to the ulna to allow early postoperative movement (Fig 4).

After an initially successful recovery, she returned to the clinic with good restoration of elbow flexion and extension but a recurrence of fixed supination. We suspected a posttraumatic synostosis, which was confirmed on CT scan (Fig 5).

A second procedure was therefore performed with open arthrolysis, proximal radio-ulna joint debridement to remove granulation tissue and bone, bone wax to seal the bleeding bone and a dermofascial interposition graft from

Figure 1 Initial radiographs. Note the abnormal radio-capitellar joint and dysplastic capitellum

Figure 2 Initial radiographs of the distal radio-ulna joint, demonstrating congruity

Figure 5 An axial computed tomography segment demonstrating synostosis between radius and ulna

Figure 3 Intraoperative radiographs demonstrating pre- and post-reduction position

Figure 4 Clinical photographs demonstrating the ruptured annular ligament and the surgical reconstruction

the antecubital fossa. She was also started postoperatively on non-steroidal anti-inflammatory drugs (NSAIDs).

At her last follow-up, she had a good range of movement, with extension to 10°, flexion to 120°, full supination and pronation to 45°. Her QuickDASH Outcome Measure score was 5, indicating almost normal arm function.

Discussion

This case is the only reported incidence of a pure medially dislocated radial head. Others have reported anteromedial dislocations, with the radial head pushed up the slope of the coronoid,^{1–5} but none have reported the radial head being displaced over the tip of the coronoid and down the other side. The three-dimensional reconstruction in Figure 6 demonstrates the dislocation. We believe that this could be easily missed on plain films, and that CT would be a reasonable imaging modality in elbow injuries locked in supination or pronation.

A variety of blocks to reduction have been described in patients, including the biceps tendon,^{1,2} joint capsule,⁴ and even the radial nerve,⁵ but never the bony block of the coronoid.

This case is interesting and unusual due to the delayed complication of a posttraumatic synostosis. Traumatic synostosis is thought to be a form of heterotrophic ossification. It is likely in this case that, during the dislocation and likely fracture of the radial head, seeding of mesenchymal stem cells occurred through the cortical breach. Due to the patient's fracture, systemic osteogenic factors would have been released to promote healing of her fracture, such as bone morphogenic proteins, growth differentiation factors,

Figure 6 Three-dimensional reconstruction of the elbow joint demonstrating dislocation of the radial head

transforming growth factor beta, insulin derived growth factor and platelet derived growth factor. These signal to the mesenchymal stem cells seeded across the proximal radio-ulna joint to differentiate into osteoblasts or chondroblasts. These cells subsequently proliferate, causing bony growth in an inappropriate area.^{6,7}

Risk factors for posttraumatic synostosis include a Monteggia fracture, both bones being at the same level, open fractures, high-energy fractures with soft tissue stripping, head injuries and bone fragments across an interosseous membrane.

The main difficulty with managing posttraumatic synostosis is the prevention of recurrence. The pathological process of synostosis formation is derived from the bony injury, which is recreated during debridement. In this case,

the proximal radio-ulna joint demonstrated bony spurs with fibrous union across them. This was debrided back to bleeding bone; however, we were able to use bone wax during surgery to seal the bleeding edges of bone and thus minimise the load of any stem cells into the joint. We then performed a thorough lavage to, again, minimise the residual load of mesenchymal stem cells. Next, we used a dermo-fascial interposition graft. The fat acts as physical barrier to bone healing across the joint. It is, however, relatively avascular and, hence, prone to atrophy. The dermal component allows revascularisation and thus propagation of this barrier. To prevent formation of inclusion cysts, the epidermis must be fully separated from the graft.

Finally, we put the patient on NSAIDs. This is believed to interfere with the systemic release of osteogenic factors, thus reducing the potential for mesenchymal stem cells to differentiate into osteoblasts or chondroblasts.

Conclusions

We believe this case highlights the need for careful investigation of elbow injuries and the need to follow them up to ensure the resolution of seemingly innocuous injuries. It also highlights the need to follow up these fracture dislocations over long term to provide surveillance for delayed complications, such as the synostosis described here.

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