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Paediatric Pedunculated Dorsal Osteochondroma of the Scapula: A Medical Oddity with Review of Literature

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Learning Point of the Article:

Pediatric pedunculated variety of osteochondroma of the scapula is quite rare. Meticulous history, examination and investigations are a prerequisite to obtain a picture of the anatomical area of compression of neighboring structures secondary to its mass effect and to plan the surgical corridor for excision with minimal soft tissue damage.

Abstract

Introduction: Encountering osteochondroma of the scapula is an oddity in clinical practices amid its incidence of 14.4% of all tumors of scapula. It is also noteworthy that the majority of osteochondromas arise from the ventral surface of the scapula, whereas only a few reported cases originate from the dorsal surface, with these lesions typically presenting as the sessile variant. The purpose of this case report is to reveal the clinicopathological and radiological presentation along with the surgical exposure of dorsal scapular osteochondroma of pedunculated morphology in a pediatric age group.

Case Report: We report a case of 8-year-old male patient who presented with the complaints of abnormal painless hard swelling over the right side of the upper back since last 5 years, which was gradually progressive in nature. It was associated with discomfort in lying supine position and inability to take turn toward right side. On examination, swelling measured approximately 4 × 3 cm in size. Roentgenographic examination revealed bony outgrowth from the dorsomedial aspect of the right scapula. Computed tomography scan revealed a pedunculated stalked mushroom-like mass arising from the dorsal surface at the medial border of the scapula. Patient underwent en block excisional biopsy, which on histopathology turned to be osteochondroma.

Conclusion: Although the dorsal scapular region is a very rare location for osteochondroma to occur, especially in pediatric population, its clinical manifestation is not uncommon, that is, "the mass effect." Patient's presentation is largely guided by the morphology and location of the tumor; therefore, meticulous history and examination are necessary to correlate the symptoms with the location of the tumor. Proper investigation is pivotal in identifying the appropriate surgical corridor, which should respect as much soft tissue as possible.

Keywords: Osteochondroma, dorsal scapula (omoplate), pedunculated, sessile variant.

Introduction

Developmental malformation instead of a veracious neoplasm is a more apt entity to define osteochondroma and its oddity nature in the scapula. It is a benign growth within the periosteum covered with hyaline cartilage that usually has the tendency to grow away from the epiphyseal plate. Accounting for 35–46% prevalence of all benign tumor family, osteochondromas constitute a major tumor burden to the society. Scapular osteochondroma tends to develop usually in the second decade of life (10–20 years), with men are more likely than women to develop osteochondroma before the age of 30 [1,2]. Metaphyseal region of long bones, especially the tibia, the

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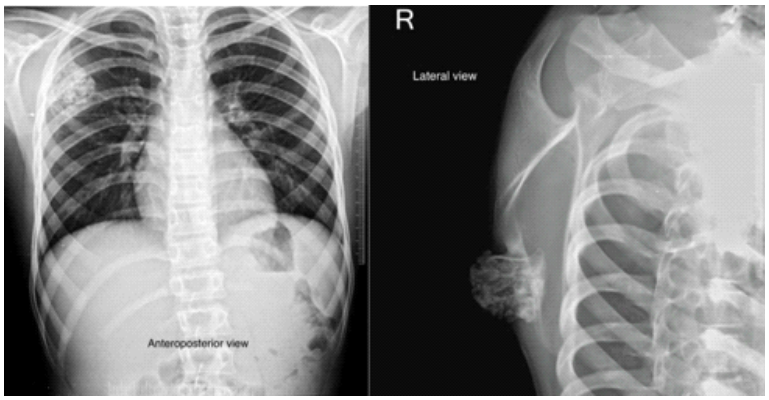

Figure 1: Roentgenogram anteroposterior and lateral views depicting bony outgrowth from the dorsomedial aspect of right scapula.

humerus, and the distal femur combinedly share the region of involvement, with 90% of all exostoses have an outgrowth that is radiologically appreciable [2,3]. Only 3–4.6% of all cases of osteochondroma occur in flat bones like the scapula, and 14.4% of scapular tumors are identified as osteochondroma [4,5].

