Case Report

Integrated treatment of a lumbar vertebral hemangioma with spinal stenosis and radiculopathy: A case report and a review of the literature

ABSTRACT

We describe a comprehensive, multidisciplinary treatment approach for lumbar vertebral hemangiomas (VHs) with spinal stenosis and radiculopathy. A 59-year-old female presented with 1 year of pain predominantly in the lower back, with pain in the left buttock and proximal left anterior thigh as well and magnetic resonance imaging of the lumbar spine demonstrated lumbar scoliosis and an L3 vertebral lesion suspicious for hemangioma. A computed tomography guided biopsy was done, which supported the diagnosis. Definitive treatment entailed preoperative angiography and embolization, followed by L3 laminectomy, right L3 pedicle resection, partial L3 corpectomy, L3 vertebral cement augmentation, and L1 to L5 instrumented fusion. By 1-year postoperatively, the patient reported no radicular pain and only mild groin pain attributed to left hip degenerative joint disease. Radiographs 1-year postoperatively confirmed the stability of the instrumented posterior fusion and a magnetic resonance imaging with and without contrast confirmed no VH recurrence. A comprehensive and multidisciplinary approach for the treatment of VHs with neurological symptoms or signs is presented. This approach is recommended to maximize lesion removal, ensure biomechanical stability, and minimize recurrence.

Keywords: Lumbar spine, neoplasm, vertebral hemangioma

INTRODUCTION

Vertebral hemangiomas (VHs) are benign neoplasms of endothelial origin that penetrate and may remodel surrounding bony trabeculae.[1,2] These lesions have an estimated incidence of 11% in the adult population and are commonly found in the vertebral bodies of the thoracic and lumbar spine.[1-4] The large majority of these lesions are asymptomatic and discovered incidentally by imaging, whereas a minority of them may become symptomatic and lead to back pain, radiculopathy, and myelopathy.[1] The imaging appearance of aggressive VHs (lesions that cause compression of neural elements) in radiographs may exhibit vertebral collapse and pedicle erosion.[1] Using advanced imaging techniques, other features of aggressive VHs may be seen: a "polka dot" appearance, due to reinforced trabeculae, in computed tomography (CT) axial sequences and low signal on T_1 sequences and high signal on T_2 sequences, due to increased vascularity, in magnetic resonance imaging (MRI) sequences.[1,5]

A number of treatments have been proposed for symptomatic VHs, including radiotherapy, orthosis (when a threatened pathological fracture is present), ethanol injection, embolization of the lesion's vascular supply, vertebroplasty,

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kyphoplasty, or a combination of these techniques when pain or mild neurologic deficits were present.[6] The recommended treatment for more significant neurologic issues, such as radiculopathy, myelopathy, or cauda equina syndrome, is surgery.[6-8] The posterior surgical approach is commonly used unless the VH is restricted to a ventral location (which is more amenable to an anterior approach) or is suspected to be malignant (thereby necessitating wide resection with techniques such as spondylectomy).[6]

Due to the rarity of these lesions and treatment descriptions limited to small case series, no broad consensus exists regarding the optimal treatment of VHs. In this manuscript, we present the case of a patient with central and foraminal stenosis with resultant left L3 radiculopathy caused by an L3 VH. A multidisciplinary approach with a spine surgeon and musculoskeletal oncologist was used to appropriately characterize the L3 VH and treat with preoperative embolization, L3 laminectomy, intraoperative biopsy, lesion resection, vertebroplasty, and L1–L5 instrumented posterior spinal fusion. This led to pain resolution, no recurrence of the hemangioma lesion, and stable hardware positioning 1-year postoperatively. The patient consented to the publication of details of her case.

CASE REPORT

Initial presentation

The patient was a 59-year-old female seen by a spine surgeon for 1 year of low back pain, with radiation down the left buttock to the left proximal anterior thigh. At the time of the initial evaluation, she stated that her pain was 10/10 at times on the Visual Analog Scale (VAS). She had trialed conservative treatments to manage her pain, including over-the-counter analgesics, neuromodulators, and physical therapy. She denied urinary/bowel incontinence, perineal anesthesia, and numbness or paresis in the left lower extremity. The patient's neurological examination revealed no motor or sensory deficits or upper motor neuron findings in the bilateral lower extremities.

Preoperative anteroposterior and lateral radiographs, as well as computed tomography (CT) and magnetic resonance imaging (MRI), were obtained of the lumbar spine [Figure 1 and 2]. These demonstrated a lesion in the L3 vertebral body with a "honeycomb" trabecular matrix pattern that was well-vascularized, encroaching posteriorly into the epidural space, and causing severe thecal sac and left L3 nerve root compression.

