Unmasking Spinal Osteochondromas: A Comprehensive Review of an Enigmatic Entity

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ABSTRACT

Published on 28th March 2025

Spinal osteochondromas are rare benign bone tumours that can cause significant morbidity through compression of spinal cord, nerve roots or major vascular structures. This review provides a comprehensive overview of spinal osteochondromas, covering incidence, prevalence, clinical presentation, management strategies, potential complications, aetiology and future research directions. Osteochondromas are more frequent in the cervical spine.[1,2] Diagnosis is based on clinico-radiographic correlation using CT and MRI1. Surgical treatment is indicated for symptomatic patients with pain and/or neurovascular deficits.[1] When surgery is contemplated, complete resection of the mass along with the cartilaginous cap is essential to minimize recurrence.[3] The outcome of surgical treatment is generally favourable but it tends to be less favourable for thoracic osteochondromas.[4] Future research maybe focused on understanding the genetic factors predisposing to osteochondroma formation, identifying and developing targeted therapies to prevent growth and recurrence.

Keywords: Osteochondroma, Spinal Tumours, Cord Compression, Cartilage Cap

**See End Note for complete author details*

INTRODUCTION

Osteochondromas are the most common benign bone tumours.[5,6] In the long bones, the location is at the metaphysis.[6] Spinal involvement occurs for only 1-4% of all osteochondromas.[1] But spinal osteochondromas can cause significant mortality and morbidity due to its potential for spinal cord or nerve root compression.[6] This review provides insight into spinal osteochondromas and its incidence, clinical presentation, complications and management.[5]

BACKGROUND

Spinal osteochondromas are benign cartilaginous tumours that can occur as solitary lesions or as multiple lesions associated with hereditary multiple exostoses,[5] which is an autosomal dominant disorder characterized by multiple osteochondromas. They usually arise from the growth plates of long bones. Spinal involvement is rare.[7] Osteochondromas arise due to a process of progressive enchondral ossification or aberrant cartilage of the growth plate. In vertebral bodies, the secondary ossification centres lie within the endplates, which fuse during adolescence. The secondary ossification centres appear at the approximate ages of 11 in the cervicothoracic spine and 18 for the lumbar spine. The more rapid the ossification of these centres, the more likely aberrant cartilage can develop, explaining why osteochondromas are more frequent in the cervical spine.[8]

The unique anatomical constraints, difficult approaches, especially at the junctional zones and proximity to major neuro vascular structures render spinal osteochondromas clinically challenging.[9] For effective management of the lesions, a proper understanding of the pathogenesis and natural history of these lesions are of utmost importance.

Cite this article as: Pillai SS, Prameela KB, Deep A, Sujakumari NM. Unmasking Spinal Osteochondromas: A Comprehensive Review of an Enigmatic Entity. Kerala Medical Journal. 2025 Mar 28;18(1):19–23. | [DOI] https://doi.org/10.52314/kmj.2025.v18i1.690

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Incidence and prevalence:

Even though osteochondromas account for 20-50% of all benign bone tumours, spinal involvement is relatively uncommon and represent only 1-4% of all osteochondromas.[10] This exact incidence and prevalence are difficult to determine due to their rarity and potential for asymptomatic presentations.[11] They are most frequently seen in males and typically present during the second or third decade of life. Cervical spine has the highest incidence of osteochondromas with over 50% reported cases of all spinal osteochondromas.[12] Thoracic osteochondromas are second most common with an incidence of 28%, followed by lumbar osteochondromas (21%).[12] Sacral osteochondromas account for less than 0.5% cases of spinal osteochondromas.[13,15]

