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A rare pediatric case of proximal radius exostosis with radio-capitellar joint dislocation-marginal resection with joint reconstruction

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Abstract
We present a case of a patient with an incidental finding of an isolated radial head osteochondroma. This progressively enlarged to become symptomatic causing gradual subluxation of the radio-capitellar joint.
Marginal excision and an annular ligament reconstruction was performed using a forearm fascia graft. The patient made a full recovery with symptom resolution and preservation of range of movement. He successfully returned to physical activity by the 3-month mark.

Keywords: Pediatric case, proximal radius exostosis, radio-capitellar joint, dislocation-marginal

Introduction
Osteochondromas are the most benign bone tumor. These benign tumors are derived from aberrant cartilage, and usually occur in the adolescent to young adult group. They can present in isolation as a solitary lesion, as part of multiple hereditary exostoses (MHE) or if neglected, in its late stage as a secondary chondrosarcoma (malignant lesion).
These lesions occur on bony surfaces and sites of tendon insertions. Osteochondromas most commonly present around the knee, proximal femur, proximal humerus and forearm. They can cause local symptoms due to pain and impingement, or even stiffness and deformities depending on their size and location [1].
We present a rare pediatric case of a solitary proximal radius exostosis causing chronic radial head dislocation. This was treated with marginal excision of the lesion with reconstruction of the radio-capitellar joint.

Case Report
The patient first presented during his early childhood years to the emergency department (ED) for swelling over the proximal forearm. He claims this occurred after he was slapped by his mother on the arm. He subsequently noticed a bony lump with associated “clicks” on elbow flexion and extension. He denied any pain prior to this presentation.
Prior to this, he had an unremarkable birth history. He was a full-term child born via normal vaginal delivery. Other than a past medical history of distal hypospadias, he was otherwise a healthy child with normal development.

Clinical Findings
Examination showed a 2x3cm bony lump over the radial aspect of his right elbow. He had a full range of motion of the elbow, and was neurovascularly intact. There were no other lumps noticed over the rest of the body. Imaging at the time showed a proximal radius exostosis with slight radial head volar subluxation. In view that he was clinically asymptomatic and there were no functional limitations, the decision was made to monitor the lesion with a 2-yearly follow-up.
Unfortunately, he started to develop pain in the right elbow after 1 year, and presented back to our outpatient clinic ahead of schedule. On examination, range of movement and neurovascular function was preserved, but there was pain on palpation of the bony lump.

Diagnostic assessment
Radiographs of the elbow and forearm showed an isolated bony exostosis arising from the radial head with dislocation of the radio-capitellar joint. (Figure 1)

There were no other lesions, and no deformities in the forearm.

Magnetic resonance imaging (MRI) was ordered at the second presentation. This was for further evaluation due to the development of pain, as well as for surgical planning. It showed a right radial head lesion that was continuous with the cortex and medullary canal of the radial shaft, likely an osteochondroma. The radial head concavity was maintained. MRI also revealed a 5mm cartilage cap. (Figure 2)

Differential diagnosis (If any)

The top differential was a bony exostosis based on clinical and radiological findings.

Therapeutic Intervention

He underwent marginal excision of the right elbow exostosis with annular ligament reconstruction. This was done via the Kocher's approach to the elbow. Intra-operative fluoroscopy was utilized to identify the exact location of the exostosis and physis. The excision was performed with osteotomes. (Figure 3)

The radio-capitellar was unstable following the resection and hence an annular ligament reconstruction was performed using the forearm fascia as a donor. This technique was adapted from Hui *et al*. [2] Through the same incision, a strip of fascia graft from the forearm was harvested and fashioned, leaving the proximal base attachment intact. The radial head was then reduced into the joint.

This graft was then used to reconstruct the annular ligament by slinging it around the radial neck, and secured with a tunnel in the ulna.

As intraoperative forearm rotation and elbow flexion and extension were stable post-reconstruction, a radio-capitellar joint transfixing wire was not inserted.

Post fixation, stability and reduction was checked with fluoroscopy. An above elbow back-slab was applied with the elbow at 90 degrees of flexion.

Follow-Up and Outcomes

Post-operatively, radiographs on arrival at the 1-week mark showed an enlocated elbow. (Figure 4) He was converted to a removable back slab, and allowed to range the elbow as tolerated. At the 3-month mark, range of movement at the time was full and equal to the contralateral limb. (Figure 5) He was allowed a graduated return to sports and other activities.

Discussion

Osteochondromas can present in different ways, depending on their location. They can be completely asymptomatic or picked up incidentally on radiographic evaluation of the region.

These lesions can also cause local symptoms such as pain, impingement with reduction of range of motion, neurovascular compromise, or growth deformities such as coxa valga or coxa vara. When in a peri-articular location such as in the radial head, there is the additional risk of ligamentous stretching and dysfunction resulting in loss of joint congruency [3].

The above case is a rare presentation of an isolated exostosis of the proximal radius with radio-capitellar joint dislocation. In some of these cases, one may expect abnormalities in the rest of the radius and ulnar shaft as described by Masada *et al*. [4] However in this particular patient, radiographs of the radius and ulna showed normal anatomy.

