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Myelopathy Secondary to Thoracic Spondylolisthesis: A Case Report and Review of the Literature

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ABSTRACT

Objective: To compare a case of thoracic myelopathy secondary to degenerative thoracic spondylolisthesis with previously reported cases and radiologically assess the cause of degenerative thoracic spondylolisthesis.

Summary and background data: The thoracic and costovertebral joints provide relative stability to the upper and middle thoracic spine. Therefore, thoracic myelopathy of the lower thoracic spine associated with degenerative thoracic spondylolisthesis is rare. We report a case of degenerative spondylolisthesis of T11 associated with thoracic myelopathy.

Methods: A 76 year old woman with numbness in both lower limbs and gait disturbance was diagnosed with grade I degenerative spondylolisthesis of T11 on plain radiography according to the Meyerding classification. Stenosis of the spinal canal at T11-T12 and signal changes in the spinal cord were observed on sagittal T2-weighted MR images. Myelography identified an incomplete block at T11-T12 and computed tomography images showed severe facet joint degeneration between T11 and T12. A posterior decompression was performed combined with fixation of T11 and T12.

Results: The pedicle-facet joint angle at T11 was 124°, which was larger than that at T10 (99°) and T12 (97°).

Conclusion: Marked degeneration and leveling of the facet joint between T11 and T12 seem to be the underlying etiology of degenerative thoracic spondylolisthesis.

INTRODUCTION

The thoracic and facet joints provide flexion-extension stability to the upper and middle thoracic spine. However, very few cases of thoracic myelopathy in the thoracolumbar area (lower thoracic spine level) due to spondylolisthesis have been reported. We report a patient with degenerative spondylolisthesis of T11 who presented with thoracic myelopathy.

CASE REPORT

History and clinical examination

A 76 year old woman reported a tendency to fall in the previous 12 months. On initial examination, she complained of bilateral numbness in the thighs that extended distally and worsened gradually during the preceding 6 months. Over the past month, the numbness was associated with gait disturbance, for which she was referred to our hospital. A physical examination showed weakness of muscles of the lower extremities, no hypoesthesia, spastic gait, severe bilateral numbness from the groin downward, aggravated bilateral deep tendon reflexes, and a positive Babinski sign. A plain radiograph showed a grade I degenerative thoracic spondylolisthesis, based on the Meyerding classification. The pedicle-facet joint angle (PFJA) at T11 was 124°, which was larger than the PFJAs at T10 and T12 (99° and 97°, respectively) **(Figures 1 and 2)** [1,2]. Canal stenosis and high-signal changes were observed in a sagittal section at T11-T12 on a T2-weighted MRI **(Figure 3)**. A myelography identified an incomplete block at T11-T12 **(Figures 4A and 4B)**. The spondylolisthesis was 8 mm at flexion and 5 mm at extension; the disc angle was 2° at flexion and 0° at extension **(Figures 1C and 1D)**. Compression of the spinal cord by the posterior edge of the T12 vertebral body and the hypertrophied ligamentum flavum between T11 and T12, as well as severe degeneration of the T11-T12 facet joint were observed on computed tomography images taken after myelography **(Figures 4C and 4D)**.

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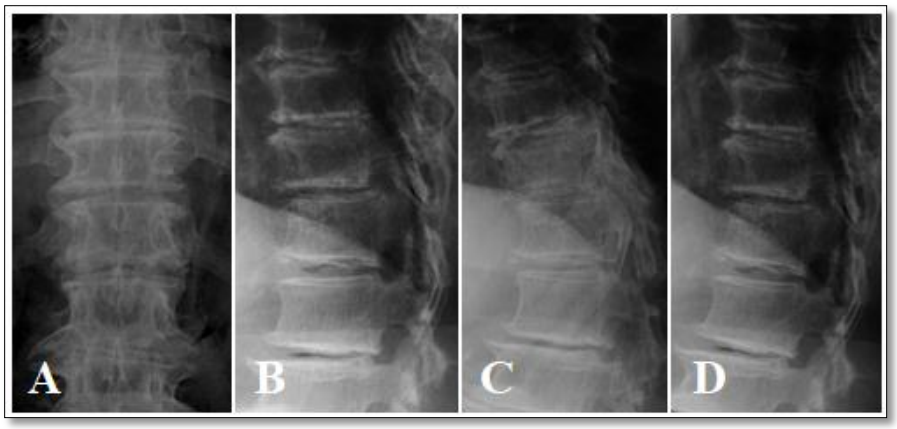

Figure 1. Grade I degenerative spondylolisthesis between T11 and T12 is observed on frontal (A) and lateral (B) plane radiographs. The pedicle-facet joint angles are 99°, 124° and 97° at T10, T11 and T12. Spondylolisthesis is 8 mm in the flexion position (C) and 5 mm in the extension position (D). The disc angle is 2° in the flexion position (C) and 0° in the extension position (D).

