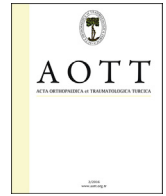


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## Anterior decompression and plate fixation in treatment of cervical myelopathy: A multicentric retrospective review

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### ABSTRACT

**Objectives:** The aim of this study was to evaluate the results on anterior decompression and fusion with titanium mesh or expanding cage and plate fixation in patients with cervical myelopathy.

**Methods:** We conducted a retrospective multicentric review of 114 patients, 75 males and 39 females, with cervical myelopathy who underwent surgical treatment between July 2009 to December 2011. All surgeries were performed via a ventral approach. Based on the type of surgery the patients received, they were divided into 3 groups: group 1 consisted of 49 patients who received multilevel corpectomies and fusion with strut iliac bone graft and plates; group 2 consisted of 26 patients who received multilevel corpectomies and fusion with titanium expanding cage and plating; group 3 consisted of 39 patients who received multilevel corpectomies and fusion using titanium mesh with autologous bone graft and anterior plating.

**Results:** Decompression of the cervical spinal cord and grafting with plate fixation via a ventral approach demonstrated a high rate of improvement in neurological function with minimal complications. Fusion was documented radiologically in all cases. Eighty-three patients experienced a partial improvement and 41 had a complete recovery according to Nurick's myelopathy grading. Sixty-two patients were ranked as excellent, 48 as good, 4 as fair; unsatisfactory outcome was related to donor site complications.

**Conclusion:** Spinal decompression and fusion with titanium cages and plates appears to be a safe and effective alternative in patients with cervical spinal myelopathy.

**Level of evidence:** Level of evidence: Level IV, therapeutic study.

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### Introduction

Cervical spondylosis is a degenerative condition of the intervertebral discs and vertebral bodies resulting in cervical nerve root compression or spinal cord stenosis. This progressive condition may cause myelopathy and radiculopathy at one or more levels.<sup>1</sup> The management of cervical spondylosis may be medical, surgical, or both. Surgical management becomes necessary in those patients with neurological deficits, pain, and documented

compression of the spinal cord or nerve roots. The goal of surgery is to decompress the affected nerve roots and spinal cord.<sup>2</sup> MRI has established its place as the diagnostic modality of choice in various cervical problems.<sup>3</sup> It also helps to take the more suitable treatment for cervical spondylotic myelopathy (Fig. 1). Cervical corpectomy is a common procedure for degenerative stenosis, trauma, instability, infection, deformity, and tumor. However, the choice about what kind of materials can be used during interbody fusion and reconstruction of bone defects after anterior discectomy or corpectomy is still controversial. Nonunion, malunion, graft dislodge, and graft collapse were also reported throughout the literature.<sup>4</sup> Bone grafting techniques include iliac crest autograft, allograft, or fibular strut graft. Iliac crest autograft has been considered the best solution for graft material, but morbidity associated with harvesting has put the procedure into question.<sup>5</sup> Autogenous fibula strut graft

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**Fig. 1.** MR: it determines the extent of the affected segments, the degree of canal stenosis, the magnitude of neural compression, and the nature of the compressing pathology.

