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## Case Report

# Hemivertebrectomy of L5 in Grade 2 Chondrosarcoma: Is a Single Posterior Approach with No Nerve Root Sacrifice Possible? A Case Report

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### ABSTRACT

*En-bloc* resection of spine tumors is difficult to achieve compared to extremities tumors for anatomical reason. Several surgical techniques have been described, such as combined multiple surgical approaches or an enlarged single posterior approach. These demanding strategies correlate with high rate of intraoperative/postoperative complications. The current case is about a patient treated with a single posterior-lateral surgical approach to perform hemivertebrectomy of L5 for a single grade 2 chondrosarcoma metastasis (WBB 2-5/b-c). Usually, L5 hemivertebrectomy requires a combined surgical approach to preserve L5 root. The final solution was to perform a T-shape skin incision: a longitudinal branch centered on the vertebral spine and a transverse branch on the iliac crest. This approach allowed osteotomy of the ipsilateral iliac crest, achieving sufficient view to preserve L5 root and vessels anteriorly; the same osteotomy was used to create a bone autograft to reconstruct the residual part of L5. Finally, cryotherapy was used in order to increase the adequacy of surgical margins. A L3-S1 arthrodesis is assembled to achieve stability of the system. Surgical time was 5 hours, no nerve roots have been sacrificed nor any other intraoperative complications occurred. This surgical technique had never been described before in literature.

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### Introduction

The gold standard in surgical treatment of primary bone tumors is obtaining wide margins according to Enneking-Campanacci [1, 2]. In spine surgery, however, achieving oncologic adequate margins is difficult for anatomical reason. In fact, the limitation in mobilizing the spinal cord, neural roots or the dural sac forces the surgeon to use either a combined multiple surgical approach or an enlarged single posterior approach, both linked with high rate of intraoperative or postoperative complications. In oncologic surgery, the approach should guarantee the surgeon a good intraoperative view in order to perform a wide or radical excision of the tumor obtaining disease-free margins. This paper described a single posterior-lateral surgical approach to perform hemivertebrectomy of L5 for a grade 2 chondrosarcoma (CHS). The choice of a single surgical approach was made in order to reduce intra and postoperative complication in a patient treated 5 years before with an anterior surgical approach to perform a pelvic hemiresection for a grade 2 chondrosarcoma. The surgical approach performed to treat that patient had never been described before in literature.

### Case Presentation

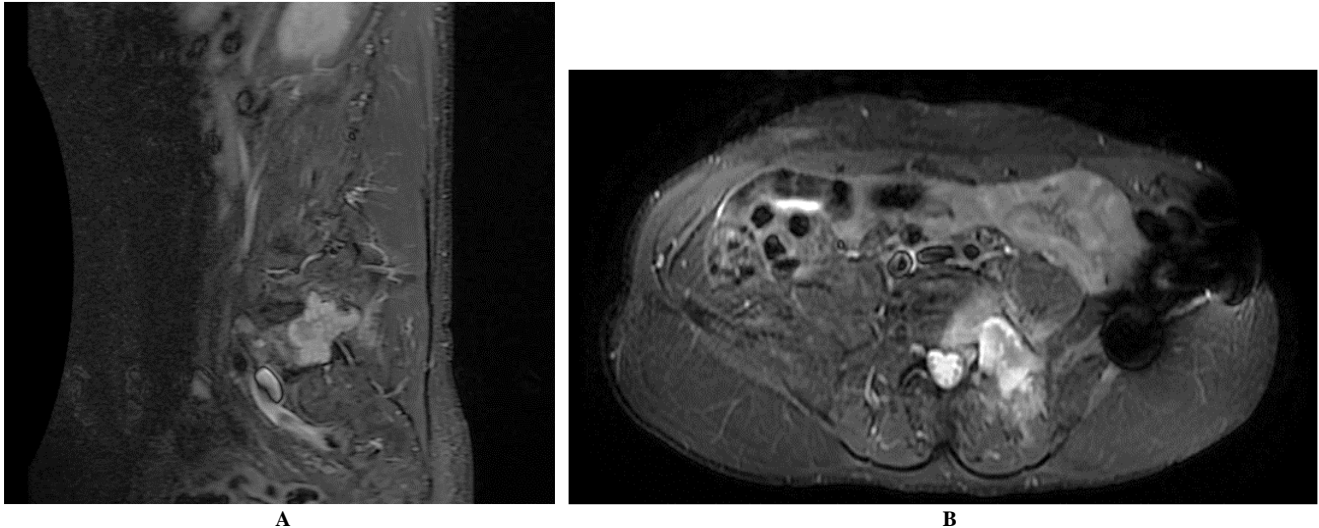
In February 2019, a 72-year-old male came to our attention with a history of grade-2 chondrosarcoma (G2-CHS) of the left hip treated 5 years before with a wide resection of hemipelvis and bone graft reconstruction. At follow up, the patient reported worsening back pain. MRI of the spine shows an intra-compartmental bone tumor involving the left side of the body of L5 (2-5 /B-C according to WBB classification) (Figures 1A & 1B); a CT-guided biopsy of L5 was then performed [3]. The core biopsy diagnosed a G2-CHS localization. The PET-scan did not show any other localization of the tumor.

