



# Two-Stage Multilevel Cervical Spondylectomy for Aneurysmal Bone Cyst

## *Anevrizmal Kemik Kisti için İki Aşamalı Çok Seviye Servikal Spondilektomi*

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### ABSTRACT

Aneurysmal bone cyst is a benign tumor-like bony lesion with a propensity to develop in the pediatric population. It generally involves one vertebral level when localized to the spine. The degree of resection correlates highly with fewer recurrences. En bloc spondylectomy is the procedure of choice for this reason, but its high complication rate has led to the development of alternative surgical methods. This paper presents a three-level aneurysmal bone cyst that was excised totally in two stages, and the safety and efficacy of this method especially in the pediatric population are emphasized. This paper also states that anterior and posterior instrumented fusions are necessary in spite of the growing spine.

**KEYWORDS:** Aneurysmal bone cyst, Cervical spine, Spondylectomy, Surgery

### ÖZ

Anevrizmal kemik kisti çocukluk çağında ortaya çıkmaya meyilli, iyi huylu tümör benzeri kemik lezyonudur. Omurgayı tuttuğunda genellikle tek bir vertebrada sınırlı kalır. Rezeksiyon derecesi nüks oranı ile ters koreledir. Bu nedenle en-blok spondilektomi tercih edilen cerrahi yöntemdir, ancak yüksek morbiditesi nedeniyle cerrahi seçenekler geliştirilmiştir. Bu yazıda üç seviye anevrizmal kemik kistinin iki aşamalı girişimle tamamen çıkarılması ve bu yöntemin özellikle çocuklarda güvenle uygulanabileceği vurgulanarak sunulmuştur. Bu yazı aynı zamanda büyümekte olan omurgaya rağmen anterior ve posterior enstrümanlı füzyonu savunmaktadır.

**ANAHTAR SÖZCÜKLER:** Anevrizmal kemik kisti, Servikal omurga, Spondilektomi, Cerrahi

### INTRODUCTION

Total cervical spondylectomy is used to decompress the cervical spine for mass lesions (4). Developments in techniques for resection and in advance of stabilization methods and fixators for the spinal column have allowed for more forceful treatment of many spinal lesions. The total resection of entire motion segments is necessary for surgery related cures of certain mass lesions in the cervical spine. Total en bloc spondylectomy in the cervical spine is not feasible because the lower level cervical nerve root and the vertebral artery must be spared (3). This report describes a two-stage posterior-anterior technique of total cervical spondylectomy in a pediatric patient with aneurysmal bone cyst (ABC) of a three-vertebral level.

### CASE REPORT

A 6-year-old boy was admitted to the hospital with neck pain radiating to the shoulders and left arm and progressive weakness in arms and legs and for at least 2 years. Neurological examination revealed spastic quadriparesis at 3/5 muscle

strength and hypoesthesia on the right C5 dermatome. Direct roentgenograms disclosed multiple lytic lesions in the cervical vertebrae and alignment disorder in the sagittal plane (Figure 1). A CT scan showed expansile bony lesions in the C4-5 and 6 vertebrae and collapsing vertebral body at C5 (Figure 2). MRI of the cervical spinal area demonstrated cervical canal stenosis secondary to this expansile lesion, collapse of the C5 vertebral body and alignment disorders of the cervical spine (Figure 3). A biopsy was performed percutaneously and the result of the pathological examination (Figure 4) showed an aneurysmal bone cyst (ABC). Then a two-stage operation was planned because of the possibility of high blood loss. The vertebral angiography was within normal limits.

