Cervical spondylolytic spondylolisthesis is a rare congenital anomaly. It is often misunderstood as a result of trauma. However, most of them are congenital deformities. The vast majority of patients with radiographically proven cervical spondylolysis can be treated confidently with conservative measures. Cervical spondylolytic spondylolisthesis that cause symptoms requiring surgery is very rare. Surgical intervention should be reserved for those who fail non-operative management or exhibit neurologic compromise referable to an unstable spondylolytic defect. We report a case of cervical radiculopathy in a 45-year-old female patient who had been diagnosed with spondylolytic spondylolisthesis at the sixth vertebra and treated with surgery.

Keywords: Spondylolysis; Cervical spine; Surgery

INTRODUCTION

Cervical spondylolysis is defined as a cortical defect in pars interarticularis. It is a rare anomaly contrary to lumbar spondylolysis. Cervical spondylolytic spondylolisthesis that cause symptoms requiring surgery is even rarer. Cervical isthmic spondylolisthesis has been seldom reported. In ordinary cases, cervical spondylolysis is diagnosed incidentally in minor trauma. Although there are some hypotheses about its pathophysiology and natural history, nothing is certain. We report a case of cervical radiculopathy in a 45-year-old female patient who had been diagnosed with spondylolytic spondylolisthesis at the sixth vertebra and treated with surgery. We also reviewed current literature about cervical spondylolysis.

CASE REPORT

A 45-year-old female presented with posterior neck pain, numbness, and transient weakness on both arms. Her symptoms arose 6 months prior. One week ago after a light traffic accident, these symptoms were aggravated. She was a housewife. She did not have any medical or surgical history. She was involved in a bicycle traffic accident 5 years ago. However, she said it was not too severe.
On physical examination, she presented with weakness (grade IV) for her both grasping and radiculopathy through both the sixth vertebrae (C6) and the seventh vertebrae (C7) dermatome. Radiographic examination of the patient’s cervical spine revealed a bilateral spondylolysis on C6 and spondylolisthesis at C6 on C7 (FIGURE 1). On plain radiograph, flexion and extension lateral view showed instability between C6 and C7 (FIGURE 2). On computed tomography (CT) scan, a bilateral defect between the pedicle and the lamina was revealed. The spina bifida occulta at C6 level was revealed on CT scan (FIGURE 3). On magnetic resonance image (MRI), cord compression was not definitive. However, the bilateral neural foramen was compressed according to movement due to instability between

![FIGURE 1. Bilateral spondylosis (red arrow) and spondylolisthesis revealed in (A) X-ray and (B).]

![FIGURE 2. (A) Neck flexion and (B) extension view showing dynamic instability between C6 and C7.]

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C6 and C7 (FIGURE 4). There was a neurologic symptom. Thus, we planned to perform anterior cervical discectomy and fusion on C6 and C7 with posterior decompression and fusion using C5 lateral mass–C7 pedicle screw fixation (FIGURE 5). Postoperatively, the patient presented improved symptoms.

DISCUSSION

Cervical spondylolysis was first described in 1951 by Perlman and Hawes. Isthmic spondylolysis on C2 by trauma is often found. However, unlike lumbar spondylolysis, pure non-traumatic subaxial cervical spondylolysis is very rare. Only about 100 cases have been reported in the literature Furthermore, very few patients have had surgery (TABLE 1).
The cause of cervical spondylolysis is uncertain. Trauma, congenital anomaly, and developmental problem can be possible causes. Cervical spondylolysis by trauma is found in relatively young patients. Due to a clear history of trauma and discontinuation of cortical margin of a defect on X-ray, it can be easily diagnosed. There are often other anomalies such as spina bifida occulta in case of cervical spondylolysis by congenital anomaly that can cause a developmental problem. Schwartz et al. have reported that this condition is due to repetitive micro-trauma like lumbar spondylolysis. Cervical spondylolysis is most commonly found at C6, a transitional vertebra. Schwartz et al. have emphasized that it is because C6 is more exposed to stress than other subaxial cervical spines.

