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CLINICAL OUTCOME FOLLOWING ANTERIOR CERVICAL DISCECTOMY AND FUSION USING ZERO PROFILE SPACER IN CERVICAL SPONDYLOTIC MYELOPATHY IN A TERTIARY CENTER IN NORTH EAST INDIA

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ABSTRACT

BACKGROUND:Symptomatic cervical disc prolapse is best managed with anterior cervical discectomy with fusion. This study was conducted to assess the clinical outcomes following anterior cervical discectomy and fusion using zero profile spacer in cervical spondylotic myelopathy patients.

MATERIALS AND METHODS: This is a prospective study that was carried out in the department of Neurosurgery, Gauhati Medical College & Hospital from January 2021 till May 2022. Data was collected from all patients undergoing anterior cervical discectomy and fusion using zero profile spacer. We measured surgical outcome including dysphagia at 1 month, Nurick grade at follow up and length of hospital stay.

RESULTS: A total of 79 cases underwent anterior cervical discectomy out of which 53 patients were included in the study and followed up for a period of 6 months post operatively. Of these 53 patients, 42 were male and 11 were female. Mean age was 47.05 years (range 28-67years).Nape of neck pain was the most common presenting symptom followed by tingling sensation in all four limbs and trunk. Average time taken for surgery was 128±34 minutes. Average length of hospital stay was 2.5±1.5 days. At 1 month follow up, only three patients reported of occasional dysphagia to solids. No patient reported of dysphagia to liquids or absolute dysphagia. Nurick grade at last follow up improved in 46 patients (86.7%).

CONCLUSION: ACDF is the treatment of choice for the patients with clinical and radiological evidence of cervical cord compression.Stand-alone zero-profile cages in single level or multi-level ACDF surgeries have a good outcome in terms of reduced post-operative dysphagia and acceptable clinical and neurological improvement.

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Keywords: Anterior Cervical Discectomy (Decompression) and Fusion (ACDF), Zero-Profile Cages, Cervical Spondylotic Myelopathy

INTRODUCTION

Cervical spondylotic radiculopathy or myelopathy is a neurological disorder caused by the narrowing of the spinal canal as a result of degenerative changes in the cervical spine whose symptoms can include neck and arm pain associated with radiculopathy or myelopathy.[1-3]Degenerative cervical myelopathy may result from a variety of pathologic events in the cervical spine that mechanically compress the spinal cord.[4]Compression and ischemia, both may occur due to age related wear and tear. Trauma is another common cause of the cervical disc prolapse. Lateral disc prolapse mostly presents with features of radiculopathy and central disc prolapse results in clinical features of myelopathy. In the majority of the instances, myelopathy is associated with radiological evidence of cord compression and associated T2W changes in MRI.Such patients show improvement following the surgery.So far, the standard surgical treatment is to fuse the adjacent vertebrae to the degenerated disk[5]. Anterior cervical discectomy and fusion (ACDF), first described by Robinson and Smith in 1955 and Cloward in 1958, has become the standard of choice for cervical disc prolapse.[6,7] The ACDF approach has the lowest rate of nonunion but a slightly higher morbidity of the esophageal complication.[8,9]The zero-profile implant system (ZIS) is a contemporary system with a zero-profile implant that is contained within the excised disk space and does not protrude past the anterior wall of the vertebral body, as do the anterior cervical plates, which reduces risk of dysphagia.[10]

In this series we have discussed our results with anterior cervical discectomy and fusion using zero profile spacer done for single level and multilevel cervical disc prolapse in patients with clinical symptoms of myelopathy or radiculopathy or both.

METHODS

This was a prospective study that was carried out in the department of Neurosurgery, Gauhati Medical College & Hospital from January 2021 till May 2022.

Inclusion criteria

All patients aged above 20 years undergoing ACDF (one or two level) with features of myelopathy or myeloradiculopathy, not responding to conservative measuresand disc herniation identified by MRI with evidence of nerve root and/or cord compression.

Exclusion criteria

Patients presenting with ossification of the posterior longitudinal ligament, history of malignancy, evidence of systemic or local infection, history of cervical spine trauma, prior cervical spine surgery, patients requiring simultaneous anterior and posterior surgery and patients with preoperative dysphagia were excluded from the study.

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Patients

Patients presenting to our Neurosurgery OPD of GMCH with clinical features suggestive of cervical myelopathy or myeloradiculopathy were subjected to MRI cervical spine, cervical X-ray and ancillary investigations.On correlation of myelopathy features with cord compression due to disc prolapse or disc osteophyte complex they were advised to undergo surgery.

Clinical profile

Patients were evaluated as per the Nurick grading system preoperatively and postoperatively at an interval of 1 week, 1 month, 3 months and 6 months[11].Postoperative long term recovery was studied in terms of satisfaction with surgery, return to work or household activities.