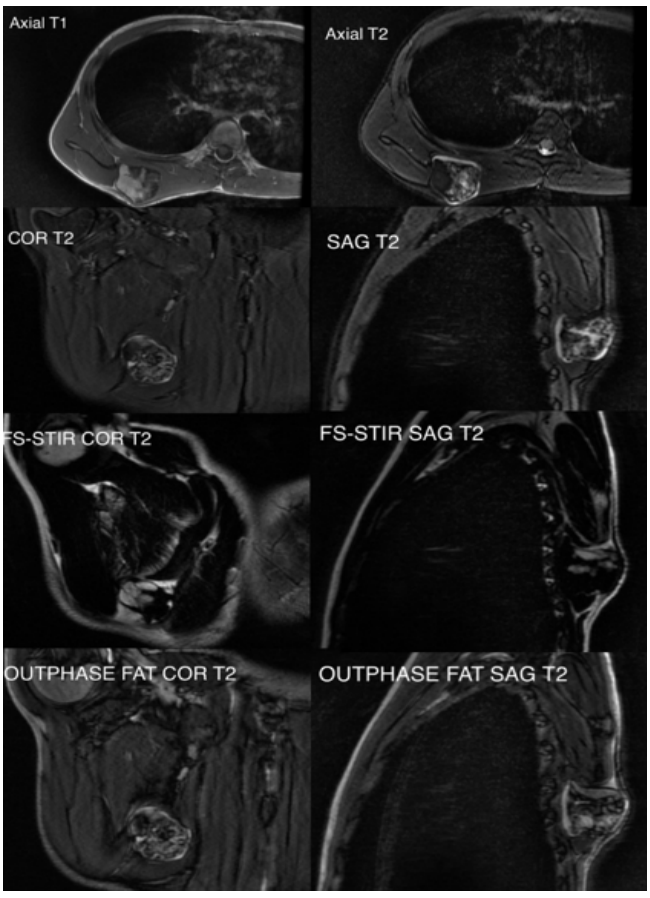

Figure 2: Magnetic resonance imaging sequences (sagittal, axial, and coronal) delineated a visible cartilaginous cap with surrounding fatty marrow and edema. Fat-suppressed short tau inversion recovery images (sagittal and coronal) obtained, which showed high signal intensity (cartilage) and the thickness of cartilaginous cap to be 14 mm. Out-of-phase (Opposed phase) fat-suppressed images showed hyper-intense signal depicting near total tumor replacement of the osseous lesion.

Although various cases have been reported talking for the location of the mass on the ventral surface of the scapula, the rate of incidence for the dorsal surface location is still unanswered [6,7].

Case Report

A 8-year male patient presented to the outpatient department of the tertiary care center with the chief complaints of an abnormal painless hard swelling over the right side of the upper back since last 5 years, which was gradually progressive in nature. It was associated with discomfort in lying supine position and inability to take turn toward right side. On examination, swelling measured approximately 4 × 3 cm in size. Having bony hard consistency on palpation of the dorsal aspect of the medial border of the scapula, it was non-tender and fixed to the underlying scapula with normal pinchable overlying skin without any neurovascular deficit of the upper limb. There was no other abnormal swelling elicited, and right shoulder range of motion was within normal limits. On further ruling out other differentials, there was no history of any fever, trauma, weight loss or similar past episodes. Roentgenographic examination

