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Osteochondroma in the Thoracic Spine of a Paediatric Patient: A Case Report and Literature Review

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1. Abstract

Osteochondromas are the most common benign paediatric bone tumour, and typically arise in the appendicular skeleton, with axial lesions involving the spinal column being less common. However, most spinal cases are reported in adolescents and adults with scarcity of studies on the paediatric population. We report a unique case of an asymptomatic spinal osteochondroma arising from T5/T6 vertebral bodies that was present at birth. The tumour underwent complete surgical resection and the patient recovered uneventfully. Therefore, our case highlights the importance of considering osteochondroma as a differential for a spinal mass in the paediatric population.

2. Introduction

Osteochondromas are the most common benign paediatric tumours of the bone, compromising around 40-50% of non-cancerous growths of the bone 1. They are cartilage-capped tumours that arise from the perichondral ring surrounding the growing physis and are common in patients between 10 and 30 years of age 2. Diagnosis of osteochondroma is made with radiographs showing sessile or pedunculated lesions found on the surface of the bone 3.

They are typically located in the metaphysis of long bones and are rarely present in the spine. Nonetheless, the Incidence of osteochondromas in the spine ranges from 1.3% and 4.1% 4. The prevalence of osteochondroma of the spine has evolved over the decades due to the pronounced incidence of reported cases; most of the lesions were reported to be in the cervical region as ossification is higher in the superior parts of the spine, typically arising from the posterior elements of it 4,5. Most spinal lesions are asymptomatic, and patients usually present with a painless mass; nevertheless, it can cause functional symptoms or symptoms of neurovascular compromise 3.

Our article discusses a rare case of thoracic osteochondroma in a young male patient that was present since birth. It comprehensively describes the clinical presentation, diagnostic process, and treatment approach employed for this case.

3. Case History

3.1. Case Presentation

An eight-year-old boy presented to the neurosurgery clinic complaining of a swelling over the mid-level of the dorsal spine. An initial visit to the neurosurgery clinic occurred at the age two months, as his paediatrician had identified the swelling at birth. At that time, the family of the patient was recommended to follow up his condition till the age of six years. Since then, the swelling has progressively grown with normal overlying skin. Occasionally, the patient has experienced pain and discomfort. However, no signs and symptoms of neurological dysfunction were reported.

3.2. Prenatal History

The mother had gestational hypertension, which necessitated a preterm birth through a caesarean section to prevent potential complications. The baby was delivered at 37 weeks of gestational age via an uncomplicated caesarean section. Upon birth, the baby had a normal Apgar score and did not require admission

to the Neonatal Intensive Care Unit (NICU). The baby's birth weight was 3 kilograms, and he was exclusively breastfed without any remarkable feeding history.

3.3. Physical Examination

The neurological assessment of both lower limbs showed intact power with preserved deep tendon reflexes and sensation as well as the examination of anal sphincter tone and perianal sensation, all revealed completely normal results. Examination of the back demonstrated a swelling located over the mid dorsal spine that had an oval shape, an elevated surface with well-defined borders, and measured 3x3 cm in diameter which has increased in size since the initial visit which was 1x1 cm. The swelling felt firm and was firmly attached to the underlying bone, with intact skin covering it. There were no signs of sinuses, discharge, or pulsations. The swelling was not pulsating, non-painful, immobile, and did not show transillumination.

3.4. Radiographs

Plain radiographs of the dorso-lumbar spine showed an elongated bony process arising from posterior elements of T6 vertebrae. Computed tomography (CT) (Figure 1) and magnetic resonance imaging (MRI) (Figure 2 and Figure 3) showed a partial fusion anomaly between T5 and T6 vertebral bodies which also involved their corresponding posterior elements. CT and MRI confirmed the presence of the elongated bony process arising from posterior elements of T5/T6 directed inferodorsal with associated overlying stranding of subcutaneous fat planes likely related to cartilaginous cap formation (Figure 3). The spinal cord and canal appeared unremarkable.