Although these findings strongly suggested aggressive VH, other diagnostic possibilities included malignancies such as metastases, multiple myeloma, lymphoma, chordoma, and epithelioid hemangioendothelioma.[1] Due to the above considerations, the

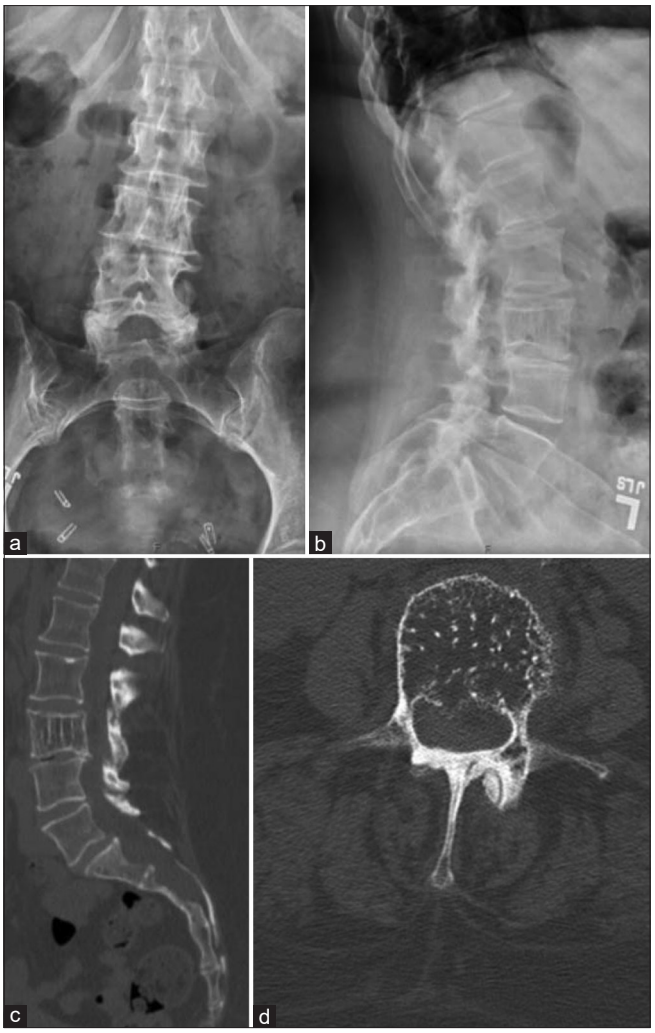

Figure 1: Preoperative anteroposterior (a) and lateral (b) radiographs and sagittal (c) and axial (d) computed tomography sequence images in a 59-year-old female with an L3 vertebral hemangioma. Striations and a "honeycomb" osseous architecture in the vertebral body characteristic of the L3 hemangioma can be visualized

patient had a consultation with a musculoskeletal oncologist before operative intervention. Afterward, she was referred to our Interventional Radiology colleagues for a transpedicular CT-guided biopsy to obtain a histopathological diagnosis. The pathological examination did not reveal any evidence of malignancy and was highly suggestive of a hemangioma.

Treatment and postoperative course

Definitive treatment began with an angiogram of the bilateral L1 to L3 radicular arteries, followed by successful embolization of the L3 branches the day before the surgery. Surgical treatment commenced with an L3 laminectomy and open biopsy of the lesion. Once the biopsy confirmed VH, right L3 pedicle resection and partial L3 corpectomy were done for neural decompression. This was followed by L3 vertebroplasty under fluoroscopic visualization and L1-L5 instrumented posterior spinal fusion [Figure 3].

