Symptomatic Osteochondroma of Lumbosacral Spine: Report of 5 Cases

Keita KURAISHI,1 Junya HANAKITA,1 Toshiyuki TAKAHASHI,1 Mizuki WATANABE,1 and Fumiaki HONDA1

1Spinal Disorders Center, Fujieda Heisei Memorial Hospital, Fujieda, Shizuoka

Abstract

We describe 5 cases of osteochondroma (OC) originating from lumbosacral spine which caused radiculopathy. Four cases originated from the lumbar spine; all from L4 inferior articular process and presented L5 radiculopathy, the other one case originated from the sacrum; the case from S1 superior articular process presented L5 radiculopathy. In all cases, definitive diagnosis was made with histopathological findings; typical cartilaginous capping was confirmed. The functional recovery was completed in all 5 cases. As for imaging study, postmyelography computed tomography revealed the most diagnostic tool for understanding the relationship between nerve tissue and the tumor. In all 5 patients, the tumors contained a high signal intensity on T2-weighted images in the central medullary area. OCs are sometimes difficult to diagnose because they mimic other conditions like bony spur formation due to osteoarthritis, so we should never fail to confirm the histopathological diagnosis of such lesions when suspected.

Key words: osteochondroma, lumbar, sacrum, radiculopathy, cartilaginous cap

Introduction

Although osteochondroma (OC) is a common benign tumor, OC of the spine is a rare manifestation. Spinal OCs are more often located in the cervical and upper thoracic vertebrae, whereas the inferior thoracic, lumbar and especially sacral levels are rarely involved. We describe 5 cases of OC originating from lumbosacral spine that caused L5 radiculopathy. In all cases, histological study confirmed the diagnosis of OC with cartilaginous capping.

Case Reports

Patient 1: A 57-year-old man presented with right leg pain over L5 dermatome for about 6 years. Computed tomography after myelography (CTM) showed a high density mass with medullary continuity between the tumor and the vertebra arising from right L4 inferior articular process, projecting into spinal canal (Fig. 1a). The lesion contained central cancellous bone displaying high signal intensity in T2-weighted image (Fig. 1b). Lumbar laminectomy was performed and the bony mass compressing right L5 nerve root was resected. The patient did not complain of symptoms at 6 years follow-up.

Patient 2: A 63-year-old woman presented with a 9-month history of motor weakness at right lower extremity (tibialis anterior and extensor hallucis longus) and numbness over right L5 dermatome. CTM showed a bony mass with cortical and medullary continuity with superior articular process of the right S1 vertebra (Fig. 2a). Magnetic resonance imaging (MRI) showed a high intensity cancellous area in T2-weighted image (Fig. 2b). The bony mass was resected via a right partial hemilaminectomy at the L5-S1 level. The mass severely compressed dural theca and right L5 nerve root. Her motor weakness gradually improved and she did not complain of symptoms at the 7 years follow-up.

Patient 3: A 48-year-old woman presented with severe low back and left leg pain over L5 dermatome for a few years. MRI showed a high signal intensity medullary area within the tumor arising from right L4 inferior articular process, projecting into spinal canal (Fig. 1a). The lesion contained central cancellous bone displaying high signal intensity in T2-weighted image (Fig. 1b). Lumbar laminectomy was performed and the bony mass compressing right L5 nerve root was resected. The patient did not complain of symptoms at 6 years follow-up.

Patient 4: A 32-year-old man presented with a 2-year history of pain involving right buttock and lateral surface of thigh. CTM showed a small bony tumor arising from inferior articular process of the right L4 vertebra (Fig. 3a). The cortex of the tumor was in continuity with the inferior articular process of the right L4 vertebra compressing right L5 nerve root. MRI showed a high signal intensity of motor weakness at right lower extremity (tibialis anterior and extensor hallucis longus) and numbness over right L5 dermatome. CTM showed a bony mass with cortical and medullary continuity with superior articular process of the right S1 vertebra (Fig. 2a). Magnetic resonance imaging (MRI) showed a high intensity cancellous area in T2-weighted image (Fig. 2b). The bony mass was resected via a right partial hemilaminectomy at the L5-S1 level. The mass severely compressed dural theca and right L5 nerve root. Her motor weakness gradually improved and she did not complain of symptoms at the 7 years follow-up.

