Cervical Spondylotic Myelopathy with Ossification of Posterior Longitudinal Ligament: Which Is the Most Suitable Surgical Procedure? A Technical Note

Edvin Zekaj\textsuperscript{1)}, Christian Saleh\textsuperscript{2)}, Andrea Franzini\textsuperscript{3)}, Andrea Ciuffi\textsuperscript{3) and Domenico Servello\textsuperscript{1)\textsuperscript{1)}}

1) Department of Neurosurgery, IRCCS Istituto Ortopedico Galeazzi, Milan, Italy
2) Department of Neurophysiology and Neurology, University Hospital Basel, Basel, Switzerland
3) Department of Neurosurgery, Università degli studi di Milano, Milan, Italy

Abstract:

Introduction: Anterior cervical discectomy and fusion (ACDF) and anterior cervical corpectomy and fusion (ACCF) are widely performed to resolve anterior cervical spine compression. The main purpose of the different surgical techniques is to obtain an adequate decompression of the spinal cord and nerve roots, preserving spinal stability like in oblique corpectomy or leading to a final solid construct to achieve arthrodesis.

Technical Note: We describe a surgical procedure for treating cervical spondylotic myelopathy (CSM) with ossification of the posterior longitudinal ligament (OPLL) at the level of C3-C4 and C4-C5. A double level discectomy C3-C4 and C4-C5 and selective posterior wedge corpectomy of C3, C4, and C5 were performed. Two cages (Zero-P VA) at C3-C4 and C4-C5 were positioned to obtain segmental stability and arthrodesis. An extended anterior cervical canal decompression was obtained and confirmed by postsurgical CT scan. At 15 months, dynamic X-ray showed fusion, and cervical magnetic resonance imaging (MRI) showed evidence of spinal canal decompression.

Conclusions: Anterior cervical discectomy followed by selective wedge corpectomy appears to be a safe and effective technique for anterior spinal cord compression extending above and below the intervertebral disc space.

Keywords: Anterior cervical discectomy, selective wedge corpectomy, anterior spinal cord compression

Introduction

Cervical spondylotic myelopathy (CSM) is a fearsome disorder, especially in the elderly\textsuperscript{1). CSM is a neurological syndrome that results from the acute or chronic compression of the cervical spinal cord due to degenerative processes. Clinical manifestations of CSM range from subacute to acute and chronic fashion. The clinical hallmarks are pyramidal tract and radicular symptoms and signs. Sphincter dysfunction, like micturition urgency or urinary retention, is also frequently present. Posterior tract alterations occur to a lesser degree. If foraminal stenosis is present, patients usually complain of radicular pain, paresthesia, and, in severe cases, paresis with atrophy in the upper limbs\textsuperscript{2}. Ossification of the posterior longitudinal ligament (OPLL) of the cervical tract consists of calcification of the posterior longitudinal ligament in his spinal segment, leading to a stenosis of the spinal canal, which may cause clinical symptoms secondary to myelopathy\textsuperscript{3}. Once CSM or myelopathy is suspected, radiological diagnostic is necessary. Gold standard imaging consists in cervical magnetic resonance imaging (MRI). In selected patients, cervical CT scan is necessary to carefully evaluate osteophyte formations and their cranio-caudal and anteroposterior extensions. OPLL is also evaluated more accurately with CT imaging. Dynamic flexion-extension X-rays may be necessary in patients with suspected instability. Furthermore, surgery is mandatory in patients with CSM secondary to acute compression or in patients with progressions of known CSM. Once surgical treatment is chosen over conservative management, the main challenge is to decide for the most suitable surgical approach. Authors have described several
anterior and posterior procedures in order to relieve spinal cord and radicular compression while ensuring postsurgical spinal stability.

In this paper, we describe a modified corpectomy in a patient with CSM secondary to spondylosis and OPLL extending behind vertebral bodies of C4 and C5.