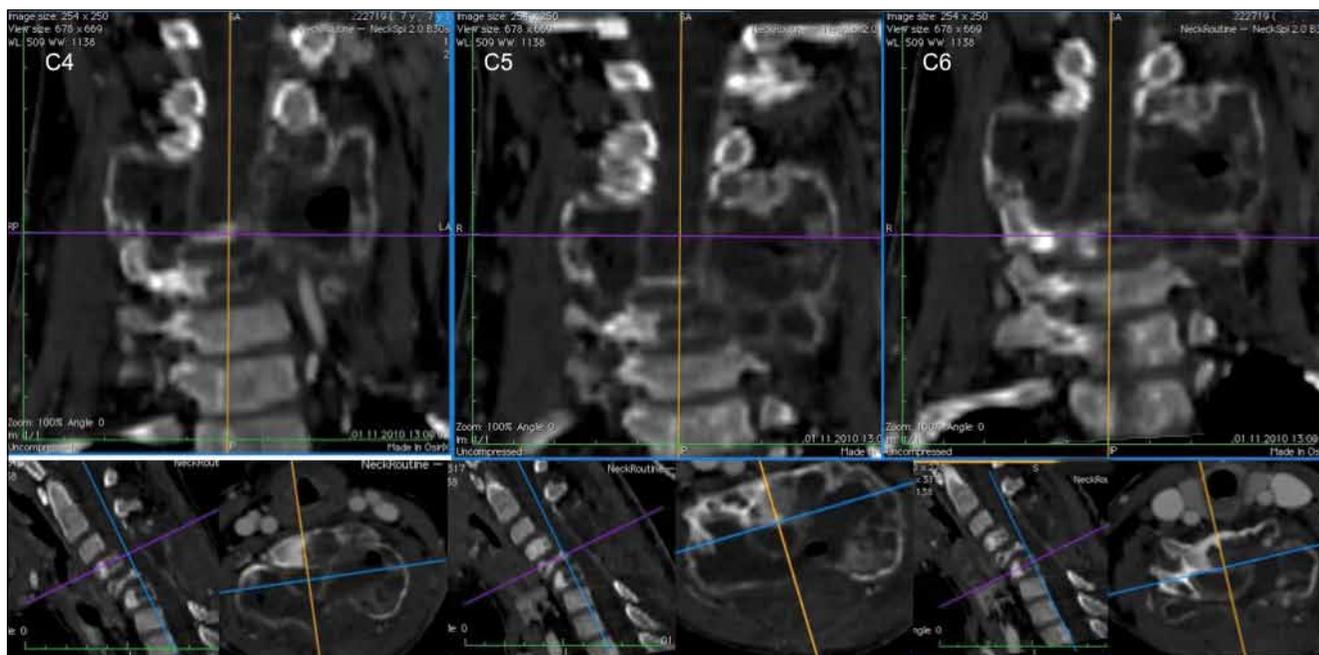
In the first stage of the operation, a posterior cervical median skin incision was performed in the prone position. After dissection of the paravertebral muscles, the vertebral level was determined anatomically and radiologically. Some bone cysts were seen immediately under the fascia. Spinous processes, laminae and lateral masses of the cervical (C) 4,5 and 6 vertebrae were removed completely. Dissection was

advanced laterally and the vertebral artery (VA) and posterior tubercle were found. Foramina were opened and the VA was dissected from C3 to C7 posteriorly. A Teflon graft was enched to the anterior surface of the artery. A bony fixation was performed with C2 pedicle, C3 lateral mass, C7, Thoracic (Th) 1 and Th2 pedicle screws and rods. The first stage of the operation ended at this point. After 3 days, the second stage of the operation was performed. An oblique anterior skin

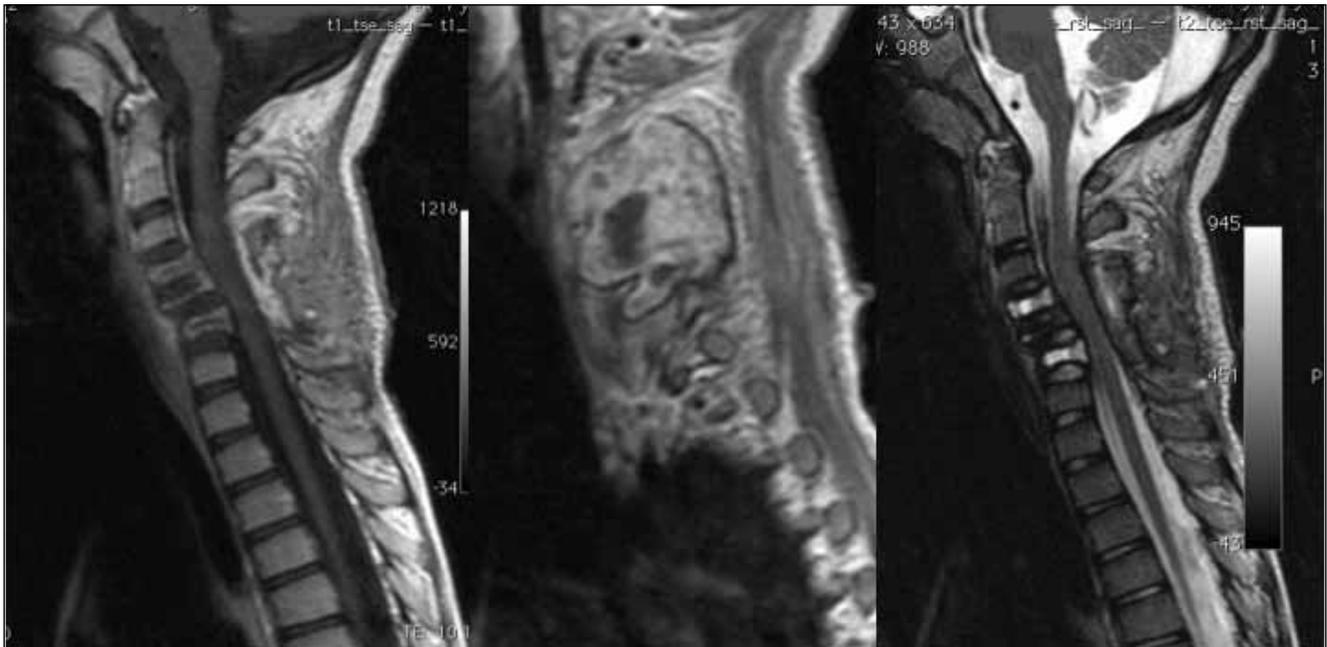
incision from the right angle of the mandible to the sternal incisura was made in a supine position. The esophagus and trachea were retracted medially and the neurovascular bundle was retracted laterally. Longus colli muscles were dissected to the lateral edge of the costal processes. Anterior parts of the foramina were removed, and corpus of the C4,5, 6 and intervertebral discs of C 3/4, 4/5 and C5/6 were excised totally. Thus VA was exposed entirely from C3 to C7. A