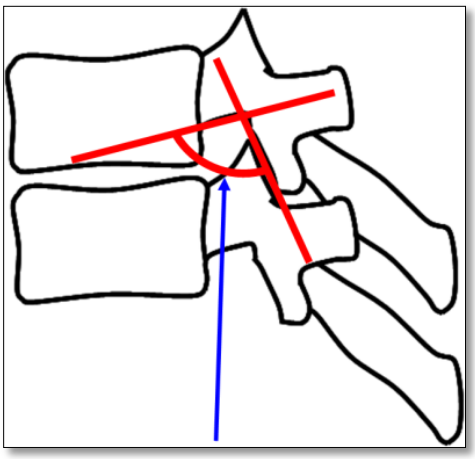

Figure 2. The pedicle-facet joint angle (PFJA) by Shimada et al. [5].

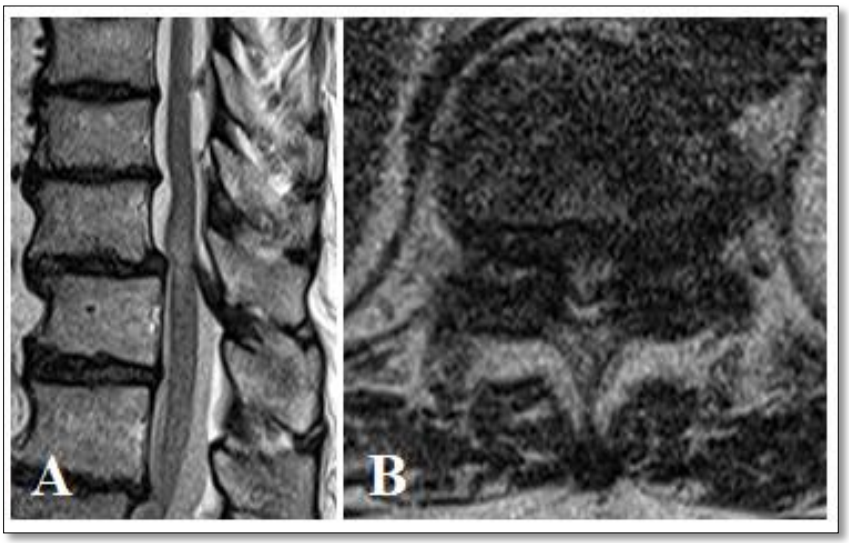

Figure 3. Spinal cord compression between T11 and T12 and high-intensity changes in spinal cord observed on T2-weighted magnetic resonance images. A: sagittal B: axial.

Figure 4. Incomplete block is observed at the T11-T12 intervertebral disc level by myelogram (A, B). Myelographic computed tomography (C, D) shows compression of the spinal cord by the posterior edge of the vertebral body of T12 and the hypertrophied ligamentum flavum between T11 and T12, as well as severe degeneration of the T11-T12 facet joint.

SURGICAL PROCEDURE

We used the posterior approach to decompress the spinal cord and stabilize T11 and T12. Severe degeneration of the T11-T12 facet joint was observed; it was lodged between the lamina of T11, which had rotated anteriorly, and the lamina of T12. The lamina of T11 and T12 was resected for full exposure of the dura mater at that level and confirmed protrusion of the dura mater and pulsation. Next, pedicle screws were inserted into T11 and T12 vertebrae and were fixed with rods **(Figure 5)**. A local bone was used for a posterolateral autogenous bone graft.

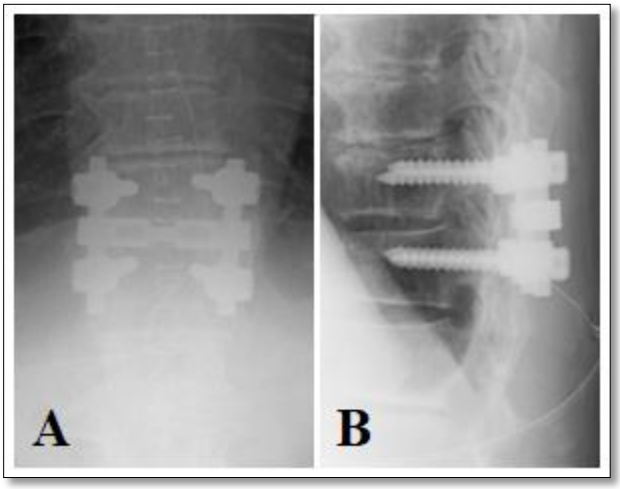

Figure 5. Postoperative plane radiograph decompression between T11 and T12 is evident. Posterior fixation was performed after decompression.

