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Clinical Study

Laminoplasty versus conservative treatment for acute cervical spinal cord injury caused by ossification of the posterior longitudinal ligament after minor trauma

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Abstract

BACKGROUND CONTEXT: No reports to date have accurately evaluated the management for acute spinal cord injury (SCI) caused by ossification of the posterior longitudinal ligament (OPLL) after minor trauma.

PURPOSE: To assess whether outcomes of laminoplasty is better than conservative treatment.

STUDY DESIGN/SETTING: A retrospective study.

PATIENT SAMPLE: Thirty-one patients underwent surgery (L group) and 29 patients underwent conservative treatment (C group).

OUTCOME MEASURES: Disability, muscle strength, sensation, and general health status.

METHODS: Patients were managed according to routine clinical practice and the results between groups were compared. Clinical and radiographic outcomes were assessed at admission, discharge, 6 months and at the final visit. Causes for trauma, duration of hospital stay, and complication were also evaluated.

RESULTS: Causes for trauma included falling, traffic accidents and sports. Mixed and segmental types were the most frequent cause of OPLL resulting into SCI. Duration of hospital stay and complications were less in the L group. Motor and sensory scores increased in the L group at discharge ($p<.05$) and at 6 months ($p<.05$), and maintained thereafter ($p>.05$); scores improved significantly in the C group at 6 months ($p<.05$), with a slight deterioration with time ($p>.05$); scores in the L group were higher than in the C group at each time point after surgery ($p<.05$). Bodily pain and mental health in SF-36 improved at discharge in the L group ($p<.05$); all scores improved at 6 months in both the groups ($p<.05$), with better improvements in the L group ($p<.05$). The canal diameter increased and occupation ratio decreased in the L group ($p<.05$), and maintained thereafter ($p<.05$); a slight increase of occupation ratio was observed in the C group ($p>.05$). Lordotic angle and range of motion were maintained in both the groups, with no significance between groups ($p>.05$). High-signal intensity decreased at 6 months ($p<.05$) in the L group; no significant change was found in the C group during the follow-up ($p>.05$); Significant difference was detected between the groups at 6 months and at the final visit ($p<.05$).

CONCLUSIONS: Most of the OPLL patients displayed as incomplete SCI after minor trauma. Although spontaneous improvement of SCI without surgery is often observed, laminoplasty has more satisfactory outcomes, prevents late compression of cord, and reduces perioperative complications, although with no significant benefit in cervical alignment and range of motion.

Keywords: Ossification of the posterior longitudinal ligament; Acute cervical spinal cord injury; Laminoplasty; Conservative treatment

FDA device/drug status: Not applicable.

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Introduction

Ossification of the posterior longitudinal ligament (OPLL) is a common cervical disease characterized as bony occupation in narrowed canal and chronic compression of the cord [1–3]. Neurological symptoms may not present in many patients in their daily lives and may underestimate the risks for disability. However, when a minor force occurs, the patient may suffer an acute spinal cord injury (ASCI). OPLL combining with ASCI complicates the treatment. Although several methods have been tried, the recovery rate and prognosis remain difficult to predict [4–6].

There are studies regarding the treatments for patients with myelopathy caused by OPLL [7,8]. Laminoplasty has been reported to have satisfactory results in treating OPLL and in preserving cervical range of motion (ROM) [9,10]. However, ASCI patients without neurological symptoms before trauma were rarely reported. In addition, some spontaneous improvement of neurological symptoms without surgery is observed in OPLL patients with cord injury. Thus, the present study was performed to evaluate the outcomes of laminoplasty versus conservative treatment for the ASCI patients preexisting with OPLL after minor trauma.

EVIDENCE & METHODS

Context
Though surgery is held as ideal by some, there continues to be debate about the role and timing of this method of treatment for patients with acute incomplete SCI (eg, central cord syndrome) in patients without gross mechanical instability. The authors reviewed their experience with such cases in which OPLL was present.

Contribution
In this retrospective report, the group found that patients who underwent laminoplasty had better neurological outcomes than patients treated nonoperatively.

Implications
These findings provide valuable information for informed consent but must be viewed in light of the potential for selection bias and other confounders given the study design.

Materials and methods

Patient population

Between January 2003 and August 2010, 68 patients with OPLL presented in our department with ASCI after minor trauma. Presence of OPLL was confirmed by X-ray or computed tomography (CT). Based on criteria established by the Japanese Ministry of Public Health and Welfare, OPLL was classified into continuous, segmental, localized, and mixed types. Severity of cord injury was determined by magnetic resonance imaging (MRI). All patients retained sensory, motion, or bowel function to some extent, and no complete neurological injury was observed. Inclusion criteria of the population in the study were at least two levels of lesions of spinal cord on radiographs that correlated with the neurological manifestations. A specific incomplete neurological syndrome called central cord syndrome was also included in the study, which was characterized as greater muscle weakness and/or sensory loss in upper limbs than in lower limbs. Exclusion criteria were neurological symptoms before trauma, complete neurological injury after trauma, cervical fracture or dislocation, disc protrusion, kyphosis, subluxation, and instability of spine. Laminoplasty (L group) was recommended to all patients because of the neurological symptoms and cord compression by OPLL associating with signal changes on MRI. Patients who refused the posterior surgery underwent conservative treatment (C group). At the final visit, patients in both groups were excluded if they died, could not be located, or were missing data before follow-up evaluation.

Treatments

Surgery time in the L group depended on the patients' general and neurological status. The ''open-door'' side was selected based on the dominant symptom or the most narrowed side on images if there was no dominant symptom. The decompression levels from C3–C7 or extended to one level cranial and/or caudal to compressive lesions were included. Posterior cervical titanium miniplates (Medtronic Sofamer Danek, or SYNTHES Corporation, Minneapolis, MN) were used to keep the ''door'' open. Patients in C group were instructed to limit cervical motion and stay in bed for at least 3 weeks.

If the spinal cord was injured within 8 hours, patients in both groups would receive a high dose of prednisolone, according to American National Acute Spinal Cord Injury Society criteria. The first dose was 30 mg/kg and given within 15 minutes; after 45 minutes, a second dose of 5.4 mg (kg/h) was maintained for 23 hours. If the injury time exceeded 8 hours, 20 mg dexamethasone was used twice a day for the first 3 days, and once daily for the next 3 days. Neurotrophic drugs, functional exercise, and symptomatic therapy were recommended for both groups. After getting out of bed, patients were instructed to wear neck collars for 3 months.

Evaluation

Patients' gender, age, cause of trauma, duration between injury and surgery, blood loss, operation time, duration of hospital stay, and complications were investigated. Patients were evaluated at admission, discharge, 6 months, and at the final visit.

Neurological status was assessed using the International Standards for Neurological and Functional Classification of