

Surgical Outcome of Elderly Patients Having Cervical Spondylotic Myelopathy: A Comparative Study Using JOA Scoring

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ABSTRACT

Background: Surgical outcome in patients with cervical spondylotic myelopathy may be affected by a variety of factors. Different study outcomes suggest that the number of symptoms and involved levels, symptom duration and posterior approach significantly increased with increasing age, whereas preoperative Japanese Orthopaedic Association score decreased among the different age groups.

Objective: The goal of this study is to analyze the surgical outcome by comparing younger and elderly patient groups on the basis of preoperative radiological and clinical data.

Methods: To find out the surgical outcome the clinical and radiological data of 32 patients who underwent expansive laminoplasty were reviewed after their surgery had been performed. All of the patients were divided into two groups, group (a): younger patient group (<65 yr of age; n = 13) and an elderly patient group (≥65 yr of age; n = 19). Patients were assessed by use of the Japanese Orthopaedic Association scale (JOA) to know the neurological status of them. Computed tomographic myelography and magnetic resonance imaging examined for radiological features. Finally, the effects of the clinical and radio-logical findings on neurological outcome were investigated.

Results: The scores of preoperative and postoperative mean of (JOA) in elderly patients were significantly lower than younger patients. In the elderly patients cases, the transverse area of the spinal cord at the level of maximum compression

and symptom duration were the factors that predicted an excellent recovery. On the other hand, the transverse area was the only predictor of excellent recovery in younger patients. Intensity change on the spinal cord and age, preoperative Japanese Orthopaedic Association score, canal diameter were not predictive in either age range.

Conclusion: Both younger and elderly patient groups the transverse area of the spinal cord may be a reliable predictor of excellent recovery. In case of elderly patients shorter symptom duration was an important factor in the excellent recovery.

Keywords: Cervical Spondylotic Myelopathy, Elderly, JOA, Surgical Treatment.

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INTRODUCTION

Cervical spondylotic myelopathy (CSM), caused by the degeneration of spinal structures is a highly common spinal cord disorder. It causes neurological impairment and functional decline, which reduces the independence and the quality of life of affected individuals. Previous study on the natural history of cervical diseases describes that, CSM has continuing and developing characteristics; surgery can prevent the deterioration of neurological function 1–5 and may even improve neurological function in several cases.^{1–5}

Boogaarts HD, Bartels RH. (2015) study estimated the prevalence of surgically treated CSM as 1.6 per 100,000 inhabitants; the actual incidence and prevalence of this disease, however, remains unclear.^{4–7} The elderly are higher than other population groups affected by CSM.⁵ The incidence of CSM increases annually because of socio-cultural and lifestyle changes, and the young are increasingly becoming affected. Patients with CSM in two age groups could present different clinical features and experience different surgical outcomes.

When the patient's clinical symptoms are severe and progressive, and conservative treatment is not effective, surgical intervention is indicated. Previous research studies have shown that surgical treatment of CSM achieved satisfactory functional improvement in many cases.⁸⁻¹³ Elderly patients are usually frail and frequently have a variety of medical and social problems. Limited data exist on the outcomes of surgery to treat CSM in elderly patients.¹⁴⁻¹⁶

OBJECTIVE

The main objective of this study is to analyze the surgical outcome by comparing younger and elderly patient groups on the basis of preoperative radiological and clinical data.

METHOD

To find out the surgical outcome the clinical and radiological data of 32 patients who underwent expansive laminoplasty were reviewed after their surgery had been performed. This study conducted between 2015 to 2017 at private medical hospitals in

Dhaka. All the patients were observed prospectively. All of the patients were divided into two groups, group (a): younger patient group (<65 yr of age; n=13) and an elderly patient group (≥65 yr of age; n = 19). (Mean age, 64.5±12.0, male: female 18:14). Because patient age is a continuous variable, the determination of the point between the elderly and younger patient groups is difficult for statistical analysis. With that in mind, however, we chose to define "elderly" as patients older than 65 years.

Patients were assessed by use of the Japanese Orthopaedic Association scale (JOA) to know the neurological status of them. Computed tomographic myelography and magnetic resonance imaging examined for radiological feature. Finally, the effects of the clinical and radio-logical findings on neurological outcome were investigated.

All the patients had radiological and long-standing clinical signs of cervical spondylotic myelopathy. The neurological status of the patients was recorded according to the Japanese Orthopaedic Association (JOA) scale.^{15,17,18} (Table-1).