Postoperatively there was an improvement in the spasticity of the lower limbs and poor gait, but the numbness persisted. The patient was able to walk using a wheeled walker at a follow-up examination after 2 years.

DISCUSSION

The thoracic and costovertebral joints provide support and stability to the upper and middle thoracic spine, relative to the lumbar spine. However, similar structures do not exist in the thoracolumbar area, thus greater mobility often causes spondylosis [3]. A paper by Aizawa et al. [4] revealed that thoracic myelopathy affects mostly the lower thoracic spine, especially at Th11/12 and that 52% of these cases are associated with ossification of the ligamentum flavum, especially in Asian patients while only 8% are associated with thoracic spondylosis. Thoracic spondylolisthesis is rare, especially degenerative spondylolisthesis, because the facet joints are parallel to the coronal plane at the thoracic level. Extensive search of the PubMed 1990-2013 library and the Japan Medical Abstracts Society (JAMAS) showed 5 only such cases [1,2,5,6]. Ishibashi et al. [1] suggested that intervertebral slippage presents with large arch angles. In the present case, the PFJA between T11 and T12 was 124°, which indicated leveling of the T11 facet joint.

Figure 6 summarizes the PFJA of the present and previously reported cases. The angles are clearly larger than the PFJAs

of healthy subjects as examined by Shimada et al. [5], which suggest that facer joint leveling is necessary for the onset of degenerative thoracic spondylolisthesis. Although the etiology and prognosis remain unknown, it seems that spondylolisthesis develops when the PFJA extends beyond 110° by gradual deformation of the facet joint due to intervertebral disc degeneration, facet joint subluxation, or other factors. As all the reported cases were from Japan, racial and/or environmental factors may play a role in the pathogenesis of this disease **(Figure 6)**.

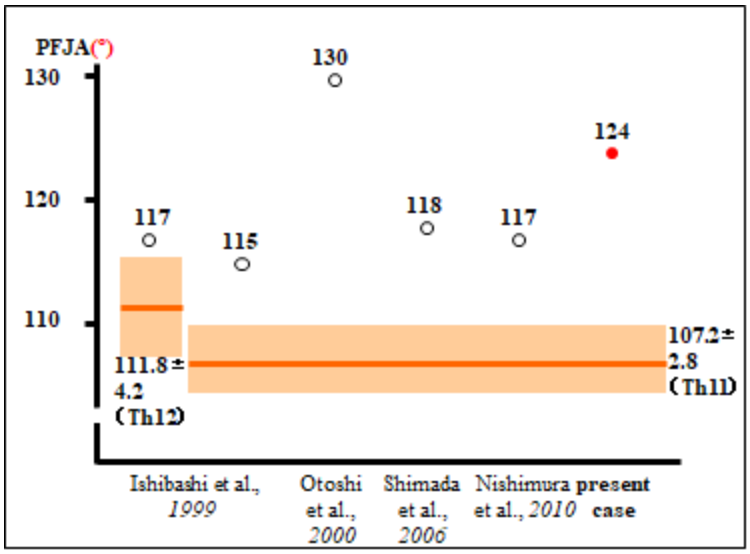

Figure 6. Pedicle-facet joint angles (PFJA) in this case and past case reports. PFJAs of all the cases are larger than those of the healthy subjects examined by Shimada et al. (T12:111.8, T11:107.2).

Table 1 summarizes the surgical procedures performed in the present and previously reported cases. All the surgical techniques involved decompression, with fixation of instability, if present. A posterior decompression and fixation were also performed in the present case to resolve mild instability. Partial resection of the deformed joint was necessary to achieve decompression in almost all the cases due to facet joint deformation. Since the intervertebral space is unstable by nature, it is logical to perform a fixation along with the decompression.

Table 1. A summary of case reports on degenerative thoracic spondylolisthesis.

Authors and Year	Age (years), Sex	Level	PFJA (°)	Operation	Facet OA
Ishibashi et al.	68, F	T12-L1	117	Laminectomy	(-)
	70, M	T11-12	115	Fenestration	(+)
Otoshi et al.	68, F	T11-12	130	Laminectomy + PLF	(+)
Shimada et al.	41, F	T11-12	118	Laminectomy + PLF	(+)
Nishimura et al.	66, M	T11-12	117	Laminectomy + PLF	(+)
Present case	74, F	T11-12	124	Laminectomy + PLF	(+)

Abbreviations: F: Female; M: Male; PLF: Posterior Lateral Fusion; OA: Osteoarthritis

CONCLUSION

- A rare case of myelopathy secondary to thoracic spondylolisthesis was experienced.
- We performed posterior decompression with fixation for this case.
- One of the causes was thought to be the leveling of the facet joints and significant degeneration.

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