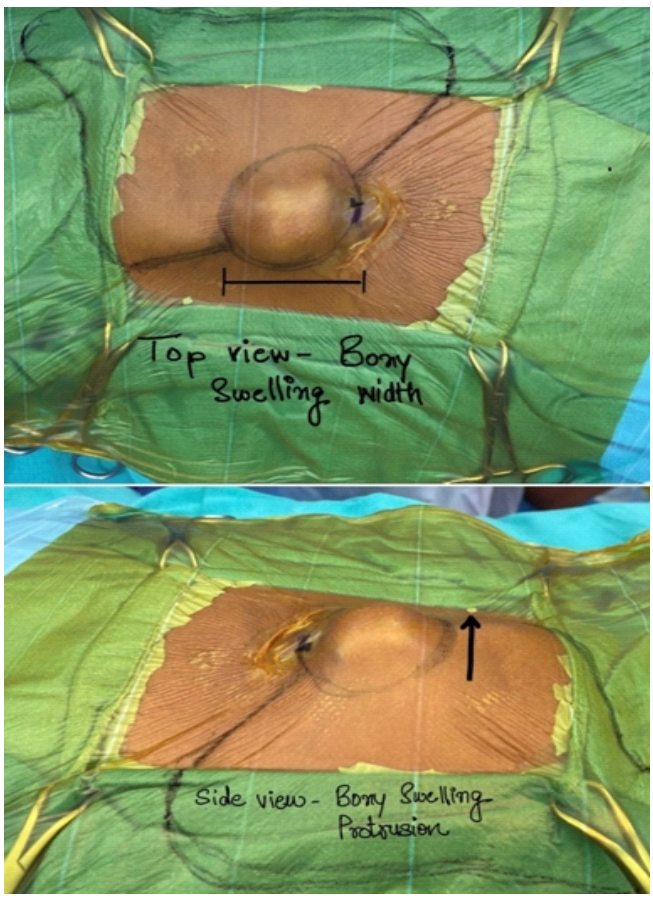

Figure 3: Intraoperative prone positioning with osseous mass centered, the draping depicting width and protruding height of the lesion.

Figure 4: Removing adventitious bursa overlying the tumor and exposing the tumor circumferentially, osteotomize the base of the peduncle till the posterior cortex of scapula.

revealed bony outgrowth from the dorsomedial aspect of the right scapula with both cortical and cancellous components, which were corresponding to the components of the parent bone, that is, the scapula (Fig. 1).

Radiographs of the both forearms and knee joints were performed to rule out other exostotic bony lesions and bowing of ulna commonly found in osteochondroma and a rare entity known as Trevor's disease (dysplasia epiphysealis hemimelica) associated with osteochondroma mainly in the epiphysis of the knee joint. Computed tomography scan revealed a pedunculated stalked mushroom-like mass arising from the dorsal surface at the medial border of the scapula. Magnetic resonance imaging (MRI) sequences delineated visible cartilaginous cap blended with surrounding fatty marrow and edema (Fig. 2). To clearly delineate the cartilaginous cap measurement and to differentiate from edematous medullary fat, fat-suppressed short tau inversion recovery images obtained, which showed high signal intensity (cartilage) against the dark background (macroscopic medullary fat) and the thickness of the cartilaginous cap to be 14 mm. Out-of-phase (Opposed phase-FS) fat-suppressed images also obtained to differentiate between benign fatty marrow infiltration (microscopic fat with signal drop out) from near total tumor replacement (hyper-intense signal), which does not delineated signal drop out.

Neither any pathological fracture nor any chest wall abnormality elicited. Blood investigations were within normal limits. Based on the above findings, a provisional diagnosis of osteochondroma of the right dorsal scapula was made, and the patient was planned for excisional biopsy. In en block excision of the tumor, an incision given directly over the globular swelling in the prone position (Fig. 3), and after retracting the overlying soft tissue and bursa, the whole of the tumor became exposed.

Peduncle of the tumor identified and was resected without any post-resection void in the scapular body; thus, there was not any need of fixation (Fig. 4).

Excised specimen was sent for histopathological examination, which confirmed the diagnosis as osteochondroma. On gross examination, a globular bony tissue measured 3.8 × 3.2 × 4 cm was obtained, with the cut surface showed brownish white color (Fig. 5).

Cartilaginous cap measured 14 mm in thickness. Histopathological examination showed a bone tumor with three distinct layers comprising of fibrous perichondrium, cartilaginous cap, and bony trabeculae, with their junction showed endochondral ossification (Fig. 6).