Table 1: Scoring system for cervical myelopathy proposed by the Japanese Orthopaedic Association (JOA)^a

I. Upper extremity function

0. Impossible to eat with either spoon or chopsticks
1. Possible to eat with spoon but not with chopsticks
2. Possible to eat with chopsticks but inadequately
3. Possible to eat with chopsticks but awkwardly
4. Normal

II. Lower extremity function

0. Impossible to walk
1. Need cane or aid on flat ground
2. Need cane or aid only on stairs
3. Possible to walk without cane or aid but slowly
4. Normal

III. Sensory function

- A. Upper extremity
 0. Apparent sensory loss
 1. Minimal sensory loss
 2. Normal
- B. Lower extremity (same as A)
- C. Trunk (same as A)

IV. Bladder function

0. Complete retention
1. Sense of retention or dribbling or straining
2. Urinary frequency or hesitancy
3. Normal

^a Recovery rate (%) = (Postoperative JOA score — preoperative JOA score) × 100 / (17 (full score) — preoperative JOA score)

RESULTS

In this study most patients showed a lordotic curvature. The number of patients with spinal instability (horizontal displacement of the vertebral body >2 mm) was (10.5%) in younger patients and (17.2%) in elderly patients. Ossification of the posterior longitudinal ligament was found in (10.5%) patients in the younger patient group and (11.5%) in the elderly patient group. Pincer phenomenon in a long cervical segment was observed in (34.6%) patients in the younger patient group and (40.0%) patients in the elderly patient group.

The mean follow-up period was 20 months. (77%) showed neurological improvement after the operation, and (70.2%) exhibited excellent recovery. In the younger patient group, 85.0 ± 20.2 showed neurological improvement, and all of them achieved excellent recovery, 11.6 ± 16.9 achieved fair recovery. In the elderly patient group, most of the patients showed neurological improvement, and 82.4 ± 19.5 patients achieved an excellent recovery. Clinical and radiological data are summarized in Table 2. The mean preoperative ($P < 0.0001$) and postoperative

($P = 0.046$) JOA scores of the elderly patients were significantly lower than those of the younger patients. However, there was no significant difference between the younger and elderly patient groups in terms of mean recovery rate ($P = 0.759$). There were no significant differences in age, symptom duration, AP canal diameter, transverse area of the spinal cord, and intensity change on MRI scans between the younger and elderly patient groups (Table 3). The AP canal diameter showed a trend to be smaller in the elderly patient group, but this trend was not significant ($P = 0.061$). For younger patients, the single factor predictive of excellent recovery was the transverse area at the level of maximum compression ($P = 0.042$; odds ratio [OR], 1.214; 95% confidence

interval [CI], 1.007–1.465) (Table 3). In contrast, symptom duration ($P = 0.004$; OR, 0.886; 95% CI, 0.817–0.961) and the transverse area at the level of maximum compression ($P = 0.003$; OR, 1.264; 95% CI, 0.108–1.4747) were both predictive of excellent recovery in elderly patients. A higher rate of signal intensity change on the MRI scan tended to be associated with a poor outcome in elderly patients, but this tendency did not reach significance ($P=0.051$) (Table 4). Therefore, these data suggest that excellent neurological improvement was obtained in elderly patients with shorter symptom duration (<12 mo). A larger transverse area of the spinal cord at maximum compression (≥ 30 mm²) was required for an excellent recovery in both age ranges.

Figure 1: Gender of the patient

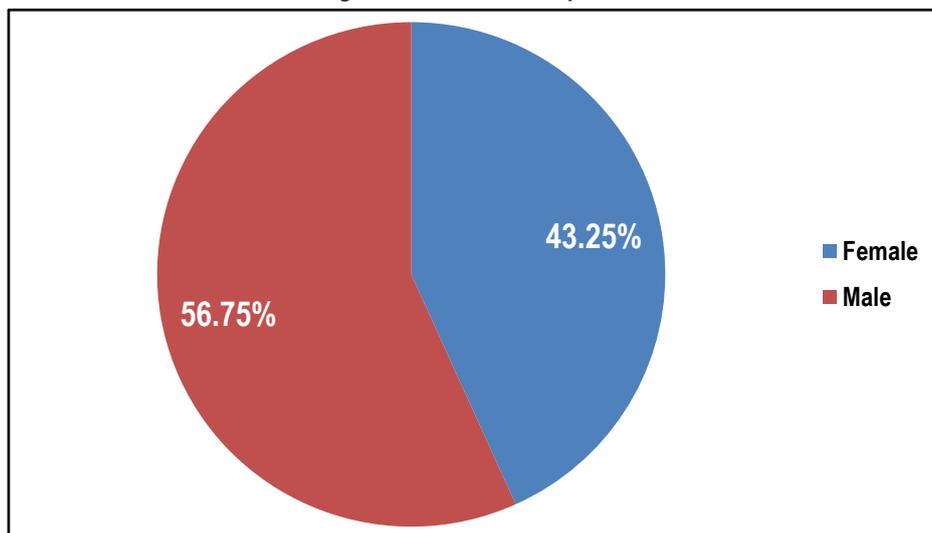


Table 2: General distribution of patients according to age (n=32)

