



Case study:

En bloc resection for treatment of cervical chondrosarcoma

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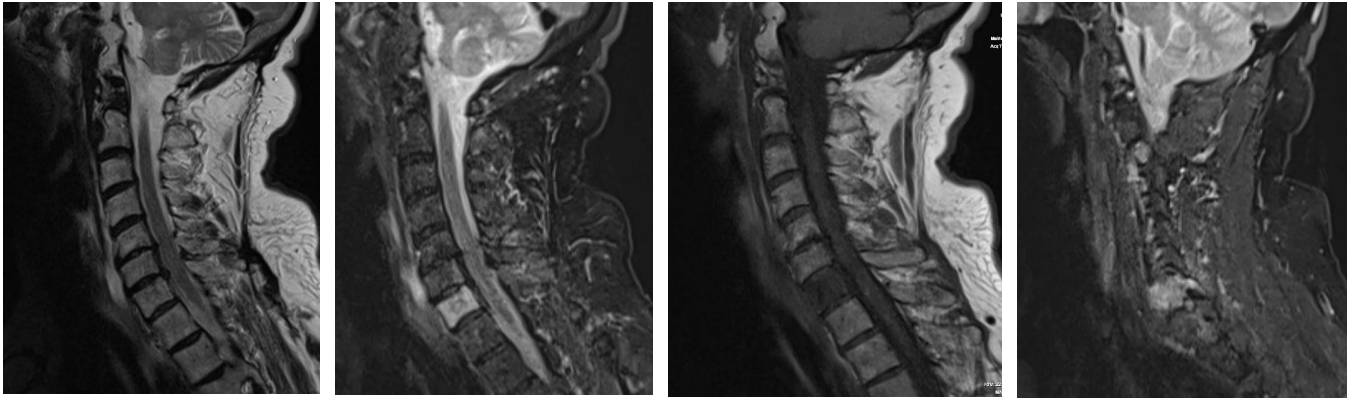
Matthew Colman, MD, specializes in spine surgery and musculoskeletal oncology. Dr. Colman has an interest in treating bone and soft tissue tumors. He also treats a comprehensive set of non-tumor-related spinal problems, including degenerative disease, deformity and trauma.

History

A male patient in his 50s was diagnosed with grade II clear cell chondrosarcoma of the right proximal humerus in late-2019. His tumor was treated with en bloc resection, followed by reconstruction via reverse total shoulder arthroplasty. Unfortunately, late in 2020, the patient developed severe neck pain and right-sided triceps weakness.

Background on chondrosarcoma

Chondrosarcoma is a malignant primary osseous tumor that originates in chondrocytes and is characterized by the production of cartilage matrix. It most frequently arises in the long bones of the appendicular skeleton, such as near the joints of the upper and lower extremity, although it can occur in other bones including the pelvis, ribs and axial spine, among others. Chondrosarcoma accounts for about 30% of primary osseous sarcomas, making it the second most common type of bone cancer after osteosarcoma. The prevalence of this type of cancer is the same in both men and women and the risk of getting chondrosarcoma increases until about age 75. It is rare in people younger than 20.



Presentation Sagittal MRI

Presentation and examination

About one year following tumor resection and reconstruction of his shoulder, the patient began experiencing severe symptoms of cervical radiculopathy, presenting as neck pain and radiating pain to both his left shoulder and triceps area with weakness and numbness.

Imaging workup consisting of x-rays, CT scan and MRI revealed a T2-bright, contrast-enhancing tumor involving the right side of C7 concerning for chondrosarcoma metastasis. Bone detail on CT scan was suggestive of subtle pathologic fracture. Biopsy of the lesion was pursued which confirmed chondrosarcoma metastasis. Staging workup of the entire body demonstrated no other lesions.

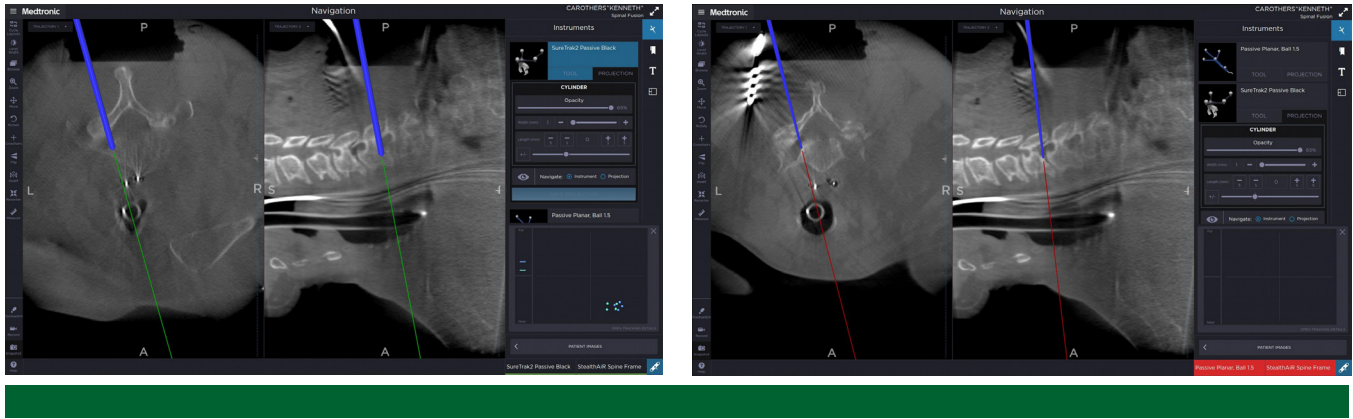
The Rush multidisciplinary tumor board was convened and various treatment options, including intralesional surgery, wide margin surgery and nonoperative care, were discussed. These treatment options were presented to the patient and all parties agreed to proceed with wide margin surgical management to give the patient the best chance of a long-term cure of his tumor.

