

# Total Spondylectomy for Giant Cell Tumor of Cervical Spine

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Giant cell tumor which is arisen at vertebra is rare and this tumor of the cervical vertebra has been very rarely reported tumor which is less than 1% of all giant cell tumor. When the treatment option is considered, the curettage is often selected rather than total resection because the anatomic relationship of adjacent structures is complicated and there are major vessels and organs around the cervical vertebra. The prognosis of this tumor is decided by degree of resection so, total spondylectomy should be considered as primary surgical option. We report a case of cervical giant cell tumor in which the total spondylectomy was performed successfully and discuss the feasibility of this procedure at cervical region.

**KEY WORDS :** Giant cell tumor · Cervical spine · Total spondylectomy.

## Introduction

Cooper and Travers reported the first case of giant cell tumor at 1818 and they constitute about 4~8% of all tumors originated from bone<sup>1</sup>. The majority of them has the predilection for distal end of long bone in location. But the cases involving the vertebral column are uncommon, occurring in approximately 5~10% of all giant cell tumors<sup>3</sup>. Dahlin<sup>4</sup> and Goldenberg, et al.<sup>5</sup> reported the incidence of cervical spine involvement as 0.4~1.0% of all giant cell tumors. Management of these tumor of the spine is often difficult. Early detection of the tumor followed by complete excision is recommended. Conventionally, because of the anatomic complexities among the major vessels, neural structures and the involved vertebrae, curettage or intralesional resection, including removal of the malignant tissue in a piecemeal fashion, is the common practice<sup>11</sup>. This conventional surgery has many disadvantages including a high possibility of tumor cell contamination of the surrounding structures and difficult identification of a demarcation zone separating neoplastic tissue from healthy tissue. These factors may contribute to local recurrence due to incomplete

resection and increase the need of adjuvant radiation therapy<sup>9</sup>.

We report a case of cervical giant cell tumor in which the total spondylectomy was performed successfully and discuss the feasibility of this procedure at cervical region.

## Case Report

A 33-year-old man was admitted to the hospital presented with a posterior neck pain which had been developed acutely after head trauma. He showed the limitation of neck motion due to pain but other symptoms and neurological deficits were not found. The initial cervical plain films showed the compression deformity at C3 vertebra. The computed tomography and MRI revealed the tumorous infiltration of vertebra body, pedicle and lamina. But there was no infiltration in the adjacent soft tissue(Fig. 1).

We planned the staged operation for total resection of C3 vertebra. First, through anterior approach, intervertebral discs including cartilagenous end plate were removed. The entire vertebral body and anterior portion of transverse foramen was resected with high speed air drill and Kerrison punch. After the removal of anterior portion of transverse foramen, the vertebral artery was identified. The great care should be taken to avoid the injury of vertebral artery. The iliac bone graft was performed, with mesh cage and reinforced by Orion plate system between C2 and C4(Fig. 2A, B).

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The histopathological study showed that mononuclear cells infiltrated into bony trabecula and multinucleated giant cells were also found. These findings were compatible with giant cell tumor (Fig. 3).

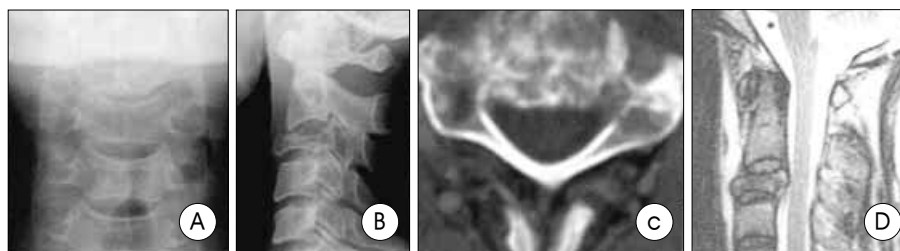
Because of transient increased liver enzyme, second operation was performed at the 19th day after 1st operation. Through posterior approach, spinous process, lamina, and facet joint were removed bilaterally with air drill. The posterior part of transverse foramen was removed with Kerrison punch, finally. During the resection around vertebral artery, bleeding from venous plexus was occurred. The oxidized cellulose and microfibrillar collagen were effective for bleeding control. The posterior fixation was performed with pedicle screw in C2 and lateral mass screw in C4 (Fig. 2C, D).

No neurological problems occurred after two serial operations. Because the total resection was confirmed on postoperative CT scan, the adjuvant radiotherapy was not performed. At 12 months after the operation, the solid fusion was shown and there was no local recurrence.