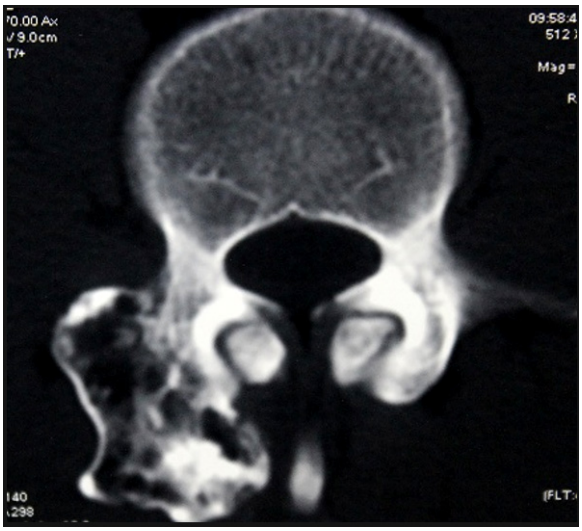

Figure 1. **A.1.24 M L3 osteochondroma from facet, CT scan**

CLINICAL FEATURES

Osteochondromas of the spine presents differently depending on the location, size and the degree of neural compression. Most of the cases are asymptomatic and are discovered incidentally.[11] Reports of compression of neural elements with neurological symptoms are rare.[14] Symptomatic patients present with pain, radiculopathy, myelopathy or neurological deficits.[15] The presentation depends on the location and size of the tumour.[12] Cervical spine lesions may present with neck pain, radicular pain or myelopathy. Thoracic spine lesions can cause pain, intercoastal neuralgia or spinal cord compression. Lumbar spine lesions may present with low back pain, radiculopathy or cauda equina syndrome.

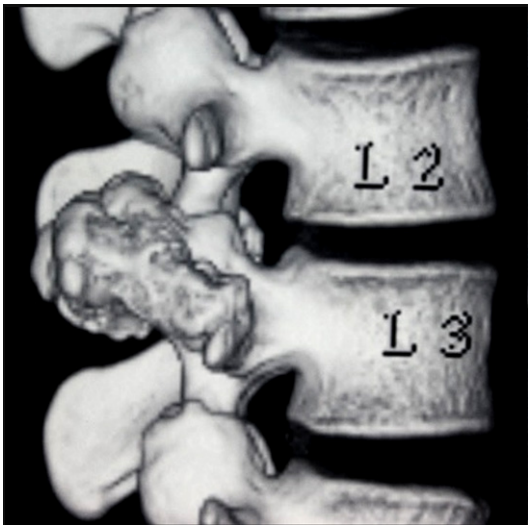

Figure 2. **A.2.24 M L3 osteochondroma, CT scan**

DIAGNOSIS

Accurate diagnosis depends on a combination of clinical evaluation and radiographic imaging. Plain x-ray may show a bony occurrence but CT and MRI scans are essential for detailed evaluation.[9] The size, location and bony architecture are better delineated with a CT scan. MRI helps in assessing the cartilaginous cap, assessing neural compression and in differentiating these lesions from other spinal lesions.[15] The presence of cartilaginous cap exceeding 2 cms in adults and 3 cms in children should raise suspicion for malignant transformation.[16,17] Rapid progression of tumour size also indicates a possibility of malignant transformation.[14]

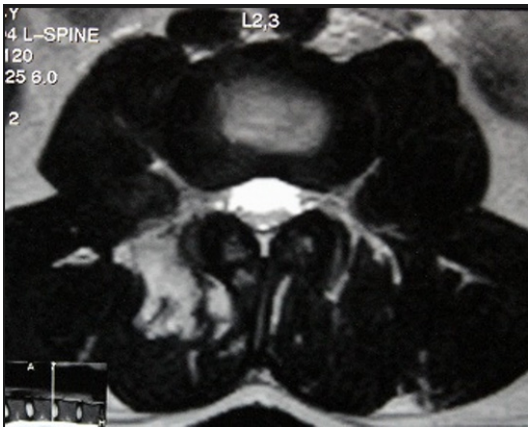

Figure 3. **A.3.24 M L3 osteochondroma from facet, MRI Scan**

MANAGEMENT

The mainstay of treatment of spinal osteochondroma is surgical. The indications for surgery include symptomatic lesions, lesions causing neurovascular deficit or those with evidence of malignant transformation.[18] Asymptomatic lesions can be observed and followed up. The surgical approach depends on the location and

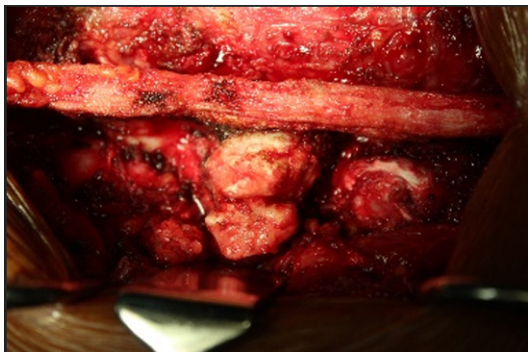

Figure 4. **A.4.24 M L3 osteochondroma from facet, Intra operative picture**

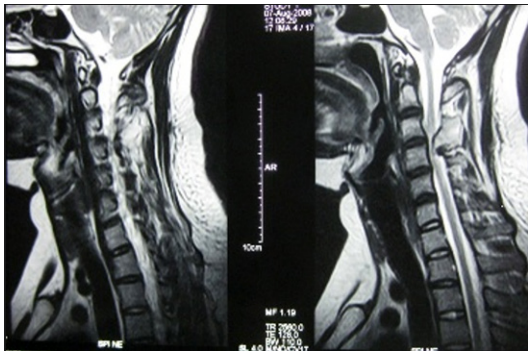

Figure 5. **B.1.Osteochondromatosis with lesion in the cervical spine with cord compression. MRI**

