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Case Report

Eosinophilic granuloma of the sacrum treated with radiation therapy: a case report

David B. Bumpass, MD[a,*], Andrew Park, MD[a], Kirk T. Hill, MD[b], Jiayi Huang, MD[c], Michael V. Friedman, MD[d], Lukas P. Zebala, MD[a]

[a]*Department of Orthopaedic Surgery, Washington University, 660 S. Euclid Ave, Campus Box 8233, St. Louis, MO 63110, USA*
[b]*Department of Pathology, Washington University, 660 S. Euclid Ave, Campus Box 8118, St. Louis, MO 63110, USA*
[c]*Department of Radiation Oncology, Washington University, 660 S. Euclid Ave, Campus Box 8224, St. Louis, MO 63110, USA*
[d]*Mallinckrodt Institute of Radiology, Washington University, 660 S. Euclid Ave, Campus Box 8131, St. Louis, MO 63110, USA*

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Abstract

BACKGROUND CONTEXT: Eosinophilic granulomas (EGs) of the sacrum have been reported in fewer than 10 patients. Treatment algorithms for these tumors remain poorly defined; there are no reports of treating solitary sacral EG with radiation therapy (RT).
PURPOSE: This study aimed to describe the presentation, treatment, and outcome of sacral EG in an adult patient with intractable pain and radiculopathy, treated in a novel fashion with RT.
STUDY DESIGN/SETTING: The study design was a case report from a tertiary cancer referral center.
METHODS: Patient records, imaging, and pathology were reviewed.
RESULTS: A 35-year-old man received 20 Gy of radiation to his S1 EG lesion. He subsequently developed vertebra plana of S1 causing symptomatic L5–S1 stenosis, but 15 months after RT treatment was free of pain or tumor recurrence.
CONCLUSION: Radiation therapy is an effective treatment option for sacral EG causing severe axial pain and neural impingement.

Keywords: Benign bone tumor; Eosinophilic granuloma; Langerhans cell histiocytosis; Radiation therapy; Sacrum; Spine tumor

Introduction

Eosinophilic granulomas (EGs) are benign bone lesions caused by Langerhans cell histiocytosis (LCH). Although EG in the mobile spine are relatively common (10%–15% of EG cases), reports of sacral EG are extremely rare [1,2]. We present a case of EG in an adult patient presenting with intractable pain and radiculopathy. The patient was successfully treated with a single course of radiation therapy (RT), a treatment not previously reported for solitary sacral EG. The patient subsequently developed vertebra plana of S1 causing L5–S1 foraminal stenosis.

Case report

A 35-year-old man with 2 months of progressive low back pain presented to the emergency department. His pain was initially 3/10 in severity but worsened to 10/10, requiring use of a walker; the pain radiated to both legs, and he experienced transient numbness of his left foot. He denied bowel

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* Corresponding author. Department of Orthopaedic Surgery, University of Arkansas for Medical Sciences, 4301 W. Markham St, Little Rock, AR 72205, USA. Tel.: +501-686-7812.

E-mail address: dbbumpass@uams.edu (D.B. Bumpass)

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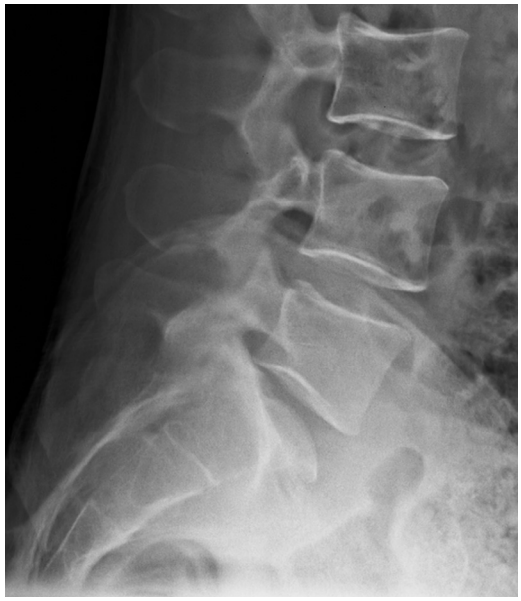

Fig. 1. Lateral radiograph of the lumbar spine, read as normal.

or bladder incontinence or lower extremity weakness, but did admit to a 7-kg unintentional weight loss and subjective fevers. His past medical history was unremarkable, and he had no family history of malignancies. He was initially evaluated by his general practitioner as well as a chiropractor, both of whom diagnosed sacroiliitis, and was prescribed non-steroidal anti-inflammatory drugs, which did not relieve his symptoms.

