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Impinging exostoses of the proximal radius: a report of two cases with distinct clinical features

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Owing to the rotatory motion of proximal radius and the closely apposed anatomic structures, cortically based osseous lesions at the level of the proximal forearm may produce symptomatic impingement. While osseous impingement onto the adjacent proximal ulna may result in limited forearm rotation, impingement on the surrounding soft-tissue structures may produce symptoms as well. Here, we describe two cases of symptomatic proximal radius exostosis, each of which produced distinct clinical symptoms. In the first case, impingement on the posterior interosseous nerve produced symptoms of radiating forearm pain and paresthesia resembling radial tunnel syndrome. In the second case, impingement of the exostosis on the distal biceps tendon resulted in painful mechanical snapping with rotation of the forearm. In both cases, symptoms rapidly improved after surgical excision.

Impinging bony lesions may arise from a variety of etiologies including neoplasia, trauma, iatrogenic, or degenerative processes of adjacent joints or tendon insertions. In the upper extremity, exostoses are most commonly observed in the setting of neoplasia or due to post-traumatic causes. In the cases of neoplasia, they may occur in isolation as a solitary osteochondroma or in multiples in patients with multiple hereditary exostosis. Post-traumatic exostoses frequently occur in the phalanges and metacarpals, described classically as the "turret exostosis" by Wissinger and Boyes.[9] Similar lesions have also been reported in the metatarsals, neck of the talus, and on the coronoid process of the mandible.[2,4,5,7]

Around the elbow, impinging osseous lesions are frequently described in the context of post-traumatic olecranon and coronoid fossa osteophytes, heterotopic ossification, malpositioned fracture fragments, and radioulnar synostosis.[8] In this context, they cause limitation in the elbow flexion-extension arc or in forearm rotation owing to the highly congruous articulations between the distal humerus, proximal radius, and proximal ulna.[8] In addition, multiple tendinous and neurovascular structures cross the elbow in close proximity to this articulation. While much of the literature focuses on loss of motion at the elbow, symptoms may manifest secondary to impingement of osseous lesions on these soft-tissue structures as well. In the present work, we describe two cases of exostosis of the proximal radius with distinct clinical features produced by impingement on adjacent soft-tissue structures. In the first case, a post-traumatic exostosis after a radial neck fracture was found to produce symptoms similar to radial tunnel syndrome owing to its impingement on the adjacent posterior interosseous nerve. In the latter case, a solitary osteochondroma of the proximal radius produced symptomatic snapping of the biceps tendon as the forearm was moved through its arc of rotation. Awareness of these atypical clinical presentations may aid in patient evaluation and surgical planning for osseous lesions about the proximal forearm.

Case 1

A 43-year-old woman presented to clinic 10 weeks after sustaining a minimally displaced left radial neck fracture after a fall onto an outstretched hand. This was initially treated nonoperatively and progressed to radiographic union; however, she continued to endorse pain over the lateral aspect of left proximal forearm.

Physical examination was notable for tenderness with palpation over the radial tunnel. Deep palpation over the proximal radius during forearm rotation demonstrated a firm mass that moved with forearm rotation. Her forearm pronation was limited to 60 degrees on the right compared with the contralateral side, which measured 80 degrees. Supination was full and equal to the contralateral side.

Radiographs of the left elbow (Fig. 1) demonstrated her prior radial neck fracture to be well-healed and well-aligned; however, a 1-cm exostosis was noted to project from the radial aspect of the radial neck. Computed tomography of the left elbow (Fig. 2)