There were no signs of malignant transformation. Post-

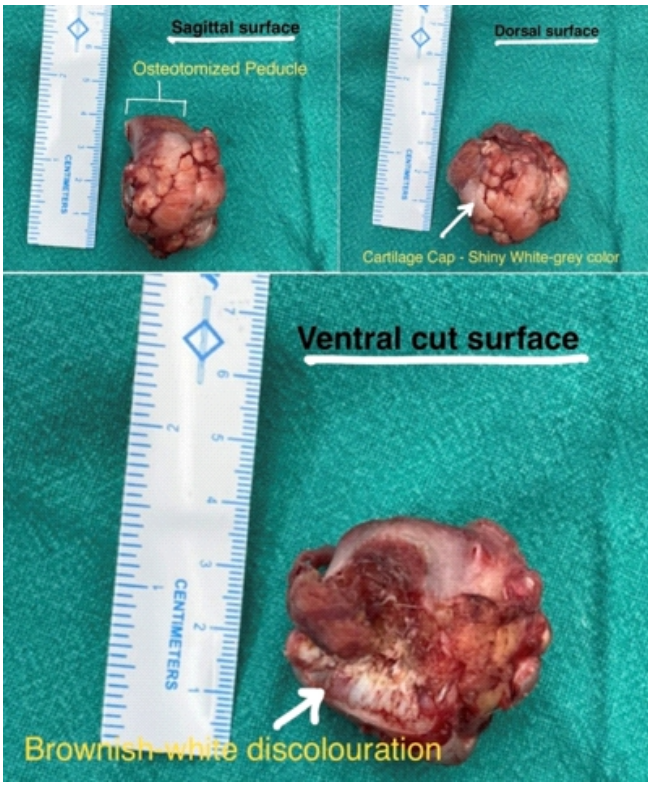

Figure 5: Gross section images of the tumor mass excised measuring 3.8 × 3.2 ×4 cm with ventral cut surface showed brownish-white color. Cartilaginous cap can be appreciated as shiny white-grey color over the dorsal surface. Tumor peduncle can be seen on the sagittal surface.

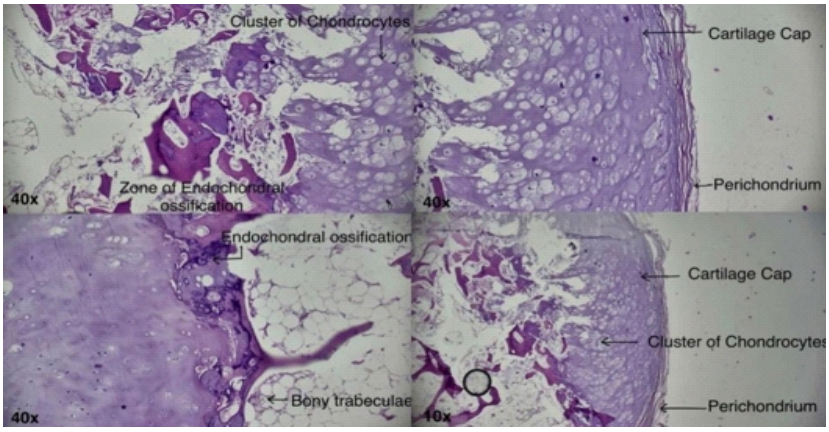

Figure 6: Histopathological examination delineated fibrous perichondrium, hyaline cartilage (×10), island of bony trabeculae and junctional endochondral ossification (×40).

operative period was uneventful and shoulder range of motion was within normal functional limits. After 1 month, 3 months, 6 months and 1 year of sequential follow-up, there was no evidence of recurrence (Fig. 7).