harvesting can lead to significant donor-site complications.<sup>6</sup> Efficacy of fusion with allograft bone has been controversial as to whether it has equivalent fusion rates to autograft.<sup>7</sup> A vertebral body substitute has to guarantee stability, axial load-bearing resistance, a large interbody/bone interface to facilitate fusion and prevent migration, and to give the right height and sagittal alignment.<sup>8</sup> Reconstruction with titanium mesh cages after cervical corpectomy has replaced autogenous tricortical bone grafts. Thanks to this procedure, we have no more complications correlated to autograft harvesting such as fracture and donor site pain. The use of titanium mesh cages has shown significant stability and low complication rates (no donor site complication will occur).<sup>9</sup> Corpectomy with titanium cage reconstruction has been advocated because it provides a rigid biomechanical construct within the cage design itself. Corpectomy with titanium cage reconstruction allows for the use of local autogenous bone graft to obtain a high fusion rate without the associated donor site morbidity. The cervical vertebral body that was removed is replaced with a titanium cage packed with local autograft. The lateral walls of the vertebral body, as well as the prepared endplates, create an optimal condition through a three-sided cancellous bed for bony in-growth into the porous titanium cage.<sup>10</sup> Treatments involving more than two levels of interbody fusion with the use of autograft or allograft were correlated to a significantly increased incidence of pseudoarthrosis and unsatisfactory outcomes. Zdeblick and Ducker<sup>11</sup> reported that the incidence of pseudoarthrosis and graft collapse was higher when using a freeze-dried allograft in two-level interbody fusion than autograft alone. Several series indicate a high rate of pseudoarthrosis (as high as 50%) for three-level procedures with the use of autograft, the same procedure has a higher failure rates with the use of allograft.<sup>12</sup>

Many authors have studied the use of subtotal corpectomy of the intervening vertebra (e) followed by strut fusion for multilevel degenerative disease and cervical kyphosis as an alternative procedure that decreases the fusion surfaces to only two with a lower nonunion rate.<sup>13</sup> This procedure is not always possible due to the

impossibility to achieve an adequate decompression of the cord and roots. If autogenous graft is used, the donor site morbidity has been reported in up to 20% of patients,<sup>14</sup> with symptoms including sustained pain, hematoma, muscle herniation and lateral femoral cutaneous nerve injury.

The purpose of this study is to demonstrate that decompression of the cervical spinal cord and grafting with plate fixation through a ventral approach create an high rate of improvement in neurological function with minimal complications, also cervical corpectomies with titanium mesh or expanding cage may offer a viable alternative to previously described anterior cervical fusion technique.

## Material and methods

We conducted a retrospective cohort study of 114 patients, 75 males and 39 females, with cervical myelopathy who underwent surgical treatment between July 2009 to December 2011. Their ages ranged from 67 to 73 years old. An independent observer extensively reviewed medical charts and radiographs. All patients included in this group had multi-level symptomatic degenerative disc disease, disc herniation, or stenosis of the cervical spine with clinical criteria of myelopathy and radiological criteria of cord compression.<sup>14</sup> Myelopathy was diagnosed if abnormal reflexes such as clonus, positive Babinski sign or positive Hoffman sign were evident on physical examination or if the patient had a demonstrable disturbance of gait and hyperactive reflexes.<sup>15</sup> The period between the onset of symptoms and surgery was variable from one to two years. Clinical status during postoperative follow-up was assessed by a score based on the criteria of neck pain, depending on drugs and ability to return to daily activities (Table 1). Neurological status was assigned according to Nurick's system (Table 2) and radiculopathy in motor or sensory function. Functional outcomes were evaluated by one of the authors with interviews either personally or by phone. Preoperative analysis included static radiographs, MRI, and CT scans. Postoperative analysis included static radiographs, flexion–extension radiographs, and three-dimensional CT (3D – CT) scans (Fig. 2). Surgery techniques were performed by three different surgeons at three different institutions (University of Sassari – Italy, Cantonal Hospital Fribourg – Switzerland; Santorso Hospital – Italy).

**Table 1**  
Criteria of clinical outcome evaluation.

Pain	None = 0	No pain or mild ache which interferes with daily activities
	Mild = 1	Mild pain, but generally able to perform daily activities
	Moderate = 2	Pain tolerable but patient makes concessions for the pain, some limitations on daily activities.
	Severe = 3	Severe pain most or all of the time, serious limitations on activities.
Meds.	None = 0	
	Non-narc = 1	
	Narcotic = 2	
Return To Work	Full ret = 0	
	Modified = 1	
	No = 2	
Total (0–7)		
Definitions		
0–1 = Excellent (Satisfactory)		
2–3 = Good (Satisfactory)		
4–5 = Fair (Unsatisfactory)		
6–7 = Poor (Unsatisfactory)		

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