

# Aggravation and subsequent disappearance of cervical disc herniation after cervical open-door laminoplasty

## A case report

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### Abstract

**Rationale:** Cervical open-door laminoplasty can enlarge the volume of the cervical vertebral canal and thus has become an effective and safe treatment for multilevel cervical disc herniation and cervical stenosis. Some post-surgery complications exist, such as reduction of cervical alignment and local kyphosis. However, aggravation of cervical disc herniation at the surgical level during short-term follow-up has not been discussed. Additionally, spontaneous disappearance of herniated disc pulposus is a common phenomenon in the lumbar region but is relatively rare in the cervical region.

**Patient concerns:** A 42-year-old female presented with a 7-year history of neck pain and a 2-year history of paresthesia and weakness in the upper and lower limbs. The sensations and muscle strength of both upper and lower limbs were decreased. The radiological findings showed that the Pavlov ratios from C3-7 were decreased obviously. Osteophytes as well as spinal cord compression were observed at C4/5, C5/6, and C6/7.

**Diagnoses:** Considering the symptoms and clinical examinations, the patient was diagnosed with cervical stenosis.

**Interventions:** We performed cervical open-door laminoplasty at C3-7 to enlarge the space of the cervical vertebral canal.

**Outcomes:** At the 6-month post-surgery follow-up, the patient showed obvious improvement in paresthesia and weakness in the upper limbs. The cervical disc herniation at C3/4 was aggravated. However, at the 18-month follow-up, the symptoms were relieved, and the herniated cervical disc at C3/4 spontaneously disappeared without any special treatment.

**Lessons:** We suggest that the attachment points of deep muscles in the neck region should be carefully protected during this surgery. Patients who undergo cervical open-door laminoplasty should pay attention to their cervical position and perform neck exercises to train their neck muscles. MRI is an important imaging method to observe dynamic changes in herniated discs for patients with cervical disc herniation.

**Abbreviations:** FSU = functional spinal unit, MRI = magnetic resonance imaging, ROM = range of motion, SDHNP = spontaneous disappearance of the herniated nucleus pulposus.

**Keywords:** aggravated disc herniation, cervical disc disappearance, cervical disc herniation, cervical laminoplasty, disc regression

## 1. Introduction

Cervical disc herniation is a common condition that can cause serious symptoms, such as pain and numbness. Cervical open-door laminoplasty can enlarge the volume of the cervical

Editor: N/A.

XW and YM contributed equally to this work and should be considered co-first authors.

The devices are FDA-approved or approved by the corresponding national agency for this indication.

The authors declare no conflicts of interest.

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Medicine (2018) 97:10(e0068)

Received: 6 December 2017 / Received in final form: 9 February 2018 /

Accepted: 9 February 2018

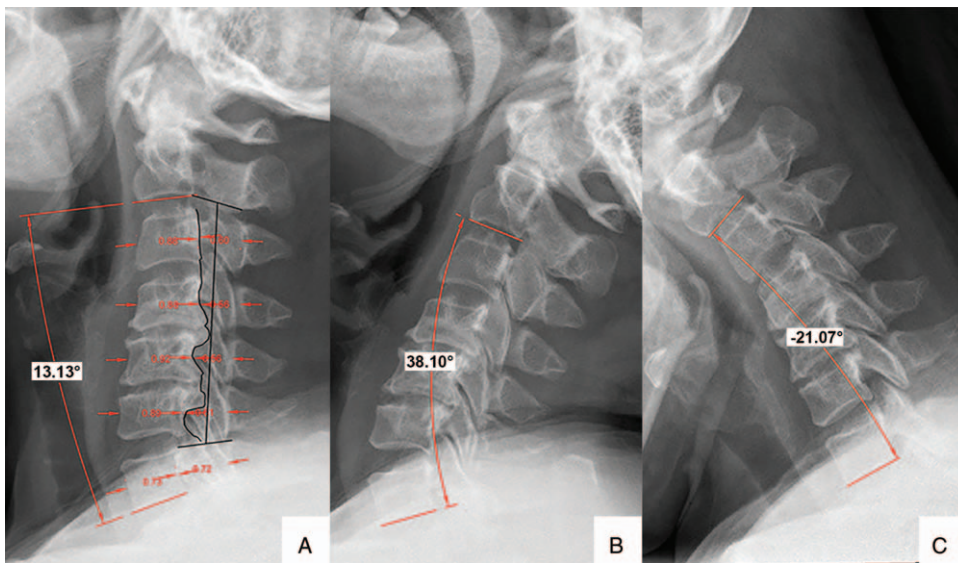
<http://dx.doi.org/10.1097/MD.00000000000010068>