Surgical Treatment

Stage 1: Posterior approach

For the first stage of the procedure, the patient was placed in a prone position in skeletal traction to protect his spinal cord. An incision was made posteriorly from C4 to T3. Under the guidance of computer navigation, pedicle screws were inserted in T1, T2 and T3 bilaterally, as well as lateral mass screws bilaterally at C4 and C5, and on the patient's left side at C6 given the proximity of tumor involvement on the right.

A wide laminectomy was performed at C6, C7 and T1, exposing the spinal cord and exiting C7 and C8 nerve roots. In order to avoid disruption of the lateral mass of C7, which was involved by tumor, the interarticular processes of C6 and T1 were resected on the patient's right side, leaving the posterior elements of C7 intact and the C7 and C8 nerve roots free of impingement. Then, from the left side of the open spinal canal, using an ultrasonic bone scalpel under direct computer navigation, a posterior-to-anterior hemi-sagittal cut through the left side of the C7 vertebral body was then performed, staying clear of the tumor and exiting through the anterior bone.



Navigation being used to plan hemisagittal cut.

Once the cut was complete, custom cut and bent transitional 5.5 mm to 3.5 mm titanium rods were placed, and crushed cancellous allograft and non-tumor bearing local bone autograft was packed into the posterolateral gutter to promote arthrodesis at C4, C5, C6, C7, T1, T2 and T3. The patient was transferred to the supine position for the second stage of the procedure.

Stage 2

A sharp transverse incision was made over the C7 vertebral body and blunt dissection was performed in the Smith Robinson approach, while also taking down part of the insertion of the mastoid.

Once the vertebral artery and longus colli were protected with the assistance of Kirsten Stenson, MD, from otolaryngology, discectomy was performed both above and below the tumor at the C6-C7 and C7-T1 disks. Subsequently, the posterior longitudinal ligament was resected at both levels. After preparing the C6 and T1 endplates down to bleeding cortical bones, the C7 vertebral body was found to be mobile given the prior hemisagittal cut. The lateral mass and elements were further exposed on the right side and the C7 segment was slowly mobilized through meticulous soft tissue dissection, all the while protecting the spinal cord and vertebral artery. The tumor was removed in one segment, leaving no residual lesional tissue.

To complete the arthrodesis, a static 22-mm interbody corpectomy cage was packed with crushed cancellous allograft and impacted into place and secured with variable angle screws into C6 and T1. The patient was then transferred to the recovery area in excellent condition.

Outcome

The patient did very well after surgery. Immediately postoperatively, his neck and arm pain was much improved as was the numbness in his left fingers. By six weeks, he continued to do well. The patient began physical therapy as well as radiation therapy under the care of his medical oncologist, Marta Batus, MD. At the three-month follow-up appointment, healing was progressing nicely and the patient had resumed most of his desired activities with little to no pain.

Analysis

En bloc resection is a technically difficult procedure that involves the removal of a tumor completely surrounded by a continuous layer of healthy tissue without violation of its margins. However, the morbidity and technical challenges are typically offset by the improved local control and survival afforded by removing the entirety of a tumor in one piece. According to the meta-analysis by Ames, et al, this procedure can offer appropriately selected patients

with primary tumors of the spine improved disease-free survival rates at 92.6%, 63.2% and 43.9% at 1, 5 and 10 years, respectively, in a primary tumor cohort.

Chondrosarcoma of the spine in particular is very difficult to treat since it recurs at a high rate, is very fastidious and is largely resistant to chemotherapy and radiation treatments. En bloc surgical resection is the preferred treatment option, offering patients a significant decrease in recurrence and an increase in survival rate.

Given the anatomical challenges of the critical neurologic and vascular structures around the spine, en bloc resection requires surgeons to have a unique set of technical expertise. The surgeon must not only have an expert knowledge of spinal anatomy and surgical oncology, but must also leverage the skill of their multidisciplinary partners, collaborate with other surgeons and utilize technology appropriately.

Summary

This patient was diagnosed with a single site of metastatic clear-cell chondrosarcoma at C7 with neck pain, nerve pain and weakness. He was successfully treated with wide-margin surgery in order to gain the highest chance of the tumor not coming back and for long-term survival. Critical aspects of this case were multi-physician and multidisciplinary collaboration, use of cutting edge technology and careful preoperative planning.

For more information, visit
rush.edu/spinal-tumor-care



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