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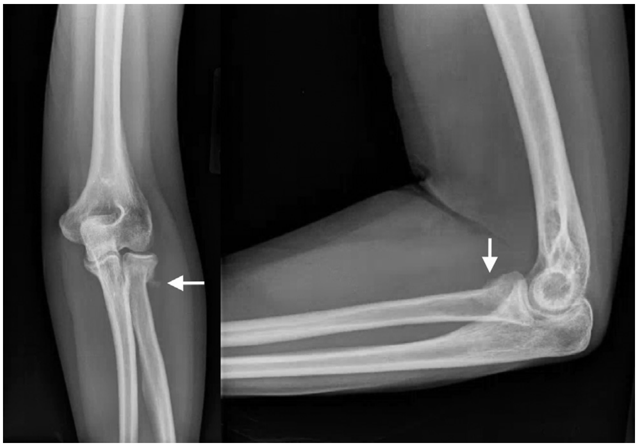

Figure 1 Preoperative AP and lateral radiographs of the left elbow demonstrating 1-cm exostosis (*white arrow*) projecting from the radial aspect of the radial neck.

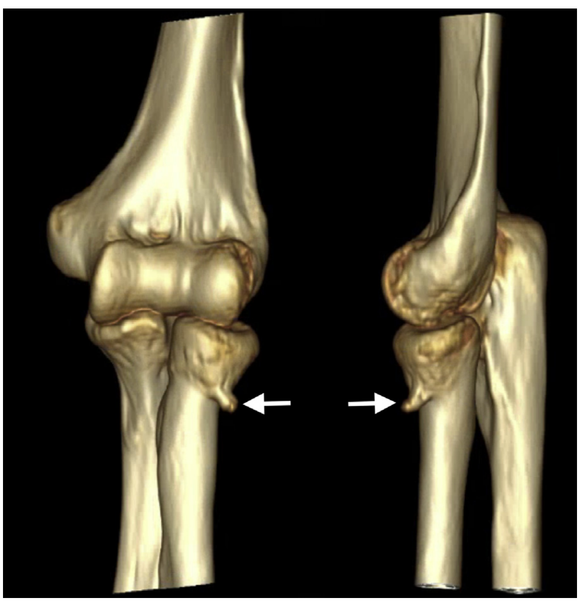

Figure 2 Preoperative 3-dimensional CT reconstructions of the left elbow demonstrating 1cm exostosis (*white arrow*) projecting anterolaterally from the site of prior radial neck fracture along the expected course of the PIN. *CT*, computed tomography; *PIN*, posterior interosseous nerve.

revealed that the exostosis projected along the expected course of the posterior interosseous nerve (PIN).

We decided to excise the exostosis and performed an anterolateral common extensor splitting approach exposing the PIN, the exostosis on the radial neck, and the radiocapitellar joint, maintaining the integrity of the lateral collateral ligament complex. This exposure was necessary to safely expose the PIN and the radial neck to address the pathology. Given the proximity of the pathoanatomy to the joint, the senior author thought it prudent to open the joint for orientation and to visualize the mechanics of the proximal radioulnar and radiocapitellar joints and the lesion during joint motion. The PIN coursed directly over the exostosis (Fig. 3) and snapped over it with forearm rotation (Video 1). Once the exostosis was excised, the snapping resolved. Examination of the PIN was not remarkable for any lesion of the nerve.

At final follow-up, her lateral elbow pain had resolved, and range of motion was full and equal to the contralateral side. Radiographs demonstrated no recurrence of the excised exostosis (Fig. 4).

