Efficacy of Posterior Segmental Decompression Surgery for Pincer Mechanism in Cervical Spondylotic Myelopathy – A Retrospective Case-Control Study using Propensity Score Matching

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Introduction: Compression of the cervical spinal cord in cervical spondylotic myelopathy (CSM) consists of a pincer mechanism due to bulging discs and hypertrophied ligamentum flavum. Posterior decompression of the cervical spinal cord in CSM is sufficient to remove the elements of the articular segment, such as the ligamentum flavum and the superior or inferior edge of the lamina. The surgical procedures of this concept for posterior decompression include the segmental partial laminectomy or laminotomy. The authors have performed cervical microendoscopic laminotomy (CMEL) as a minimally invasive strategy for cervical posterior decompression surgery of the articular segment with a pincer mechanism in CSM patients. The purpose of this study was to evaluate the efficacy of CMEL for the articular segment with pincer mechanism in CSM patients by comparing the clinical results of CMEL with conventional expansive laminoplasty (ELAP) for patients with CSM.

Surgical Technique: The MEL surgery has been developing to the bilateral decompression surgery by the unilateral approach though 16mm skin incision. On the microendoscopic system, the cervical laminotomy in the inter-lamina portion was performed until attachment of ligamentum flavum using a high-speed air drill (Fig1, 2). As the spinal cord was decompressed, the ligamentum flavum was floated. With removing the ligamentum flavum, the dural pulsation was observed. This procedure is also a spinal cord decompression procedure that maintains the posterior structures.
Methods: This retrospective case–control study of the clinical outcomes of CMEL and ELAP for the treatment of CSM used the propensity score matching method. A one-to-one matching analysis was performed between patients who underwent CMEL and ELAP on the basis of the estimated propensity scores of each patient. To estimate the propensity score, we fitted a logistic regression model for the receipt of ELAP as a function of patient demographic factors including age, sex, and preoperative JOA score. All patients were followed postoperatively for >2 years. The preoperative and 2-year follow-up evaluations included neurological assessment (Japanese Orthopaedic Association [JOA] score), recovery rates, the JOA Cervical Myelopathy Evaluation Questionnaire (JOACMEQ), axial pain (visual analog scale), and the Short Form 36 questionnaire (SF-36). All parameter were analyzed statistically (p < 0.05).

Results: There were 71 patients in each group (47 males and 24 females each). The mean ages of the CMEL and ELAP groups were 63.8 and 62.8 years, respectively. There was no significant difference in the preoperative JOA score between groups. The mean numbers of surgically affected levels in the ELAP and CMEL groups were 3.8 and 1.7 discs, respectively (p < 0.05). The groups exhibited similar recoveries of JOA, JOACMEQ, and SF-36 scores postoperatively. Sagittal alignment was maintained in both groups. However, postoperative neck axial complaints were significantly reduced in the CMEL group.

Conclusions: CMEL may be a useful and effective surgical procedure for CSM, providing similar results as ELAP. Posterior decompression of the articular segment with a pincer mechanism in CMEL can be indicated for patients with CSM. This minimally invasive technique solves some problems caused by ELAP-induced soft-tissue damage, providing an alternative surgical method for CSM patients.