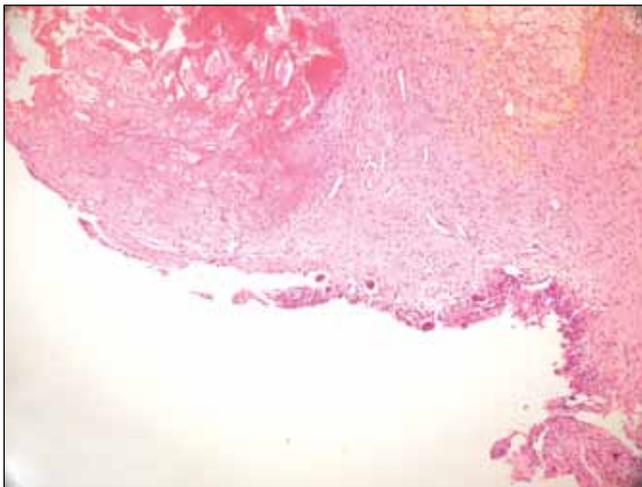
**Figure 1:** PA and lateral roentgenograms shows misalignment and dislocations of the vertebrae of the cervical spine, bony expansion laterally and posteriorly and lytic vertebral lesions.



**Figure 2:** Preoperative axial CT, sagittal and coronal reformatted images revealed expansile spongy lesions in three vertebrae, collapse of the C5 and anterior angulation of the cervical spine.



**Figure 3:** Preoperative T1 and T2 sagittal MRI disclosed secondary spinal stenosis and posterior and lateral enlargement of the bony lesion. They also show abnormal alignment of the vertebrae and collapse of C5.



**Figure 4:** Microfilm of histological preparation revealed abundant osteoclastic giant cell peripheral to the cystic cavity whose lumen is not covered by endothelium is filled with erythrocytes. HEX10.

strut fibular graft was inserted and supported by an anterior cervical plate (Figure 5). The whole surgery was performed under neuromonitoring.

After the second operation, coldness and paleness of the right hand developed probably due to temporary damage of the right sympathetic trunk. Neurological examination of the patient at the second postoperative month was within normal limits.

