Kyphotic deformity after laminectomy surgery for a gunshot wound to the spine: a case report

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Case Report

Introduction

Spinal kyphotic deformity after spinal laminectomy and laminoplasty is more common in pediatric patients than adults. Laminectomy can lead to decreased cartilage growth, anterior wedging and posterior spinal muscle insufficiency which can result in kyphotic deformity. Herein we outline a case report of a child presenting with kyphotic deformity after receiving a spinal laminectomy to treat a penetrating spinal trauma. The 8-year-old male presented with penetrating spinal trauma following a gunshot wound and subsequently underwent L1 laminectomy and thecal sac decompression to remove the foreign body. In a follow-up examination approximately one month after surgery, imaging revealed kyphotic deformity and the patient was referred to the Rasoul-e-Akram Hospital. The patient then underwent surgical reconstruction. The postoperative computed tomography (CT) scan showed appropriate repair of sagittal balance and the patient's symptoms gradually improved. Post-laminectomy kyphosis is a notable concern and complication in the pediatric population and can occur shortly after surgery. The following interventions can decrease the likelihood of post-laminectomy kyphosis: minimal muscle dissection and bone removal during laminectomy, avoidance of facet disruption, use of laminoplasty rather than laminectomy, postoperative immobilization/bracing and regular follow-up for early detection and treatment of any deformity.

Keywords: Post-laminectomy kyphosis; spinal kyphosis; sagittal balance deformity; penetrating spine injury

Case presentation

An 8-year-old male admitted to Rasoul-e-Akram Hospital presented with a penetrating spinal injury due to a gunshot wound to the thoracolumbar region. The patient had no past medical history. The patient underwent L1 bilateral laminectomy, facetectomy, thecal sac decompression and removal of foreign bodies. After surgery, he experienced severe lower limb paraparesis and sphincter control deficit. In a follow-up visit he demonstrated only minimal improvement in neurologic condition and displayed sagittal balance kyphotic deformity. The plain radiography and computed tomography (CT) scan revealed kyphotic deformity associated with L1 laminectomy (Figure 1). Because of progression of the kyphotic deformity and persistence of the neurologic deficits, he was referred to the care of the authors.

The patient then underwent a surgical procedure
following the diagnosis of post-laminectomy kyphotic deformity. The patient was given general anesthesia and placed in the prone position, and then skin preparation and draping were done. After a skin incision, sufficient dissection and exposure with a scalpel, pedicular screws were inserted into the vertebral body of T10, T11, T12, L2 and L3. Using contouring rods and by performing a compression maneuver, the deformity was corrected and the reconstructed spine was reinforced by allograft posterior fusion. The postoperative CT scan showed satisfactory correction of the deformity and good sagittal balance (Figure 2). At four months follow-up the patient demonstrated a significant improvement in neurologic condition with lower limb force and sphincter function improving significantly, although the patient displayed left foot drop.

**Discussion**

Following laminectomy, the loss of posterior elements that resist traction forces can result in kyphotic deformity. This may or may not be related to the failure of support of the anterior portion of the spinal column. In its severe form, post-laminectomy deformity may cause neurologic symptoms due to neural compression (1).

Bartolussi hypothesized that as the deformity progresses the weight tolerating pivot of the body moves anteriorly and thus can only be corrected with spinal column sagittal balance reconstruction (4). Other theories suggest that arrest in vertebral growth due to radiation and posterior muscle insufficiency are the main causes of deformity following laminectomy (2).

Except in the cervical region, post-laminectomy kyphosis is uncommon in adults because of maturation of the spine (2); post-laminectomy kyphosis is uncommon in the thoracic and lumbar spine regions in adults. This is related to the patient’s age, the number of the levels that undergo laminectomy, the region of laminectomy, the time after surgery and the patient’s gender. It is independent...
of neurologic status (5,6). In younger age groups and the higher cephalad level, the likelihood of post-laminectomy kyphosis is higher (7).

Immobilization after surgery can cause a delay in the development of kyphotic deformity, but does not appear to prevent it (1).

Surgical intervention is indicated in the severity and progression of the deformity and related neurologic deficits (5).

Lutz reported that the time between surgery and post-surgery kyphosis was four years and three months. The mean kyphotic angle improved from 87 degrees to 38 degrees. The mean age at first surgery was three years and one month and for correction surgery was eleven years and seven months (1).

Kelley reported a four year old male who underwent T9 to L3 laminectomy for resection of a tumor. When the patient was nine years old, he presented with kyphotic deformity with kyphotic angle of 110 degrees. After posterior approach repair surgery, post-operative imaging demonstrated good reconstruction with the kyphotic angle decreased to 65 degrees (8).

Norman and colleagues surveyed twelve patients with severe post-laminectomy and post-radiation kyphosis. The mean age was fifteen years and the mean follow-up time was sixty-five months. Following repair surgery, the mean kyphotic angle improved from 84 degrees to 39 degrees. The posterior approach was performed in three patients and the remaining nine patients underwent a combined anterior and posterior approach for their repair surgery. The time between initial laminectomy surgery and repair surgery was at least nine months (5).

In another study, Papagelopoulos and co-workers

![Postoperative radiograph and CT scan. (A) Plain radiograph, lateral view; (B) CT scan, sagittal reconstruction view. CT, computed tomography.](image)
followed 36 patients who underwent multilevel lumbar or thoracolumbar total laminectomy. Twelve of the patients were younger than seventeen years of age and their mean age was eleven years. At a mean follow-up of fourteen years, spinal deformity was identified in 33% of pediatric patients and 8% of adult patients. These results indicate that age, clinical condition and follow up period can influence the post-laminectomy kyphosis (9).

The key features of the aforementioned studies are outlined in Table 1.

The aforementioned studies indicate that post-laminectomy kyphosis: usually occurs several years after surgery, is more common following laminectomy involving the cervical and thoracic spine and occurs more frequently following laminectomy within the cephalad level or multilevel laminectomy. In contrast, we reported a case where the deformity occurred one month after a one level laminectomy in the thoracolumbar region (L1). Furthermore, we performed corrective surgery with the patient using the posterior approach only and reconstructed the posterior column to attain a good sagittal balance and then reinforced it by posterior fusion.

**Conclusions**

Post-laminectomy kyphosis can occur shortly after surgery and is a primary concern and complication in pediatric patients after a laminectomy. It is important to consider the following factors during surgical planning in order to prevent the development of post-laminectomy kyphosis: minimize muscle dissection and bone removal during laminectomy, avoid facet disruption, use laminoplasty rather than laminectomy, include post-operation immobilization and bracing, perform regular follow-ups for early detection and treatment of any deformity.

**Acknowledgements**

The authors would like to thank Rasoul-e-Akram Research Development Center for editing of this paper.

**Footnote**

*Conflicts of Interest:* The authors have no conflicts of interest to declare.
References


Cite this article as: Babashahi A, Taheri M. Kyphotic deformity after laminectomy surgery for a gunshot wound to the spine: a case report. J Spine Surg 2016;2(1):64-68. doi: 10.21037/jss.2016.01.02