Patient 5: A 48-year-old woman presented with severe low back and left leg pain over L5 dermatome for a few years. MRI showed a high signal intensity medullary area within the tumor arising from right L4 inferior articular process, projecting into spinal canal (Fig. 1a). The lesion contained central cancellous bone displaying high signal intensity in T2-weighted image (Fig. 1b). Lumbar laminectomy was performed and the bony mass compressing right L5 nerve root was resected. The patient did not complain of symptoms at 6 years follow-up.
signal intensity medullary area within the tumor arising from right L4 inferior articular process (Fig. 3b). The tumor with smooth surface was meticulously resected via a right partial hemilaminectomy at the L4-5 level (Fig. 4a). Histological diagnosis was OC (Fig. 4b). The patient became symptom-free immediately after surgery. At the 19 months follow-up, the postoperative course was uneventful (Fig. 4c).

**Patient 5:** A 62-year-old man presented with a 6-month history of pain involving bilateral buttocks and legs. CTM showed a small bone spicule continuing with inferior articular process of the right L4 vertebra. MRI showed a high intensity mass in the T2-weighted image. The tumor was resected via a right partial hemilaminectomy at the L4-5 level. He was relieved from pain. At 1 year follow-up, the postoperative course was uneventful.

**Discussion**

OC is caused by the separation of a fragment of growth
plate cartilage, which grows as a result of progressive enchondral ossification, leading to subperiosteal osseous excrescence with a cartilage cap that projects from the bone surface. Enchondral ossification leads to medullary bone with a fatty or hematopoietic marrow. OC is a common tumor affecting bone. OCs are classified as either solitary or multiple. Solitary OCs develop in a single bone and are not hereditary. Multiple OCs can occur either spontaneously or in an autosomal dominant disorder known as hereditary multiple exostoses (HME). The lesions are rarely found in the spine; only 1.3% to 4.1% of solitary OCs and 3% to 9% of HME arise in the spine.

Symptomatic OCs compressing the neural structures are rare, because the majority of these lesions grow out of the spinal canal. Spinal OCs are more often located in the cervical and upper thoracic vertebrae, whereas the inferior thoracic and lumbar levels are rarely involved, especially sacrum. In the English language literature, there are only 11 reported cases of symptomatic OC in the lumbar spine with sufficient information about the patient’s age, sex, symptom, the situation of the tumor, and the outcome. In this report, we presented...
additional 4 cases of OCs arising from lumbar vertebra; all tumors originated from right L4 inferior articular process and presented L5 radiculopathy (Table 1). As to the symptomatic OC in the sacral spine, Sung et al. reported their experience of 54 primary tumors originated from the sacrum including 2 cases of OCs in 1987.15 In the report, there is little information about the patient’s age, sex, symptom, the situation of the tumor, and the outcome. To the best of my knowledge, Hanakita and Suzuki reported the first case in 1988 with detailed information.16 Adding our new case (Patient 2), there are only 4 reported cases of symptomatic OCs originating from the sacrum (Table 2).16–18 Complete excision of the cartilaginous component is also reported to be 10% to 30% in HME as compared to 1% to 5% in solitary OC, so complete excision of such lesion is very important.6,19 In the present report, using microscope in all surgery, no recurrence was observed for more than 1 year after total excision of the tumor including the cartilaginous cap. According to 11 reported cases with present 4 cases (Table 1), the origin of symptomatic lumbar spinal OCs was from articular process in 9 cases (60%), lamina in 3 cases (20%), pedicle in 2 cases (13%), and vertebral body in 1 case (7%).5,7,9–14 Predominance of articular process is explained by the existence of so-called secondary ossification center. Secondary ossification centers lie in the spinous process, transverse process, articular process, and the endplate of vertebral body. The cartilage of these secondary ossification centers could be the origin of aberrant islands of cartilaginous tissue that cause OC to form.6