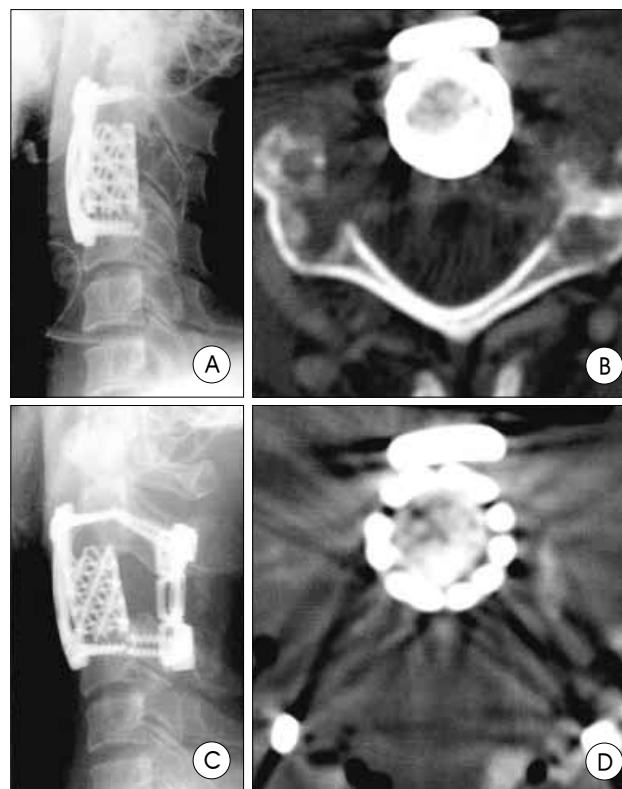
## Discussion

Since the descriptions of total spondylectomy by Stener and Johnson<sup>10</sup> for large giant cell and other malignant spinal lesions, aggressive surgical treatment of patients with spinal giant cell tumors has become much more common and now usually is considered a standard part of the treatment of these patients. The primary measure of successful outcome in the treatment of giant cell tumors is avoidance of recurrence. The recurrence rates of giant cell tumors in the limbs have been 26–50%, with the highest recurrence rates occurring in lesions treated by intralesional curettage<sup>4,5</sup>. Dahlin found 44% recurrence rate for all giant cell tumors, but found 16.5% recurrence rate when these tumors arose in the spine<sup>4</sup>. This led him to speculate that these lesions may be less aggressive when they arise in the spine, despite their histologically identical appearance.

The prognosis of primary bone tumor originated from vertebrae is decided by type of tumor, resection method, adjuvant chemotherapy, and radiotherapy<sup>8,11</sup>. To date, chemotherapy and radiotherapy are not effective to this tumor according to reports which have been published<sup>11</sup>. Excellent

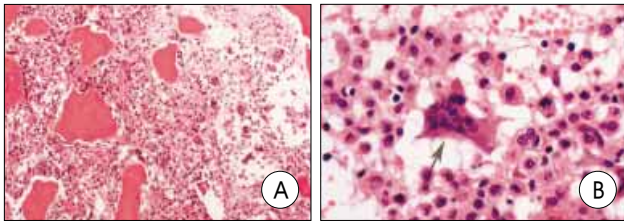


**Fig. 1.** A, B : Preoperative plain anteroposterior and lateral film. The compression fracture is noted at 3rd cervical vertebra. C : Preoperative computed tomography shows the infiltration of tumorous lesion in body, lamina, and processes. D : Preoperative magnetic resonance image. There is mild cord compression due to compression fracture of 3rd cervical vertebra.



**Fig. 2.** After 1st operation. Plain lateral film (A) and computed tomography (B). After final operation. Plain lateral film (C) and computed tomography (D).

results after megavoltage radiation therapy for axial or inoperable giant cell tumors also were reported<sup>7</sup>. Eighty five percent of the tumor had not progressed after treatment and no malignant transformation occurred in a median 9.3 years follow up. Although secondary malignant change was reported in 6% of patients with giant cell tumors and in 69% of patients with malignant changes who previously had received irradiation<sup>2</sup>, for patients with inoperable tumors there is no other adequate surgical treatment. Radiation therapy seems to be justified in inoperable tumors.



**Fig. 3.** Histopathologic Findings. A : The tumor is composed of mononuclear cells. They infiltrate among the bony trabecula(H&E ×100). B : The tumor cells make the multinucleated giant cells(Black arrow) (H&E ×400).

So, the resection method is one of the most important factors among these prognosis factors<sup>4,5</sup>. Surgeons have used a various treatment methods for giant cell tumors, including wide primary resection, simple curettage and so on. Ideally, if giant cell tumors can be resected safely with negative margins, then it is the choice of treatment options. The cervical area has complicated anatomic structures including major vessels and organs. Because of these reasons, the total spondylectomy for cervical bone tumors has been rarely attempted. Campanacci, et al. reported a recurrence rate of 27% after intralesional curettage versus rates of 8% and 0% after marginal or wide excision, respectively<sup>2</sup>. In addition, although lower rates of recurrence have been reported in recent series of extremity giant cell tumors with en bloc resection or curettage with phenol and bone cement, the use of adjuvants to curettage of spinal lesions has not received substantial attention<sup>1,6</sup>. In these reasons, we believe that the initial surgery should be as aggressive as possible and that radiation should be used for lesions that are incompletely resectable or that have recurred.

In cervical area, it is difficult to attempt total spondylectomy through one-stage operation because of vertebral artery and adjacent organs. We recommend that the staged operation is reasonable. The initial approach can be decided by area of tumor involved but if the posterior approach may be selected initially, the axial load is transferred through only anterior column so, the possibility of the compression of

vertebral body that is weakened by tumor infiltration may be increased. However, the anterior approach and anterior interbody fusion with bone graft can provide stability and we believe that anterior approach should be selected initially.

## Conclusion

Although frequently difficult, wherever possible total spondylectomy is required for the treatment of giant cell tumor invaded all 3 spinal columns, with subsequent replacement of the bone defect with bone graft. The total spondylectomy of cervical spine can be performed successfully by the staged operation. The understanding of complex cervical anatomy and the great care for vertebral artery are essential for this surgical procedure.

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