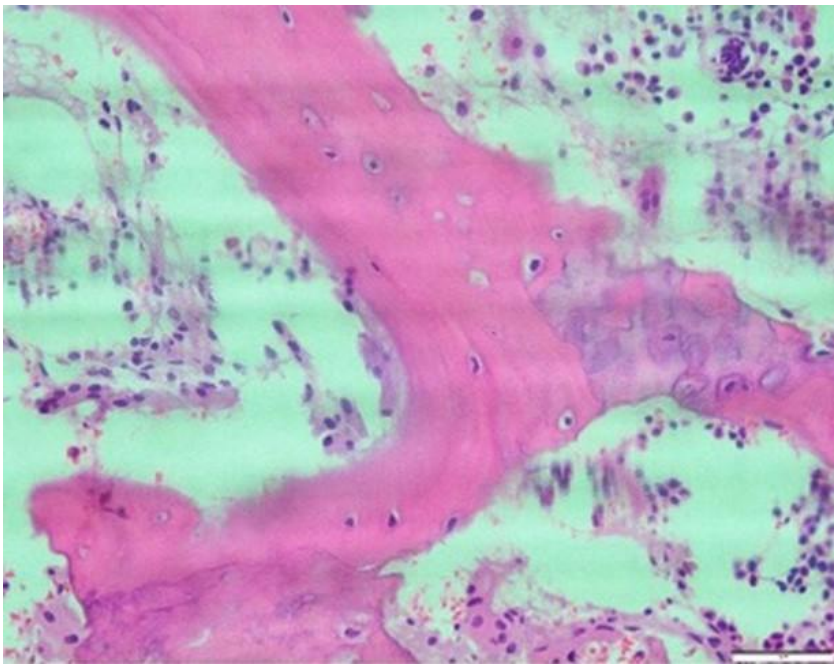

Figure 1: Computed tomography (CT) image of the thoracolumbar spine showing a fusion anomaly between T5 and T6 vertebral bodies, that also involved their corresponding posterior elements.

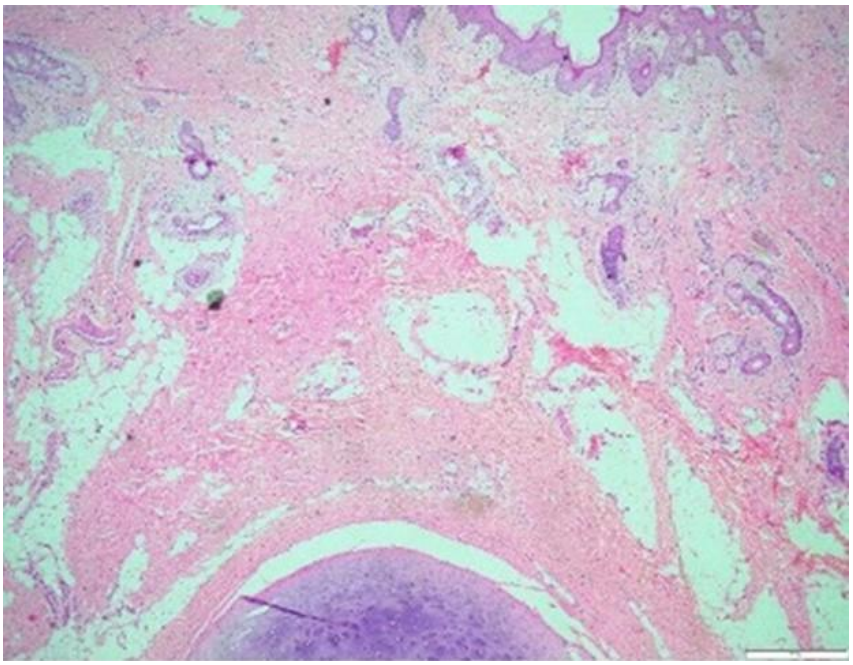

Figure 2: Magnetic resonance imaging (MRI) T2-sequence of the thoracolumbar spine showing elongated bony process (Fusion anomaly) arising from posterior elements of T5/T6, with an unremarkable spinal cord and canal.