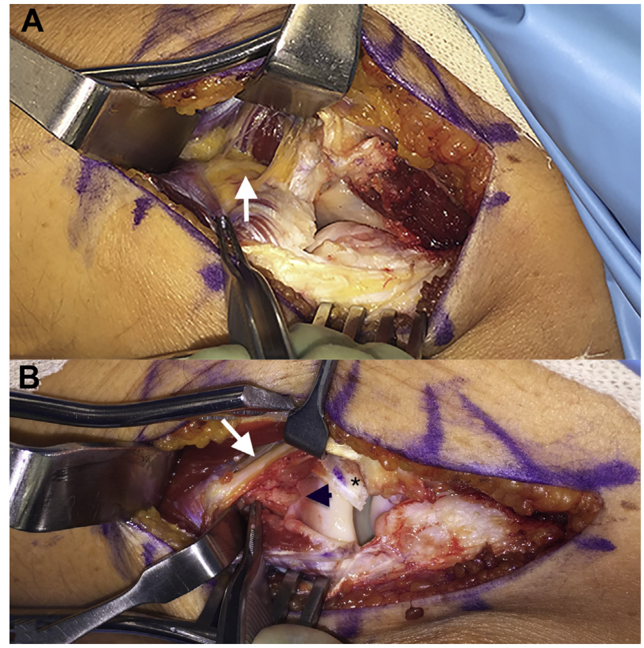

Figure 3 Intraoperative photograph demonstrating (**A**) the course of the PIN at the lateral aspect of the elbow after division of the muscle fibers of the supinator. (**B**) Retraction of the PIN anteriorly, further dissection of the muscle fibers of the supinator, and division of the annular ligament (*) demonstrates a 1-cm exostosis projecting from the site of the patient's prior radial neck fracture, directly underlying the course of the PIN. *PIN*, posterior interosseous nerve.

Case 2

A 60-year-old man presented to clinic with a snapping sensation in the antecubital fossa of the right elbow for the past 3 to 4 years that had become increasingly painful.

Physical examination was notable for a firm, painless mass within the subcutaneous tissue of the antecubital fossa. The mass was noted to move radially and ulnarly with pronation and supination of the forearm, respectively. A painful snapping of the distal biceps tendon over the mass was elicited with forearm rotation (Video 2). His forearm pronation was limited to 65 degrees on the right with a hard end point, compared with 80 degrees on the contralateral side. Supination was full and equal to the contralateral side.

Radiographs of the right elbow (Fig. 5) demonstrated an exostosis projecting from the radial neck, proximal to the bicipital tuberosity.

We elected to excise the exostosis. We approached the elbow anteriorly, exposing the biceps tendon dissecting down to the insertion on the radial tuberosity. A large venous plexus was encountered overlying the mass, requiring ligation and division. The distal biceps tendon was stretched over the mass with an interposed layer of bursal tissue. The mass was exposed demonstrating a pedunculated osteochondroma with a gray cartilage cap (Fig. 6). Snapping of the biceps tendon over the osteochondroma was visually confirmed with passive forearm rotation (Video 3). The mass was excised at the base of its stalk, which was noted to be confluent with intramedullary canal of the proximal radius. After excision, forearm pronation was improved with resolution of snapping at the distal biceps tendon. There was attritional rupture of the proximal one-third of the distal biceps tendon. This was repaired with a 3.5-mm suture anchor placed at the proximal footprint on the bicipital tuberosity, preloaded #2 nonabsorbable suture, and a Krackow stitch.

At final follow-up, his snapping symptoms had resolved, and range of motion was full and equal to the contralateral side.

Figure 4 Postoperative AP and lateral radiographs demonstrating complete excision of exostosis without recurrence at final follow-up.

Figure 5 Preoperative AP and lateral radiographs demonstrating large pedunculated exostosis (*white arrow*) arising at the proximal aspect of the bicipital tuberosity.

Radiographs demonstrated no recurrence of the excised exostosis (Fig. 7), and final pathology was consistent with osteochondroma.

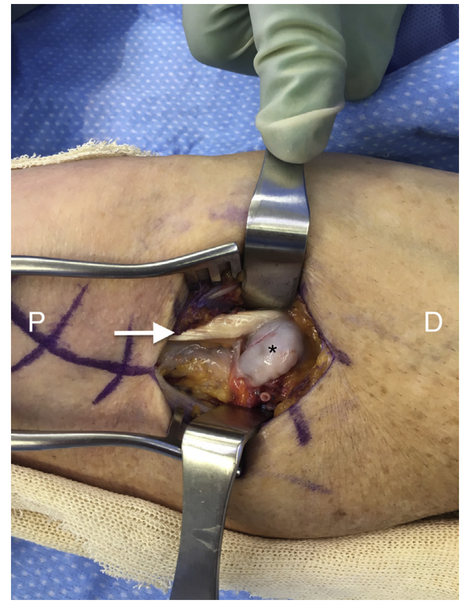

Figure 6 Intraoperative photograph demonstrating large osteochondroma with gray cartilage cap (*) impinging on the distal biceps tendon (*white arrow*). *D*, distal; *P*, proximal.