Age (years)	Frequency	Percentage (%)
Elderly patient group ≥ 65 yr of age	19	59.37
Younger patient group	13	40.63
Total	32	100
Mean age	64.5 \pm 12.0	

Table 3: Summary of all cases

Characteristic	All patients (n = 32)	Younger patients (n = 13)	Elderly patients (n = 19)	P Value
Age (yr)	64.5 \pm 12.0	53.4 \pm 7.8	73.9 \pm 4.4	NA
Symptom duration (mo)	25.6 \pm 30.6	33.6 \pm 39.8	20.7 \pm 19.2	0.095
Preoperative JOA score	13.3 \pm 2.9	14.8 \pm 1.9	12.0 \pm 3.0	<0.0001
Postoperative JOA score	15.2 \pm 2.5	15.8 \pm 2.0	14.6 \pm 2.8	0.046
Canal diameter (mm)	10.2 \pm 4.1	11.2 \pm 5.6	9.3 \pm 1.9	0.061
Transverse area (mm ²)	39.4 \pm 11.2	39.4 \pm 11.2	42.1 \pm 12.7	0.378
Intensity change on T2WI	18 (28.1%)	8 (27.6%)	10 (28.6%)	0.931
Recovery rate (%)	60.5 \pm 40.3	62.3 \pm 42.7	59.1 \pm 38.7	0.759

^a JOA, Japanese Orthopaedic Association scale; T2WI, T2-weighted magnetic resonance image; NA, not applicable.

Table 4: Recovery Rate of patients

Status of Recovery	Young patients	Elderly patients
Excellent	85.0 \pm 20.2	82.4 \pm 19.5
Fair	0.0 \pm 0.0	11.6 \pm 16.9



Fig 2A: Preoperative MRI of cervical spine

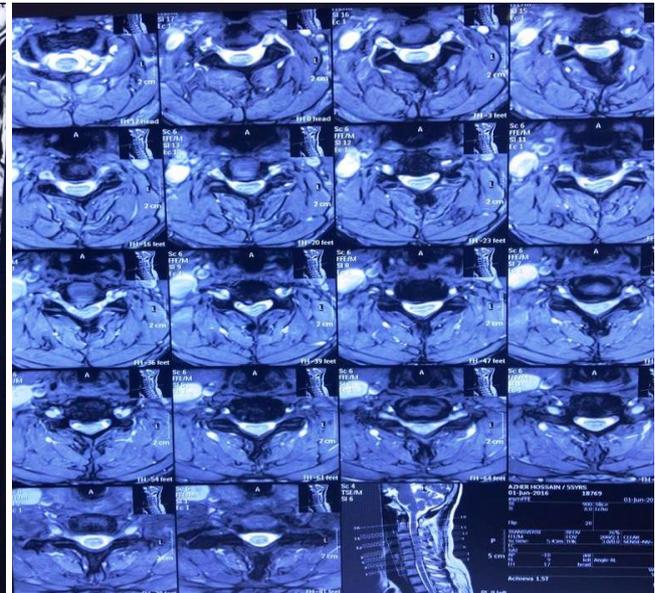


Fig 2B: Preoperative MRI of cervical spine



Fig 2C: Preoperative MRI of cervical spine



Fig 2D: Preoperative MRI of cervical spine



Fig 3A: Post-operative Xray of cervical spine



Fig 3B: Post-operative Xray of cervical spine

DISCUSSION

Particularly in the elderly population, the decision to intervene surgically requires special consideration that is based on balancing the risks and benefits associated with the surgical treatment. Operation related risk should be weighed against the functional impairment and the potential for disability resulting from a natural progression of the myelopathy. Accurate prediction of the surgical results is important, but it is more difficult in elderly patients than in younger patients. The study results indicate that resumption of normal daily activities after the operation is strongly influenced by the transverse area of the spinal cord at the level of maximum compression in patients of all ages, and it is influenced by symptom duration only in elderly patients. This finding may represent the inability of the nervous system to recover in elderly patients.

Even though the current study had no medically matched control patients who was treated conservatively, surgical decompression for cervical myelopathy seems to be effective for neurological improvement even in elderly patients, provided that the symptom duration is less than 12 months and the transverse area of the spinal cord at the level of maximum compression is larger than 30 mm². The transverse area of the spinal cord at the level of maximum cord compression can be used as a prognostic indicator for patients in any age range, and symptom duration is more important as an indicator of excellent recovery in elderly patients.¹⁹

CONCLUSION

Both patient groups younger and elderly, the transverse area of the spinal cord may be a reliable predictor of excellent recovery. In case of elderly patients shorter symptom duration was an important factor in the excellent recovery.

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