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**Clinical Study** 

# A circumferential decompression-based surgical strategy for multilevel ossification of thoracic posterior longitudinal ligament

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Abstract

**BACKGROUND CONTEXT:** Multilevel ossification of posterior longitudinal ligament (OPLL) at thoracic spine can be simultaneously symptomatic. Different approaches for thoracic decompression have been reported, among which circumferential decompression (CD) seems promising but is invasive, so methods to find approaches indicating levels for CD are also important.

**PURPOSE:** This study aimed to introduce a CD-based surgical strategy for multilevel thoracic OPLL and describe its clinical outcomes.

STUDY DESIGN: A retrospective clinical study was used.

**PATIENT SAMPLE:** A cohort of 26 patients were recruited, whose average age was 51.2±9.1 years old.

**OUTCOME MEASURES:** A modified Japanese Orthopedic Association (JOA) scale for thoracic spine was used to evaluate neurologic status, and final recovery rates were assessed according to Hirabayashi system.

**METHODS:** Posterior decompression was initially performed for all compressive levels, whereas CD levels were decided through combined modalities, of which intraoperative ultrasound was an important determinant. All patients were regularly followed for more than 2 years.

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**RESULTS:** The average operative duration and blood loss were  $279.3\pm54.8$  minutes and  $2257.7\pm1443.9$  mL, respectively. There were 17 patients (65.4%) who achieved instant improvement and 9 (34.6%) neurologically deteriorated. Cerebrospinal fluid leakage occurred in 10 patients (38.5%), but its occurrence did not affect the final neurologic recovery. Other complications included urinary infection, incision infection and disunion, lung infection, and subcutaneous fluid collection. Late events included death from cerebrovascular accident, pseudomeningocele, unremitted intercostal pain and continuing deterioration. The final JOA score and recovery rate were correlated with OPLL levels and preoperative JOA scores (p<.05). Eventually, the average JOA score was significantly elevated from  $4.5\pm1.8$  to  $8.3\pm2.3$  (p<.05), with the recovery rate of 11 patients rated as excellent, 7 as good, 6 as fair, and 2 as unchanged or deteriorated. The average recovery rate was 60.4%. **CONCLUSIONS:** This CD-based surgical strategy was effective for multilevel thoracic OPLL and had fair late outcomes, but its postoperative courses were quite eventful. Intraoperative ultrasound was a reliable modality to determine CD levels. © 2015 Elsevier Inc. All rights reserved.

Keywords:

Circumferential decompression; Intraoperative ultrasound; Multilevel; Ossification of posterior longitudinal ligament; Surgical strategy; Thoracic

## Introduction

Ossification of posterior longitudinal ligament (OPLL) at thoracic spine sometimes involves more than one level, which is a huge challenge for spinal surgeons. Although different surgical approaches were previously described for this entity, their clinical outcomes were often unsatisfying [1-7]. Posterior decompression (PD) via laminectomy is a relatively safe option [3,4,6], but sometimes insufficient for some clinical situations, such as severe anterior compression, beak-type OPLL, and segments with a predominant kyphosis [3,6,7]. Theoretically, direct elimination of anterior compression is the most rational option, but attaining it via an anterior approach is too demanding, and this approach only allows the decompression of one or two levels [5-7], which is apparently not enough for multilevel OPLL. Circumferential decompression (CD) has emerged as a promising option, because it allows the removal of all compressive elements surrounding the pinched spinal cord [1,8]. However, this approach is quite invasive and always complicated with undesirable postoperative events caused by its unneglected drawbacks, such as prolonged operative duration, extensive removal of spinal elements, more blood loss, and blocked vision during anterior manipulations [1,7,8]. So this procedure should be discretely performed, and meanwhile, ways to decide its indicating levels are also important. This study aimed to report a surgical strategy for multilevel thoracic OPLL, within which PD and CD were both incorporated and intraoperative ultrasound was employed as a major modality to decide CD levels.

### Materials and methods

#### Materials

The term "multilevel thoracic OPLL" in this study referred to three or more levels of compressive thoracic OPLL, and the inclusion criteria were as follows: (1) OPLL at multiple thoracic segments were symptomatic; (2) intraoperative ultrasound was employed as one of the major modalities to determine CD levels; (3) completeness of clinical data and regular follow-ups was required. This study was approved by the Institutional Review Board and funded by two governmental projects (see "Acknowledgments").

Eventually, 26 patients were recruited, from October 2008 to August 2012, and the cohort included 7 males and 19 females, averagely aged at 51.2±9.1 years old. All subjects complained of weakness in the legs and impaired walking incompetence to a certain degree; 21 subjects reported recognizable tightness in body, numbness, hypoesthesia, and other feeling disorders; and 11 subjects suffered sphincter dysfunction, among whom 2 were admitted with urinary catheterization. Noticeably, seven subjects had a history of cervical decompression. Imaging workup demonstrated multilevel thoracic OPLL in all subjects, among whom nine presented ossification of ligamentum flavum at the same levels. The compressive OPLL ranged from 3 to 8 levels (averagely, 4.8±1.7 levels), and distributed from T1 to T11, of which T3 to T7 were the most commonly affected vertebrae (Fig. 1). The average follow-up period was 48.0±14.7 months (Table 1).

## Methods

#### Surgical procedures

Patients lay prone and all procedures were performed under general anesthesia and intraoperative electrophysiological monitoring (IEM). The decompression levels were determined according to preoperative symptoms, physical examination, as well as the imaging workups. Full exposure of posterior elements was made via a posterior midline incision. PD was then attained via laminectomy, of which the range was similar to or one vertebra above and below that of compressive segments. The removed elements included spinous processes, laminae, medial aspects of bilateral facet joints, and ossification of ligamentum flavum, if any.

Immediately, the sufficiency of decompression was assessed by observation of refilling and pulsating of the dural sac, feeling its tension, intraoperative ultrasound to detect the backward shift of the spinal cord and the space between OPLL Download English Version:

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