On initial examination at our institution, the patient had intact motor and sensory neurologic function, but had significant pain with ambulation that essentially confined him to bed. Initial radiographs were normal (Fig. 1). Magnetic resonance imaging (MRI) of the lumbosacral spine was performed, revealing a mixed solid and cystic lesion involving S1, with the solid components demonstrating T1 hypointensity, T2 hyperintensity, and contrast enhancement (Fig. 2). The differential diagnosis based on imaging included aneurysmal bone cyst, hemangioma, and chordoma. Laboratory studies included an erythrocyte sedimentation rate of 16.0 mm/h (normal range 0.0–12.0 mm/h) and a C-reactive protein level of 25.3 mg/L (normal range 0–10 mg/L). Complete blood count and metabolic panels were normal. Dexamethasone and intravenous narcotics were administered for pain control, which were then transitioned to oral analgesics.

A computed tomography-guided bone biopsy was performed, with the CT images demonstrating an aggressive-appearing lytic lesion involving the majority of S1 (Fig. 3). Histology review showed epithelioid-like histiocytes with eosinophils and acute inflammatory cells. Immunohistochemistry demonstrated reactivity for vimentin, CD68, and CD1A; the latter finding in particular was highly consistent with eosinophilic granuloma (Fig. 4) [1,3]. A subsequent skeletal survey as well as a positron emission tomography scan demonstrated no other osseous or visceral lesions.

Spine surgical oncology, medical oncology, and radiation oncology were consulted. Treatment options were discussed with the patient, including surgical stabilization with tumor debridement or radiation therapy (RT). The patient elected to undergo external beam radiation, with a total of 20 Gy in 10 fractions of 2 Gy/d, delivered Monday to Friday over 14 elapsed days. At the conclusion of RT, the patient's pain had improved to 8/10, and he was able to walk.

Three months later, the improvement of his pain had plateaued to 4/10, and he also developed radiating pain from his right hip to his right foot. Because of his persistent pain, he was unable to return to work as a machinist. An MRI of the lumbosacral spine was obtained to further investigate the source of his persistent pain, which showed vertebra plana from an S1 compression fracture with mild bilateral L5–S1 neuroforaminal narrowing. He subsequently underwent an L5–S1 epidural corticosteroid injection, which significantly alleviated his pain. At 6 months post-RT, he was free of any

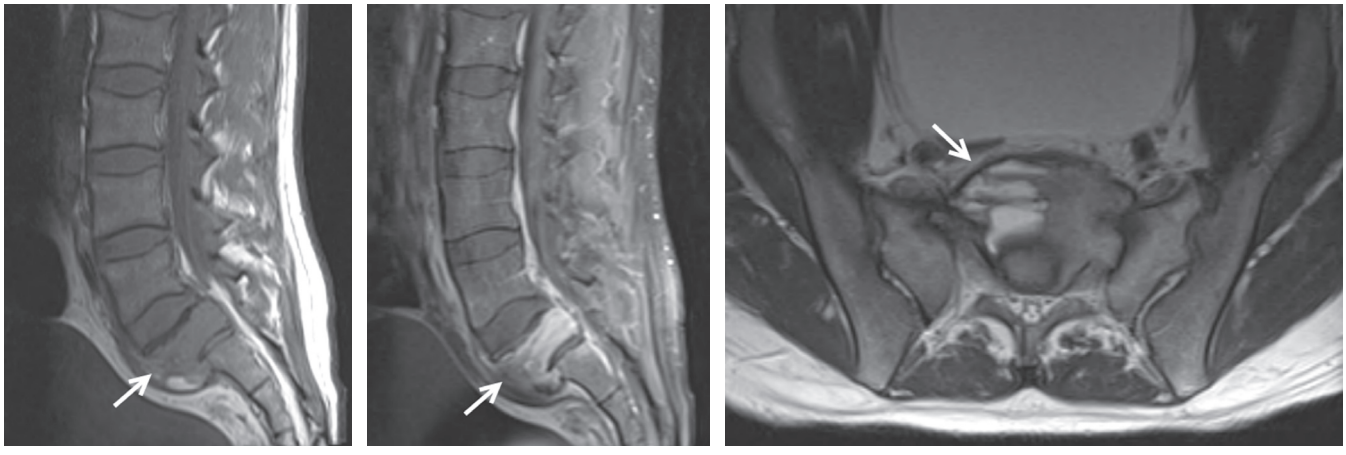

Fig. 2. Sagittal T1-weighted (Left) and post-contrast fat-saturated T1-weighted (Middle) MR images of the lumbar spine show an enhancing marrow replacing lesion (arrows) involving the majority of S1. An axial T2-weighted (Right) MR image demonstrates the mixed solid and cystic nature of the lesion with fluid-fluid levels (arrow).