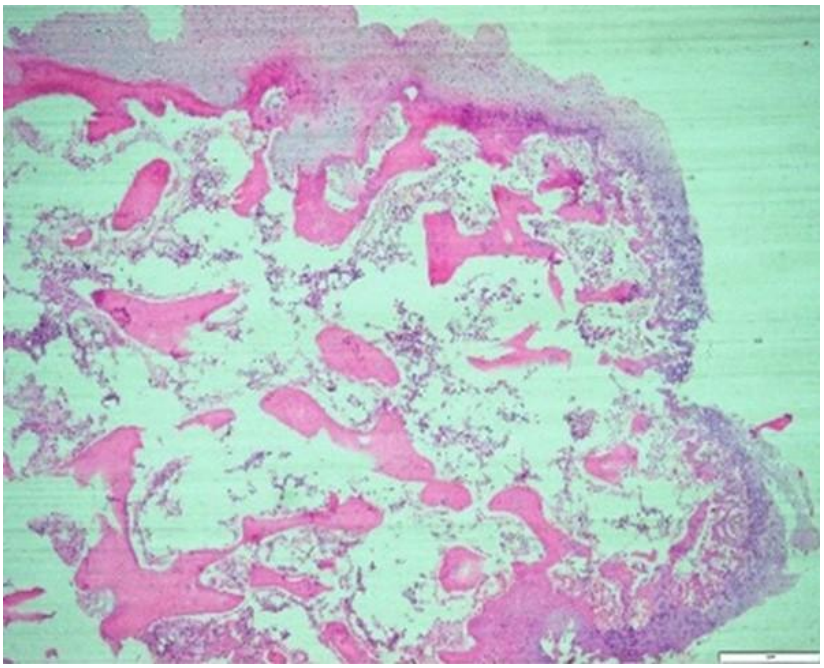

Figure 3: Magnetic resonance imaging (MRI) T2-sequence of the thoracolumbar spine showing elongated bony process arising from posterior elements of T5/T6 with associated overlying stranding of subcutaneous fat planes likely related to cartilaginous cap formation.

3.4. Operation and Postoperative Note

The patient was planned for excision of the tumour. A biconcave skin incision over the site of abnormal swelling, dissection of the pedicle and releasing the pedicle from an enlarged spinous process and complete excision of the lesion were done. The abnormal elongated spinous process was removed by rongeur and micro drilling.

Following the surgery, the patient's postoperative recovery was satisfactory. He experienced some redness, itching, and mild discomfort at the surgical site but did not encounter any limitations in his range of motion. His neurological examination revealed entirely normal findings. During subsequent follow-up visits, the patient continued to progress well, and the surgical site appeared normal. The itching had subsided, and there were no signs of recurrence.

3.5. Histopathology

Histologic examination of sections revealed unremarkable skin with underlying subcutaneous tissue that overlies reactive cartilaginous tissue (Figure 4), as well as caps composed of mature hyaline cartilage with overlying fibrous perichondrium, and endochondral ossification resembling growth plate (Figure 5). Beneath lies marrow space and cancellous bone contiguous with that of the native bone. Bone and cartilage were in continuity with the subcutaneous tissue and are both mature without malignant features. The described histologic findings are in keeping with the clinical and radiological diagnosis of osteochondroma.

