# Anterior Decompression and Fusion for Cervical Spondylotic Myelopathy

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**Abstract**

The result after anterior decompression and fusion for cervical spondylotic myelopathy was retrospectively studied in 49 patients. There were 33 men and 16 women, their ages ranged from 27 to 82 years (average 53.7 years). The most common level of involvement was $C_{5-6}$, followed by $C_{3-4}$. Walking difficulty of various degrees in combination of numbness and weakness of upper limbs were the most common presenting symptoms. The duration of pre-operative symptoms ranged from 1 month to 10 years (average 6 months). The functional results at final follow-up were evaluated using the author's grading criterias. Mean follow-up time was 5.3 years (range 1-10 years). Forty-six patients were neurologically improved at various degrees, three cases were unchanged, none had neurological deterioration. There was no time limit of neural recovery as to the duration of disease prior to surgery. The potential cord recovery might be partly affected by age, duration of the symptoms, and pre-operative functional grade.

Cervical spondylosis is one of the most common spinal disorders, especially in Asian countries. Spinal cord compression as a result of this condition, so called cervical spondylotic myelopathy is not common. The clinical entity of cervical spondylotic myelopathy (CSM) became well recognized in the 1950s through the work of Brain and associates[1,2], as well as that of Clarke and Robinson[3]. It is generally accepted that a combination of mechanical compression from chondro-osseous spurs in the presence of intervertebral motion, as well as vascular phenomena are responsible for the cause of cervical myelopathy[4-8]. Initial size of the cervical canal is one of the pathologic factors. The author has observed that a patient who has a narrow cervical spinal canal has a higher risk of developing cervical myelopathy when the disc is degenerated with posterior osteophyte formation. Several surgical interventions have been reported to correct this condition in the

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past 40 years. It has been well documented that there may be significant immediate or delayed impairment of neural function following laminectomy[9,10] and this procedure alone should not be performed in most situations. Laminoplasty is basically to increase the size of the spinal canal from a posterior approach[11-13]. The effectiveness of this procedure is yet to be proved. Anterior decompression and fusion is currently utilized among orthopedic surgeons as a standard surgical intervention[14-17]. It is a safe and reliable procedure that has stood the test of time.

## MATERIAL AND METHOD

Fifty-five consecutive patients with documented cervical spondylotic myelopathy were operated on by the author between 1986 and 1997. These patients were examined and followed-up regularly on by the author. Two cases of doubtful diagnosis and four cases being lost to follow-up were excluded from this series, therefore, forty-nine cases were left for study. Independent clinical evaluation by a neurologist including special investigations by doing cervical myelography or MRI was obtained in all cases pre-operatively for the purpose of diagnosis and to eliminate other causes of myelopathy (Fig. 1).

There were 33 men and 16 women. The patients' ages at surgery ranged from 27 to 82 years (average 53.7 years).

The level of involvement is shown in Table 1.

The duration of symptoms prior to admission is shown in Table 2.

**Table 1. Level of cord compression.**

| | |
|---|---|
| $C_{3-4}$ | 10 |
| $C_{3-4}$, $C_{4-5}$ | 2 |
| $C_{3-4}$, $C_{5-6}$ | 1 |
| $C_{4-5}$ | 5 |
| $C_{4-5}$, $C_{5-6}$ | 5 |
| $C_{4-5}$, $C_{5-6}$, $C_{6-7}$ | 2 |
| $C_{5-6}$ | 20 |
| $C_{5-6}$, $C_{6-7}$ | 2 |
| $C_{6-7}$ | 1 |
| $C_{6-7}$, $C_7$-$T_1$ | 1 |
| | 49 |

**Table 2. Number of cases and duration of the symptom prior to admission.**

| Duration of symptom | Prior to admission |
|---|---|
| 0 - 3 mo. | 23 |
| 3 - 6 mo. | 10 |
| 6 mo. - 1 yr. | 13 |
| more than 1 yr. | 3 |
| | 49 |