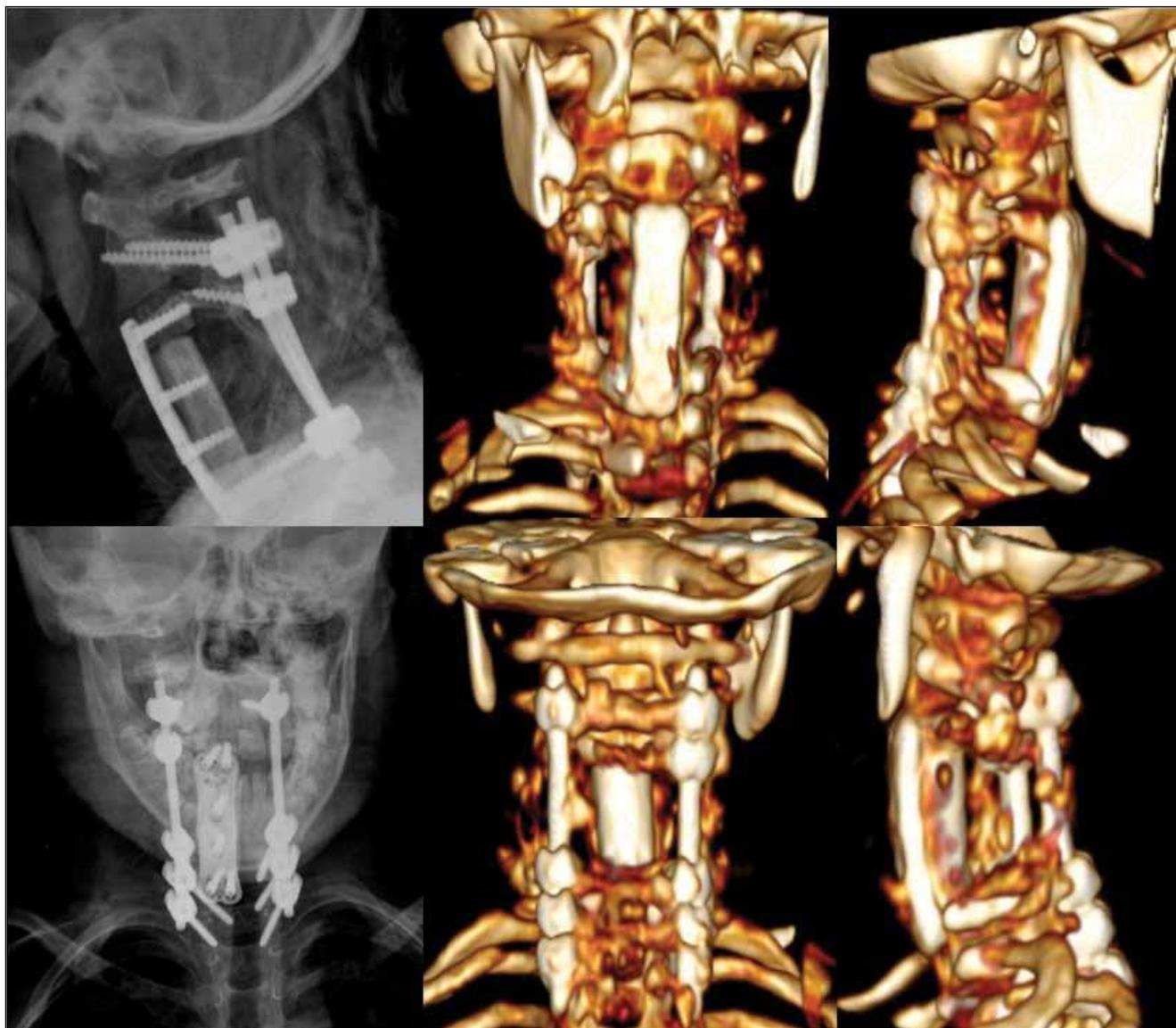
### DISCUSSION

ABC was identified as a distinct clinicopathologic entity in 1942

by Jaffe and Lichtenstein (7). Although it is viewed as a benign lesion, it is aggressive in its ability to destroy and expand bony tissue. It is an expansile, tumor-like, osteolytic lesion consisting of a highly vascular honeycomb of blood-filled cavities separated by connective tissue septa, surrounded by a thin cortical bone shell that may expand, which frequently affects the pediatric population (5). ABC comprises about 1.4% of all bone tumors and 15% of all primary spine neoplasms (10). Ten to 30 percent of all cases involve the spine. ABC usually arises in the posterior elements of a vertebra and spreads into pedicles, body and can expand to the spinal canal resulting in pathological fractures and neurological deficits. It is generally characterized by progressive growth.

Treatment options include intralesional curettage, complete excision, embolization, radiation therapy and combination of these (2,5). The high rate of cure relates to the degree of excision (2,5). It is discussed in the literature that the degree of excision correlates with local recurrence free survival (1,6,9,11). Resection of the lesion completely must include entire cyst walls and spongy tissues that are lined with hypervascular membrane because of its reactive expansion.

The determining procedure for surgical treatment of ABC depends on various factors such as the age of the patient, widening of the lesion, presence of neurological deficits, existence of pathological fractures and spinal deformity. Iatrogenic instability after the operation is another issue that must be considered (8). Besides, the vertebral artery (VA) that is generally encasing by the lesion is the most important anatomical structure that must be protected. Because of a high index of VA rupture in en bloc spondylectomy, total excision by curettage with a high speed drill or piecemeal



**Figure 5:** Postoperative direct roentgenograms and 3D reformatted CT images disclosed three level spondylectomy, 360° instrumentation, and correction of the deformity.

resection is a generally accepted surgical option (12). Skeletonizing the VAs is an essential part of the procedure to protect them bilaterally.

In this case, circumferential and multilevel involvement of the three cervical vertebrae required complete resection of these three vertebrae and 360° instrumented fusion, avoiding postoperative radiation because of the age of the patient, correction of the sagittal misalignment, and providing stability. The two-stage operation was planned due to a high probability of intraoperative bleeding. Total excision of the body of three vertebrae and four intervertebral discs after the posterior elements were removed completely at two stages was chosen to protect VAs bilaterally.

## CONCLUSION

The two-stage procedure is an effective and safe way for complete resection of cervical spinal ABC without sacrificing VAs. It can be applied at more than one vertebral level with extensive instrumented fusion.

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