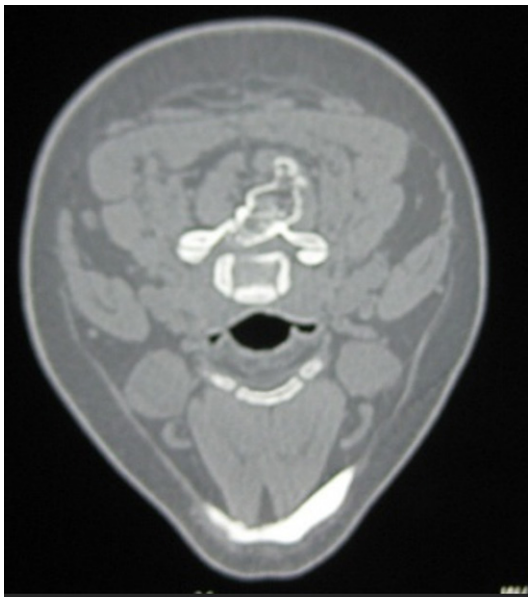

Figure 6. **B.2.Osteochondromatosis with lesion in the cervical spine showing cord compression. CT scan**

the size of the tumour. Anterior, posterior or combined approaches may be necessary depending on the size and location of the tumour. Complete excision of the tumour along with the cartilaginous cap is necessary to minimize the risk of recurrence.[18]

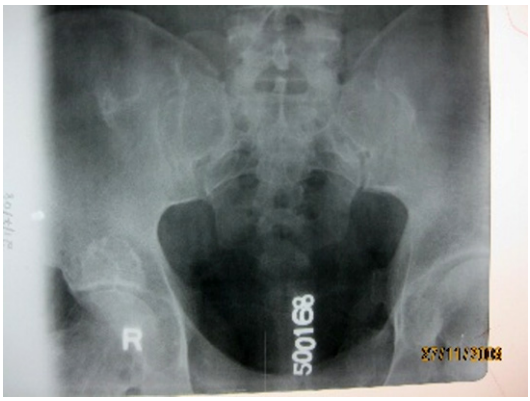

Figure 7. **B.3.Osteochondromatosis. X-ray of the same patient with osteochondromas in the ileum.**

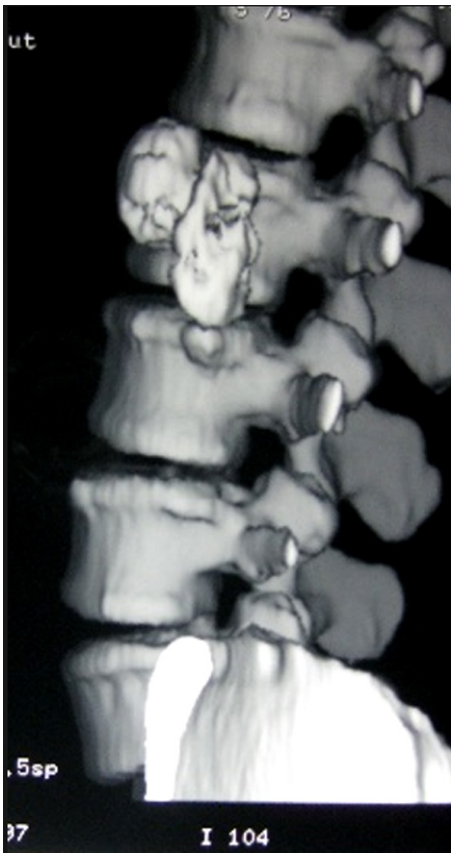

Figure 8. **C.1.osteochondroma arising from the vertebral body**

Table 1. Clinical features of spinal osteochondromas by location

Location	Common symptoms
Cervical spine	Neck pain Radicular pain Myelopathy
Thoracic spine	Back pain Intervertebral neuralgia Cord compression
Lumbar spine	Low back pain Radicular pain Cauda equina syndrome