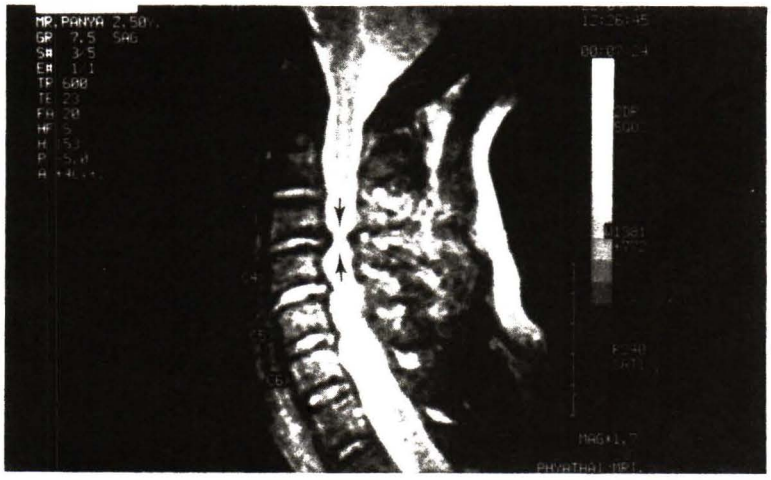

**Fig. 1. MRI in a case of cervical spondylotic myelopathy of $C_{3-4}$.**

The most presenting symptoms were walking difficulty of various degrees in combination of numbness or weakness of upper limbs. The author has classified a functional severity of cord involvement into 4 grades as shown in Table 3. According to this grading, these patients were graded pre-operatively as shown in Table 4.

**Table 3. Grading system of cord involvement in cervical spondylolic myelopathy.**

| | |
|---|---|
| Grade I | Signs of cord involvement of lower limbs (hyperreflexion, spasticity, leading to slow walking) |
| Grade II | Spastic gait, walk without assistance |
| Grade III | Spastic gait, walk with assistance |
| Grade IV | Unable to walk, chairbound or bedridden |

**Table 4. Number of cases and severity of cord involvement.**

| | |
|---|---|
| Grade I | 8 |
| Grade II | 26 |
| Grade III | 10 |
| Grade IV | 5 |
| | 49 |

**Surgical procedure**

All cases were operated on by doing anterior decompression and fusion with full thickness iliac crest graft using the technique described by Smith and Robinson. The disc material and posterior osteophyte at the level of cord compression were completely removed until the posterior longitudinal ligament was clearly visualized (Fig. 2). The disc space was restored to its normal height and maintained by a horse-shoe shaped bone graft from the iliac crest. In doing this, the cause of anterior cord compression was removed and the intervertebral motion at the lesion would be eliminated. This would help to correct the pathogenesis of cervical myelopathy.

Post-operatively, the neck was full time immobilized in Philadelphia cervical collar for 6 weeks and as part time immolization for an additional 6 weeks. The radiograph was taken to confirm the solid fusion of the affected part (Fig. 3). In case of multilevel fusions or osteoporotic bone, minerva cast was used for immobilization for the first 3-4 week period to prevent post-operative collapsing of the bone graft.

## RESULT

Patients were evaluated periodically until the neurological status became unchanged. Mean follow-up time was 5.3 years (range 1 to 10 years). Forty-six cases showed various degrees of neuro-

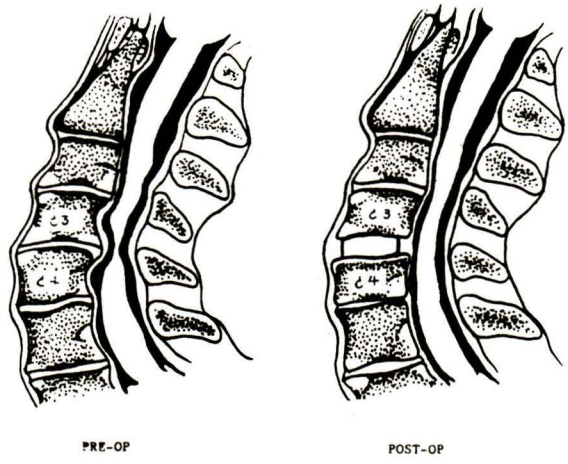


**Fig. 2. Diagrams show pre-operative conditions of cervical cord compression at $C_{3-4}$ and post-operative status after anterior decompression and fusion.**

**Fig. 3. A post-operative radiograph shows solid spinal fusion at $C_{3-4}$ level.**

**Table 5. Number of cases and functional results after surgery.**

| | No. of patient | Normal | Improved | Unchanged |
|---|---|---|---|---|
| Grade I | 8 | 8 | - | - |
| Grade II | 26 | 2 | 24 | - |
| Grade III | 10 | - | 8 | 2 |
| Grade IV | 5 | - | 4 | 1 |

logic recovery, the other 3 cases did not improve as shown in Table 5. There was no deterioration of cord function and no surgical mortality in this series. The cord recovery was found to be affected by the pre-operative severity and time period of cord involvement. The cases with more severity and the longer period of time of cord involvement had a lesser degree of cord recovery. Of the 3 patients who remained unchanged post-operatively, two cases were at grade III, one case at grade IV pre-operatively. Most of patients had neurological return at least 1 grade post-operatively. All patients in grade I recovered normal neural functions, except hyperreflexia which remained in all cases and Babinski's sign was positive in some cases at the final evaluation. The younger age group had a better recovery, while the majority of patients in this group had a soft disc herniation as combination to the posterior osteophytes.