Discussion

It is quite infrequent for the scapula to have an osteochondromatous growth arising from it. With a prevalence of 14.4% of all benign tumors of the scapula, osteochondroma is considered to be a very rare tumor of flat bones [5]. Although predominantly located on the ventral surface of the omoplate (63%) [8], the dorsal scapular osteochondromas droves the patient to seek medical treatment much earlier, as presented in our case scenario due to inability of the patient to sleep in the supine position amid swelling at the upper back region and cosmetic reasons, which is the reason of interest nowadays. On the contrary, the overlying anatomical tissues are immediately compressed by ventral scapular osteochondromas, which directly causes symptoms, or indirectly by reactive bursitis, which causes snapping scapula syndrome, pseudo-winging of scapula and limits range of motion [8] with which the patient usually presents late. Likewise, lateral scapular location may result in subacromial impingement syndrome [8]. Beauchamp-Chalifour and Pelet in 2018 demonstrated a patient with trapezius weakness due to impingement of spinal accessory and suprascapular nerves amid the mass effect of dorsal superomedial angle of scapula osteochondroma [9]. Therefore, it is of immense importance to have a proper history from the patient about the symptoms to know about the correct region of involvement and the underlined pathology behind the manifestation. Location of the lesion on the scapula can aid for the differential diagnosis. The scapula was classified into two zones by the musculoskeletal tumor society: The S1 zone consists of "blade-spine" part of the scapula, and the S2 zone consists of the "glenoid-acromial complex." Although severe benign tumors like aneurysmal bone cysts and giant cell tumors are more likely to reside in the S2 zone, osteochondromas are frequently seen in the S1 zone, as presented in our case, which is more prone to malignancies [9] as represented in the diagram (Fig. 8).

According to their morphology, osteochondromas can range in

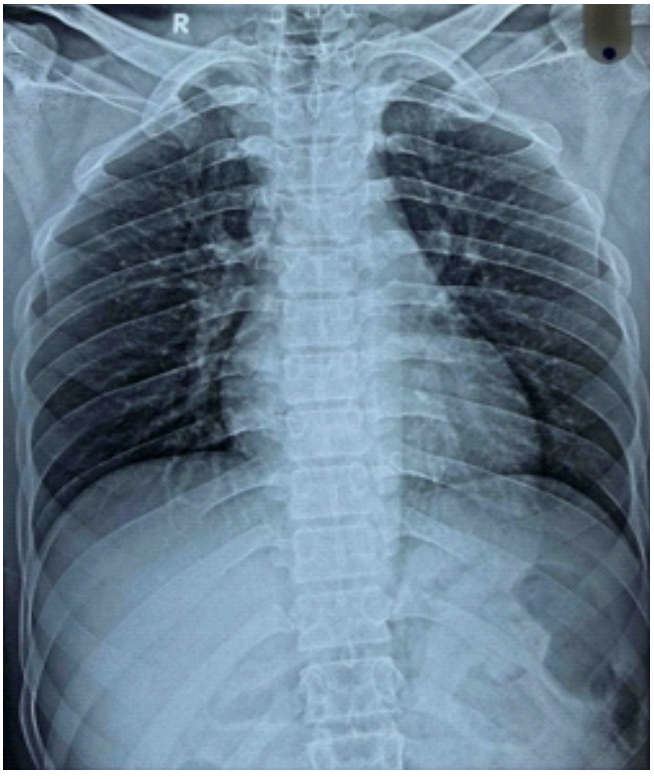

Figure 7: Post-operative roentgenogram anteroposterior view of right scapula depicting complete removal of the bony growth.

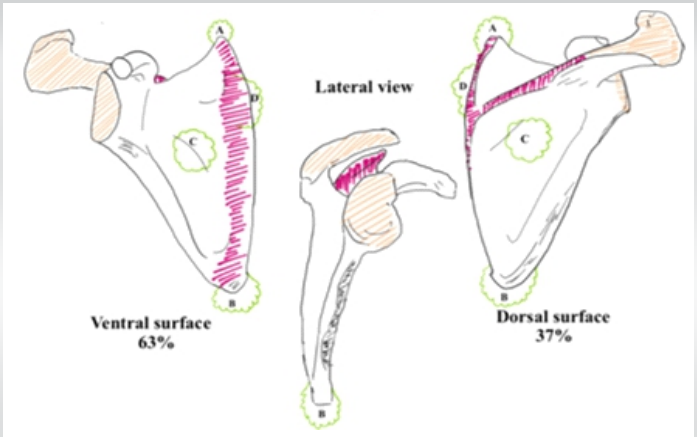

Figure 8: Image representing zones of scapular tumor by musculoskeletal tumor society (Pink: S1 zone, Orange: S2 zone) along with common mass location (A, B, C, D).

