Chondroblastoma of the lumbar spine

Report of two cases and review of the literature

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Chondroblastoma is a benign cartilaginous neoplasm that generally affects the appendicular skeleton. Twenty-six cases of spinal chondroblastoma have been reported in the past 50 years, only six of which were located in the lumbar region. The authors report two cases involving this exceptional location. In both patients, low-back pain, in the absence of radicular pain, was the presenting symptom. In both cases, plain radiography and computerized tomography scanning revealed an osteolytic lesion surrounded by marginal sclerosis. Magnetic resonance imaging allowed the authors to study the tumor’s local extension. Examination of a percutaneous fluoroscopy-guided biopsy sample revealed the following typical histological features of chondroblastoma: chondroid tissue, focally alternating with cellular areas, and no nuclear atypia or pleomorphism. To reduce the risk of local recurrence, vertebrectomy and anterior–posterior fusion were performed in both cases. In one case, a structural lumbar scoliosis was corrected during the posterior procedure. There was no postoperative complication. No recurrence was observed during the 3- to 6-year follow-up period. The surgery-related results were deemed successful.

Although exceptional, the diagnosis of chondroblastoma is possible in lesions involving the lumbar spine. Other spinal locations are described in the literature, and frequency of recurrence is stressed. A vertebrectomy is advised to reduce the risk of local recurrence.

KEY WORDS • chondroblastoma • lumbar spine • surgery

C HONDROBLASTOMAS are rare benign cartilaginous tumors typically arising in the epiphyses of long bones, especially during maturation. The male/female ratio is approximately 2:1. The distal femur is the most common location. Chondroblastomas constitute less than 1% of all bone tumors.\(^3,20\) The typical radiographically documented finding is an eccentric osteolytic lesion at the epiphysis of long bones with metaphysial expansion and cortical thinning. The lesion may exhibit radiopaque stippled or fluffy calcifications with occasional areas of bone formation. Localization in the spine is rare (1.4%), with the most frequent location being the cervical spine.\(^1-18,21\) Lumbar and sacral involvement is exceptional.\(^1,3,6,7,13,14,16\) The tumor’s characteristic macroscopic appearance is that of a chondroid lesion with cystic and hemorrhagic areas. Histologically, it is characterized by uniform closely packed round-to-polyhedral cells separated by a scanty interstitial matrix, manifesting a chondroid appearance. Treatment options include local curettage or resection. The local recurrence rate ranges from 24 to 100% when the long bones are involved.

We describe the clinical and imaging findings as well as the therapeutic course of two patients harboring lumbar chondroblastomas; the findings are compared with those of the cases previously reported in the literature.

Case Report

Case 1

Presentation and Examination. This 55-year-old woman complained of a history of low-back pain (> 1 year), with a recent increase in intensity. Neurological and laboratory examinations demonstrated normal findings. Lumbar radiography revealed a well-defined osteolytic lesion involving the right part of the L-4 VB as well as a superior endplate fracture. Lumbar CT scanning also demonstrated a large nonexpansive osteolytic tumor involving more than half of the L-4 VB with marginal sclerosis (Figs. 1A and B). Axial CT scanning revealed anterior cortical erosion and no soft-tissue involvement or spinal canal invasion. Subtle intralesional calcifications were identified. Magnetic resonance imaging confirmed the L-4 VB tumor, appearing
hyperintense on spin echo T₁-weighted MR images, het-
erogeneous on FSE T₂-weighted images, and hypointense
on FSE STIR-weighted images. Homogeneous enhance-
ment was observed on contrast-enhanced T₁-weighted MR
images with fat saturation. Internal septations were not
identified on all sequences. An area of edema involving
the posterior L-4 VB was observed on fast–spin echo
STIR–weighted and contrast-enhanced T₁-weighted im-
ages (Fig. 2A and B). There was no evidence that the
tumor infiltrated the posterior elements or the spinal canal.
Percutaneous biopsy sampling of the tumor was performed
under fluoroscopic control. Histologically, the tumor con-
sisted of sheets of uniform round-to-polygonal cells with
well-defined cytoplasmic borders, slightly eosinophilic
cytoplasm, and an ovoid nucleus. The nucleus often exhib-
ited grooves. Nuclear atypia were absent. Osteoclast giant
cells were present. Nodules composed of eosinophilic chon-
droid material were interspersed in the tumor (Fig. 3). These
histological features were diagnostic of chondroblastoma.

Operation. Surgery consisted of an L-4 vertebrectomy.
The posterior arch was removed first via a wide posterior
approach, and the dural sac as well as L-4 roots were iso-
lated from the L-4 VB and pedicles. Posterior osteosynthe-
sis and fusion were performed via the posterior approach.
The entire L-4 VB was then removed via a left anterolateral
approach, and we then performed anterior osteosynthesis
and fusion in which a cage was packed with iliac crest auto-
graft.