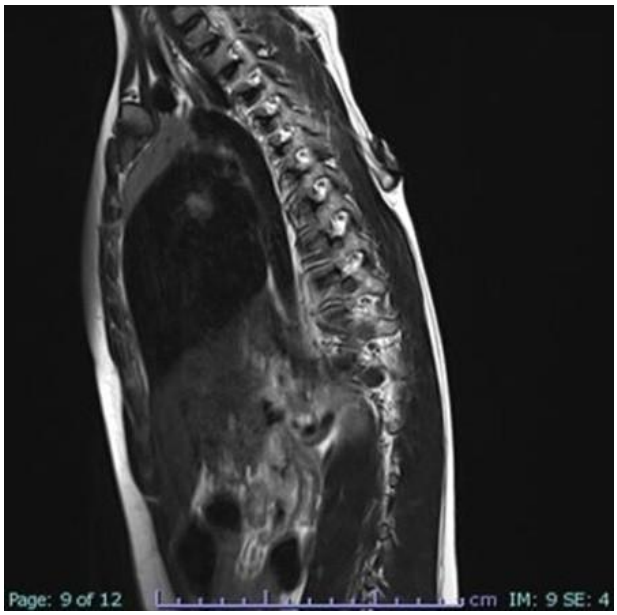

Figure 4: Histologic appearance of hematoxylin and eosin-stained specimen (40x power magnification) showing unremarkable overlying skin and subcutaneous tissue, with an underlying reactive cartilaginous tissue formation.

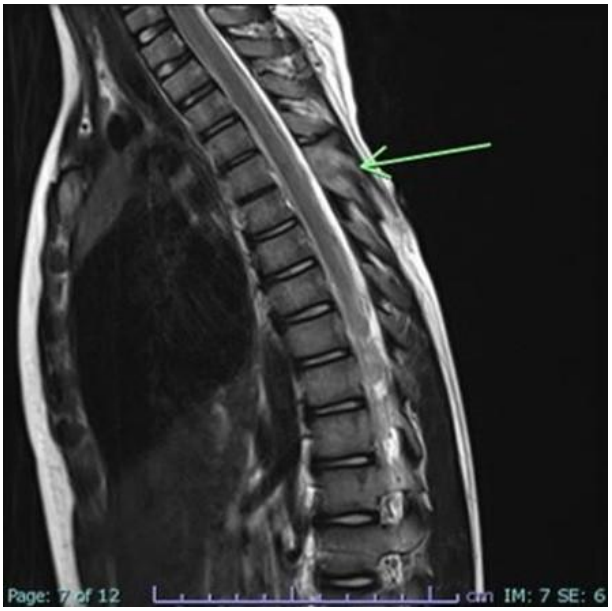

Figure 5: Histologic appearance of hematoxylin and eosin-stained specimen (40x power magnification) showing the cartilaginous cap formation, covered by fibrous periosteum and with underlying cancellous bone trabeculae and bone marrow spaces.

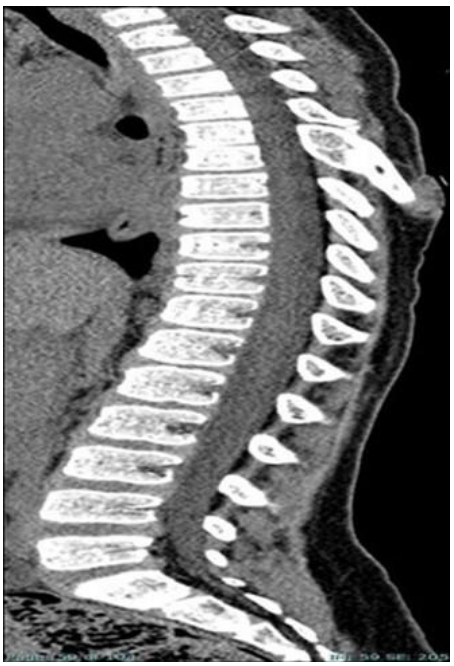

Figure 6: Histologic appearance of hematoxylin and eosin-stained specimen (400x power magnification) showing cancellous bony trabeculae with bone marrow spaces in between.

4. Discussion

Osteochondroma is the most common benign bone tumor in children representing 20%-50% of all benign bone tumors and 10%-15% of all bone tumors [1]. The metaphysis of long of bones is the most frequent locations of these tumors. More specifically, the long bones of the lower limbs are most frequently affected (50% of cases), followed by those of the upper limb (25% of cases). Meanwhile, vertebral involvement is rare [1]. Regarding vertebral incidence, its reported incidence is around 4% as sporadic solitary osteochondromas and around 47% in patients with Multiple Hereditary Exostoses (MHE) [6]. Additionally, around 49% of vertebral osteochondromas develop in the cervical vertebrae, 26% in the thoracic vertebrae, and 23% in the lumbar vertebrae [2]. The higher incidence in the cervical region is likely due to the more rapid process of ossification of the secondary ossification centers in this region in comparison to other vertebral regions [4]. Furthermore, the relatively increased mobility of these segments likely contributes to cartilage displacement and subsequent exostosis [7].

