Osteoblastoma of the lumbar spine in an adolescent: A case report and review of literature

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Abstract

Introduction: Osteoblastomas are primary bone tumors representing 1% of all bone tumors and 10% of all spinal osseous neoplasms with a predilection for posterior elements.

Case report: A 13-year-old boy with insidious backache for six months presented with progressive radiating paraesthesia and claudication, restricted lumbar motion and positive straight leg test bilaterally with weakness of left ankle dorsiflexion. Radiograph showed an subtle expansile lytic lesion in the L3 posterior elements. CT and MRI revealed a space-occupying lesion of the L3 vertebra lamina, involving the left pedicle causing severe spinal canal stenosis. Excision of the posterior elements of the L3 vertebra including the facet and left pedicle and short segment fixation from L2-L4 using autogenous rib was done.

Conclusion: Autogenous structural rib can be used for posterolateral fusion after osteoblastoma excision with potential instability.

Keywords: Osteoblastoma, back pain, rib graft, postero-lateral fusion, en-bloc resection.

Introduction

Osteoid osteoma was first described by Jaffe in 1935 [1], osteoblastomas were described by Jaffe and Lichtenstein in 1956 independently [2]. They are benign bone tumours constituting about 11% of all primary bone tumours [1-3]. The condition is more frequent in males, (male to female ratio of 2:1) and occurs during the second decade of life [1-3]. The most common location for these lesions is the spine with a preponderance for posterior elements of the spine constituting 30-40% of all the cases [1,3,4]. Two types of osteoblastoma have been described in the literature; conventional osteoblastomas and aggressive osteoblastomas, the latter being characterised by high alkaline phosphatase levels and size of more than 1.5 cms with paravertebral or epidural extension and lytic changes on radiographs [4].

Treatment of osteoblastomas of the spine involves en bloc excision of the lesion in Enneking stage 3 lesions and intralesional curettage in Enneking stage 2 lesions [5,6]. Radiotherapy is considered as an adjuvant or an alternative to surgical excision if excision demands unacceptable functional sacrifice or in non-accessible locations [7]. Recurrence can occur if excision is inadequate. Overall recurrence rates reported for osteoblastomas has been around 10 – 15% [2]. Recurrences are typically seen 5-10 years after index procedure [4].

We describe a case of osteoblastoma of posterior elements of L3 vertebra in a 13-year-old boy treated with en bloc excision and posterolateral fusion using rib autograft.

Case report

A 13-year-old boy presented to clinic with complaints of low back pain of six months duration which was insidious in onset, gradually worsening with time. Pain was present during rest, radiated to both lower limbs associated with parasthesia, and claudication symptoms with walking, with relief on lying down with the hips and knees flexed. There was no history of trauma, heavy weightlifting, no unaccustomed activity, no history of fever, weight loss, loss of appetite, tuberculosis, no morning stiffness, or small joint pains. Past medical history was unremarkable. On examination there was restriction of movements of the lumbar spine and focal tenderness over the lumbar region. Power of ankle dorsiflexion on the left side was grade 3. Ankle jerk on the left side was diminished. Rest of the neurological examination was unremarkable.

Radiograph showed a lytic lesion in posterior elements of L3. MRI revealed a space occupying lesion in the posterior

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elements of L3 involving the left pedicle and causing severe spinal canal stenosis. CT revealed a heterogeneous expansile bony lesion with lytic and sclerotic component arising from the spinous process of the L3 vertebra extending into the left pedicle (Figure 1-3). A PET-CT scan showed the solitary lumbar lesion with no other lesion elsewhere. Alkaline phosphatase level was 224 IU/L (Normal- 38 – 94 IU/L).

After pre-operative work-up, consent and general anaesthesia, patient was positioned prone; exposure of L2-L4 levels was done after level confirmation. En bloc excision of the L3 lamina including the facet joint and left pedicle was done as these were involved. Posterior stabilisation with pedicle screws at L2 and L4 was done. Posterolateral fusion was performed to prevent iatrogenic instability and autogenous rib graft (left 10th rib) was harvested for fusion (Figure 4). The estimated blood loss was 200 ml. Closure was performed and the patient was extubated, the post-operative period was uneventful. Histopathological examination of the resected specimen confirmed the lesion to be osteoblastoma (Figure 5).

Patient followed up every six months and at two years’ post-operatively has had no symptoms or radiological evidence of recurrence of the disease or implant loosening (Figure 6, 7, 8).

**Discussion**

**Clinical presentation:** Osteoid osteomas and osteoblastomas of the spine are uncommon tumours which may present with atypical symptoms and normal radiological findings in the initial course of the disease and thus may lead to delays in diagnosis [2]. It may present as persistent, dull back pain. Other presentations may include a painful scoliosis. Scoliosis is usually convex
opposite to the side of the lesion. Radiculopathy and neurological deficit with cauda equina syndrome can occur if the lesion impinges on the nerve roots or the spinal cord [3]. Thus, backache should not be presumed to be postural or inflammatory if long-standing and with red flags. 

Investigations: Plain radiographs maybe less sensitive in picking up the lesion in early stages as lytic lesions cannot be identified on radiographs unless there is approximately 50% bone destruction [4]. CT scan and MRI provide detailed information of the extent of the lesion, involvement of adjacent structures, distortion of local anatomy and intra-spinal extent of the lesion. A PET-CT scan detects involvement of other regions and allows staging.

Pathology: Osteoblastomas are known to be more aggressive tumours. Locally aggressive tumours can cause mass symptoms. Malignant transformation of osteoblastomas has also been reported [2].

Literature summary is shown in Table 1. 