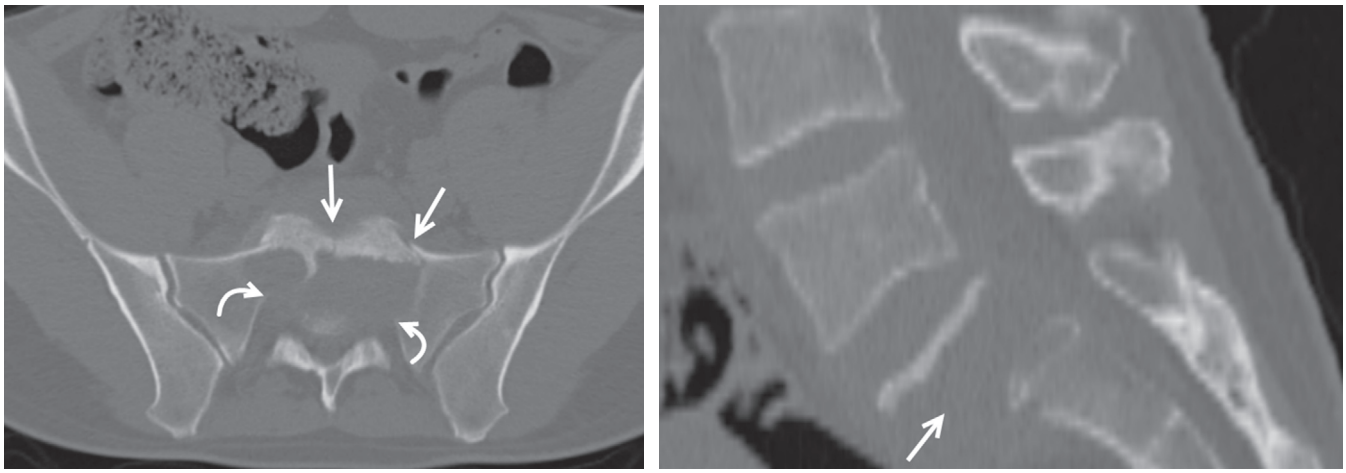

Fig. 3. Axial (Left) CT image of the sacrum shows an aggressive appearing lytic lesion involving S1 and extending into the bilateral S1 neuroforamina (curved arrows). There is a pathologic fracture of the superior end plate (arrows). Sagittal (Right) CT image shows replacement of the majority of the S1 vertebral body with relative sparing of the end plates (arrows).