Table 1: Different approaches and muscle division undertaken to expose tumor

References	Year	Techniques	Muscular plane
Fageir *et al.* [14]	2009	Medial border of scapula approach	Trans trapezius and detachment of rhomboid major
Pérez *et al.* [15]	2011	Mini-Thoracoscopic approach	Trans serratus anterior, rhomboid major and trapezius
Kwon and Kelly *et al.* [16]	2012	Medial border of scapula approach	Trans trapezius and detachment of rhomboid major
Tungdim *et al.* [17]	2017	Medial border of scapula approach	Trans trapezius and rhomboid major
Steven's *et al.* [18]	2018	Sparing of trapezium with incision at medial scapular border	Rhomboid major reflection from tip of scapula

size from 1 cm to 20 cm and have cartilage cap that are typically <2 cm thick [8]. A cartilage cap thicker than 2 cm typically signifies the development of malignancy [10]. Malignant transformation of a scapular osteochondroma is an unusual complication, estimated to happen in <1–2% for solitary, sporadic lesions. Risk of malignancy increases to about 10% in patients of multiple hereditary exostosis [11]. Although rare, for osteochondroma to occur, the scapula can be aptly labeled as "location of tension" because the ilium, the scapula, and the pubic rami are the most common sites associated with malignant changes, which we have tried to delineate by the diagrammatical representation in Fig. 8 [12]. The cartilage has the appearance of a chaotic growth plate that is undergoing endochondral ossification till the time of physeal closure, continued growth in adulthood should strongly raise the suspicion of malignant transformation into

Table 2: Reported cases of dorsal scapular osteochondroma in best of our search since 1914

Author (year)	Age (year)/gender	Presentation	Side/location	Tumor size (cm)	Treatment	Follow-up in months
Yadkikar and Yadkikar (2013) [19]	11/F	Progressive pain and difficulty in sleeping supine	Left, Dorsal centromedial scapular region	3 × 2.5	Excisional biopsy	12
Jadhav *et al.* (2016) [7]	12/M	Problem in lying supine in bed	Right, Dorsal inferior scapular angle	4 × 3	*En block* excision	12
Nekkanti *et al.* (2018) [5]	19/M	Upper back pain and swelling increased over time	Left, Dorsal medial border of body	3 × 3	Complete excision	-
Beauchamp-Chalifour and Pelet (2018) [9]	25/M	Pain and winging of scapula	Right, Dorsal superomedial angle of scapula	3 × 3	Complete excision	36
Bektas and Ozmanevra (2019) [6]	15/F	Left side upper back lump, painful left shoulder movement, difficulty in sleeping supine	Left, Dorsal superomedial scapula	6 × 4	Complete excision with the help of osteotomy	12
Shahid *et al.* (2021) [20]	23/M	Painless scapular mass	Left, Dorsal medial aspect of body	1.5 × 1.8	Observe	-
Altwaijri *et al.* (2022) [21]	2/F	Worsening painful swelling	Left, Dorsal medial aspect of body	3 × 2.5	Complete excision	6
Das *et al.* (2023) [22]	10/M	Painless swelling, discomfort in lying supine	Right, Dorsal inferior angle of scapula	4.8 × 4	En-block excision	12
Chun *et al.* (2023) [3]	8/M	Mid back pain, winging of scapula, scoliosis	Left, Dorsal inferior angle of scapula	2.3 × 1.3	Chiropractor did scapular manipulation, observe	6
Qureshi *et al.* (2023) [23]	25/F	Non-specific pain at shoulder, neck, hard lump at upper back	Right, Dorsal at superomedial border	-	-	-
Jangir *et al.* (2024) [24]	21/M	Upper back swelling with discomfort	Right, dorsal infero-medial border of scapula	5.5 × 6	En-block excision	3
Raja and Rao (2024) [25]	12/F	Painful swelling of scapula	Left, Dorsal medial aspect of body	4 × 4	Extraperiosteal resection	1.5
Khan and Chand (2024) [26]	12/M	Progressive painful swelling, difficulty in lying supine	Left, Dorsal lateral border of scapula	2 × 2	Excisional biopsy	12
Kalekar and Kumar *et al.* (2025) [27]	15/F	Left shoulder pain, decrease range of motion, swelling	Left, Dorsal inferior scapular blade	3.5 × 2	En-block excision	-

