Surgical Outcome of Anterior Cervical Diskectomy for Cervical Spondylosis with Myelopathy

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Abstract

Cervical spondylosis with myelopathy and myelomalacia presenting with quadriparesis may present a difficulty in decision making regarding the dubious outcome of surgical decision and possible complications of surgery on pathologically compromised cord. This study is carried out to demonstrate the rate of improvement of cases with cervical spondylosis and disc prolapse with myelomalacia and myelopathic clinical signs after anterior cervical diskectomy aiming at finding a way to improve their clinical status caused by cervical cord dysfunction.

Result: Substantial improvement in neurological status was noticed after surgery and good percentage of patients could be able to resume near normal life.

Conclusion: Anterior cervical diskectomy provides a good solution with subsequent satisfactory results for patients with cervical spondylosis, disc prolapse, and cord malacia.

Key Words: Cervical diskectomy – Myelopathy – Spondylosis.

Introduction

CLINICAL spondylotic myelopathy is the result of narrowing of cervical spinal canal by degenerative and developmental changes resulting in cervical disc protrusion, osteophyte formation, and posterior ligament calcification and hypertrophy. It is the most common spinal cord disorder in person above 55 years of age [1,2].

The predominant changes associated with cervical spondylosis are situated ventral to neurovascular structures within the spine, and the anterolateral approach allows these structures to be decompressed directly. While conservative management is usually the first treatment option for many other spinal problems, early surgery is recommended for cervical spondylotic myelopathy. Evidence strongly suggests that performing surgery within one year of the onset of symptoms is associated with a substantial improvement in neurological status [3].

The onset of cervical spondylotic myelopathy invariably incidious and commonly involves gait spasticity, followed by upper extremity numbness and loss of fine motor control in the hands [4].

Pathogenesis:

Cervical spondylotic myelopathy often occurs in patients who have a cervical spinal canal that is narrower than normal (under 14mm sagittal width) and in whom osteophytes and ligamentous hypertrophy further compromise the size of the canal. The pathogenesis of the disease remains uncertain. Compression of the spinal cord by disc material or traction of the cord against osteophytes is etiologically important, particularly in the case of an acute myelopathy, for example, one associated with traumatic disc protrusion [5,6].

In chronic myelopathy, however, the causes can be attributed to mechanical factors and ischemia. The mechanical factors are divided into two groups: static and dynamic. Static factors include: congenital spinal canal stenosis, disc herniation, osteophyte formation in the vertebral bodies, degenerative osteoarthrosis of the uncovertebral and facet joints and hypertrophy of the ligamentum flavum and posterior longitudinal ligament [7,8].

Dynamic factors are abnormal forces placed on the spinal column and spinal cord during flexion and extension of the cervical spine under normal
physiological loads. An example would be the trauma caused to the spinal cord by repetitively being compressed against an osteophytic bar during normal flexion and extension [9].

Acute myelopathy secondary to thrombosis of anterior spinal artery is very rare and does not explain the progression seen in chronic myelopathy. It may be that secondary to the spondylotic distortion and flattening of the cord, distortion of its intrinsic arterioles and compromise of the feeding and intrinsic vessels of the cord occur, beside reduced flow in the pial plexus and impaired venous flow leading to vascular insufficiency [10].

The stepwise progression of neurological deficit characteristically seen in certain cases with cervical spondylotic myelopathy actually represent repeated small infarctions within the cord substance with spinal cord necrosis and cavitation in the grey matter [5].

Clinical syndrome:

Cervical spondylotic myelopathy was characterized as a distinct entity and was further defined as consisting of five distinct syndromes including:

1- A transverse lesion syndrome with corticospinal, spinothalamic and dorsal column involvement.
2- A motor system syndrome with corticospinal tract and anterior horn cell dysfunction.
3- A Mixed syndrome with root and cord findings presenting with radicular pain and long tract involvement.
4- A partial Brown-sequard syndrome.
5- An Anterior cord syndrome with distal arm weakness [7,9].

Three facts should be kept in mind contemplating the diagnosis of cervical spondylotic myelopathy. It can cause a vast array of signs and symptoms. There are no pathognomonic findings, and the onset is insidious, with long periods of fixed disability and episodic worsening [11].

Differential diagnosis:

Differential diagnosis of cervical spondylotic myelopathy is quite broad. It is important to exclude both multiple sclerosis (a central demyelinating process with tendency to cause both motor and sensory abnormalities) and amyotrophic lateral sclerosis (which affects both upper and lower motor neurons), as their clinical presentations are similar to that of cervical spondylotic myelopathy. Cervical spondylotic myelopathy does not affect the cranial nerves or the normal jaw jerk reflex, whereas these other disorders may. In addition, amyotrophic lateral sclerosis as a pure motor disease, therefore, sensation is not affected. Cervical spondylotic myelopathy may have motor findings similar to those of amyotrophic lateral sclerosis, in addition to sensory findings such as numbness or parasthesias in the upper extremities. Other disorders in the differential diagnosis include spinal cord tumors, syringomyelia, subacute combined degeneration, cerebral hemispheric disorder, and peripheral neuropathy. Normal pressure hydrocephalus, with its gait and bladder involvement, should also be considered [12].