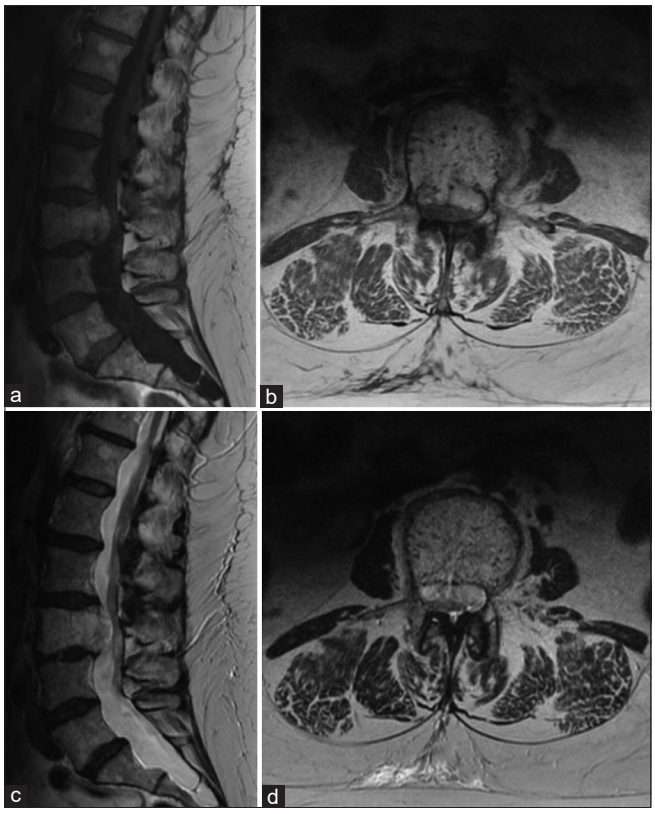

Figure 2: Preoperative (a) sagittal and (b) axial magnetic resonance imaging T_1 sequence images, and (c) sagittal, and (d) axial magnetic resonance imaging T_2 sequence images in a 59-year-old female with an L3 vertebral hemangioma. The patient was indicated for surgical intervention due to central and foraminal stenosis causing a left L3 radiculopathy

The patient experienced no immediate intraoperative or postoperative complications and total estimated blood loss was approximately 1500 mL. On the day of discharge (4 days postoperatively), she reported 6/10 pain on the VAS and standing radiographs demonstrated good hardware position and no L3 collapse or cement extrusion [Figure 4a and b]. At the patient's routine 6-week and 3-month postoperative visits, she reported that her radicular pain was significantly improved compared to her preoperative baseline and repeat radiographs were stable. By 1-year postoperatively, the patient reported no radicular pain and only mild groin pain attributed to left hip degenerative joint disease. Radiographs 1-year postoperatively [Figure 4c and d] confirmed the stability of the instrumented posterior fusion and an MRI with and without contrast confirmed no VH recurrence.

DISCUSSION

When determining treatment for a VH, it is important to consider whether it is asymptomatic or not, the location and extent of its effect on osseous structures, and which neural elements are affected by the lesion. A VH that is symptomatic with focal neurologic complaints or exam

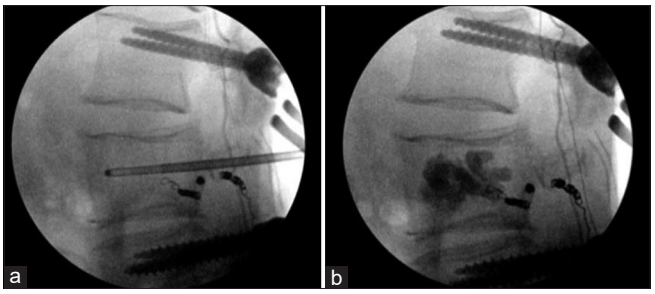

Figure 3: Intraoperative lateral (a and b) fluoroscopic images of the lumbar spine demonstrating placement of a Jamshidi needle for vertebroplasty of the L3 vertebral following laminectomy, resection of the vertebral hemangioma, and posterior instrumented fusion from L1 to L3. Preoperatively, the patient underwent a left transpedicular approach for biopsy of the L3 vertebral hemangioma by interventional radiology and angiography and embolization of the lesion by neurosurgical surgery the day before definitive resection

findings, in conjunction with imaging demonstrating a metabolically active tumor with compression of neural elements, is consistent with an aggressive VH that is indicated for surgery.[1,6] The posterior location of the VH, the extent of its expansion, and its compression on neural elements precluded anterior only and posterior decompression alone surgical approaches for this patient. A posterior approach with decompression, intralesional resection, and instrumented fusion, complemented by preoperative embolization and cement augmentation, was our preferred technique and this has been used successfully to treat noncontiguous VHs.[9] A marginal or wide resection for VH alone, particularly a spondylectomy, was not necessary for recurrence control based on a multicenter study by Goldstein *et al*.[10] Since aggressive VHs may be difficult to distinguish from malignancy, we recommend routine involvement of a musculoskeletal oncologist and preparation for wider-than-initially-anticipated resection using oncologic principles (which has shown acceptable morbidity and satisfactory survival).[11]

Benefits of our approach, for our patient's case, are its combination of angiography and embolization of the VH the day before the surgery, combined with laminectomy, open biopsy, intralesional resection, limited vertebroplasty under fluoroscopic guidance, and a long construct posterior spinal instrumented fusion. Preoperative angiography and embolization aids in reducing intraoperative blood loss and associated morbidity.[9,12] A wide decompression to grossly inspect the neoplasm, with open biopsy by the musculoskeletal oncologist, then permits definitive histopathological confirmation that the VH is not a malignancy (which could have mandated a wide resection). Intralesional resection with limited vertebroplasty under fluoroscopic guidance then aids in local tumor control, reducing recurrence, and imparting additional mechanical support. Finally, we choose a long construct for posterior spinal instrumented fusion (2 levels