chondrosarcoma [5,9]. As such, there are no differentiating features for dorsal and ventral osteochondromas as far as roentgenography is concerned, except for diagnosing malignant transformation, where MRI plays a pivotal role. "Nora lesion" can mimic an osteochondroma; however, it is quite a rare entity and can be differentiated on the basis of MRI, which characteristically shows only the outer cortical contact with the parent bone and no continuation of the medullary canal, unlike osteochondroma [13]. The surgical approach and the challenges associated with the location of the tumor mass are also a topic of discussion. Considering ventral surface osteochondroma, the subscapularis muscle usually breached due to impingement of the growing mass between the tumor and rib cage. Therefore, dissection of the subscapularis plays a pivotal role in tumor exposure. Anatomically, while taking the medial parascapular approach, there are three muscles which come across while exposing the ventral tumor mass, that is, the Trapezius, the rhomboid major and the latissimus dorsi. Along with the medial border of the scapula, all these muscles form what we call as the "Triangle of Auscultation." In 2019, Prakash et al. reported a case series using the same approach mentioned above for ventral scapular osteochondromas excision [8]. There are other approaches also being reported on reviewing literature, as mentioned in Table 1.

Approach for excision of dorsal scapular osteochondroma is relatively easy with less soft tissue insult as compared to that for ventral scapular osteochondroma. The idea is to respect as much anatomy as possible while going from skin toward the tumor peduncular stalk so that there occurs minimal damage to musculature and neurovascular bundle, which aid to quicker post-operative recovery and minimal complications.

On reviewing the literature, McWilliams in 1914 reported the first case of scapular osteochondroma with adventitious bursitis [28]. Since 1914, 19 cases of ventral scapular osteochondroma along with the large encapsulated bursa have been reported [29]. Similarly, less than 50 cases of snapping scapula syndrome secondary to ventral scapular osteochondroma have been documented [30]. Dorsal scapular osteochondromas are considered exceedingly rare; only 14 cases were published till date, enough to describe the oddity of the location (Table 2). Locations of the reported dorsal scapular lesions in accordance with the image in Fig. 8 were five at the inferior angle of the scapula (35.7%), three at the superomedial margin (21.4%), five at the medial-central body (35.7%), and one at the lateral border of the scapula. Only two cases out of fourteen (14.2%) lying in the unusual age group, that is, in the first decade of life, as our patient.

Conclusion

Symptoms caused by osteochondromas can vary depending on where they are located. Although osteochondroma is uncommon in the scapula, it should be remembered that it is the most typical benign tumor of the scapula. Depending on the extent of the mass, osteochondroma's dorsal involvement may also result in clinical symptoms due to its mass effect, even though it is more common in the ventral region and causes a clinical snapping scapula.

Clinical Message

A meticulously rehearsed sequence of history taking, examination, appropriate imaging, and excisional biopsy is the prerequisite for the diagnosis of osteochondroma at a location as unusual as the dorsal scapula. En bloc excision is the choice of procedure for favorable outcome. Regular follow-up is necessary amid its notorious nature, although rare, to transformed into malignancy, especially for the scapular lesions.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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