Original Article

Outcome of Anterior Cervical Discectomy and Fusion for Cervical Spondylotic Myelopathy

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Abstract

Background: *Cervical spondylotic myelopathy (CSM) is a progressive degenerative disease and the most common cause of cervical spinal cord dysfunction (SCD) in older patients. Anterior cervical discectomy andfusion (ACDF) is a common procedure for patients with severe neurological deterioration. The goals of this study were to evaluate the clinical and functional outcome, radiological fusion and operative complications in case of CSM who underwent ACDF by autogeneous-tricortical bone graft and stabilized with plate and screws.*

Methods*: This prospective interventional study was carried out at National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR) and different private hospitals in Dhaka from January 2012 to December 2014. Within this period total 12 CSM patients were included as study sample. All were surgically treated by ACDF and stabilized by plate and screws. All patients were clinically and radiologically evaluated before and after surgery.*

Results: *Single level ACDF by autograft and stabilization by plate and screws was done in 10 (83.33%) patients and 2 (16.67%) patients had two level fusion. The mean follow up period was 12 months. The satisfactory result was found in 10 (83.33%) patients. Post-operative complications were donor site morbidity in2 (16.67%) patients and transient dysphagia in 1 (8.33%) patient. The fusion rate was 100% in this series.*

Conclusion: *ACDF with anterior plating for CSM is a safe and effective procedure. It results in highest fusion, least complication and relatively lower cost.*

Key words: *Anterior cervical discectomy and fusion, cervical spondylotic myelopathy, outcome.*

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Introduction

Cervical spondylotic myelopathy (CSM) is a progressive degenerative disease and the most common cause of cervical spinal cord dysfunction.[1,2] The etiology of CSM is multifactorial and its chronic nature likely induces compensatory mechanism within the cord. The cord is at risk of compression from protruding vertebral body, facet joint hypertrophy, osteophytic lesion, hypertrophied ligamentumflavum and ossified posterior longitudinal ligament (OPLL). These degenerative processes can result in static compression and they can exacerate compression of spinal cord under dynamic movement. Ultimately, boththe static and dynamic compression may result in axonal stretch-associated injuries, spinal cord ischemia from vascular compression and venous congestion.[3]

Spondylosis has been shown to be the most common etiologyfor cervical myelopathy in people over 55 years.[4]Early recognition and treatment of CSM before the onset of spinal cord damage is essential for optimal outcome.

Features of myelopathy include altered gait, muscle weakness, bladder/bowel dysfunction, reduced fine motor skills, which all depend upon the location of compression. Neck or shoulder pain with radiation to one or both upper limbs, tingling, numbness or weakness in the hand is common presenting symptoms of cervical

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radiculopathy.Myelopathic or upper motor neuron lesion (UMNL) (eg. hyperreflexia and gait disturbance)are the typical manifestations. Myelopathichand, grip release sign, Hoffman's sign, Romberg test along with gait disturbance (broad based and hesitant) are common in severe condition. Changes in the pattern of bladder and bowel dysfunction are the key components of the history found in 20%-50% of the patients.[5]

The objective of this study were to evaluate the clinical and functional outcome, radiological fusion and operative complications in case of CSM who underwent ACDF by autogenoustricorticalbonegraft and stabilized with plate and screws.

Methods

This prospective interventional study was carried out at National Institute of Traumatology and OrthopaedicRehabilitation (NITOR) and different private hospitals in Dhaka from January 2012 to December 2014. Total number of patients were 12 who underwent instrumentation at single and two level by ACDF with autogenoustricortical iliac crest graft and plating in locking mode. Ten patientshad single and two patients had two level fusion (Table I). Patients were selected on the basis of history, clinical examinations, radiological and magnetic resonance imigaing (MRI) findings. Patients with diagnosis ofspondylolisthesis, tumour, tuberculosis and previous cervical spine surgery were excluded from the study.

We assessed pain status improvement by visual analogue score (VAS), the clinical outcome (sensory, motor and reflex) by clinical tests and overall functional outcome with modified JapaneseOthopaedic Association (mJOA) score. Patients were discharged with soft cervical collar for one month and began range of motion exercises as early as pain subsided.

Patients were instructed to resume normal activity which was 3 weeks if the job required minimal labour, 6 weeks for moderate labour and 12 weeks for heavy labour. Post-operative evaluation included clinical examinatins and lateral cervical spine radiograph at 3,6,12 weeks and at 6, 12 months to assess solid fusion and progression of bony incorporation at the graft vertebral interface.

Results

Regarding age distribution, maximum patients were within 40-49 years (66.67%) with average 44.7 years. Ten (83.33%) patients were males and two (16.67%) were females. Most of the patients were sedentary worker (6, 50%). Mean duration of symptoms was 1.3 years with mean follow up period was 18 months (range: 6-18 months). Average operation time was 2.5 hours and average hospital stay was 3 days and average time to return to normal activities was 3 weeks. Neck and arm pain improved significantly ($P<0.001$) post-operatively as was true for sensory, motor and reflexes ($P<0.05$) (Table II).