Figure 4: Standing anteroposterior and lateral radiographs of the lumbar spine obtained 2 days (a and b) and 1 year (c and d) postoperatively demonstrating stability of the posterior instrumented fusion and vertebroplasty. In addition, no recurrence of the previously resected L3 hemangioma lesion is seen

above and below the VH). This decision was due to the lesional resection mimicking the structural deficiencies of an unstable three-column thoracolumbar fracture, shown by biomechanical studies to be well stabilized by long constructs.[13]

Future considerations could include cement-directing kyphoplasty (instead of vertebroplasty) to achieve more void augmentation and decrease the risk of cement extravasation. More detailed pain and function assessments of patients postoperatively could help assess the success of our proposed treatment approach and improve surveillance for potential VH recurrences.

In conclusion, this case report describes a novel multidisciplinary collaboration between a spine surgeon, musculoskeletal oncologist, and other providers allowing for comprehensive diagnosis and treatment of an aggressive VH with epidural extension and focal neurologic findings. Our recommended treatment for this VH is preoperative angiography and embolization, decompression with laminectomy, open biopsy, partial corpectomy/debulking with vertebroplasty, instrumented posterior spinal fusion with a long segment construct, and careful postoperative surveillance. This approach maximizes lesion removal, ensures biomechanical stability, aids in resolving radicular symptoms, produces a stable posterior spinal fusion, and minimizes recurrence.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Gaudino S, Martucci M, Colantonio R, Lozupone E, Visconti E, Leone A, *et al*. A systematic approach to vertebral hemangioma. Skeletal Radiol 2015;44:25-36.
2. Slon V, Stein D, Cohen H, Sella-Tunis T, May H, Hershkovitz I. Vertebral hemangiomas: Their demographical characteristics, location along the spine and position within the vertebral body. Eur Spine J 2015;24:2189-95.
3. Fox MW, Onofrio BM. The natural history and management of symptomatic and asymptomatic vertebral hemangiomas. J Neurosurg 1993;78:36-45.
4. Pastushyn AI, Slin'ko EI, Mirzoyeva GM. Vertebral hemangiomas: Diagnosis, management, natural history and clinicopathological correlates in 86 patients. Surg Neurol 1998;50:535-47.
5. Rodallec MH, Feydy A, Larousserie F, Anract P, Campagna R, Babinet A, *et al*. Diagnostic imaging of solitary tumors of the spine: What to do and say. Radiographics 2008;28:1019-41.
6. Jiang L, Liu XG, Yuan HS, Yang SM, Li J, Wei F, *et al*. Diagnosis and treatment of vertebral hemangiomas with neurologic deficit: A report of 29 cases and literature review. Spine J 2014;14:944-54.
7. Vinay S, Khan SK, Braybrooke JR. Lumbar vertebral haemangioma causing pathological fracture, epidural haemorrhage, and cord compression: A case report and review of literature. J Spinal Cord Med 2011;34:335-9.
8. Cloran FJ, Pukenas BA, Loevner LA, Aquino C, Schuster J, Mohan S. Aggressive spinal haemangiomas: Imaging correlates to clinical presentation with analysis of treatment algorithm and clinical outcomes. Br J Radiol 2015;88:20140771.
9. Yu B, Wu D, Shen B, Zhao W, Huang Y, Zhu J, *et al*. Noncontiguous lumbar vertebral hemangiomas treated by posterior decompression, intraoperative kyphoplasty, and segmental fixation. J Neurosurg Spine 2014;20:60-6.
10. Goldstein CL, Varga PP, Gokaslan ZL, Boriani S, Luzzati A, Rhines L, *et al*. Spinal hemangiomas: Results of surgical management for local recurrence and mortality in a multicenter study. Spine (Phila Pa 1976) 2015;40:656-64.
11. Fisher CG, Keynan O, Boyd MC, Dvorak MF. The surgical management of primary tumorsof the spine: Initial results of an ongoing prospective cohort study. Spine (Phila Pa 1976) 2005;30:1899-908.
12. Smith TP, Koci T, Mehringer CM, Tsai FY, Fraser KW, Dowd CF, *et al*. Transarterial embolization of vertebral hemangioma. J Vasc Interv Radiol 1993;4:681-5.
13. Baaj AA, Reyes PM, Yaqoobi AS, Uribe JS, Vale FL, Theodore N, *et al*. Biomechanical advantage of the index-level pedicle screw in unstable thoracolumbar junction fractures. J Neurosurg Spine 2011;14:192-7.