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Editorial

Supernumerary Elbow Bones and their Differential Diagnosis

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This editorial reviews the literature on supernumerary elbow bones, including accessory ossicles and sesamoids, defines their differential diagnosis, and presents illustrative cases from our orthopaedic practice.

Accessory ossicles (AO) are either additional centers of ossification or posttraumatic fragments of secondary ossification centers. In both cases, they remain unfused or fail to unite in adulthood. AO are distinct from sesamoids, which, although structurally similar, are located within a muscle or tendon and serve to improve joint biomechanics. Recent studies indicate that AO and sesamoids form during the embryonic period or in response to local stresses [1-3]. Seven types of supernumerary bones have been identified in the elbow: supratrochleare anterius (ventrale), supratrochleare posterius (dorsale), subepicondylare mediale (ulnar humeral apophysis), subepicondylare laterale (radial humeral apophysis), tricipitale (patella cubiti), conoid (brachiale), and the ununited ossification center of the olecranon process. Five types are extraarticular, while the anterius and posterius supratrochleares are intraarticular. In addition, four types are sesamoids: two are located at the common origin of the extensor and flexor muscles, and the other two are located in the tendons of the brachialis and triceps brachii muscles. The most frequently detected types were the os subepicondylare mediale (0.46%) (Figure 1) and the os subepicondylare laterale (0.21%) (Figure 2). On radiographs, supernumerary bones appear as smooth, discrete osseous structures that are rounded, oval, or conical in shape [4,5]. The term fabella cubiti accurately refers to a sesamoid bone of the biceps tendon, but not to an intra-articular ossicle of the fossa coronoidea [6]. A pseudo-articulation of the AO may also be visible on radiographs [7].

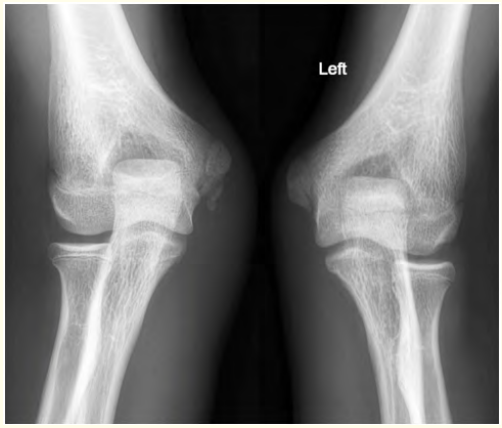

Figure 1: *A 14-year-old boy with a unilateral os subepicondylare mediale, a pseudo-articulation, and a multipartite medial epicondyle ossific nucleus on the right humerus.*

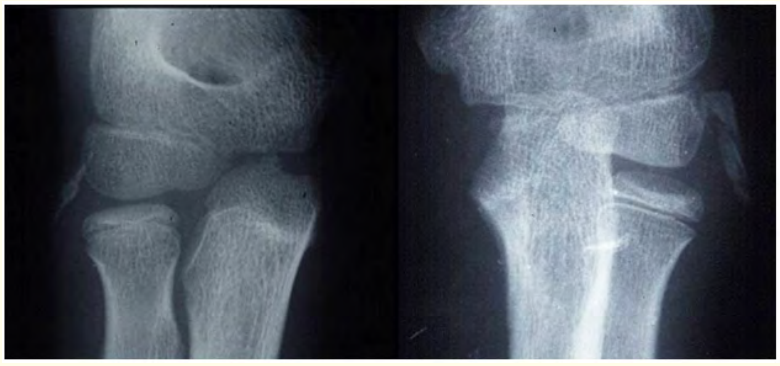

Figure 2: *A 9-year-old boy was examined after a left elbow injury. Radiographs showed a bilateral os subepicondylare laterale with pseudo-articulation. A diagnosis of a genetic or acquired disorder, such as neurogenic, traumatic, or idiopathic, was excluded. Post-immobilization, both elbows were painless with no limitation of movement.*

Most supernumerary bones remain asymptomatic throughout adulthood. However, some may become symptomatic, typically following trauma. Intraarticular AO complicated by catching, locking, a reduced range of motion, persistent pain, and swelling may necessitate surgical removal. Similarly, sesamoids that cause pain and restrict movement due to tendon dysfunction may need to be removed [8].