Postoperative Course. A thoracolumbosacral orthosis
was provided to assist in fusion during the first 4 months.
No postoperative complication was observed. The patient
was regularly evaluated by the orthopedic surgeon during
a 6-year follow-up period. No local recurrence was ob-
erved.

Case 2

Presentation and Examination. This 23-year-old woman
had a 6-month history of low-back pain. Lumbar spine ra-
diography revealed an osteolytic tumor at L-3 associated
with a 30° lumbar scoliosis (Fig. 4A and B). Neurological
status and laboratory findings were normal. Lumbar CT
scanning and MR imaging revealed erosion of the posteri-
or vertebral wall and tumor extending to the right L-3
pedicle and articular process, with encasement of the right
L-3 nerve root (Figs. 1C and D, 2C and D, 5A and B). Per-
cutaneous biopsy sampling of the tumor was performed
under fluoroscopic control. Histological features were di-
agnostic of chondroblastoma.

Operation. Surgery consisted of an L-4 vertebrectomy
after tumor embolization. The operative technique was the
same as that used in Case 1. The structural lumbar scolio-
sis was corrected and fusion performed via a posterior
approach. Anterior–posterior spinal fusion was performed
(Fig. 6A and B).

Postoperative Course. No postoperative complication was
observed. A thoracolumbosacral orthosis was provided for 4
months. The patient was regularly evaluated by the ortho-
pedic surgeon during a 3-year follow-up period. No local
recurrence was observed.
Discussion

Chondroblastoma is a benign cartilaginous neoplasm that generally affects the appendicular skeleton and occurs in the second decade of life. Male individuals are affected much more commonly than females. When it develops in patients outside the usual age range, it also tends to occur in unusual sites. In the study of 104 cases by Bloem and Mulder, only one patient harbored a vertebral chondroblastoma. Ilaslan, et al., have recently summarized the age distribution, sex, incidence, and imaging findings of vertebral chondroblastoma in nine of 856 patients with these lesions. Twenty-six cases of spinal chondroblastoma have been reported during the past 50 years. Demographic and location details of these cases are presented in Table 1. Lumbar location is extremely rare, reported only in six cases. Our two patients presented with long histories of back pain without radicular pain, which led to a delay in diagnosis. This is in keeping with most of the published reports in which pain and spinal stiffness are the most common nonspecific presenting symptoms. Neurological symptoms and signs, however, may occur when the spinal canal is invaded. For example, in two cases involving lumbar chondrosarcoma, a radiculopathy was associated with back pain; dyspnea due to tumor-induced tracheal compression was the presenting symptom of an upper thoracic spinal localization. The tumor seems to be more aggressive and expansive when located in the spine than in the long bones. It involved only the VB in our Case 1 but also invaded the posterior elements in Case 2. In the literature, associated anterior and posterior involvement has been reported in 19 of 20 cases (Table 1). Isolated anterior localization has been noted in only one case. Although chondroblastoma has a well-known predilection for the epiphysis, isolated involvement of the posterior elements has not yet been reported. This fact remains unexplained, however, despite the fact that the posterior vertebrae can be

Fig. 3. Case 1. Photomicrograph. Nodule composed of eosinophilic chondroid material containing uniform round-to-polygonal cells. Note the presence of osteoclast giant cells. H & E, original magnification × 20.

Fig. 4. Case 2. Anteroposterior (A) and lateral (B) lumbar radiographs revealing an osteolytic tumor of L-3 associated with a 30° lumbar scoliosis.

Fig. 5. Case 2. Coronal (A) and sagittal (B) CT reconstructions demonstrating scoliotic curve and posterior tumoral extension to the L-3 right pedicle and involvement of the intervertebral foramen.

Fig. 6. Case 2. Lateral (A) and anteroposterior (B) lumbar radiographs obtained 1 year after vertebrectomy.
Chondroblastoma of the lumbar spine

As reported in recent imaging-based studies, a vertebral chondroblastoma typically appears as an aggressive osteolytic lesion, often associated with spinal canal invasion and soft-tissue extension. In our Case 1, the tumor appeared as a nonexpansive osteolytic and partially calcified lesion with a sclerotic border involving only the VB, with no evidence of soft-tissue involvement. The cartilaginous nature of the neoplasm was suspected because of the presence of calcifications detected on the CT scan. In the literature, approximately 50% of the cases are associated with evidence of matrix calcification. A sclerotic border, either complete or incomplete, has also been observed in a few cases. In our Case 2, no calcification was observed but the destructive osseous lesion invading the spinal canal was suggestive of a malignancy. Biopsy sampling is required to establish a definitive diagnosis before undertaking resection. In our two cases, percutaneous biopsy sampling contributed to the diagnosis, as we observed in cells with ovoid nuclei and a well-defined cytoplasmic border with so-called chicken-wire calcification without any sign of malignancy. Table 2 provides a summary of the key clinical, neuroimaging/radiological, and pathological features of spinal chondroblastoma.