Diagnostic evaluation:

The accurate preoperative delineation of the relationship of the nerve roots and spinal cord to the structures of the cervical spinal canal requires MRI. MRI I is particularly valuable in the assessment of cervical myelopathy both before and after surgery. The exact cause of increased signal intensity of the spinal cord on T2-weighted images may represent oedema, inflammation, ischemia or gliosis [13].

The increased signal intensity diminishes postoperatively in patients who improved clinically and remain the same or worsened after decompression. MRI may be used postoperatively in this manner in patients with residual deficits to assess the adequacy of the operation and the potential need for another procedure [14].

Material and Methods

Cases of this study had been chosen from those patients presenting to Al-Azhar University Hospitals over the year 2006.

Twenty cases has been included in this study ranging in age between (35-70 years) with mean age 52.5 years. Male to female ratio was 12-8. All these cases presented with symptoms and signs related to cervical myelopathy and all of them were quadriparetic with variable degrees for a period of time of more than 4 months.

Imaging of all these cases revealed cervical spondylosis, disc prolapse, and cervical cord malacia at a single level. This was preferred to make the surgery confined to the incriminated level which is the target of this study and to avoid bone grafting and instrumentation.

MRI of cervical spine had been done for all cases and cervical cord malacia was apparent in all of them. Quadriparesis was the main stay presentation in all cases beside the other clinical
symptoms and signs that had been assessed before making the treatment decision.

Those symptoms and signs included: Motor power in both upper and lower limbs, sense of heaviness and tightness, ability to walk, radicular pain, neck pain, spinothalamic pain, sensory affection, numbness and tingling, sphincteric troubles, tone reflexes and clonus.

Tables (1,2) show the percentage of clinical symptoms and signs in all cases, that considered as a baseline clinical assessment to be compared with neurological status after surgery. All the cases in this study had undergone anterior cervical microscopic diskectomy via anterolateral approach.

Table (1): Prevalence of symptoms among cases.

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>No. of cases</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense of tightness</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Sense of heaviness</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Inability to walk</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>Precipitency</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>Constipation</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>Numbness and tingling</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Neck pain</td>
<td>12</td>
<td>60</td>
</tr>
<tr>
<td>Radicular pain</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td>Spinothalamic pain</td>
<td>5</td>
<td>25</td>
</tr>
</tbody>
</table>

Table (2): Elicited clinical signs in all cases.

<table>
<thead>
<tr>
<th>Signs</th>
<th>No. of cases</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertonia</td>
<td>16</td>
<td>80</td>
</tr>
<tr>
<td>Hyperreflexia</td>
<td>18</td>
<td>90</td>
</tr>
<tr>
<td>Clonus</td>
<td>12</td>
<td>60</td>
</tr>
<tr>
<td>Sensory level</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Deep sensation</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Quadriparies</td>
<td>20</td>
<td>100</td>
</tr>
</tbody>
</table>

In this microsurgical technique, the intervertebral disc is removed with linear curettage of both end plates above and below. The posterior osteophyte is removed either by drill, curette, or kerrison, and the prolapsed discal fragment is removed. The posterior longitudinal ligament is opened in some cases with puckering of the ligament with tightness around the cord as seen in MRI.

No parts of the vertebral body were removed and no bone graft had been used and no instrumental fixation had been applied. A postoperative neck collar is applied for three months.

The patients were followed in the first week after surgery while in the hospital and two weeks after discharge and then at interval of three months, six months and one year.

The follow-up is essentially clinically with comparison to baseline presentation. Rarely we resorted to cervical MRI for postoperative assessment and deserved for cases in whom satisfactory results had not been achieved.

**Results**

It is apparent that the development of cervical cord malacia with signs of cervical myelopathy in cases of cervical spondylosis is related to a central osteophyte or central disc prolapse that narrowing the neural canal and compressing the cord for a long time.

According to the present study, the disease has male predilection with the male to female ratio (60-40%). The quadriparies with sense of heaviness and tightness being present in all cases denote the sensitivity of the corticospinal tract to anterior compression.

Seventy five percent of the cases were not able to walk properly and 25% of them were bed ridden due to severe degree of weakness. Sphincteric troubles in form of precipitency and constipation being present in 40% of cases indicate severe cord dysfunction.

The absence of neck pain and radicular pain in some patients may be due to pure anterior central cord compression sparing the exiting roots and this explain the only spinothalamic pain in 25% of cases.