vertebral canal and thus has become an effective and safe treatment for multilevel cervical disc herniation and cervical stenosis.<sup>[1-3]</sup> Studies have reported post-surgical complications, such as reduction of cervical alignment and local kyphosis.<sup>[4-6]</sup> However, aggravation of cervical disc herniation at the surgical level during short-term follow-up has not been discussed. Spontaneous disappearance of the herniated nucleus pulposus (SDHNP) was first reported by Jelasic F in 1953.<sup>[7]</sup> Most cases occur in the lumbar region, and cervical SDHNP is relatively rare. Many hypotheses have been proposed to explain the mechanism of SDHNP, but none have been comprehensive. We report a patient with aggravation of cervical disc herniation at C3/4 after cervical open-door laminoplasty at C3-7 during a short-term follow-up. The herniated disc subsequently spontaneously disappeared during long-term follow-up. We share our opinion about the mechanisms underlying these phenomena.

## 2. Case report

The patient provided informed consent for the publication of his clinical and radiological data. This case report was approved by the Medical Ethical Committee of West China Hospital, Sichuan University.

A 42-year-old female presented with a 7-year history of neck pain and a 2-year history of paresthesia and weakness in the



**Figure 1.** The lateral radiograph (A) showing that the cervical vertebral canal is stenotic and the K line (drawn in black line) is positive. The lateral radiograph shows a C2-7 Cobb's angle of 13.13°. The range of motion (ROM) at C2-7 was 59.17° (B, C).

upper and lower limbs. The symptoms did not subside after 3 months of conservative treatment.

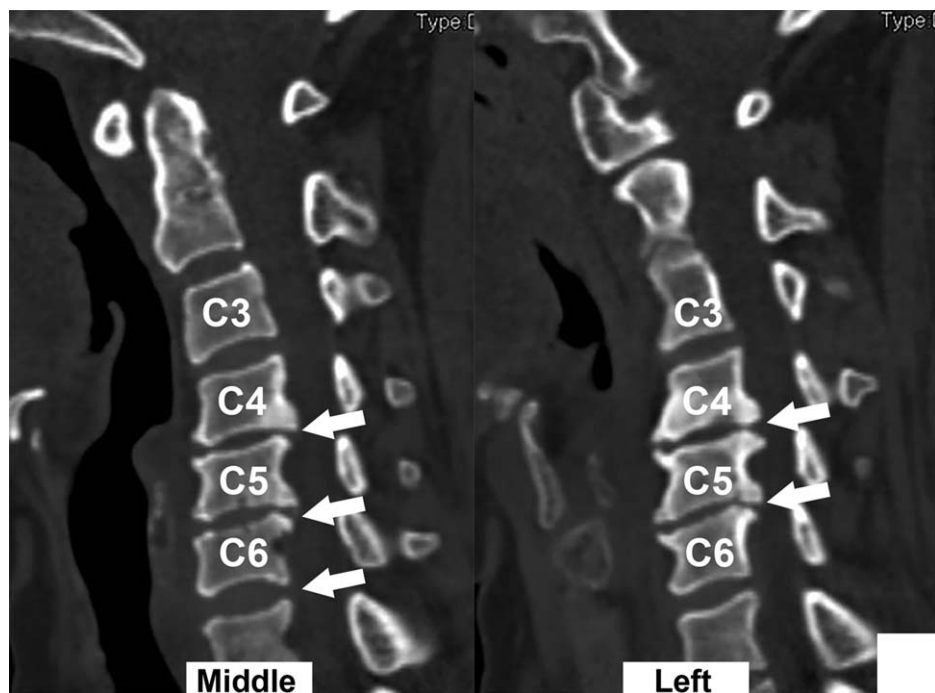
During the physical examination, the sensations of both the upper and lower limbs were decreased, and the left side symptoms were more serious. The muscle strength was grade 4 for the upper limbs and grade 3 for the lower limbs. Hoffman's sign was positive on both sides.