Chondroblastoma is a benign tumor but local recurrence has been evidenced in many cases. Recurrences are usually local but aggressive relapses involving adjacent vertebrae, and subsequent neurological complications have been reported. Extension of the tumor to adjacent soft tissues, responsible for renal, vascular, or respiratory complications has also been described in a few cases.

<table>
<thead>
<tr>
<th>Authors &amp; Year</th>
<th>No. of Cases</th>
<th>Age (yrs), Sex</th>
<th>Spinal Level</th>
<th>Vertebral Extension</th>
<th>Spinal Canal Invasion</th>
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<tr>
<td>Buraczewski, et al., 1957</td>
<td>1</td>
<td>28, M</td>
<td>T-3 &amp; T-4</td>
<td>ant &amp; pst</td>
<td>yes</td>
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<tr>
<td>Ehalt &amp; Ratzenhofer, 1967</td>
<td>1</td>
<td>12, M</td>
<td>C-3</td>
<td>ant &amp; pst</td>
<td>no</td>
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<td>Wisniewski, et al., 1973</td>
<td>1</td>
<td>17, M</td>
<td>C-1</td>
<td>anterior</td>
<td>no</td>
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<tr>
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<td>1</td>
<td>NR</td>
<td>L-3</td>
<td>NR</td>
<td>NR</td>
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<tr>
<td>Brasse, et al., 1985</td>
<td>1</td>
<td>9, M</td>
<td>C-7</td>
<td>ant &amp; pst</td>
<td>yes</td>
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<tr>
<td>&amp; Hoeffel, et al., 1987†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Akai, et al., 1986</td>
<td>1</td>
<td>48, M</td>
<td>sacral</td>
<td>ant &amp; pst</td>
<td>yes</td>
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<tr>
<td>Howe, et al., 1988</td>
<td>1</td>
<td>16, M</td>
<td>C-6</td>
<td>ant &amp; pst</td>
<td>yes</td>
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<tr>
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<td>NR</td>
<td>L-3</td>
<td>NR</td>
<td>NR</td>
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<tr>
<td>Mirra, et al., 1989</td>
<td>1</td>
<td>16, F</td>
<td>C-5</td>
<td>NR</td>
<td>NR</td>
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<tr>
<td>Campanacci, 1980</td>
<td>1</td>
<td>NR</td>
<td>L-4</td>
<td>NR</td>
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<td>Edel, et al., 1992</td>
<td>1</td>
<td>24, F</td>
<td>C-7</td>
<td>NR</td>
<td>NR</td>
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<td>Freyschmidt &amp; Ostertay, 1998</td>
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<td>59, M</td>
<td>T-6 &amp; T-7</td>
<td>NR</td>
<td>NR</td>
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<td>48, M</td>
<td>T-2</td>
<td>ant &amp; pst</td>
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<td>Chung, et al., 2003</td>
<td>1</td>
<td>54, M</td>
<td>L-5</td>
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<td>yes</td>
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<tr>
<td>Ilaslan, et al., 2003</td>
<td>9</td>
<td>mean age 28, 6M &amp; 3F‡</td>
<td>cervical 2, thoracic 5, lumbar 1, sacral 1</td>
<td>ant &amp; pst in all cases, in 6 cases</td>
<td>yes, in 6 cases</td>
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<td>Nishida, et al., 2003</td>
<td>1</td>
<td>34, M</td>
<td>C-5</td>
<td>ant &amp; pst</td>
<td>yes</td>
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</tbody>
</table>

* NR = not reported; pst = posterior.
† Same case reported in both studies.
‡ Patients ranged in age from 5 to 41 years.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Feature</th>
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</thead>
<tbody>
<tr>
<td>clinical</td>
<td>pain, spinal stiffness</td>
</tr>
<tr>
<td>x-ray, CT scan</td>
<td>osteolytic lesion, marginal sclerosis, calcifications</td>
</tr>
<tr>
<td>MRI</td>
<td>soft-tissue invasion, vertebral canal invasion, low signal on T1-weighted images, intermediate signal on STIR sequence, peritumoral edema</td>
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<tr>
<td>histology</td>
<td>cells w/ ovoid nuclei &amp; well-defined cytoplasmic border w/ chicken-wire calcification, chondroid tissue w/ cellular areas w/o nuclear atypia</td>
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</table>
has been reported in a few cases responsible for five deaths.1,4,7,11,13 Because of this high rate of local recurrence, patients have to be strictly followed over a long-term period after surgery.

Treatment options for this benign tumor include local curettage or resection. Because of the high rate of local recurrence, total vertebrectomy is the most common technique. Consequently, the preoperative neuroimaging/radiological studies must be analyzed carefully to define the most suitable surgical strategy. In our Case 2, MR imaging was necessary for preoperative planning. Because this modality demonstrated neurological compromise of the L-3 nerve root, it was impossible to perform an en bloc resection of the tumor without radicular sectioning. We decided not to resect the L-3 root with the tumor, and radicular liberation was performed via a posterior approach.

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References

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