The absence of hypertonia in 20% of cases and hyperreflexia in 10% may denote the bizarre clinical presentation of cervical cord malacia urging the clinician to make a differential diagnosis. Severe cases may show deep sensory as seen in 10 percent of cases. Before surgery some of severely affected patients were hesitated about the decision of surgery and its outcome and these beliefs were based on a physician advice that they will not improve by surgery due to cord malacia.

The result of surgery were outstanding with remarkable improvement of power and ability of walking in most of cases.

The quadriparies with sense of heaviness and tightness and the inability to walk properly being present with variable degree in all cases, were considered the mainstay measure for post operative assessment (Table 3).
Table (3): Rate of improvement of major symptoms and signs.

<table>
<thead>
<tr>
<th>Symptoms &amp; Signs</th>
<th>No. of improved patients</th>
<th>Patients who are the same</th>
<th>No. of deteriorated patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense of heaviness</td>
<td>13</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Sense of tightness</td>
<td>12</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Inability to walk</td>
<td>13</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Quadriparesis</td>
<td>15</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Hypertonia</td>
<td>13</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Hyperreflexia</td>
<td>5</td>
<td>13</td>
<td>2</td>
</tr>
</tbody>
</table>

Other measures, in spite of improvement of some symptoms, are not considered for assessment of results because of relatively limited number of cases in this study and the limited presentation of those other symptoms and signs among the cases of this study.

The first assessment was within the first week after surgery while the patients were still in the ward.

In the further assessment those patients in whom their first assessment showed improvement showed again more improvement of neurological status specially in those embarking on physiotherapy.

Patients with sphincteric dysfunction showed improvement three months after surgery.

Some patients remained the same regarding some clinical symptoms in the early assessment but showed improvement of power and ability to walk to an acceptable degree.

Two patients deteriorated regarding ability to walk, quadriparesis, hypertonia and hyperreflexia as seen in the early post operative period, but they have regained their preoperative clinical picture within three months after surgery with physiotherapy.

Discussion

The sample of patients that have undergone this study showed male predilection with male/female ratio (60-40%). This coincides with what was reported in other studies that the disease is more common in males.

Spondyloitic myelopathy with myelomalacia is a chronic disease with insidious onset, and patients may spend long time suffering mild symptoms without seeking advice and may present lately when the weakness has taken.

The presence of cervical cord malacia in MRI indicates the long period of cord compression. Cases with acute cord compression by acute cervical disc prolapse have not been included in this series and we aimed only for cervical cord malacia caused by chronic osteophyte or disc prolapse with spondylisis.

Bed ridden patients indicate severe cervical cord dysfunction as evidenced by remarkable compression and malacia in MRI. This may make the surgeon enthusiastic to give the patient a chance of improvement by surgery as no more complications will be added by the failure of surgery.

The absence of neck pain in 40% of cases may explain the late presentation and the improper early diagnosis, as it is common in the early disease to attribute the patients symptoms to a peripheral neural disease.

It is apparent that the rate of improvement after surgery correlates directly with the period of time during which the patient was complaining before surgery and the degree of neurological status before surgery.

In spite of proper improvement in weakness after surgery, but no patient has attained normality with complete cure, and this goes parallel with what was seen by Gregorious and Colleagues [9], when they stated that, complete remission was never seen.

Good to excellent results were obtained in approximately 60% in the study carried out by Henry and Donald [10], which approximately what we found in our series as 75% of patients improved regarding the quadriparesis.

In the same study 10-15% became worse immediately after technically faultless surgery, which meet our results regarding the deteriorated patients (10%).

In accordance with our results Henry and Donald [10] found that none of the patients ever again had entirely normal results on neurologic examination. This is against the finding of Wohlert, et al. [15] that 5% have no symptoms after 3 months.

In Lunsford, et al. [16] series of 32 cases of myelopathy operated upon by anterior approach, on-half of patients improved and one-half either unimproved or worse. He found no predictive indices, although patients over 60 years old with symptoms for more than 2 years tended to have unsatisfactory results.
In our series we did not adopt the policy of cervical laminectomy in spite of the similar degree of success in some studies.

It was found that cord compression comes from the front by osteophyte or discal material, and what is seen from behind the cord is just the laminar prints which has no place in axial cuts of MRI.

In this study, no bone grafting or instrumental fixation, was used as the our microsurgical technique was just limited to the disc and posterior osteophyte without harming the uncovertebral joint or the body above and below.

No signs of instability were noticed postoperatively.

Conclusion:
Cervical spondylotic myelopathy is a common cause of disability with cervical cord dysfunction and currently surgical decompression is appropriate for many symptomatic patients.

Anterior cervical diskectomy effectively reduces myelopathic symptoms and proved to be beneficial even in elderly patients with acceptable outcome.

It is stated that, the shorter the duration of clinical attention, the lesser the degree of myelopathy and the better the outcome of surgery.

References


