Ossification of the posterior longitudinal ligament case series

Lee et al. sought to evaluate the usefulness of the rostral line (R-line) as a new index for determining the degree of C2 lamina decompression in the context of ossification of the posterior longitudinal ligament (OPLL) extending to the C2 level.

The R-line was devised based on the mechanism by which the cord is shifted backward following cervical posterior decompression. According to their R-line status, 36 patients with cervical OPLL extending to the C2 level were divided into two groups of R-line (+)and R-line (-) cases, where the R-line touched the upper half of the posterior C2 lamina in the R-line (+) group and the inferior half of the posterior C2 lamina in the R-line (-) group, respectively.

Eighteen patients were classified as R-line (+) and 18 patients were classified as R-line (-). Total laminectomy of the C2 lamina was more common in the R-line (+) group, while dome-shape C2 laminectomy was more common in the R-line (-) group. All patients requiring reoperation were included in the R-line (+) group. Only the operation type showed a statistically significant difference according to the need for reoperation in the R-line (+) group; specifically, all patients who underwent reoperation in the R-line (+) group had dome-shape C2 laminectomy. It was determined that the risk factor for reoperation in the R-line (+) group was a history of dome-shape C2 laminectomy.

If the R-line touches the upper half of the posterior C2 lamina, total decompression of the C2 lamina should be performed [1)].

A study of Kang et al. of Severance Hospital and St. Mary's Hospital, was conducted to investigate the course of ossification of the posterior longitudinal ligament (OPLL) progression after laminoplasty (LP) or laminectomy with posterior fixation (PF).

Cervical laminoplasty is now recognized as a standard technique for the treatment of cervical multisegment OPLL; however, PF is beneficial for patients with severe stenosis. In recent years, there has been increasing interest in mechanical stress in OPLL, which is assumed to significantly impact progression.

The progression of OPLL was assessed using midline sagittal computed tomography images of the cervical spine at various follow-up points. Radiographic parameters including the C2-C7 Cobb angle, C2-C7 range of motion (ROM), and adjacent cranial and caudal segmental ROMs were measured. Postoperative changes and differences between the LP and PF groups in the radiographic parameters were calculated to assess biomechanical stress. Logistic regression analysis was used to analyze the risk factors affecting the progression rate.

Kang et al. included 14 PF and 36 LP patients, with a mean follow-up period of 28.9±20.8 and 37.6±16.8 months, respectively (P=0.069). After surgical treatment, both groups showed loss of cervical lordosis (9.2±6.9 vs. 5.3±8.2 degrees, P=0.220) and C2-C7 ROM (14.6± 13.5 vs. 13.1±12.2 degrees, P=0.861). The decrease of ROM in the cranial adjacent segment was larger in the LP group than in the PF group (0.7±4.1 vs. 1.4±5.5 degrees, P=0.453). The ROM in the caudal adjacent segment decreased in the LP group but increased in the PF group (-1.4±6.2 vs. 2.6±5.1 degrees, P=0.041). The progression rate was 2.15±1.31 mm/mo in the PF group and 1.53±1.04 mm/mo in the

LP group (P=0.041). PF showed an odds ratio of 12.917 for a higher progression rate (95% confidence interval, 1.397-119.443; P=0.024).

The rate of progression of cervical OPLL was significantly higher after PF than after LP [2].

A retrospective study included patients (662 males and 251 females; mean age 55.8 years) with symptomatic OPLL. All patients had been diagnosed with OPLL based on cervical magnetic resonance imaging and computed tomography scans. Demographic, surgical outcome was measured using visual analog scale (VAS) and Japanese Orthopedic Association (JOA) scale scores. The results of our study indicated radicular pain was more common in segmental and circumscribe OPLL subtypes ($P<0.05$). An anterior approach was favored in patients with less than 3 involved vertebral levels ($P<0.05$). All surgical methods showed good outcomes ($P<0.05$). Continuous and mixed OPLL subtypes showed worse surgical outcome with higher VAS and JOA scores ($P<0.05$). Laminoplasty and anterior cervical discectomy and fusion were significantly associated with a higher recovery rate ($P<0.05$). Among these patients, there were more complications with the anterior approach ($P<0.05$). Male gender, open door laminoplasty ipsilateral, and ipsilateral-to-symptom-side opening were associated with postoperative C5 palsy ($P<0.05$). Cervical OPLL may cause myelopathy, surgery is a safe and effective treatment for OPLL. There were no differences in clinical outcome according to surgical type, but complication rates varied depending on sex and surgical approach to symptom [3].

Moon et al., from the Departement of Neurosurgery, Chonnam National University Hospital and Medical School, Gwangju, Korea. examined the prevalence and incidence of cervical OPLL. Age/sex-matched controls were randomly extracted, with 10 times the number of OPLL cases. The differences in sex, co-morbidity, and relative survival rate, compared with controls, were assessed.

The cumulative prevalence was 20,960 per 1,025,340 people for 12 years. The annual incidence was approximately 199 to 371 per 1 million people. Overall, the crude mortality rate was 7.64%. The relative survival rate of OPLL cases was not significantly different from that of control cases. Diabetes, hypertension, cardiovascular disease, and cerebrovascular disease, except renal disease, correlated significantly with OPLL, compared with controls ($p < 0.001$). Additionally, between dead and surviving patients among the OPLL cases, all co-morbidities correlated more significantly with death ($p < 0.001$). Further, between the surgery and non-surgery cases of OPLL, diabetes, hypertension, and renal disease ($p < 0.05$) were significantly associated with surgery.