Treatment: Enneking staging has been used by many authors to guide the method of treatment [4,7]. Intra-lesional excision has been advised for Enneking stage 2 lesions and en-bloc resection for stage 3 [7]. Pre-operative arterial embolization has been shown to reduce intra-operative blood loss [8]. Surgical resection is the conventional treatment of choice for spinal osteoblastomas after meticulous surgical planning. Intraoperative use of navigation provides accurate localisation facilitating complete removal [9]. In this case interbody fusion was avoided as it would violate compartments. Stabilisation is warranted if excision of intervertebral joints or facets is done [5]. Minimally invasive options like CT-guided radiofrequency ablation and image guided cryoablation may avoid need for fusion. Recently fully endoscopic resection has been described for spinal osteoblastoma. Use of denosumab preoperatively has been reported to regress tumour, ossify and facilitate resection [10].

To conclude, Autogenous rib graft can be used as a structural graft for posterolateral fusion after osteoblastoma excision with potential instability.

Clinical relevance

Back pain in adolescents should not be considered as postural or inflammatory especially when associated with red flags. The patient should undergo appropriate investigations to reach a diagnosis. Autogenous rib can be reliably used as a structural graft for posterolateral fusion.

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

Conflict of Interest: NIL; Source of Support: NIL.
Table 1: Review of Literature

| NAME | AUTHOR/ JOURNAL/YEAR | SAMPLE | SEX | MEAN AGE (yr) | LEVEL | INVOLVED AREAS OF THE VERTEBRA | SYMPTOMS | ABLATION THERAPY | TECHNIQUE | BEDPSY | IMPLANTS | COMPLICATIONS | CONCLUSION |
|------|----------------------|--------|-----|---------------|-------|-------------------------------|----------|------------------|-----------|--------|----------|-------------|------------|
| Osteoblastoma A 31 year study of 93 cases | Sagade BS et al/ Journal of Surgical Oncology/2006 | 93 | 43M 30F 20 | 24 | 24 in the vertebral, rest in the extremities | NA | NA | NA | NA | NA | Recurrence | OBL frequently affects the long bones and the spine. Recurrence rates following en-bloc excision are relatively high and can be minimized by en-bloc resection. |
| Management of osteoblastoma and osteoid osteoma of the spine in childhood | Sharma BN et al/ Journal of Neuroradiology/2009 | 15 | 20M 12F | 12 | 11 C, 17 L, 1 Cerv | Body and posterior elements, pain, radiculopathy, radiculopathy, about 3 months | NA | En-bloc excision | NA | NA | NA | Analytic rise in 1 surgical site infection in 3. |
| Staging and treatment of osteoblastoma and osteoid osteoma of the spine: a review of 33 cases | Srinivas Bhatia et al/ East Spine J/2010 | 31 | 34M 17F | 24 | 11 C, 17 L, 1 Cerv | Par, radiculopathy | NA | Pre-operative embolisation, Postoperative radiotherapy | Intrallesional excision + en-bloc excision | NA | NA | Death, progressive kyphosis in 2, lumbar resection in 3, lumbar resection in 3. |
| Osteoblastoma of the spine: 20 years clinical and radiological review | Phyo Bhaigat et al/Spine/2014 | 19 | 16M 2F | 36 | IS 54 | Anterior and posterior | Radiofrequency ablation + chemotherapy. Radiotherapy in 1, chemoradiation in 1 | Intrallesional excision + en-bloc excision | Needle core biopsy - en-bloc resection or metastatic lesion resection | NA | NA | Neurodeficit, wound, kyphosis, infection, radiotherapy |
| Surgical excision of vertebral tumors and complications of surgery | Bhagat Bhandari et al/ J Pediatr Orthop B/2012 | 17 | 6M 4F | 115 | SC, LC, OL, LC, SC/OL, SC/OL | Osteoid osteoma, primary element and adjacent elements | Pain, radiculopathy, radiculopathy, tendinitis | NA | Intralesional excision, wide excision | NA | None, viable bone, Halo | Persistent pain, recurrence, indolent |
| Surgical management of osteoblastoma of the spine: a case report and review of literature | Reponen Eider et al/ Turkish Journal of Orthopedics/2016 | 5 | 3M 2F | 28 | SC, LC, SC | Precocious elements of extra spinal | Pain, neurodeficit | Pre-operative embolisation in 1 | CT guided biopsy | Pedicle screws, Allograft, OBL | Recurrence |
| CT guided radiofrequency ablation of spinal osteoid osteoma: treatment and long term follow up | Fuccillo Antiga et al/ International Journal of Hyperthermia/2006 | 11 | 7M 4F | 26 | TT, 4L, 2S | NA | Pain | CT guided radiofrequency ablation | CT guided biopsy | Pedicle screws, Allograft, OBL | CT guided radiofrequency ablation, in safe and effective for spinal OBL, the advantage of being minimally invasive. |
| Percutaneous image guided cryoablation of osteoblastomas | Roberto Canizer et al/ American Journal of Neuroradiology/2013 | 10 | 7M 3F | 13 (median) | SC, LT, 2L, 2S | NA | Pain | Pre-operative embolisation in 2 cases | Cryoablation | In 7 patients | Permanent sensory deficit in the area, recurrent bone sarcoma, treatment rate following curretage is relatively high and can be minimized by en-bloc resection. |
| Osteoid osteoma enucleation: a challenge in the extremities: a case report | Addame Mustaf et al/ World Neuroradiology/2015 | 2 | M | 25, 34 | L3, T10 | Body, lumbar and pedicle | Pain, radiculopathy | Postoperative radiofrequency ablation | CT guided biopsy | Pedicle screws, cage | Recurrence and death. |
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