The lateral radiograph showed a narrowed cervical vertebral canal, and the Pavlov ratios from C3-6 were 0.68, 0.64, 0.61, and 0.69, respectively (Fig. 1A). The C2-7 Cobb's angle was 13.13°,

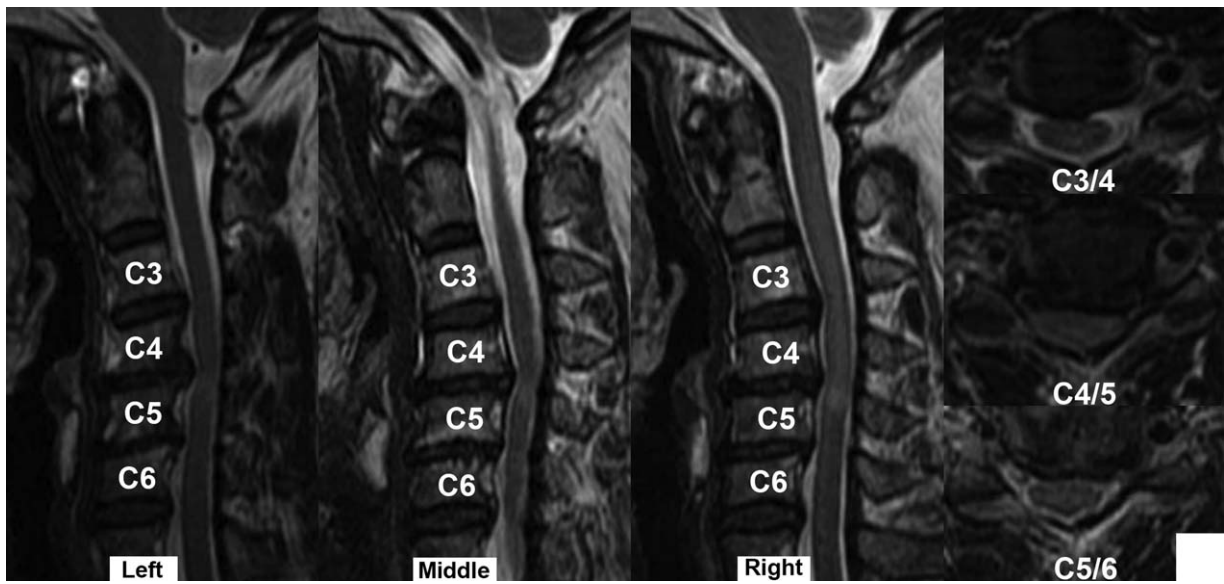
and the K line was positive. The range of motion (ROM) at C2-7 was 59.17° (Figs. 1B, C).

The CT scan showed obvious cervical stenosis. Osteophytes were observed at C4/5, C5/6, and C6/7 (Fig. 2). Magnetic resonance imaging (MRI) revealed cervical spinal cord compression at C3/4, C4/5, and C5/6 (Fig. 3).

Considering the symptoms and clinical examinations, the patient was diagnosed with cervical stenosis. We performed cervical open-door laminoplasty at C3-7 to enlarge the space of the cervical vertebral canal.



