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Editor: Nancy E. Epstein, MD Winthrop Hospital, Mineola, NY, USA

Technical Note

Surgical nuances of partial sacrectomy for chordoma

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Received: 24 June 17 Accepted: 19 August 17 Published: 20 November 17

Abstract

Background: Sacral chordomas are rare, slow growing, locally aggressive tumors. Unfortunately, aggressive surgical resection is often associated with increased neurological morbidity.

Methods: This technical note focuses on the utilization of partial sacrectomy for the resection of complex spinal chordomas.

Results: The case presented documents the potential range of postoperative morbidity seen in patients undergoing partial sacrectomy for chordomas. Despite iatrogenic morbidity and tumor recurrence, with the cooperation of medical and surgical spine specialists, majority of patients can achieve good long-term outcomes.

Conclusions: Sacral chordomas are rare lesions and pose a therapeutic challenge for spinal surgeons and oncologists. *En-bloc* surgical resection (e.g., partial sacrectomy) is the treatment of choice for these lesions, and the cooperation between subspecialists can lead to good neurologic outcomes, particularly if gross total resection is achieved.

Key Words: *En-bloc* chordoma resection, partial sacrectomy, technical surgical nuances

Access this article online
Website: www.surgicalneurologyint.com
DOI: 10.4103/sni.sni_230_17
Quick Response Code:

INTRODUCTION

Sacral chordomas are rare, slow growing, and locally aggressive tumors that only have a limited response to radiation and chemotherapy. Although partial sacrectomy is associated with a better prognosis, there is also a concomitant increased neurological morbidity. Due to the complexity of treating these tumors, they are best managed at tertiary care centers by a multidisciplinary team.[3]

Surgical considerations

Goal for treatment of sacral chordomas: En-bloc oncologic resection

The surgical goal for sacral chordomas is *en-bloc* resection with adequate oncologic tumor margins. There is no role for intralesional debulking, as partial removal with

How to cite this article: Terterov S, Diaz-Aguilar D, Scharnweber R, Tucker A, Niu T, Woodard J, *et al.* Surgical nuances of partial sacrectomy for chordoma. Surg Neurol Int 2017;8:277.
http://surgicalneurologyint.com/Surgical-nuances-of-partial-sacrectomy-for-chordoma/

capsule violation invariably leads to tumor cell spillage, and greatly increases the risk of local recurrence.

Anterior approach for partial sacrectomy
A plane must be established between the ventral sacrum and critical retroperitoneal structures (rectum, iliac vessels, and nerve plexi). If such a plane cannot be developed separating the rectum, it should be resected and a colostomy should be performed.

Posterior approach for partial sacrectomy
The posterior approach we recommend first involves a midline lumbosacral incision. Dissection is continued until the sacral ala, coccyx, sacropelvic ligaments, and mesorectum are all clearly visualized and the sacropelvic ligaments are then divided. Next, an inferior L5 laminectomy and superior S1 laminotomy are performed, with the traversing S1 nerve roots are identified and preserved. Sacral osteotomies are then guided by fluoroscopy and then performed in an inverted U shape while preserving the sacral nerves in the pelvis [Figures 1 and 2].

Sacropelvic stability and reconstruction considerations
In cases of total sacrectomy, biomechanical stability relies on the integrity of iliac instrumentation. For most sacral defects, reconstruction relies on transpelvis vertical rectus abdominisabdominus myocutaneous flap (VRAM) or gluteal flaps. Perineal defects can be reconstructed with similar flaps, as used for sacral defects.

Case Illustration

History
A 73-year-old male had a sacral chordoma identified on magnetic resonance (MR) [Figure 3]. A needle biopsy confirmed the diagnosis of chordoma. The patient underwent a combined anterior and posterior approach with a L5 laminectomy and a S1 laminotomy. An osteotomy was performed at the S1-2-disc space through the ala sparing the bilateral sacroiliac joints [Figure 4].

Postoperatively, the patient had no motor or sensory deficits in the lower extremities. He developed permanent perineal numbness, urinary retention, and fecal incontinence.[5]

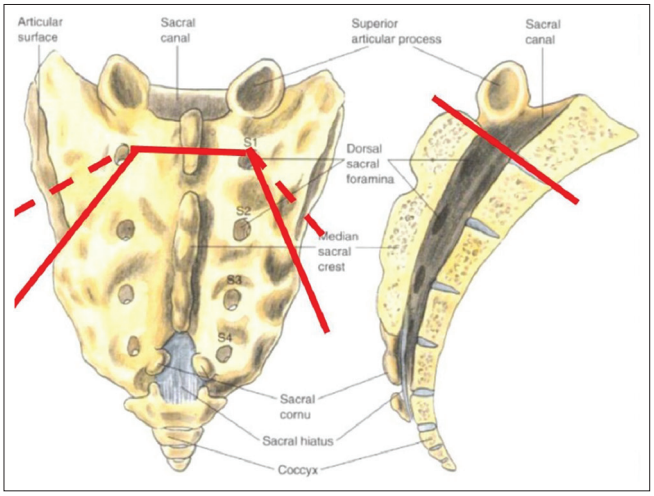

Figure 1: Schematic diagram demonstrating the anterior (left) and lateral (right) projections of the partial sacrectomy osteotomies at the level of the S1/2-disc space. The dotted lines represent more lateral osteotomy extension into the sacroiliac joints