Supernumerary bones in both children and adults are usually diagnosed as incidental radiographic findings following an elbow injury and are defined as normal variants. In pediatric elbow trauma radiography, supernumerary bones may be overlooked or misinterpreted as avulsion fractures, aseptic necrosis, or osteochondritis dissecans. A pediatric study has emphasized that irregularities or multipartite elbow ossification centers may mimic fractures in the context of elbow trauma [9].

In our pediatric practice, when considering conservatively treated avulsion fractures of the medial epicondyle, it should be noted that callus healing may occasionally be misinterpreted as a multipartite medial epicondyle nucleus. This is due to the physis of the medial epicondyle being present between the epiphysis and hard callus formation. This multipartite radiographic appearance due to callus formation has previously been reported in the literature [10]. Additionally, irregularity of the trochlea's ossification centre (Hegemann's disease), which produces a fragmented particle shape, as well as a bipartite ossification centre of the olecranon, can mimic fractures (Figure 3).

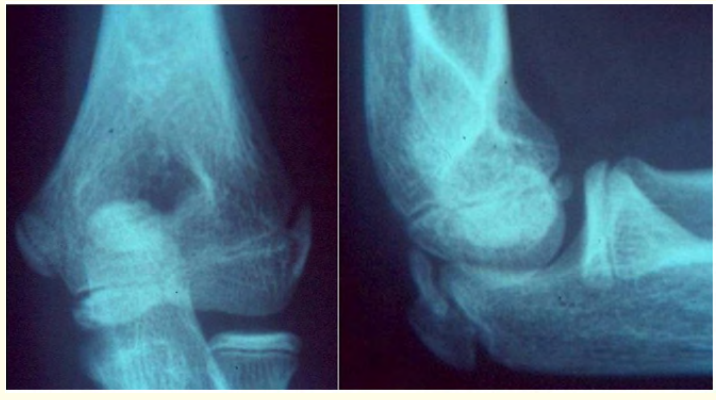

Figure 3: *A 10-year-old girl was examined after an elbow injury. Avascular necrosis of the humeral trochlea was incidentally diagnosed. In the lateral view, a round osseous structure was evident anteriorly to the distal humeral epiphysis. This was due to the fragmented particle-like shape of the humeral trochlea ossification centre and should not be confused with a fracture, loose body due to osteochondritis dissecans, or a sesamoid in the brachialis tendon. A bipartite ossific nucleus of the olecranon was also evident, which should not be confused with a fracture.*

Further misdiagnoses of supernumerary bones in adults include persistent epiphyses, atypical bones, ectopic ossifications, degenerative changes, and synovial osteochondromatosis (Figure 4). In adults, an os subepicondylare mediale may be confused with calcification secondary to injury to the medial collateral ligament, which can be primary or secondary to elbow subluxation or dislocation, and vice versa (Figure 5). Furthermore, ectopic ossification within the common origin of the extensor tendons should not be misinterpreted as an os subepicondylare laterale (Figure 6). Os tricipitale misdiagnoses in adults include an olecranon spur, calcification of the triceps tendon, calcific bursitis dorsal to the triceps tendon, and loose body.

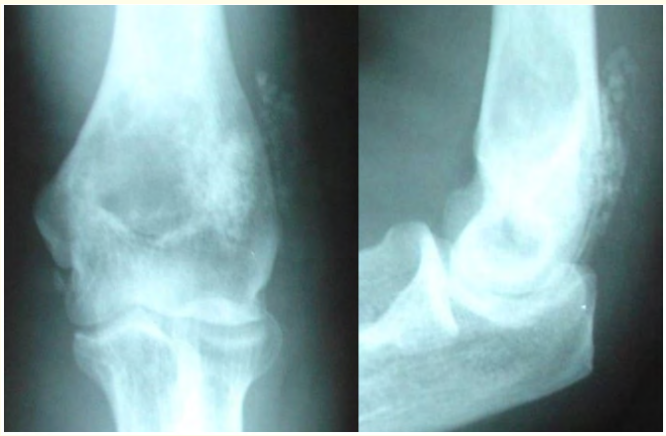

Figure 4: *A patient with primary synovial chondromatosis of the elbow. This should not be confused with the os subepicondylare mediale or the os supratrochleare posterius.*