As the neuroradiological examination tools, plain X-rays are insufficient in some cases, because of overlapping of osseous structures of the spine.16,17,19 The computed tomography (CT) scan is necessary, allowing radiologic diagnosis by showing cortical and medullary continuity between the tumor and the vertebra.17 At CT, all of our 5 cases contained honeycomb appearance or low density area in the central portion of the tumor. At MR imaging, the lesion manifests with a high intensity in the central area corresponding to the central cancellous bone in T2-weighted image. Cartilaginous cap also displays high intensity in T2-weighted image.20 A chondroid tumor matrix in the

### Table 1 Literature review of reported cases of symptomatic lumbar exostoses

| Author & year       | Age (yrs), sex | Level | Site  | Presentation          | Lesion type | Outcome |
|---------------------|---------------|-------|-------|------------------------|-------------|---------|
| Urso et al. (1977)  | 9, M          | L4    | Lamina| Cauda equina synd.     | HME         | Good    |
| van der Sluis et al. (1992) | 26, F | L4    | AP    | L5, S1 radiculopathy   | SOC         | ?       |
| Fiumara et al. (1999) | 35, F | L5    | AP    | S1 radiculopathy       | SOC         | Good    |
| Fiechtl et al. (2003) | 8, F  | L4    | Lamina| L4, 5 radiculopathy    | HME         | Good    |
| Ohtori et al. (2003) | 56, M | L3    | AP    | L4 radiculopathy       | SOC         | Good    |
| Ohtori et al. (2003) | 55, F | L4    | AP    | L5 radiculopathy       | SOC         | Good    |
| Gürkanlar et al. (2004) | 35, M | ??    | ??    | L4, 5 radiculopathy    | SOC         | Good    |
| Xu et al. (2009)    | 38, M         | L5    | Lamina| L5 radiculopathy       | SOC         | Good    |
| Lotfinia et al. (2010) | 29, M | L4    | Pedicle| L5 radiculopathy      | HME         | Good    |
| Present study       | 57, M         | L4    | AP    | L5 radiculopathy       | SOC         | Good    |
|                     | 48, F         | L4    | AP    | L5 radiculopathy       | SOC         | Good    |
|                     | 32, M         | L4    | AP    | L5 radiculopathy       | SOC         | Good    |
|                     | 62, M         | L4    | AP    | L5 radiculopathy       | SOC         | Good    |

AP: articular process, F: female, HME: hereditary multiple exostoses, M: male, SOC: solitary osteochondroma, VB: vertebral body.

### Table 2 Literature review of reported cases of symptomatic sacral exostoses

| Author & year       | Age (yrs), sex | Level | Site  | Presentation          | Outcome          |
|---------------------|---------------|-------|-------|------------------------|------------------|
| Sung et al. (1987)  | ?             | Below S3 | ? | ?                      | Good             |
| Hanakita et al. (1988) | 42, F | S1    | Lamina| Urinary disturbance, hypesthesia | Good             |
| Agrawal et al. (2005) | 14, M | ?    | Sacral ala| Leg pain | ?             |
| Samartzis and Marco (2006) | 11, M | S2    | Lamina| Leg pain | Good          |
| Present study       | 63, F         | S1    | AP    | Drop foot, numbness    | Good             |

AP: articular process, F: female, M: male.
cap may show increased signal intensity on $T_2$-weighted images, but if the cap is thin or highly cellular, distinctive signal characteristics may be absent. Low signal intensity mineralization that serves as a boundary between the medullary space and a thin cartilaginous cap may be present, especially in children. With age, cartilage tends to thin and disappear at numerous points on the surface of an OC. In our 5 patients, cartilaginous cap, on $T_2$-weighted images (Figs. 1b, 2b, 3b).

Conflicts of Interest Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper. All authors have registered online self-reported COI Disclosure Statement Forms through the website for the Japan Neurosurgical Society (JNS) members.

