

Morphometric Study of Exophytic Growths of the Humerus and its Clinical Implications

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Exophytic growths of humerus are rare anatomical variant which can be misdiagnosed as osteochondroma, benign lesion that occurs in the diaphysis of the bone. Case series: 100 adult humeri from osteological collection of department of Anatomy, Yenepoya Medical college, Mangalore, India were procured for the study and examined for any morphological variations. Two of 100 humeri presented with exophytic growths. One humerus presented with a bony projection from the anteromedial surface of the humerus about 6 cm above the medial epicondyle. Another humerus showed a lateral osteophytic growth. Both are rare anatomical variants. Knowledge of exophytic growths of bone is essential for clinicians because of its occasional presence for differential diagnosis and surgical management. Such anatomical variations can be a morphological indicator in the recognition of different races, as the incidence of such cases was reported more among Turkish population.

Key words: Humeri, exophytic growth, supracondylar process, variations

Introduction

Exophytic lesions are usually incidental finding that includes anatomical variations, arthritic changes or as sequelae of metabolic defects [10]. Exostosis is a benign growth of bone extending outwards from the cortical surface of the bone more commonly from the metaphyseal region of long bones. Most common type of exostosis includes osteochondroma which is differentiated histologically by the presence of cartilage. Osteochondroma is a benign bone tumour with an incidence of 1-2% [23]. Exophytic growths of the immature skeleton generally affect the extremities of the long bones resulting in deformities. They usually occur singly, but a multiple form of presentation may be found. They are easily diagnosed as they have a very characteristic

appearance. When presented in axial skeleton, malignant transformation of the lesion can sometimes make it difficult to identify osteochondromas immediately by means of radiographic examination because of unusual site of presentation [25]. Other bone lesions that mimic osteochondroma can be of diagnostic and therapeutic challenge due to its clinical similarity and rarity of presentation [21]. Most of the diagnosis is made due to neurovascular compression symptoms. The progress of such exophytic growths is unpredictable with some remain throughout life without any complications, some disappear and few undergo malignant transformation. Such growths are mostly seen in bones with endochondral ossification [2, 22, 14] as bones of the shoulder, legs and pelvis. Benign exostosis is generally asymptomatic but when it is symptomatic the pain may be due to the adjacent structures being affected. Exostosis may limit the range of motion of the affected bones like flexion or rotation. Osteochondromas can interfere with the development of the skeletal system and may give rise to deformities of the limbs and thereby the consequences could be malalignment of the joints, bowing or adjacent bone dislocation. Other complications include fracture, osseous deformities, bursa formation neurological symptoms [4, 12]. Many conditions can mimic osteochondroma. Hence the differential diagnosis of osteochondroma include Subungual Exostosis (also referred to as Dupuytren exostosis), Dysplasia Epiphysealis Hemimelica (Trevor Disease), Turret Exostosis, Bizarre Parosteal Osteochondromatous Proliferation (Nora lesion), Parosteal osteosarcoma, Juxtacortical chondroma, Subperiosteal hematoma [3, 8, 16, 17].

The aim of the study was to identify any exophytic growths associated with humerus and to define morphometric parameters about that. In the present study we report 2 cases: a case of supracondylar process of humerus and an outgrowth from lateral surface of humeral diaphysis. Reporting of such exophytic variations can reduce misdiagnosis and improve symptoms with surgical excision.

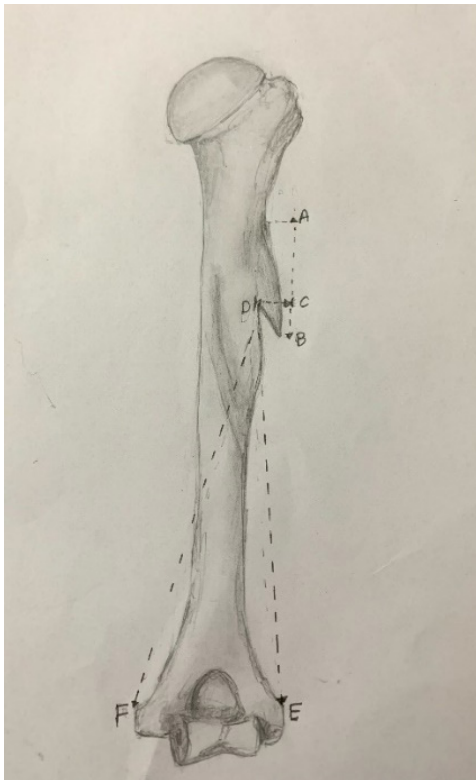


Fig. 1. Schematic representation of the first case. Distance AB shows the length of the spur. Distance CD shows the breadth at its base. DE is the distance of spur from lateral epicondyle of humerus and DF is the distance from medial epicondyle of humerus.

Material and Methods

Out of 100 humeri which was randomly procured from the osteological collection of Department of Anatomy, Mangalore, India, two humeri showed unusual bone projections with an incidence of 2%. Both bones belonged to the right side. The dimensions of bone growths were measured, tabulated and photographed. The following measurements like length of the spur, breadth at its base, the distance from nutrient foramen, the distance from the process to the medial and lateral epicondyle, distance from highest point on head of humerus and trochlea (**Fig. 1**) were measured with sliding calipers. The remaining parts of skeletons of these specimens were not available for the study.