The surgical approach was performed with a T shape skin incision: a longitudinal branch centered to vertebral spines and another branch perpendicular on iliac crest. After obtaining a good exposure of the bone planes, we proceeded to implant pedicle screws in L3, L4, L5 and S (Figure 2). Then surgeons performed extensive laminectomy in L5 and removed a portion of the iliac crest in order to have a good anterolateral exposition of the L5 vertebra, root and anterior large vessels (Figure 3).

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Hemivertebra of L5 was released proximally and distally with an accurate discectomy in L4-L5 and L5-S1 (Figure 4). The surgeons sacrificed the left segmental artery of L5, protecting the cauda posteriorly, left L5 root and the large vessels anteriorly, then performed

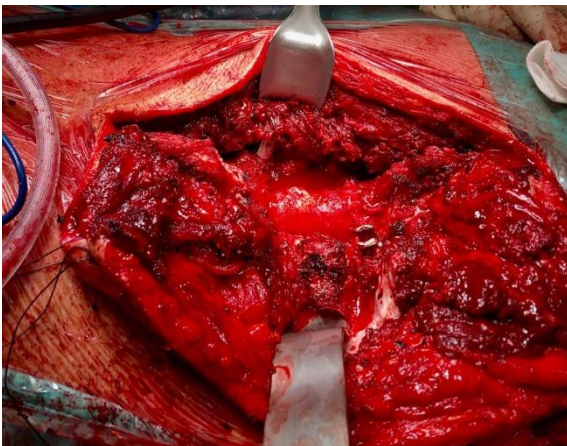
L5 hemivertectomy with apparent wide margins. Finally, in order to obtain an increase in the adequacy of surgical margins, 3 cycles of cryotherapy (-180° 8 minutes each) were performed in the residual portion of the L5 vertebra.



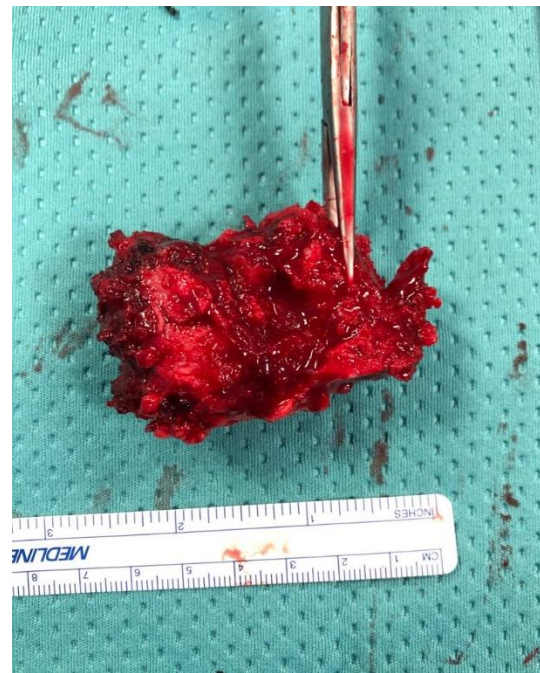
**Figure 1: A & B)** Preoperative MRI STIR-sequences showing an hyperintense mass of the left hemivertebral of L5 with presence of edema extended until hemivertebral body of L5.



**Figure 2:** Surgical field with intrapeduncular screws in position.



**Figure 3:** Surgical exposition after osteotomy of the left iliac crest and laminectomy of L5.



**Figure 4:** Lateral view of the surgical specimen after *en-bloc* resection (left pedicle with a portion of vertebral body of L5).