Table I Distribution of patients according to level of fusion (N=12)

Level of fusion	Number	Percentage
C4-C5	3	25%
C5-C6	6	50%
C5-C6, C6-C7	2	16.67%
C6-C7	1	8.33%

Average time of union was 4 months (range: 3-9 months). Satisfactory outcome was found in 10 (83.33%) patients (Table III). No patient required further surgery in the same level. Radiological fused level was C4-C5 (3,25%), at C5-C6 (6,50%) (Figures 1 & 2), at C5-C6, C6-C7 (2, 16.67%) and C6-C7 (1, 8.33%).

Table II Clinical outcome (N=12)

		Preoperative	At 6 months	At 12 months
Neck pain	VAS	7.0± 1.5	2.5 0.5	2 0.5
Arm pain	VAS	7.8 0.5	2 0.75	2 0.5
Sensory		9 (75%)	5 (41.67%)	2 (16.67%)
Motor		7 (58%)	5 (41.67%)	2(16.67%)
Reflex		12(100%)	4 (33.33%)	1 (8.33%)

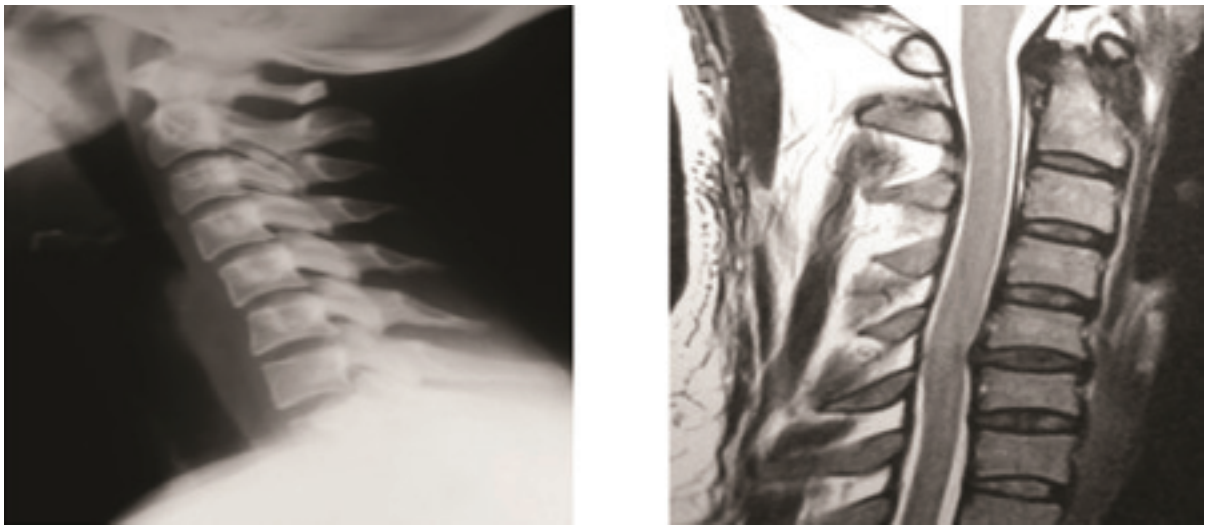

Figure 1 *Pre-operative X ray lateral view and MRI sagittal view showing CSM at C_5-C_6*