Figure 5: *A 50-year-old man was admitted to the hospital following a traffic accident. He suffered from a closed head injury that caused a coma. The elbow dislocation was treated with closed reduction. Following recovery, calcification of the medial collateral ligament was evident in the radiographs. He was diagnosed with a non-neurogenic, post-traumatic ectopic ossification.*

Figure 6: *Ossification resulting from chronic elbow epicondylitis. This should not be confused with an os subepicondylare laterale.*

A review of the literature revealed that no studies have been conducted on supernumerary bones in children. Only a few case reports in adults have been published. This may be directly related to the wide range of misdiagnoses of supernumerary bones around the elbow in both children and adults. In our pediatric practice, supernumerary elbow bones are extremely rare. It should be noted that a diagnosis of an ultimately unossified bone can only be made with certainty in adults. Although ectopic ossification in the elbow is common in children [11], it is even more prevalent in adults due to its increased etiopathological background.

This paper does not aim to evaluate the statistical findings presented in the literature regarding the incidence of supernumerary bones in elbow radiography. However, in our practice, ectopic ossification in the medial and lateral subepicondylar regions is frequently detected incidentally on radiographs. These lesions can appear on radiographs as being almost identical to supernumerary bones. Therefore, it can be assumed that the diagnosis of supernumerary elbow bones in adults may often be inaccurate. In pediatric radiography, it is crucial to know the precise anatomical location of the AO and sesamoids in the elbow region in order to prevent misdiagnosis of fractures and vice versa (Figure 7). We consider that the clinical findings should drive treatment recommendations following elbow trauma radiography in children with evidence of a supernumerary bone but no fracture. We typically proceed with immobilization in a plaster splint for symptomatic children and conduct regular weekly follow-ups. The persistence of clinical symptoms after the first couple of weeks suggests an occult fracture, which may become evident on radiographs following periosteal healing. In addition, in children diagnosed with a supernumerary bone following elbow injury, radiographic follow-up is valuable to ensure that its contour and dimensions remain intact. It should be noted that the growth plate in children is weaker than the surrounding tendons, ligaments, joint capsule, and bone. Therefore, unlike in adults, traumatic injuries to the developing skeleton are more likely to result in avulsion and physeal injuries, rather than ligamentous ones [12].

In conclusion, the radiographic diagnosis of supernumerary elbow bones is commonly missed or misinterpreted in children. On the contrary, ectopic ossification in adults is often misdiagnosed as a supernumerary elbow bone. To ensure that patients receive the necessary treatment and are handled safely without the use of sophisticated imaging techniques, it is essential that clinicians, surgeons, and radiologists are familiar with the radiographic location and appearance of these bones and lesions.

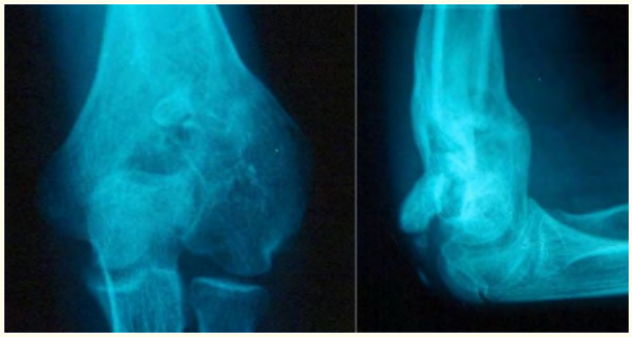

Figure 7: *A 14-year-old girl with a healed comminuted supracondylar humeral fracture that was treated conservatively. Although the radiographic appearance could be consistent with an os supratrochleare posterius, this is actually a free fragment. The two smaller posterior osseous structures are also bone fragments.*

Conflict of Interest Statement

The author certifies that he has no commercial associations (such as consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted article. The author received no financial support for this study.

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