

# Failure of reconstruction surgery using anterior fibular strut grafting to correct postlaminectomy kyphosis

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## Abstract

A patient with postlaminectomy kyphosis with a neurological deficit which developed following the initial surgical treatment is reported. A 49-year-old man, complaining of neck pain, sought treatment in 1995. An extramedullary cervical spinal tumor was diagnosed and C2–C4 laminectomy and resection of the tumor were performed. Recurrence of the tumor was seen 1 year later and a second tumor resection and radiation therapy were performed. One year after the second resection of the tumor, X-rays of the cervical spine revealed kyphosis. Anterior spinal fusion without instrumentation was performed followed by immobilization using a halo vest for 4 months. However, pseudoarthrosis and progression of the kyphosis occurred postoperatively. Iliac bone grafting at the pseudoarthrosis site and posterior internal fixation with lateral mass plates was performed. Bony fusion between the graft and C6 vertebra was obtained after these procedures, but the neurological deficits were not completely resolved. Clinicians who treat spinal cord tumors may learn from this treatment failure.

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**Keywords:** Postlaminectomy kyphosis; Bone graft; Spinal fusion; Spinal instrumentation; Pseudoarthrosis

## 1. Introduction

The occurrence of postlaminectomy kyphosis is a rare and challenging problem.<sup>1</sup> The surgeon must consider multiple factors to prevent subsequent kyphosis when performing laminectomy of the cervical spine. If a kyphotic deformity of the cervical spine does develop postoperatively, the deformity must be corrected and neural compression relieved with caution, due to the fragility of soft tissue restraints.<sup>1,2</sup> The failure of postlaminectomy reconstruction surgery is commonly caused by graft failure, fixation failure, or both.<sup>1</sup>

We report a patient with postlaminectomy kyphosis and the clinical results after corrective surgery. The first reconstruction surgery failed, but revision surgery finally achieved a successful fusion.

## 2. Case report

The patient was a 49-year-old man with neck discomfort that began in January, 1995 and for which he sought treatment in April, 1995. Magnetic resonance imaging (MRI) showed a spinal tumor extending from C2 to C4 (Fig. 1). In August 1995, a laminectomy at C2–4 and an excision of the extramedullary spinal tumor were performed. A pathological examination of the excised tumor revealed it to be a

meningioma. One year post-laminectomy, a localized recurrence of the tumor was found. An excision of the spinal tumor was again performed in August, 1996, followed by radiation therapy, after which no recurrence was observed. A year later in 1997, the patient returned with gait disturbance as his chief complaint. He also reported neck pain, which had been present since 1995, and numbness of his left upper arm. Radiographs of the cervical spine showed 35° of kyphosis between lines extending from the posterior margins of the C2 and C7 vertebrae (C2–7 angle) (Fig. 2).

A neurological examination showed hypesthesia of the upper extremities, bilateral ankle clonus and exaggerated deep tendon reflexes; a physical examination revealed that the patient was not able to hold his head upright. Increasing neck pain, muscular spasms and dysfunction in finger motion and of the bladder had occurred over the past 6 months. The patient could not use chopsticks and suffered from pollakisuria. MRI showed that the cervical kyphotic deformity and osteophytes were exerting anterior compression on the spinal cord.

To correct the kyphosis and to relieve the neural compression, an anterior cervical corpectomy and fusion of C3–C5, using fibular strut bone, was performed in December, 1997 (the first corrective surgery). The C2–7 angle was decreased to 9° of kyphosis (Fig. 3). The patient was immobilized with a halo vest for 4 months.

Sixteen months after this corrective surgery, the patient's symptoms worsened. He could not hold his head upright. He had gait disturbance, severe neck pain and hypesthesia of both arms. The neurological dysfunction was even more

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Fig. 1. T1-weighted sagittal MRI of the cervical spine. An extramedullary spinal tumor was observed extending from C2 to C4 (arrow). A pathological examination revealed this tumor to be a meningioma.

severe than that seen before the first corrective surgery. Cervical spine X-rays revealed migration of the fibular strut bone into the C6 vertebra and subsequent kyphotic deformity of 30° in the C2–7 angle (Fig. 4). The C2 vertebra and graft were united, but the C6 vertebra had not united with the graft. MRI showed that a residual fragment of the C4 vertebra remaining after the corpectomy was compressing the spinal cord (Fig. 5).

In February, 2000, revision surgery (the second corrective surgery) was performed to relieve both the neurological deficit and non-union at the pseudoarthrosis site. Anterior decompression of the C4 vertebra, curettage at the pseudoarthrosis site and iliac bone grafting were initially performed, followed by posterior spinal fusion of C4–Th1 with a lateral mass plate. The kyphotic deformity was then decreased to 20° in the C2–7 angle. A Halo vest was applied for 3 months postoperatively and satisfactory osseous fusion of the graft was achieved (Fig. 6). Improvement in gait and restoration of the patient's ability to keep his head upright were seen, although numbness in the hands and arms and the neck pain were not completely relieved.



Fig. 2. Lateral cervical spine X-ray before the first corrective surgery showed a kyphotic deformity of the cervical spine. The angle between two lines extending from the C2 and C7 posterior margins was 35° of kyphosis.

### 3. Discussion

Postlaminectomy kyphosis of the cervical spine is unusual.<sup>1</sup> One of the causes of this condition is the removal of the tethering posterior restraints in the cervical spine<sup>1</sup> or weakening of the posterior restraints resulting from radiation treatment for tumors.<sup>1</sup> Pre-existing kyphosis significantly increases the risk of increased deformity following cervical laminectomy.<sup>1,3,4</sup> This patient had undergone two surgical procedures as well as radiation therapy; these treatments may have caused the posterior restraints of the cervical spine to weaken. The straight alignment of the cervical spine, which was observed preoperatively, is also a risk factor for postlaminectomy kyphosis.<sup>1</sup>

Symptoms of postlaminectomy kyphosis may include neck pain, muscle spasm, progressive neurological deficits and postural dysfunction. Generally, as the kyphotic deformity progresses, the spinal cord becomes draped over the posterior aspect of the vertebrae and longitudinal cord tension is increased.<sup>1</sup> In this patient, the kyphotic deformity developed after the first corrective surgery because the residual C4 vertebral body shifted medially and evaginated into the spinal canal, significantly compressing the spinal cord. This may have occurred because the residual vertebral body after anterior corpectomy and posterior laminectomy has a 360° instability.<sup>1</sup>

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