The annual incidences of OPLL were from 199 to 371 per 1,025,340 people for 10 years. Diabetes, hypertension, cardiovascular disease, and cerebrovascular disease, except renal disease, correlated significantly with OPLL, compared with controls. Especially, diabetes, hypertension, and renal disease were associated with OPLL patients who underwent surgery [4].

Sixty patients with cervical OPLL were included. All underwent an initial CT examination and had at least 24 months' follow-up with CT. The mean duration of follow-up was 29.6 months. Fourteen patients (Group A) had CT evidence of OPLL progression, and 46 (Group B) did not show evidence of progression on CT. The 2 groups were compared with respect to the following variables: sex, age, number of involved segments, type of OPLL, and treatment methods. The CT findings, such as the

connection of an OPLL mass with the vertebral body and formation of trabeculation in the mass, were evaluated.

Sex and treatment modality were not associated with OPLL progression. The mean age of the patients in Group A was significantly lower than that in Group B ($p = 0.03$). The mean number of involved segments was 5.3 in Group A and 3.6 in Group B ($p = 0.002$). Group A had a higher proportion of cases with the mixed type of OPLL, whereas Group B had a higher proportion of cases with the segmental type ($p = 0.02$). A connection between the vertebral body and OPLL mass and trabeculation formation were more common in Group B ($p < 0.01$).

Progression of cervical OPLL is associated with younger age, involvement of multiple levels, and mixed-type morphology. OPLL masses that are contiguous with the vertebral body and have trabecular formation are useful findings for identifying masses that are less likely to progress [5].

A case series of selective patients with MOPLL of cervical spine undergoing anterior surgery is reported. All patients were strictly selected based on CT images with the appearance of open-base. 29 cases with more than 12 months follow-up (average, 31.0 ± 10.0 m) were reviewed. Average age at operation was 59.3 ± 8.2 years (43-73 years). Anterior decompression was done only for one or two vertebrae.

One corpectomy was done in 13 cases, two corpectomies in 3 cases, and one corpectomy and one discectomy in 13 cases. Three levels were fused in 16 cases and two levels in 13 cases. No permanent neurological deterioration was observed. Neurological improvement was observed in every patients with an average improvement rate of 64 ± 23%. Mesh migration was observed in one case. A fusion rate of 100% was achieved.

Anterior surgery using our technique may be a relatively simple and safe procedure in selective patients with massive ossification of posterior longitudinal ligament of cervical spine [6].

1)
Lee BJ, Lee S, Jeon SR, Roh SW, Park JH. A New Indicator Predicting the Degree of Cord Shift After Posterior Decompression of Cervical Ossification of the Posterior Longitudinal Ligament Extended to the C2 Level and Its Clinical Usefulness. Turk Neurosurg. 2020 Oct 16. doi: 10.5137/1019-5149.JTN.31668-20.1. Epub ahead of print. PMID: 33624283.
2)
Kang MS, Kim KH, Park JY, Kuh SU, Chin DK, Kim KS, Jin BH, Cho YE. Progression of Cervical Ossification of Posterior Longitudinal Ligament After Laminoplasty or Laminectomy With Posterior Fixation. Clin Spine Surg. 2019 Sep 27. doi: 10.1097/BSD.0000000000000898. [Epub ahead of print] PubMed PMID: 31569177.
3)
Yudoyono F, Cho PG, Park SH, Moon BJ, Yi S, Ha Y, Kim KN, Yoon DH, Shin DA. Factors associated with surgical outcomes of cervical ossification of the posterior longitudinal ligament. Medicine (Baltimore). 2018 Jul;97(29):e11342. doi: 10.1097/MD.0000000000011342. PubMed PMID: 30024507.
4)
Moon BJ, Choi SK, Shin DA, Yi S, Kim KN, Yoon DH, Ha Y. Prevalence, Incidence, Co-morbidity, and Mortality Rates of Ossification of Posterior Longitudinal Ligament (OPLL) in the Cervical Spine: A Nested Case-Control Cohort Study. World Neurosurg. 2018 Jun 12. pii: S1878-8750(18)31238-5. doi: 10.1016/j.wneu.2018.06.023. [Epub ahead of print] PubMed PMID: 29906583.
5)
Choi BW, Baek DH, Sheffler LC, Chang H. Analysis of progression of cervical OPLL using computerized tomography: typical sign of maturation of OPLL mass. J Neurosurg Spine. 2015 Jul 17:1-5. [Epub ahead

of print] PubMed PMID: 26186351.
6)

Wang X, Chen D, Yuan W, Zhang Y, Xiao J, Zhao J. Anterior surgery in selective patients with massive ossification of posterior longitudinal ligament of cervical spine: technical note. Eur Spine J. 2012 Feb;21(2):314-21. doi: 10.1007/s00586-011-1996-y. Epub 2011 Aug 31. PMID: 21879414; PMCID: PMC3265583.