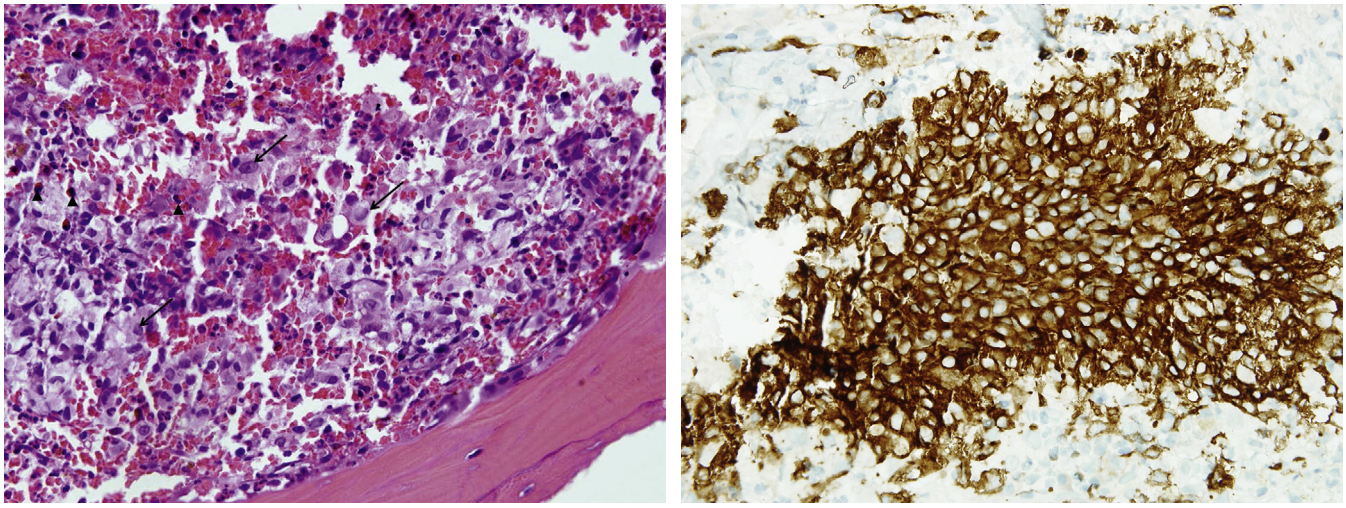

Fig. 4. (Left) High magnification view of the S1 needle biopsy showing a focal area of epithelioid-like histiocytes (arrows) with eosinophils (arrowheads). (Right) CD1a immunohistochemistry demonstrates histiocytes with strong positivity, consistent with a diagnosis of eosinophilic granuloma.

pain and was able to resume working full-time. Fifteen months after RT, he continued to be fully ambulatory without neurologic impairment or pain. Follow-up MRI at that time demonstrated resolution of the soft tissue mass without evidence of recurrence or height restoration of the S1 vertebra plana (Fig. 5).

Discussion

Eosinophilic granulomas are focal bone lesions that are one of the three syndromic manifestations of LCH. Hand-Schuller-Christian disease (triad of skull lesions, diabetes insipidus, and exophthalmos) and Letterer-Siwe disease (disseminated lesions in visceral organs) are the other two forms of LCH, both of which have a poorer prognosis than EG [4]. Eosinophilic granuloma typically affects children and young adults, and more than 40% of spinal EG patients can have multiple affected vertebrae [5]. While typically presenting with pain and swelling, spinal EG can also cause radiculopathy [6]. Differential diagnosis is typically age-dependent and includes osteomyelitis, metastasis, Ewing sarcoma, osteosarcoma, neuroblastoma, aneurysmal bone cyst, chordoma, and leukemia or lymphoma [4,7].

The classic radiographic finding of spinal EG is vertebra plana, which occurs in approximately one of four cases [5]. Magnetic resonance imaging appearance is variable and nonspecific, with the most common appearance being a lesion that is T1 hypointense, T2 hyperintense, and demonstrates contrast enhancement. Eosinophilic granuloma lesions almost never violate the vertebral end plates. Interpretation of imaging studies is complicated by the differential appearance of acute-stage lesions versus late-stage lesions in which the bone is reconstituting [4,8]. Fluid-fluid levels are unusual findings in EG [9].

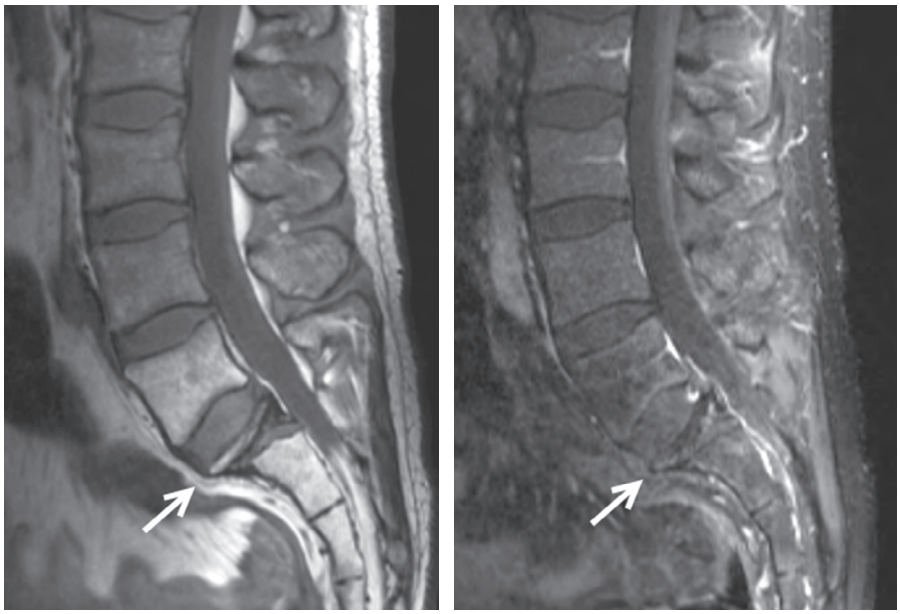

Fig. 5. Fifteen months post-RT. Sagittal T1-weighted (Left) and post-contrast fat-saturated T1-weighted (Right) MR images of the lumbar spine demonstrate complete resolution of the soft tissue mass without evidence of residual or recurrent disease. The remaining end plates have collapsed together (arrows).