Cervical spondylolithesis is found in all ages. The 6th vertebra is the most commonly involved, account for 70% of the cases reported in the world literature. As mentioned above, Schwartz et al. have pointed out that it is because C6 is a transitional vertebra.

### Table 1. Summary of publications pertaining to operation of congenital cervical spondylolysis

| Author | Year | Age | Location | Main Symptom | Trauma | Operation                      |
|--------|------|-----|----------|--------------|--------|--------------------------------|
| Woo et al. | 2021 | 45  | 6        | Radiculopathy | None   | ACDF 6/7, Posterior fixation  |
| Ahn et al. | 2010 | 52  | 6        | Neck pain   | None   | ACDF 6/7                      |
| Ahn et al. | 2010 | 54  | 6        | Neck pain   | Yes    | ACDF 6/7                      |
| Redla et al. | 1999 | 29  | 6        | Neck pain   | None   | ACDF 6/7                      |
| Bhojraj and Shahane | 1992 | 8   | 6        | Myelopathy  | None   | ACDF 6/7                      |
| Faure et al. | 1990 | 24  | 6        | None        | None   | Posterior fixation            |
| Hirota et al. | 1988 | 38  | 6        | Neck pain   | None   | ACDF 6/7, Posterior fixation  |
| Schwartz et al. | 1982 | 14  | 6        | None        | None   | Posterior fixation            |
| Prioleau and Wilson | 1975 | 46  | 6        | Myelopathy  | None   | ACDF 6/7                      |
| Bellamy et al. | 1974 | 16  | 5        | Myelopathy  | None   | Posterior fixation            |
| Dawley | 1971 | 11  | 6        | None        | None   | ACDF 6/7                      |
| Durbin | 1956 | 25  | 4        | Myelopathy  | None   | Posterior fixation            |

ACDF: anterior cervical discectomy and fusion.
Cervical spondylolysis caused by congenital anomaly often includes cleft in the articular mass, dysplastic pedicle, spina bifida, and so on. It can be easily diagnosed by plain radiograph and CT. Compression of neural tissue can be seen by MRI. Its characteristic radiographic findings include well-corticated margins at the defect, a characteristic “bow tie” deformity, and ipsilateral dysplastic facets. Compensatory hypertrophic changes of adjacent articular processes, spina bifida, and spondylolisthesis are frequently, but not always, seen in cervical spondylolysis.

In our case, the patient did not have a history of any memorable trauma. There was a spina bifida occulta on her 6th vertebra and a clear cortical margin in the defected area (FIGURE 3). Thus, we think that congenital anomaly is the cause of her cervical spondylolysis. In previously reported cases, treatment was based on symptoms and signs of the patient. If there was no neurologic deficit by instability or medically intractable pain, most of them were treated by conservative methods including medication and immobilization. Our patient underwent surgery because she had neurologic deficit and instability. Anterior and posterior access surgeries were performed (anterior cervical disectomy with fusion between C6 and C7, posterior fixation with C5 lateral mass screw and C7 pedicle screw). The reason for performing posterior fixation from the fifth vertebra, not the sixth vertebra, was that pedicles of the sixth vertebra were dysplastic. In addition, the screw shaft might stimulate the nerve root passing nearby.

Surgical treatments for cervical spondylolytic spondylolisthesis, which is caused by a congenital reason rather than trauma, are very rare. Since the 1950s, when such a case began to be reported, only about 12 such cases have been reported. Thus, the authors think that this case is worthy of reporting.

CONCLUSION

Cervical spondylolytic spondylolisthesis is a rare congenital anomaly involving mainly C6. Most patients present with mild posterior neck pain without a neurologic deficit. The vast majority of patients with radiographically proven cervical spondylolysis can be treated confidently with conservative measures. Surgical intervention should be reserved for those who fail non-operative management or exhibit neurologic compromise referable to an unstable spondylolytic defect.

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