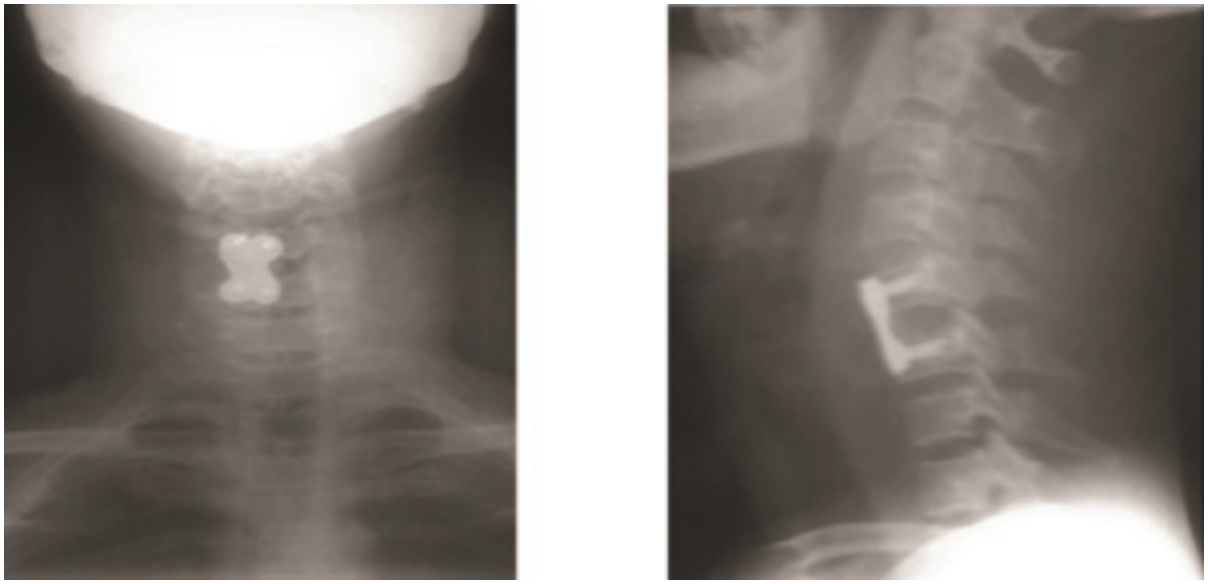

Figure 2 *Post-operative X ray antero-posterior and lateral ateral view showing ACDF with plate and screws at C_5-C_6*

Table III Functional outcome according to modified JOA Score (N=12)

Functional outcome	Number	Percentage
Excellent	5	41.67%
Good	5	41.67%
Fair	2	16.67%
Poor	0	0%

Regarding post-operative complications, donar site morbidity was found in 2 (16.67%) patientswhich improved at 3 months. Dysphagia was found in 1 (8.33%) patient which was mild and self limited. There were nodysphonia, pseudoarthrosis or deformity due to graft subsidence, graft dislodgement, plate loosening or breakage, screw migration or misdisplacement and cerebrospinal fluid (CSF) leakage. There was no deterioration of neurological symptoms and adjacent segment degeneration (ASD).

Discussion

CSM is an age related degeneration of cervical spine leading to compression and ischaemia of spinal cord that ultimately results in spinal cord dysfunction. The purpose of treating symptomatic CSM is to achieve early neurological decompression, stabilization and fusion for early rehabilitation.

The procedure of ACDF is suitable for CSM. In the current study, 12 patients were diagnosed with CSM on clinical examinations and MRI findings. Because of the existence of osteoporosis, osteophyte, instability or hypermobility, local or global kyphosis, they underwent ACDF instead of artificial disc replacement, posterior laminectomy or laminoplasty. The significant clinical improvement (neck pain, arm pain, sensory, motor and reflex) was comparable to reports by Wang.[6]

In this study, age of the patients varied from 35-65 years. Majority of patients belonged to age group 40-49 years and mean age was 44.7 years and most of the patients were male. C5-C6 was the commonest involved site. This was close to the study of Ali[7] where male patients were predominant and C5-C 6 was the commonest involved site.

In this series, all patients were operated under general anaesthesia and by anterior transverse incision on the left side of neck due to constant course of recurrent laryngeal nerve. Decompression, fusion and stabilization was done by anterior cervical plate and screws. Epstein[8] recommended that anterior cervical plating can maintain lordosis and addition of a ventral cervical plate may add to the security of fixation.

Connolly[9] reported fusion rate with autograft ranging from 87-97% and Emery[10]reported 20-27% rate of pseudoarthrosis for anterior discectomy and autogenous bone fusion. The risk of pseudoarthrosis increases with each additional level of surgery.[9]Although we had 100% fusion and no pseudoarthrosis, the results might have varied with longer follow up and larger study population.

In our series, 2 patients developed bone graft donar site pain and 1 patient developed transient dysphagia. In most reviews, bone graft donar site pain in autogenous bone grafting was reported mostly due to infection, haemotoma, iliac crest fracture.[11] The literature shows 3% complication of post operative dysphonia due to recurrent laryngeal nerve palsy, more on right side.[12]But we did not face such problem in any patient. Wound haematoma with air way obstruction was found in 3-7.30% in some literature[13] but it was not found in our small series.

Deformity owing to graft subsidence, graft dislodgement or plate loosening[14] can occur but it was more problematic with multilevel corpectomy (3 or more level), but it was absent in our series. Casper and Piltzen[15] reported that graft migration was decreased in multilevel fusion and eliminated in single level fusion. Graft collapse was reported in 20-30% of multilevel fusion operation.[16] Incidence of adjacent segment disease (ASD) was found 2.90% at 10 year follow up in the literature[15] but in our short term follow up this complication could not be assessed.

The limitation of this study was that the sample size was small and follow up period was also short to comment largely.

Conclusion

Based on the results shown above it was concluded that one or two level ACDF with anterior plating for CSM was a safe and effective procedure which provides rapid return to normal activities.

Conflict of interest: Nothing to declare.

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