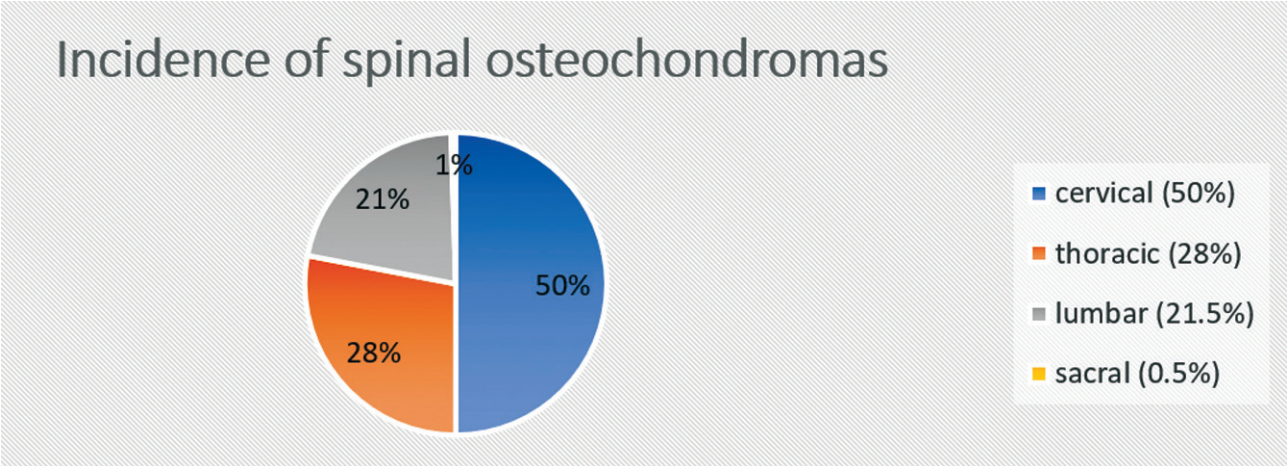

Figure 9. **A pie diagram showing the percentage of osteochondromas found in each section of the spine – cervical, thoracic, lumbar and sacral**[11]

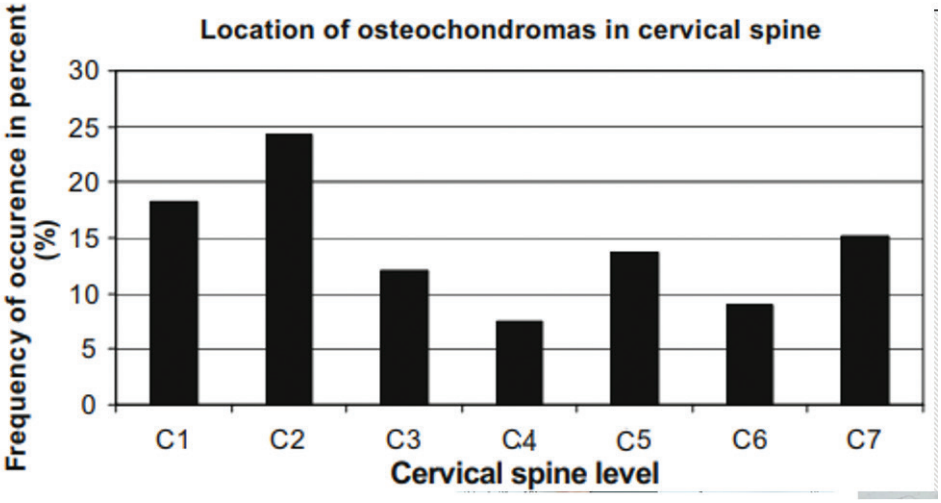

Figure 10. **Incidence of cervical osteochondroma based on the location of the specific vertebra.**[14]

COMPLICATIONS

The main complications associated with spinal osteochondromas are neurological deficit, recurrence and malignant transformation. Recurrence is a possibility with incomplete removal of the cartilaginous cap.[19] Malignant transformation is rare but can occur in about 1/5th of cases. Regular follow up of these patients is recommended. Fracture of the osteochondromas have been reported during physical exercise.[19]

FUTURE RESEARCH

The key areas to be addressed are

1. Refining the surgical approach and techniques to minimize complications.
2. Improvement in diagnostic accuracy with imaging modalities and bio markers.
3. Research on the molecular basis of development of these tumours and targeted therapies.
4. Long term studies to understand more about the natural history of these tumours and the risk of malignant transformation.
5. Robotic surgery may be further explored and its possibilities to minimize complications in the future.

END NOTE

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Conflict of Interest: None declared

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