**Technical Note**

Results from cervical MRI (Fig. 1a) revealed a severe narrowing of the spinal canal at the levels of C3-C4 and C4-C5 with compression extending behind C4 and C5. Intramedullary signal abnormality at C3-C4 and C4-C5 was present. Particularly, axial T2 MRI sequences (Fig. 1b-e) showed an important anterior compression at both these levels with compression of the spinal cord. The prevailing anterior compression was well demonstrated on CT scan with the presence of OPLL that extends in both the cranial and caudal direction with respect to the C4-C5 intervertebral disc, particularly behind the C5 body (Fig. 2a and b). Given the progressive neurological deterioration and the prevailing anterior compression, an anterior surgical procedure was proposed. At each level, under microscopic view, an accurate discectomy was performed, and selective drilling of the postero-inferior part of the overlying vertebrae and of the postero-superior of the underlying one was performed in oblique fashion, drawing the shape of reversed wedge on the sagittal plane. A part of the OPLL was carefully removed, leaving in situ the part that was tightly attached to the dura mater. Lastly, two cages fixed with body screws (Zero-P VA, DePuy Synthes) were positioned in place of the removed discs, thus improving spinal stability and promoting bone fusion (Fig. 3). Results from the postsurgical CT scan showed an adequate decompression of the spinal cord and nerve roots with correct positioning of the cages and fixing screws (Fig. 4a and b). At 15 months, dynamic cervical X-rays (Fig. 5) demonstrated a solid fusion, and cervical MRI showed decompression but without restoration of CSF flow (Fig. 5).

**Discussion**

The surgical procedure for spinal cervical canal stenosis inducing myelopathy might be quite challenging. Once the surgery is proposed, the first step for the spine surgeon is to choose the most suitable surgical procedure for the single
Figure 3. Schematic design of the surgical procedure in the sagittal plane. Spinal canal decompression at the end of selective somatotectomy is shown in light gray color. Interrupted dots show the selective corpectomy extension at C3, C4, and C5. Intervertebral cages are also designed with arrows showing the direction of positioning.

Figure 4. a. Axial CT scan images and sagittal reconstruction at the C3-C4 level showing the wide decompression medial to lateral and cranial to caudal. b. Axial CT scan images and sagittal reconstruction at the C4-C5 level showing the wide decompression medial to lateral and cranial to caudal extension, with minimal persistence of pre-foraminal osteophytes on the right side.
perform a corpectomy of C4 and C5 with the need to place an expandable cage from C3 to C6 with anterior plating. A double level ACDF might have been inadequate due to the need to decompress not only behind the vertebral bodies but also at the level of the disc. A more selective resolution of the problem appeared possible, so we planned a C3-C4 and C4-C5 discectomy associated with posterior selective corpectomy of C4 and C5, removing part of the OPLL extending behind the vertebral body levels. With our procedure, we spared the C5-C6 disc and shifted this more challenging and potentially hazardous procedure to a modified double ACDF. The postsurgical cervical CT scan showed the decompression and the correct position of the cages. Thus, the early primary goal of spinal canal decompression was achieved. At 15 months of follow-up, dynamic X-rays showed a solid fusion (Fig. 6). Thus, the late primary goal of arthrodesis was achieved. Cervical MRI, beside its low quality, did not show restoration of CSF leak (Fig. 7). We suppose that this is due to the remaining tight adherent posterior ligament.

**Conclusion**

In recent years, reducing the invasiveness of single surgical procedures has become a major goal of spinal surgeons. Thus, we need to tailor the surgical procedure to each patient to reduce invasiveness while achieving the primary goal of spinal canal decompression.
goals. Selective posterior somatectomy might be considered safe for ACDF as it potentially has less device problems compared with multiple corpectomies\textsuperscript{7}. This procedure might be considered for patients with anterior spinal cord compression extended above and/or below the intervertebral disc space. Further studies with long follow-up times are necessary to confirm the safety and efficacy of our described procedure.

Conflicts of Interest: The authors declare that there are no relevant conflicts of interest.

Ethical Approval: This article does not contain any studies with human participants performed by any of the authors.

Informed Consent: The patient consented to the surgery and to have his data published.

References