To our knowledge, there are only nine other reports of sacral EG. Cardon et al. treated a 25-year-old man with multifocal LCH who had a sacral EG, as well as EG lesions in the L2 vertebra and his middle ear. He was initially given 40 Gy of wide-field radiation to the lumbosacral spine; the sacral lesion resolved but he subsequently developed a new lumbar EG treated with vertebroplasty [10]. In a series of 342 osseous LCH lesions by Howarth et al., only 2 sacral lesions (0.6%) were identified; presentation and treatment were not discussed [2]. Kaplan et al. described a neurologically intact 7-year-old girl who presented with LCH lesions at T4, T10, L5, and the sacrum; treatment choice was not presented [8]. Becker et al. treated a 12-year-old boy with an expansile EG in the S1 body who presented with back pain and lower extremity weakness. Prednisone and vinblastine chemotherapy produced radiographic and clinical improvement [7]. Baillet et al. reported a sacral alar EG in a 44-year-old male who presented with L5 radiculopathy. The lesion was treated with indomethacin and intravenous pamidronate over 1 year. The patient improved markedly, and at 18 months, the lesion had nearly re-ossified [6]. Rimondi et al. treated 19 patients with solitary spinal EG with intralesional corticosteroid injections. Two patients had a sacral EG; one was asymptomatic at 4-year follow-up, whereas the other developed multifocal skeletal disease within 6 months and required systemic treatment [11]. Kasukawa et al. followed a 13-year-old boy with a sacral EG for 2 years, noting complete symptom and radiographic resolution with medical interventional treatment [12].

Minimal high-level evidence exists regarding how to best treat spinal EG. Because of the rarity and generally benign natural course of EG, no randomized clinical trials have been performed to establish standard treatment guidelines. In children, spinal EG often resolve spontaneously, with observation and non-steroidal anti-inflammatory drugs being the primary method of treatment [1,13–15]. Intralesional corticosteroids have also been used. Multiple series have used chemotherapy or RT as well [13,16,17]. Yeom et al. established a well-reasoned treatment algorithm for spinal LCH. For cases of unifocal LCH causing slowly progressive neurologic impairment, RT was their treatment option of choice. They posited that chemotherapy should be reserved for unifocal disease causing severe neurologic compromise or for multifocal LCH [17]. Radiation therapy has been shown to be effective against osseous LCH lesions, but its use should be avoided if possible, particularly in pediatric patients, because of the risk of radiation-induced sarcoma and growth arrest [14,18–22]. Prospective clinical trials comparing intralesional steroid injection versus low-dose focal radiotherapy are needed to define the optimal treatment for unifocal symptomatic EG in the future.

Eosinophilic granuloma is considered very radioresponsive. A wide range of RT doses have been employed in the literature, ranging from 2 to 40 Gy [23–26]. In a survey of 98 patients with EG treated with a median dose of 24 Gy, 91% local control was achieved [23]. The RT dose is typically determined based on age and tumor location. Generally, lower doses are used for pediatric patients to minimize the long-term side effects and also if the lesion is adjacent to critical structures. Reddy et al. previously identified 14 spinal EGs in the literature, of which 9 of 14 had RT as part of their treatment with good outcome [27].

In the case of our patient, we discussed with him at length options including observation, medical treatment with bisphosphonates, corticosteroid injections, surgical curettage, RT, and chemotherapy. Because of the severe nature of his pain and his inability to ambulate, he opted to undergo a

course of RT in the hope that this would provide the most immediate pain relief. Given the large size of his lesion, his adult age, and his radicular symptoms, we felt that this was a reasonable treatment. Three months after RT, he developed vertebra plana from an S1 compression fracture and continued to have moderate pain, which completely resolved following an L5–S1 epidural corticosteroid injection. The RT may have contributed to causing his vertebra plana, although it is not possible to conclusively determine this.

In conclusion, we report one of the few cases of a sacral EG. To the best of our knowledge, this is the first reported instance of RT being used as an effective treatment for a solitary sacral EG. At 15 months post treatment, the patient was pain-free without imaging evidence of residual or recurrent disease.

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