DISCUSSION

Due to the indolent and aggressive nature of sacral chordomas, aggressive surgical treatment is often warranted and offers the greatest chance of cure.[1,7] However, when the tumor involves the sacrum or coccyx and if adequate margins can be achieved below S3, partial resection is indicated rather than a total sacrectomy with resection up to S1.[9]

During operative planning, the surgical team must decide their style of approach. An anterior approach allows the surgical team to visualize and directly protect the visceral organs. A posterior approach allows for increased visualization/exploration of the neural elements. The combined approach offers the benefits of each, but is associated with increased operative and recovery times.[1,8,10]

When dealing with chordomas, the benefits of preserving neural function and the integrity of visceral organs must also be balanced against those of disease recurrence. Preservation of both S3 roots is often associated with a near 100% preservation of urinary and bowel dysfunction.[2,5,11] Therefore, in certain cases, surgeons may elect to serially embolize the tumor in an effort to decrease tumor size and attempt to preserve additional neural function.[4,6]

CONCLUSION

Sacral chordomas are rare tumors, and *en-bloc* surgical resection with partial sacrectomy is the primary treatment of choice. In certain cases, partial sacrectomy to achieve gross total resection may be safe and effective for removal of a sacral chordoma, resulting in acceptable neurologic outcomes.

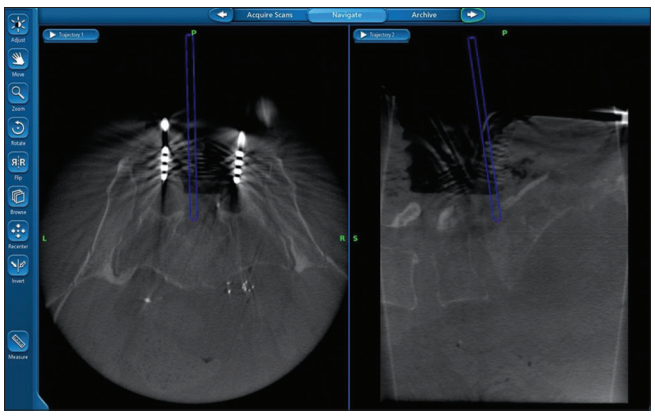

Figure 2: Intraoperative screenshot of the O-arm guided osteotome projection (blue contour) in the axial (left) and sagittal (right) planes

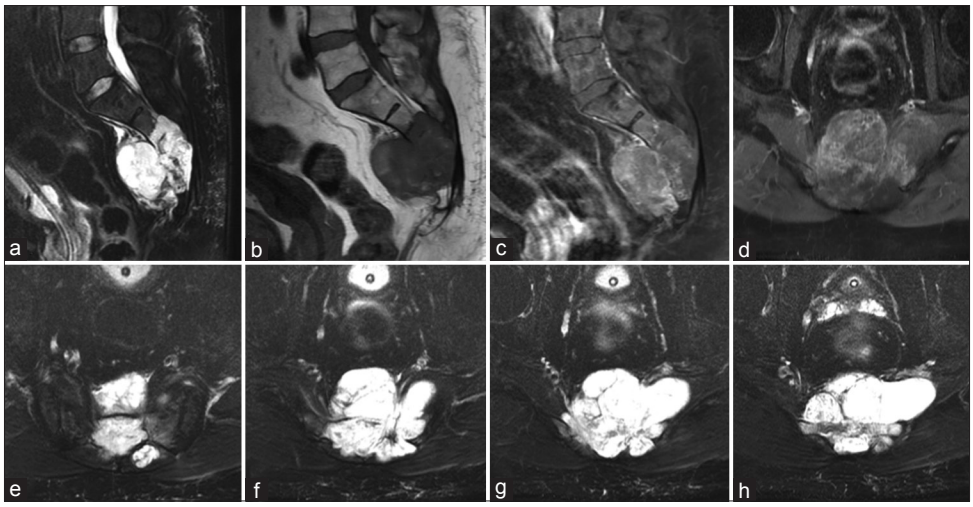

Figure 3: Sagittal magnetic resonance images of T2 (a), T1 precontrast (b), T1 postcontrast and T2 STIR sequences (c and d), demonstrating a T2 hyperintense, weakly enhancing sacral mass with a small amount of extension into the pelvis. Serial axial T2 sequences demonstrating the lateral extent of the mass in the sacrum (e-h)

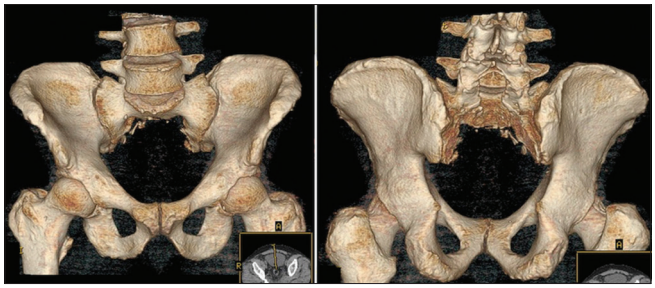

Figure 4: Postoperative anterior (Left) and posterior (Right) views of a 3-D CT reconstruction of the pelvis, demonstrating the partial sacrectomy defect. Notably, both sacroiliac joints are intact

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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