



## Clinical Study

# Clinical outcomes after decompressive laminectomy for symptomatic ossification of ligamentum flavum at the thoracic spine



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## ABSTRACT

Ossification of the ligamentum flavum (OLF) is a rare disease that causes acquired thoracic spinal canal stenosis and thoracic myelopathy. The aim of this study was to investigate clinical outcomes of symptomatic thoracic OLF treated using posterior decompressive laminectomy. We retrospectively analyzed the medical records of 22 patients who underwent posterior decompressive laminectomy for symptomatic thoracic OLF. The surgical results were evaluated using the modified Japanese Orthopaedic Association (JOA) scoring system and Hirabayashi recovery rate. The intensity of pain was evaluated using a visual analog scale (VAS). The mean duration of follow-up was 35.6 months. The mean JOA score was significantly improved at final follow-up ( $9.18 \pm$  standard deviation of 1.53 points [range, 6–11 points]) compared with before surgery ( $5.64 \pm 2.04$  points [range, 3–9 points]) ( $P < 0.001$ ). The mean Hirabayashi recovery rate was 65.49% (range, 20–100%). Recovery outcomes were excellent in nine patients, good in eight patients, fair in four patients and unchanged in one patient. No patient was classified as deteriorated. The VAS scores were  $2.82 \pm 3.08$  before surgery and  $0.59 \pm 1.05$  at final follow-up ( $P = 0.001$ ). Surgical complications, which resolved after appropriate and prompt treatment, included dural tear in five patients, cerebrospinal fluid leakage in one patient, immediate postoperative neurologic deterioration in one patient, epidural hematoma in one patient, and wound infection in one patient. Our findings suggest that posterior decompressive laminectomy is an effective treatment for symptomatic thoracic OLF and provides satisfactory clinical improvement, but surgery for thoracic OLF is associated with a relatively high incidence of complications.

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## 1. Introduction

Ossification of ligamentum flavum (OLF) is a rare disease that is characterized by heterotopic bone formation in the ligamentum flavum. OLF is increasingly recognized as a major cause of acquired thoracic spinal canal stenosis, which frequently results in thoracic myelopathy [1,2]. Thoracic OLF primarily occurs in Asian populations, especially in Japan [3]. The prevalence of thoracic OLF is as high as 36% in the Japanese population [4] and 3.8% in the Chinese population [5], but there are insufficient epidemiological data for other Asian and non-Asian populations. The diagnosis of OLF is usually delayed due to the insidious onset and very slow progression of the disease. Surgical treatment is indicated once thoracic OLF becomes symptomatic because conservative treatment is

mostly ineffective [6]. The goal of surgical treatment is spinal cord decompression, and posterior decompressive laminectomy is the most commonly advocated method [3]. However, surgical outcomes are not always satisfactory, and complications are frequently encountered [3]. This study retrospectively analyzed the clinical outcomes after decompressive laminectomy for symptomatic OLF at the thoracic spine.

## 2. Material and methods

We retrospectively reviewed the records of all patients who underwent surgical decompression for thoracic OLF at our institution between January 2005 and June 2014. OLF was diagnosed from postoperative histopathology records and preoperative imaging studies, including radiograph, MRI, and CT scanning. Patients with incomplete medical records and patients lost to follow-up were excluded. Ultimately, 22 Chinese patients were included in this study. Demographic data, preoperative neurological status,