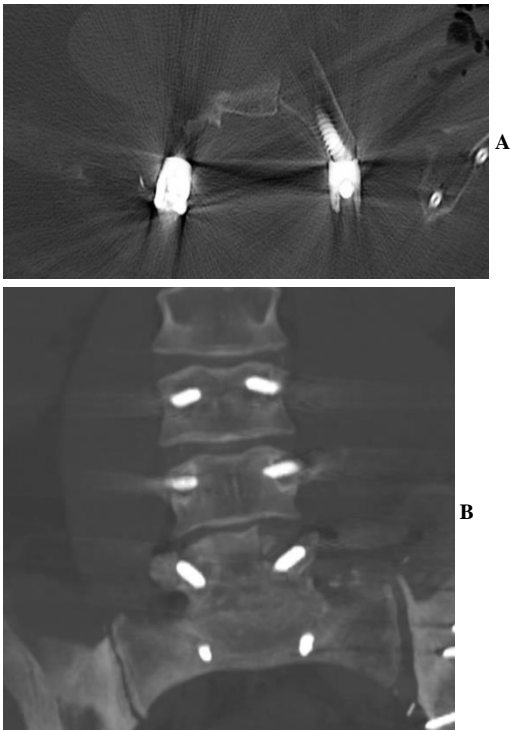
The previous osteotomy of the iliac crest was used to create a bone autograft to reconstruction L5 hemivertebra. The bone autograft was fixed with pedicle screw at the final system of lumbar-sacral arthrodesis. The residual portion of iliac crest was then fixed with 2 screws to the iliac wing (Figures 5-7). Histological analysis of the resected mass confirmed findings of the previous specimen and the margins were assessed as disease free. The patient had a postoperative stupor of L5 spontaneously regressed about 60 days after surgery.



**Figure 5:** X-Ray postoperative control in lateral view.



**Figure 6:** X-Ray postoperative control in antero-posterior view.



**Figure 7: A & B)** Postoperative axial and coronal CT scan showing the iliac crest bone autograft instead of specimen and fixed with pedicle screw.

## Discussion

Chondrosarcoma (CHS) is a malignant cartilaginous matrix-producing tumor frequently diagnosed in proximal femur and pelvis. Grade 2 CHS is characterized by a slow growth rate and by a high metastatic potential, with recurrence within 5 years and death occurring in 30% [4, 5]. The treatment of metastatic disease is particularly challenging mainly because conventional chemotherapy has proven to be ineffective [5-7]. In the current case we decided to treat the tumor as a primitive CHS planning to achieve wide margins of resection since the patient did not show signs of systematic disease. When margins are disease-free local control after an *en-bloc* resection rises to 82% in chondrosarcoma [8].

During preoperative planning, several different surgical approaches have been considered, among the ones described in literature [9, 10]. Usually, hemivertebrectomy of L5 require a combined surgical approach to preserve L5 root [10]. The anterior approach followed by a subsequent posterior could be a good choice to perform an appropriate resection avoiding the nerve root sacrifice. However, the ventral to dorsal working direction makes it difficult to estimate the distance to spinal cord and it correlates with an increase in term of intraoperative complications leading to midline exposure to L5 (visceral lesions, postoperative adhesions and infections) [10]. The surgical strategy reported in current case considered the high risk of infection of the hemipelvis allograft implanted in previous surgery, visceral lesions and postoperative adhesions. As a matter of fact, surgical combined approach correlates with long time and large surgical exposition of soft and bone tissue. Using a direct access through the iliac crest we were able to remove the whole mass without causing any neural lesion. We were able to obtain as well an autograft in order to get a better stability of the anterior column.

In spine tumors there isn't any univocal surgical technique. Each technique and approach should be tailored on the tumor extension, spine location and the histology. When possible obtaining wide margins, healthy tissue surrounding the tumor, is mandatory. The approach described here allowed surgeons to have a sufficient view of the field and of the tumor. A single enlarged surgical access like the one described here helped to decrease surgical timing, 5 hours in the current case, and therefore the risk of infection. Finally, cryosurgery is demonstrated to be a good adjuvant treatment and to have good short-term results after intralesional procedure for low-grade malignant chondroid tumors [11, 12].

## Conflicts of Interest

I hereby certify, to the best of my knowledge that the authors listed in the case report presented have no affiliations with or involvement in any organization or entity with any financial interest, or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

## Author Contributions

S. Colangeli gave the idea of surgical approach and revised the manuscript; R. Capanna approved the surgical approach; A. D. Ruinato, E. Ipponi described the surgical procedure.



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