References

1) Rodallec MH, Feydy A, Larrousserie F, Anract P, Campagna R, Babinet A, Zins M, Drapé JL: Diagnostic imaging of solitary tumors of the spine: what to do and say. Radiographics 28: 1019–1041, 2008
2) Albrecht S, Crutchfield JS, SeGall GK: On spinal osteochondromas. J Neurosurg 77: 247–252, 1992
3) Dahlin DC, Unni KK: Bone Tumors. General Aspects and Data on 8,542 Cases. Springfield, Charles C. Thomas, ed 4 1986, pp 228–229
4) Robbins SE, Laitt RD, Lewis T: Hereditary spinal osteochondromas in diaphyseal aclasia. Neuroradiology 38: 59–61, 1996
5) Royster RM, Kujawa P, Dryer RF: Multilevel osteochondroma of the lumbar spine presenting as spinal stenosis. Spine 16: 992–993, 1991
6) Fiumara E, Scarabino T, Guglielmi G, Bisceglia M, D’Angelo V: Osteochondroma of the L-5 vertebra: a rare cause of sciatic pain. Case report. J Neurosurg 91[2 Suppl]: 219–222, 1999
7) Ohtori S, Yamagata M, Hanaoka E, Suzuki H, Takahashi K, Samedia H, Moriya H: Osteochondroma in the lumbar spinal canal causing sciatic pain: report of two cases. J Orthop Sci 8: 112–115, 2003
8) Bess RS, Robbin MR, Bohlman HH, Thompson GH: Spinal exostoses: analysis of twelve cases and review of the literature. Spine 30: 774–780, 2005
9) Fiechtl JF, Masonis JL, Frick SL: Spinal osteochondroma presenting as atypical spinal curvature: a case report.

Spine 28: E252–E255, 2003
10) Gürkanlar D, Aciduman A, Günaydın A, Koçak H, Colik N: Solitary intraspinal lumbar vertebral osteochondroma: a case report. J Clin Neurosci 11: 911–913, 2004
11) Lotffnia I, Vahedi P, Tubbs RS, Ghavame M, Meshkini A: Neurological manifestations, imaging characteristics, and surgical outcome of intraspinal osteochondroma. J Neurosurg Spine 12: 474–489, 2010
12) Urso S, Carfagni A, Amorese V: Vertebral compression syndrome in multiple exostoses (case report). Ital J Orthop Traumatol 3: 333–340, 1977
13) van der Sluis R, Gurr K, Joseph MG: Osteochondroma of the lumbar spine. An unusual cause of sciatica. Spine 17: 1519–1521, 1992
14) Xu J, Xu CR, Wu H, Pan HL, Tian J: Osteochondroma in the lumbar intraspinal canal causing nerve root compression. Orthopedics 32: 133, 2009
15) Sung HW, Shu WP, Wang HM, Yuai SY, Tsai YB: Surgical treatment of primary tumors of the sacrum. Clin Orthop Relat Res 91–98, 1987
16) Hanakita J, Suzuki T: Solitary sacral osteochondroma compressing the cauda equina—case report. Neurol Med Chir (Tokyo) 28: 1010–1013, 1988
17) Agrawal A, Dwivedi SP, Joshi R, Gangane N: Osteochondroma of the sacrum: a case report. J Neurosurg 77: 1010–1013, 1992
18) Samartzis D, Marco RA: Osteochondroma of the sacrum with a correlative radiographic and histological evaluation. Pediatr Neurosurg 41: 46–48, 2005
19) Yamaguchi N, Hongo M, Kasukawa Y, Shimada Y: Cervical myelopathy caused by atlas osteochondroma and pseudoarthrosis between the osteochondroma and lamina of the axis: case report. J Neurosurg 50: 346–349, 2010
20) Bernard SA, Murphey MD, Flemming DJ, Kransdorf MJ: Improved differentiation of benign osteochondromas from secondary chondrosarcomas with standardized measurement of cartilage cap at CT and MR imaging. Radiology 255: 857–865, 2010
21) Quirini GE, Meyer JR, Herman M, Russell EF: Osteochondroma of the thoracic spine: an unusual cause of spinal cord compression. AJNR Am J Neuroradiol 17: 961–964, 1996
22) Gille O, Pointillart V, Vital JM: Course of spinal solitary osteochondromas. Spine 30: E425–E429, 2006

Address reprint requests to: Keita Kuraishi, MD, PhD, Spinal Disorders Center, Fujieda Heisei Memorial Hospital, 123-1, Mizukami, Fujieda, Shizuoka 426-8662, Japan. e-mail: kuraishikeita@yahoo.co.jp