A literature search revealed cases that discussed acute dislocation of the radio-capitellar joint from solitary osteochondromas in the proximal radius. In the case described by Leung *et al*, the patient had known solitary osteochondroma for more than 15 years which was asymptomatic [5] This was a pedunculated osteochondroma at the level of the radial tuberosity that was spontaneously trapped in the bicep tendon, resulting in an acute dislocation.

Casstevens *et al*. described two cases of proximal radius exostosis that required excision due to local impingement on the posterior interosseous nerve and distal biceps tendon causing symptoms. In these cases, the exostosis was also at the metaphyseal region [6].

Niu *et al*. reported a case of chronic radial head dislocation from a solitary osteochondroma. In the case described, the patient presented with persistent elbow pain with limited range of motion. Radiographs revealed a radial head osteochondroma such as in our reported case, however, this was coupled with a radial shaft deformity with extensive bowing. Hence, he required marginal resection of the tumour, corrective wedge osteotomies of the radial neck and radial shaft, as well as annular ligament reconstruction [7].

The challenge with a chronic radial head dislocation is that the proximal radial-ulnar joint undergoes progressive re-modelling and deformity. Oka *et al*'s CT reconstruction study showed significant changes in radial head shape, radial notch size and cross-sectional area with longstanding dislocations of more than three years duration [8]. Fortunately, in our case, the articulating surface of the radial head was still concave, and there was no deformity on the ulnar side. As such, we recommend resection of such lesions earlier on in the disease as soon as the physis location can be identified on radiograph. This allows a safer resection and does not negate the chance of reconstructing the radio-capitellar joint due to chronicity of dislocation and remodelling of the radial head and proximal radio-ulnar joint.

The main goal of surgery was to ensure adequate resection of the lesion, as well as reconstruction of the ligament to allow for a stable, congruent joint. We employed a method that was described in a local institution primarily for chronic Monteggia lesions. This technique utilizes the nearby forearm fascia as an autologous graft for reconstruction of the annular ligament. It was highly suitable for this case and the excision as well as reconstruction could be achieved from a single incision.

In conclusion, the key takeaways from this case are as follows:

- In cases of radial head exostosis, to evaluate rest of forearm for deformities as part of pre-operative planning
- Careful assessment of radio capitellar joint congruity. If radial head subluxed or dislocated, consider chronicity of event as this may result in remodelling at the PRUJ
- Techniques employed for ligamentous reconstruction in chronic Monteggia injuries may be relevant in these cases.

Fig 1: Lateral and AP radiographs showing the proximal radius osteochondroma with anterior dislocation of the radio-capitellar joint

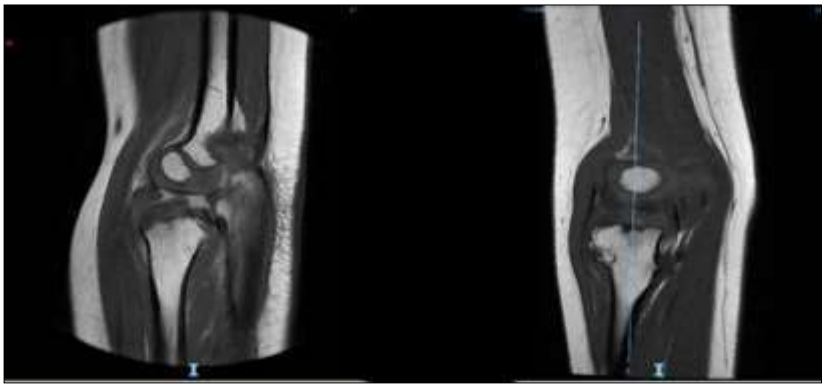

Fig 2: Sagittal and coronal T1 sequence MRI views , showing the morphology of the radial head.

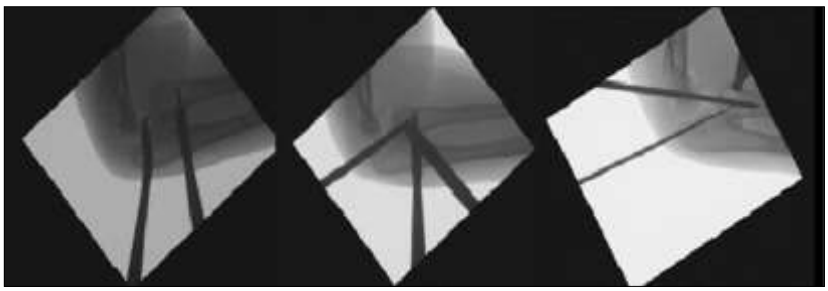

Fig 3: Intraoperative radiographs showing the identification of the lesion, and imaging guided osteotomy and resection.

Fig 4: Post-operative lateral and AP radiographs showing an enlocated radial head

Fig 5: Clinical pictures showing equal range of motion to the contralateral elbow

Informed consent
The patient and parent has given informed consent for publication of the case details.

Author's Contribution
Dr. Chan wrote the manuscript and performed the literature review around the topic of choice. Dr. Arjandas provided his mentorship and expertise for the case. Dr Wong proposed the surgical technique and performed the surgery. He provided guidance for the final case report submission.

Conflict of Interest
Not available

Financial Support
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