## DISCUSSION

Most of the reported series were operated on by several surgeons, therefore, the details in surgical techniques and skill will not be identical. In this series, all the patients were operated on by the author, which had a uniform strategy in decompressing the spinal cord anteriorly. In removing the posterior osteophytes requires a highly skilled surgeon. More and more radical removal of posterior osteophytes including part of the vertebrae are being performed with more favorable results. The tendency of late worsening or deterioration of neural function following laminectomy was significant[1], but this did not occur in this series, because the vertebral motion had been eliminated by fusion. The consequence on the acceleration of degeneration of the disc above and below the fusing segment causing recurrent cord compression needs to be considered[1], although it did not occur in this series.

The duration of disease and age of the patient has significant variable prediction of outcome. Permanent or irreversable damage is done to the cord in late cases, causing no improvement at that portion of the cord following surgical decompression. The osteophytic formation is not large in the younger age group, and the compressive force is mainly from soft disc herniation, which anterior decompression can be accomplished easily and completely. There was no time

limit of neural recovery as to duration of symptoms prior to surgical decompression, functional improvement was obtained in one patient who had symptoms for 10 years prior to admission. The patients who had no improvement of neural function post-operatively, meaning that the permanent cord damage had already occurred, probably due to vascular impairment.

The preoperative MRI is becoming increasingly important, not only for clarifying the diagnosis, but also demonstrating the cord pathology, making the surgical outcome more predictable. At present pre-operative MRI is done in every case to identify the level and extent of cord pathology.

Collapsing of bone graft may occur especially in cases of multilevel fusion, but the author believes that it will not alter the clinical result. No non-union of bone graft was observed in this series.

## SUMMARY

Anterior decompression and fusion for cervical spondylotic myelopathy gave satisfactory results in selected patients. The procedure is quite safe in the hands of skillful surgeons.

Radical removal of the posterior osteophyte is significant to obtain immediate recovery of cord function. In this series, the procedure was limited to 1-3 levels. In cases of multiple level involvement with severe spinal stenosis, a more radical anterior decompression involving multiple level corpectomies or laminoplasties appears to be a better option.

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# การผ่าตัดเอาสิ่งที่กดทับประสาทไขสันหลังส่วนคอออกพร้อมกับการเชื่อมกระดูกคอทางด้านหน้าในโรคกระดูกคอเสื่อมที่มีการกดทับประสาทไขสันหลัง

*อำนวย อุนนะนันทน์, พ.บ., F.A.C.S.**

รายงานผลการผ่าตัดรักษาภาวะ cervical spondylotic myelopathy ในผู้ป่วย 49 ราย เป็นชาย 33 ราย หญิง 16 ราย อายุระหว่าง 27 ถึง 82 ปี (เฉลี่ย 53.7) ระดับของไขสันหลังที่เกิดการกดเบียดส่วนใหญ่พบเกิดขึ้นที่ปล้องกระดูกคอ $C_{5-6}$ รองลงมาคือ ระดับ $C_{3-4}$ อาการสำคัญที่ผู้ป่วยมารับการรักษาส่วนใหญ่คือ ความผิดปกติของการเดินร่วมกับอาการชาและอ่อนแรงของส่วนแขน ระยะเวลาของอาการพบตั้งแต่ 1 เดือน ถึง 10 ปี (เฉลี่ย 6 เดือน) การผ่าตัดใช้วิธี anterior decompression และ spinal fusion ตามแบบของ Robinson ผลการรักษาภายหลังการติดตามตั้งแต่ 1–10 ปี (เฉลี่ย 5.3 ปี) พบ 46 ราย มีอาการทางระบบประสาทไขสันหลังดีขึ้น 3 รายอาการคงเดิมและไม่พบผู้ป่วยรายใดที่มีอาการเลวลงกว่าเดิมก่อนผ่าตัดรักษา

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