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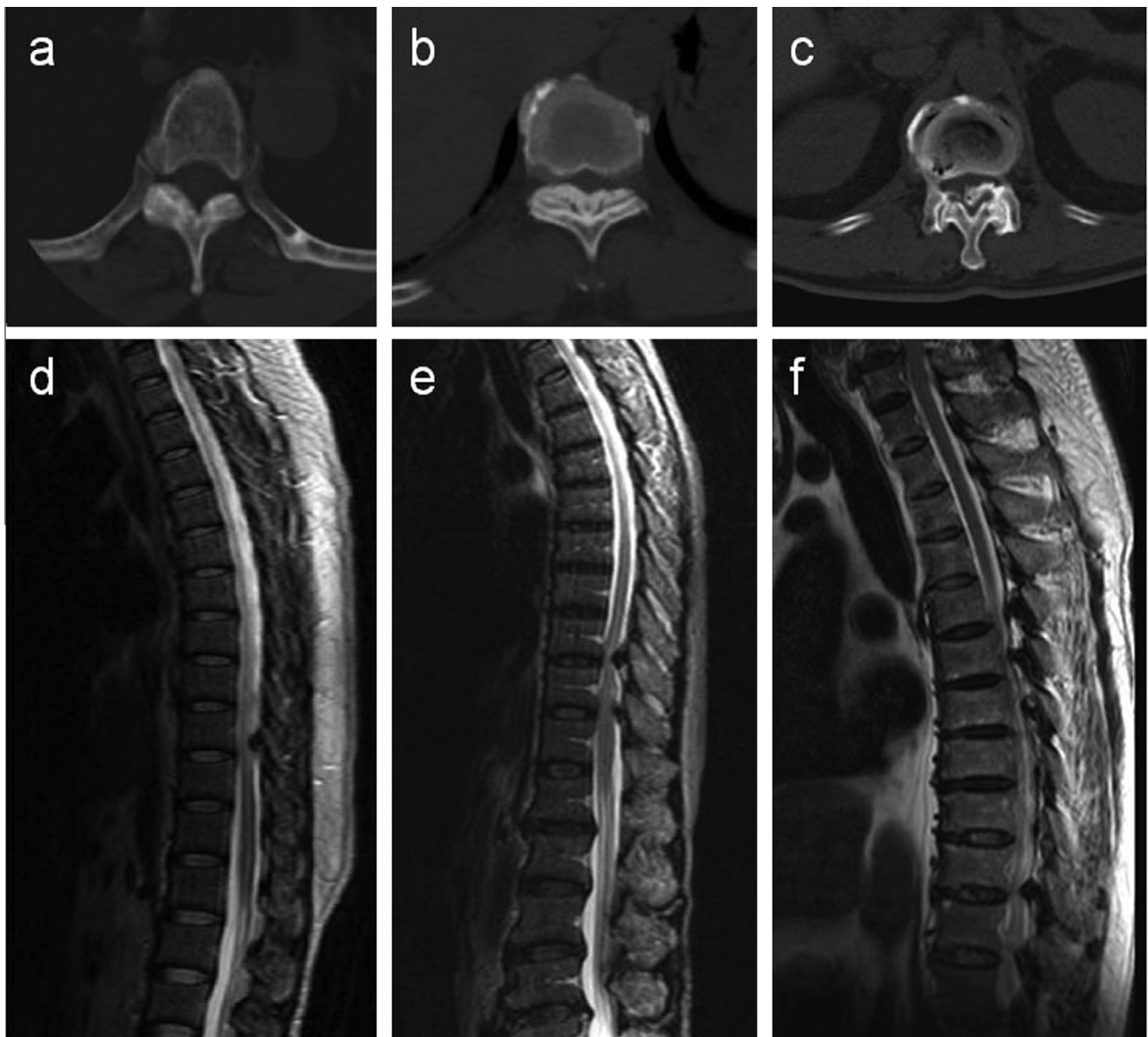
surgical procedure and results, and major complications were analyzed. Informed consent was obtained from the patients, and approval was obtained from the Institutional Review Board of the Southern Medical University, China.

The study group consisted of 22 patients (11 men, 11 women; mean age at surgery 52.4 years [range, 34–69 years]). The mean duration of symptoms between initial onset and diagnosis was 53.3 months (range, 1–240 months). Chief complaints were numbness and sensory dysfunction of the lower extremities in 18 patients (81.8%), weakness of the lower extremities in 13 patients (59.1%), gait disturbance in seven patients (31.8%), tightness sensation of the trunk in three patients (13.6%), urinary disturbance in four patients (18.2%), and local back pain and/or leg pain in 11 patients (50.0%). Most patients presented with multiple symptoms.

All patients underwent preoperative radiograph, CT scan and MRI of the spine. Imaging findings revealed that ossification lesion was located in the lower thoracic region (T1–T4) in 14 patients (63.6%), midthoracic region (T5–T8) in one patient (4.6%), and in the upper thoracic region (T9–T12) in two patients (9.1%).

Multifocal lesions were present in five patients (22.7%). Ten patients (40.9%) suffered from coexisting spinal lesions, including cervical spondylosis in three patients, cervical ossification of the posterior longitudinal ligament (OPLL) in one patient, lumbar spinal stenosis in two patients, lumbar disc herniation in one patient, thoracic OPLL in two patients and thoracic disc herniation in one patient at the corresponding levels of thoracic OLF. Configuration type of the ossified lesions on CT scans was lateral in 11 patients, diffuse in eight patients, and thickened nodular in three patients. Classification by the distribution pattern of ossifications on MRI were an isolated type (lesion within two adjacent laminae) in 13 patients, continuous type (continuous lesion along more than two laminae) in seven patients, and noncontinuous type (isolated or continuous at intervals) in two patients. [Figure 1](#) shows typical preoperative images.

Posterior decompressive laminectomy was performed in all patients. Spinal levels of decompression were determined from preoperative neurological status and preoperative imaging findings. Decompressive laminectomy consisted of removal of the



**Fig. 1.** Typical imaging findings of thoracic ossification of the ligamentum flavum. Axial CT images showing (a) lateral type, (b) diffuse type and (c) thickened nodular type configurations of ossified lesions. Sagittal T2-weighted MRI revealing the distribution of (d) isolated type, (e) continuous type and (f) noncontinuous type ossified lesions.

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