Osteochondromas are thought to arise due to a process of progressive endochondral ossification of aberrant cartilage of the growth plate due to a congenital anomaly or trauma [8]. Importantly, different types of germline mutation in tumour suppressor genes, such as EXT1 (Chromosome 8) and EXT2 (Chromosome 11) have been associated with the development of osteochondromas, either sporadically, or in a hereditary condition referred to Hereditary multiple Exostosis (HME) [8]. In fact, among European patients with HME, such mutations were found in 90% of patients, with a predominance of EXT1 mutations 9. Additionally, patients with EXT1 mutations typically have a large disease burden, suffer more severe symptoms, and are more likely to develop malignant transformation [9].

Morphologically, it is composed of cortical and medullary bone with an overlying cartilage cap. It is grossly presented as a firm, lobulated, pedunculated, or sessile mass varying in size, covered by fibrous tissue/perichondrium, which is in continuity with the periosteum of underlying bone [10].

Clinically, Osteochondroma are usually asymptomatic and are diagnosed incidentally on radiographs obtained for other reasons. The second most frequent presentation is painless palpable mass that may produce cosmetic concerns 8. Nonetheless, symptomatic presentations may be seen and are caused by compression of adjacent structures or malignant transformation. Regarding spinal osteochondromas, these lesions may cause kyphosis or spondylolisthesis if they are close to the intervertebral space. Importantly, spinal cord compression is rare, as most of them develop dorsally outside of the spinal cord 8. In our case, the patient first presented with asymptomatic dorsal spinal mass (measuring 1x1 cm) at birth, which later grew throughout the years (measuring maximally at 3x3 cm).

In conjunction with history and physical examination, imaging modalities are essential for the diagnosis of osteochondromas 8. Cortical and marrow continuity between the lesion and the parent bone, and a cartilage cap is the hallmark of Osteochondromas [11]. Osteochondromas are usually diagnosed using radiographs, particularly those situated in the metaphysis of long bones [8]. However, complex lesions and lesions involving the shoulder girdle, spine, or hip are better evaluated using Computed tomography (CT) or Magnetic resonance imaging (MRI) [12], as MRI typically reveals the extent of cord compression and the cartilaginous part of the tumor, CT scan defines the bony extent.

The mainstay of treatment for osteochondromas is observation with serial radiographs, as growth stops after closure of the

growth plates. Additional imaging with CT or MRI is warranted if patients develop new symptoms, or if growth persists after physeal closure [8].

Currently, there are no medical treatments for osteochondromas, although future biological therapies may be possible 13. Surgical management is reserved for those who develop pain, complications, cosmetic concerns, increased risk of malignant transformation, and diagnostic uncertainty [8]. For spinal involvement in particular, myelopathy, radiculopathy, vascular compression or cosmetic concerns are indications for surgical excision [14]. In our case, the mass posed cosmetic concerns among the patient family and accordingly, undergone complete surgical resection, with complete recovery and resolution thereafter.

5. Conclusion

Osteochondromas represent the most common benign bone tumours in children, however with decreased prevalence in the spine compared to long bones. They tend to present at a later age between 10-30 years rather than at birth. Uniquely, our case represents a rare presentation of a young child with an osteochondroma of the thoracic spine arising from the posterior element, which was present since birth and progressively enlarged while remaining asymptomatic. Accordingly, spinal osteochondromas as a rare aetiology of spinal masses that should be considered in the paediatric population. Patient consent statement: Written informed consent was obtained from the patient's parents for publication of this case report and any accompanying images. A copy of the consent form is retained by the authors and is available for review by the Editor-in-Chief of SJMMS upon request.

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