Figure 7 Postoperative AP and lateral radiographs demonstrating complete excision of proximal radius osteochondroma. Suture anchor (*white arrow*) at the proximal aspect of the bicipital tuberosity after repair of partial distal biceps tendon rupture. Small vessel clips visualized in superficial soft tissues.

Discussion

In the initial description by Wissinger et al,[9] the acquired or "turret" exostosis was described as an ossifying hematoma arising over the dorsum of the phalanx or metacarpal after trauma. They proposed a mechanism in which traumatic injury results in formation of a subperiosteal hematoma that ossifies owing to the persistent function of the adjacent periosteum and limited path for egress.[9] In their series, they describe impingement on the adjacent extensor mechanism of the digit as a cause of limited digit flexion and persistent symptoms.[9]

Other authors have noted confusing and redundant terminology surrounding reactive periosteal lesions after trauma with terms including ossifying hematoma, periosteal ossification, Nora's lesion, turret exostosis, and acquired exostosis used to describe what may be the same entity.[1] They can be distinguished from osteochondroma because the classic osteochondroma is continuous with the intramedullary canal of the affected bone. In contrast, the acquired post-traumatic lesion is cortically based and follows a progression of ossification and maturation after an initial trauma.[6,9] This distinction is highlighted in the present cases with the former demonstrating typical features of an acquired exostosis and the latter case representative of a solitary osteochondroma.

In a case reported by Ng et al,[6] paresthesias along the radial border of the arm and reduced sensation in the distribution of the superficial branch of the radial nerve were noted; however, they discuss bicipitoradial bursitis as the predominant cause of pain in their patient and did not describe mechanical impingement on the posterior interosseous nerve. The first case we present had similar clinical features, but bicipitoradial bursitis was not a predominant feature noted intraoperatively or on imaging and we were able to observe perturbation of the course of the posterior interosseous nerve intraoperatively with rotation of the forearm. In the present case, the nerve was decompressed and the exostosis excised through an anterolateral approach. Anterior and posterior approaches to the posterior interosseous nerve are also described at this level each of which has advantages and disadvantages for exposure and safety.[10] The senior author preferred the anterolateral approach owing to its ability to visualize the PIN, radial neck, and associated exostosis and radiocapitellar joint to fully visualize the pathoanatomy and treat it.

Kim et al[3] describe a case similar to our second case of impingement on the distal biceps tendon by a solitary osteochondroma that resulted in distal biceps rupture with elbow flexion and supination weakness. In contrast to the present case in which snapping was noted on clinical examination, they describe an insidious onset of pain over a four-month period preceding presentation to the orthopedic clinic. While they considered that the osteochondroma may have been an incidental finding coincidental to the distal biceps rupture, based on their surgical finding that the osteochondroma occupied the radioulnar space completely during forearm pronation, they hypothesized that mechanical impingement had led to attritional rupture.[3] Our second case provides further evidence for this mechanism because partial tendon attrition was associated with mechanical snapping of the distal biceps that could be reproduced clinically and intraoperatively.

Conclusion

Although uncommon, impinging osseous lesions of the proximal radius may produce significant pain and disability. The anatomic considerations illustrated by these two cases may provide guidance in assessment of atypical symptoms arising from impingement on soft-tissue structures and aid in planning for surgical resection.

Conflicts of interest

The authors, their immediate families, and any research foundations with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

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Patient consent

Obtained.

Supplementary data

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