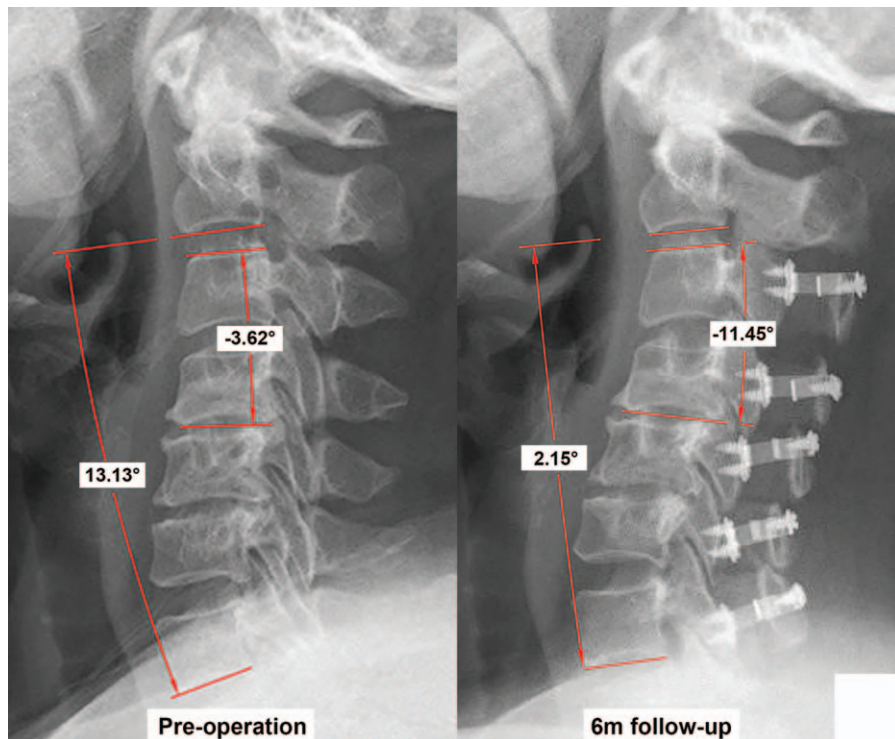
**Figure 2.** The CT scan before surgery shows obvious cervical stenosis. Osteophytes were observed at C4/5, C5/6 and C6/7 (labeled with arrows).



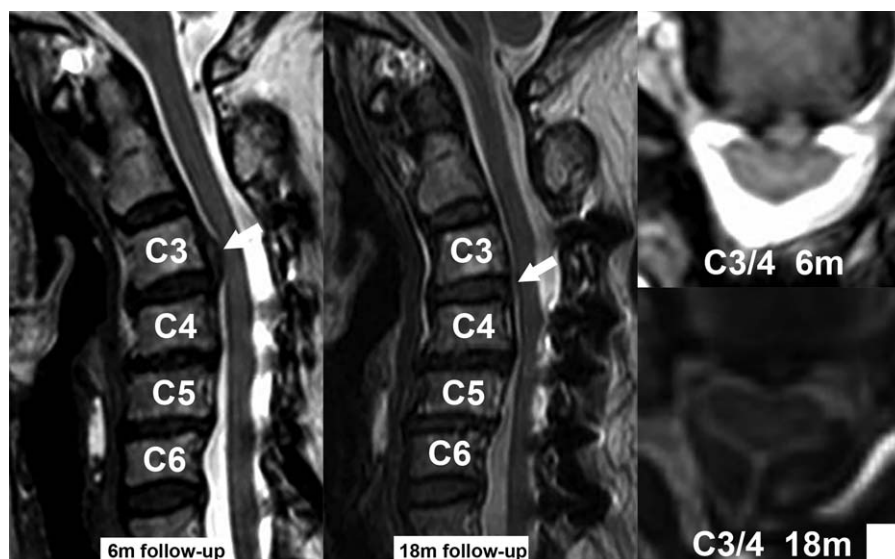
**Figure 3.** Magnetic resonance imaging (MRI) before surgery reveals cervical spinal cord compression at C3/4, C4/5 and C5/6.

At the 6-month post-surgery follow-up, the patient showed obvious improvement in paresthesia and weakness in the upper limbs. The lateral radiograph showed a straightened sagittal alignment and cervical kyphosis at the C3/C4 level. The C2-7 Cobb's angle decreased from 13.13° to 2.15°, and the functional spinal unit (FSU) angle at C3-4 decreased from -3.62° to -11.45° (Fig. 4). The MRI showed decompression at C4-7 and aggravation of cervical disc herniation at C3/4 (Fig. 5).

The patient denied any history of trauma; however, as an office worker, she was usually bent over her desk at work for long periods of time. Considering that no new symptoms occurred, we recommended follow up for the herniated disc in 12 months. At the 18-month post-surgery follow-up, she recovered well without any discomfort, and the MRI indicated an almost complete spontaneous disappearance of the herniated disc materials at the C3/C4 level (Fig. 5).



**Figure 4.** The lateral radiograph shows a straightened sagittal alignment and cervical kyphosis at the C3-C4 level at the 6-month follow-up. The C2-7 Cobb's angle decreased from 13.13° to 2.15° compared with pre-operation, and the functional spinal unit (FSU) angle at C3-4 decreased from -3.62° to -11.45°.