Results

Case 1: During routine evaluation an unusual bony projection was observed from lateral surface of humerus. The tip of the process was sharp and the base where it is attached to humerus presented a foramen. There were no other signs of pathology observed along the entire bone. There were no signs of fracture healing or other deformities observed. The distance measured is tabulated in **Table 1**.

CASE1



CASE2



Fig. 2a. Right humerus with lateral exophytic growth (**2b**) Right humerus with supracondylar process

Case 2: The supracondylar process was directed laterally from the anteromedial surface of the distal part of humerus. The process was 2 cm long, 0.8 cm wide. Thickness was 1 mm and the process projected at an angle of 80 degree from the shaft. The rest of the humeral architecture appeared to be normal with no hyperplasia. Metric measurements related to the process measured is tabulated in **Table 1**.

Table 1. Dimensions of exophytic process of humerus

Parameter	Case 1	Case2
Length of the spur	2.4 cm	2 cm
Breadth at its base	0.8 cm	0.8 cm
Distance from lateral epicondyle of humerus	13 cm	6.3 cm
Distance from medial epicondyle of humerus	15 cm	5.4 cm
Distance from nutrient foramen	5.5 cm	5.9 cm
Distance from highest point of head of humerus	11.9cm	24.9 cm
Distance from trochlea	15 cm	5.5 cm

Discussion

Variations in skeletal data are vital in anthropology and important for radiologists, anaesthesiologists and surgeons for diagnosis and treatment [20]. Myositis ossificans includes all tissue reactions that occur due to trauma and result in bone or cartilage formation, it can be either extraosseous, periosteal and paraosteal [5]. Detailed understanding of evolution is necessary for proper classification. Haiet *et al* noted that such lesions usually develop in relation with large muscle masses. It follows injuries in which these masses get compressed against the bone and may lead to avulsion of tendons and fascia from their attachment and contributes to the etiology of such growths [7]. First case reported in this paper is unique as there was a process arising laterally from the upper diaphysis of humerus. No soft tissues were attached to dry bone and can be due to ossification of lateral intermuscular septum due to stress caused by nearby muscles [1]. The case presented goes with the factor that myositis ossificans developed after crush injury with tearing of periosteum. This can be correlated with Tackler's exostosis which has a constant location that is lateral aspect of humeral shaft [6]. Neurovascular structures like radial nerve and branches of brachial artery can be damaged due to this sharp bony projection. As there are no other cases reported of such exophytic growth, the aetiology and genetics of such variant is not clear. Second case reported was that of supracondylar process for which the reported incidence is very low – only 2%. The dimensions measured are compared with other studies and are shown in **Table 2**. The present study has higher values compared to other studies. This can be an associated factor in cornelia de lang syndrome occurring in every 10,000 births [18].

Table 2. Dimensions of supracondylar process of various studies

Authors	Length of the spine	Breadth of the spine at base	SCPME	SCPNF
Guptha R. K [6]	0.3 cms	1.1 cms	6.5 cms	-
Oluyemikayode et al [19]	1.6	-	5.3	5.5
Prabahitha et al [21]	1.1	1.5	6.5	4.4
Present study	2	0.8	5.4	5.9

Compression of median nerve can occur as it passes under the ligament of Struthers. Since ulnar nerve does not pass under the ligament of Struthers the nerve stretches posteriorly around the process in the few cases. Carpal tunnel syndrome-like symptoms, ulnar nerve symptoms, loss of sensation, and disappearance of the radial or ulnar artery pulse on extension and supination of the forearm are seen when a process arises proximal to the medial epicondyle [11]. Stress fractures that may occur as a result of such growths are very difficult to treat due to their close relation to nerves and vessels [15]. Vascular symptoms like ischemia and claudication and nervous symptoms like paraesthesia, weakness and muscle wasting can occur as part of such growths which are exaggerated by heavy manual operations [9]. So thorough knowledge of various anatomical variants can reduce the complications during surgery [18]. The distance of the process from lateral epicondyle was 6.3 cm and is more than the distance from the medial epicondyle and this point is very important in nail placement in orthopaedic surgeries as the best point being anteromedial point [26]. Exophytic growths can lead to misdiagnosis by radiologists as such growths mimic osteochondroma. Exophytic growths are directed towards the joint with a continuous cortex whereas osteochondromas are directed away from the joint [20, 24]. As recurrence is common after excision of such exophytic growths they have to be removed along with overlying periosteum [9]. The diagnosis proposed is palpation but difficult in patients with well-developed musculature, radiological imaging is confirmatory method supported by doppler evaluation [13].

Conclusion

Exostosis of bones can be considered as anatomical variant but such lesions can be misjudged as pathological bone lesion. Awareness of osteophytic growths is important in orthopaedics since it is very important in preoperative planning of distal humeral fractures, for surgeons in diagnosing and treating neurovascular compression syndromes and also for radiologists to avoid misdiagnosis.

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