Ossification of the posterior atlantoaxial membrane

Case report

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The authors report a case of ossification of the posterior atlantoaxial membrane that led to the development of cervical myelopathy. Computerized tomography and magnetic resonance imaging were helpful in establishing the diagnosis, and decompressive laminectomy may be an appropriate intervention.

KEY WORDS • posterior atlantoaxial membrane • ossification • cervical myelopathy

Here have been several reports of ossification of the ligamentum flavum causing cervical myelopathy.3,4 Ossification of the posterior atlantoaxial membrane, however, is an extremely rare disease.2 We treated a case of ossification of the posterior atlantoaxial membrane associated with the development of cervical myelopathy. Computerized tomography and MR imaging were helpful in establishing the diagnosis, and decompressive laminectomy appears to be an appropriate surgical intervention.

Case Report

Presentation. This 52-year-old man presented with a 3-month history of progressive numbness of the fingers bilaterally and gait disturbance. There was no bladder or bowel dysfunction.

Examination. Physical examination revealed no pain and almost full range of motion of the neck. Neurological examination status was normal, except for diminution of vibration sense in the lower extremities and hyperactive deep tendon reflexes in both upper and lower extremities. Gait was slightly spastic, and finger movement appeared to be somewhat clumsy.

Lateral plain radiography and CT scanning of the cervical spine revealed ossification not only of the anterior longitudinal ligament but also in the posterior part of the spinal canal at C1–2. There was no ossification of the spinal ligament in the thoracic or lumbar spine. Three-dimensional CT scanning revealed marked narrowing of the spinal canal at C1–2; the anteroposterior diameter of the spinal canal was only 7 mm (Fig. 1 left). There was no evidence of atlantoaxial subluxation or basilar invagination. Magnetic resonance imaging demonstrated marked indentation of the posterior aspect of the spinal cord at C1–2 (Fig. 1 right). An area of slightly high intensity was demonstrated on a T2-weighted MR image, but T1-weighted imaging demonstrated isointensity. Computerized tomography myelography revealed ossification of the posterior atlantoaxial membrane and marked compression of the spinal cord (Fig. 2).

Operation. Resection of the posterior arch of the atlas and laminectomy of the axis were performed to decompress the spinal cord. Intraoperatively, the posterior atlantoaxial membrane was seen to be ossified, but there was no adhesion between the posterior atlantoaxial membrane and the dura mater. The dural sac was markedly indented by the ossified posterior atlantoaxial membrane. After laminectomy, the indented dural sac was restored to its normal size. Examination of the surgical specimen (Fig. 3 left) as well as evaluation of a microradiograph (Softex Company, Tokyo, Japan) (Fig. 3 right) demonstrated that ossified tissue, which was continuous with the posterior atlantoaxial membrane but not with the atlas or axis, had extended into the spinal canal. Together, these findings indicated the presence of an ossified posterior atlantoaxial membrane but no osteophyte of the atlas or axis, features in agreement with previously reported cases.1

Abbreviations used in this paper: CT = computerized tomography; MR = magnetic resonance; OLF = ossification of the ligamentum flavum.
Pathological Findings. Examination of a midline section of the axis showed ossification of the posterior atlantoaxial membrane, and evaluation of a sagittal section of the lateral part of the membrane revealed proliferation of chondrocytes and thick collagenous tissue with elastic fibers, which indicated that intracartilaginous ossification had occurred in the membrane (Fig. 4).

Postoperative Course. Clumsiness of the hands improved, and numbness of the fingers had decreased within 2 weeks. At 2 months postoperation, vibration sense had returned, but the patient’s hyperactive deep tendon extremity reflexes persisted. At 2 years after surgery, he experienced no neurological deterioration. Radiography demonstrated no evidence of malalignment. Dynamic flexion–extension radiography revealed no instability of the cervical spine; MR imaging confirmed successful decompression of the spinal cord.

Discussion

Among the various forms of spinal ligamentous ossification, OLF can lead to the development of myelopathy. Ossification of the ligamentum flavum was first reported by Polgár9 in 1929, and many reports have since been published, especially cases involving Japanese patients.3–5,7,11 In the majority of these reports, however, the authors treated OLF in the thoracic spine. Those concerning cervical OLF are rare. In 1962, Koizumi3 reported the first case in which ossification of the cervical ligamentum flavum was related to the occurrence of myelopathy. Kubota, et al.,4 reported two cases of myelopathy due to OLF of the cervical spine. Ossification of the posterior atlantoaxial membrane leading to cervical myelopathy, however, has only been reported by Kimura et, al.2

The posterior atlantoaxial membrane and the posterior atlantooccipital membrane are considered to be of a different character to the ligamenta flava. Ramsey10 reported an absence of any yellow in these two upper cervical ligaments attached to the laminae of C-1 and C-2. Furthermore, on microscopic examination of the posterior atlantoaxial membrane in adults, the concentration of elastic fibers is approximately half of that seen in true ligamenta flava but much greater than that seen in collagenous ligaments. Histological examination of the sagittal section of our case revealed proliferation of chondrocytes and thick collagenous tissue with elastic fibers, which indicated that enchondral ossification had occurred in the posterior atlantoaxial membrane.
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membrane. These findings are consistent with those of OLF reported by other investigators.4–8,12

Decompressive laminectomy and removal of the enlarged OLF is the most commonly performed surgical procedure in patients with compressive myelopathy due to OLF. Recently, some investigators have recommended laminoplasty because of unsatisfactory results following laminectomy such as subsequent deterioration due to recurrence of OLF at the same site or increased kyphotic deformity of the spine, especially in the thoracic and thoracolumbar region.7,10 In the present case, however, we resected the posterior arch of the atlas and performed laminectomy of the axis to achieve full decompression of the spinal cord. Plain radiography demonstrated no kyphotic deformity nor instability at C1–2 after surgery.

In conclusion, ossification of the posterior atlantoaxial membrane is an extremely rare disease, even among Japanese patients. We found, however, that MR imaging, CT scanning, and CT myelography may reveal the presence of this lesion and indentation of the spinal cord. Surgical treatment with laminectomy appears to be the most suitable treatment for managing this disease.

References


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