**Figure 5.** The MRI at the 6-month follow-up shows decompression at C4-7 and aggravation of cervical disc herniation at C3/4 (labeled with an arrow), whereas the herniated disc materials at C3-C4 disappeared spontaneously (labeled with an arrow) at the 18-month follow-up.

### 3. Discussion

We report a patient with cervical spinal stenosis and multilevel spinal cord compression. She underwent cervical open-door laminoplasty, and her cervical disc herniation at C3/4 was aggravated at the 6-month follow-up. Lee et al<sup>[8]</sup> reported that the cervical sagittal alignment might become kyphotic after cervical open-door laminoplasty. Usually, the attachments of deep muscle in the neck region and posterior ligamentous structures are cut during this surgery; thus, the posterior muscle strength in the cervical region is decreased after surgery. This decrease can lead to kyphosis of the cervical sagittal alignment.<sup>[9]</sup> Some authors reported that the abnormal cervical sagittal alignment was related to cervical disc degeneration and herniation.<sup>[10-12]</sup> An abnormal cervical sagittal alignment could increase the intervertebral disc pressure and change the transmission pattern of the cervical stress. In our case, the patient's C2-7 Cobb's angle decreased from 13.13° to 2.15° and the FSU angle at C3-4 decreased from -3.62° to -11.45° at the 6-month follow-up. The cervical sagittal alignment obviously worsened. Moreover, the patient was an office worker and was often bent over her desk for long periods of time. Poor positioning of the cervical and thoracic spine have been reported to be highly related to abnormal cervical sagittal alignment.<sup>[13,14]</sup> Additionally, the annulus fibrosus was broken before surgery. All of these factors could have led to aggravation of the HNP at C3/4. Lin et al<sup>[15]</sup> reported that by preserving the muscular-ligament complex unilaterally during cervical open-door laminoplasty, the cervical sagittal alignment would not significantly decrease after surgery. Qiu et al<sup>[16]</sup> reported that the volume of the neck muscles was maintained if the paraspinal muscular-ligament complex on one side was reserved during cervical open-door laminoplasty. We suggest that the attachment points of deep muscles in the neck region should be carefully protected during this surgery. Patients undergoing cervical open-door laminoplasty should pay attention to their cervical position and perform neck exercise to train their neck muscles.

At the 18-month follow-up, we found that the HNP had disappeared spontaneously without any special treatment. By reviewing the literature, we found that SDHNP was first reported in 1953.<sup>[7]</sup> Most SDHNP cases occur in the lumbar region, and cervical SDHNP is relatively rare. To the best of our knowledge, this case is the first report of the aggravation and spontaneous disappearance of cervical HNP after cervical laminoplasty. We offer some hypotheses about the mechanisms of SDHNP.

First, the inflammatory immune response could lead to SDHNP. The intervertebral discs are in an avascular physiological environment. Once the nucleus pulposus herniates into the vascular epidural space, it may be recognized as a foreign body by the immune system and cause a series of inflammatory reactions, and the herniated nucleus pulposus may be attacked and broken down.<sup>[17,18]</sup> SDHNP was observed to be more likely to appear as the size of the nucleus pulposus that herniated into the epidural space increased.<sup>[19,20]</sup> Second, some authors believe that the RNHP is a form of apoptosis induced by various cytokines.<sup>[17,21]</sup> In addition, for acute SDHNP, if the HNP does not separate from the annulus fibrosus, the herniated disc can retract back into the intervertebral disc space when the pressure of the intervertebral disc space decreases.<sup>[22,23]</sup> Furthermore, the nucleus pulposus has been hypothesized to wear out if it herniates into the epidural space and contacts the flowing cerebrospinal fluid; alternatively, the herniated nucleus pulposus may shrink and gradually disintegrate.<sup>[24]</sup>

Although this case is unique, it also has some limitations. We only obtained the patient's imaging data from her 6-month and 18-month follow-ups; therefore, we could not compare the dynamic changes of the nucleus pulposus at C3/4 consecutively.

We cannot generalize our case report beyond the present context to a larger population of patients, although our findings do suggest that cervical disc herniation can become aggravated after cervical laminoplasty and that the protruding nucleus pulposus can disappear spontaneously. Future research in the form of retrospective studies and basic experiments could be based on the work we

describe here to provide additional evidence about the phenomenon and to understand the underlying mechanisms.

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