Radiological profile

MRI cervical spinewas assessed in terms of indentation of CSF column, T2W changes in the cervical cord, evidence of disc prolapse, disc osteophyte complex, degenerative changes and ligamentum flavum calcification. X-ray cervical spine was done to note the baseline cervical lordosis and primary evaluation of fracture or associated atlanto-axial dislocation.

Surgical Procedure

All surgical procedures were performed by a single surgeon using the standard Smith-Robinson approach on the patient's right side.Based on C-arm image intensifier guidance, level confirmation was done and using a transverse incision along the transverse skin crease in the neck, blunt and sharp dissection was carried out to reach, the pre-vertebral space keeping trachea and esophagus medially and internal carotid artery and sternocleidomastoid muscle laterally.Appropriately sized retraction blades with teeth were placed under the dissected longus colli to retract over the longus colli away from the working field.Caspar pins were then applied to the vertebral bodies above and below to help distract the disc space. Discectomies and, when appropriate, foraminotomies are performed using curettes and Kerrison cervical rongeurs.Trial spacers are used to determine the appropriate implant size. Then appropriate Zero profile spacer placed in intervertebral space.Lateral and anterior-posterior fluoroscopic X-rays were performed and the correct position of the implant was adjusted. After confirmation of size and position, four locking screws were inserted using torque limitation after preparing the pilot hole oriented through the aiming device.Hemostasis is rechecked, and the skin was sutured subcutaneously. All the patients were obeyed to wear a cervical collar for 6 weeks after surgery.

Postoperative care and follow up

The patients were kept for one day in the recovery ward.Opioid analgesics were given with intravenous antibiotics for three days postoperatively. Operative drain was removed on first perioperative day. Urinary catheter was removed for all the patients who were indicating and voiding normally before surgery.The patients were advised Philadelphia cervical collar for 6

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weeks.The clinical profile was assessed on 1 month, 3 month and 6 months from the date of surgery.

Statistical analysis

Data were entered in Excel software (Microsoft, Seattle, WA) and were analyzed using SPSS software, version 11.5 (SPSS, Inc. Chicago, IL).

RESULTS

There were 53 patients in the study out of which 42 were male and 11 were female. Mean age was 47.05 years (range 28-67years). 40 patients (75.47%) presented with myelopathy and the 13 patients (24.52%) patients presented with myeloradiculopathy. 8 patients (15.09%) had diabetes. 29 patients (54.7%) gave a history of tobacco use, of which 20 patients had a history of cigarette smoking.

Most common symptom was nape of the neck pain. Sensory symptoms including tingling, paraesthesia and numbness were second most common symptoms.About half of the patients had motor symptoms, predominantly due to spasticity. 18patients(33.9%) were found to have at least one autonomic symptom, predominantly urinary urgency and constipation.Functional status of the patients was assessed using the Nurick grade system. Majority of patients had Nurick Grade III (33.9%) followed by Nurick Grade II (28.30%).

Most common level of involvement was C5-6 (48.43%), followed by C4-C5 (25%), C6-C7 (17.18%) and C3-C4 (9.3%). 13 patients (24.52%) had double level involvement.

Variables	No. of patients (%)
Age in years	
21-30	**2(3.77)**
31-40	**13(24.52)**
41-50	**15(28.30)**
51-60	**18(33.96)**
61-70	**5(9.43)**
Sex	
Male	**42(79.24)**
female	**11(20.75)**
Level of compression	
C3-C4	**6(9.3)**
C4-C5	**16(25)**
C5-C6	**31(48.43)**
C6-C7	**11(17.18)**

Table 1: Age and diagnosis

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Feature	No. of patients(%)
Presentation	
Radiculopathy	**28(52.8)**
Myelopathy	**13(24.5)**
Myeloradiculopathy	**12(22.6)**
Preoperative functional grade	
Nurick gradeI	**29(54.7)**
Nurick gradeII	**12(22.6)**
Nurick gradeIII	**6(11.3)**
Nurick gradeIV	**3(5.6)**
Nurick gradeV	**1(1.88)**
Nurick grade VI	**2(3.77)**

Table 2: Clinical features

Among all the 53 patients that underwent ACDF with zero profile spacer, 40 patients underwent single level surgery while 13 underwent double level surgery. The average duration of surgery for all ACDF procedures was 128±34 minutes. The blood loss was minimal. The average length of hospital stay was 2.5±1.5 days.

Number of Levels of Surgery	**No. of patients**
1	40(75.47)
2	13(24.52)
Length of Surgery, mean	128±34mins
CSF leak	0
Length of stay, mean (SD)	2.5±1.5 days

Table 3: Surgical details

At 1 month follow up, 3 patients reported of dysphagia to solids. All of these patients recovered with no further consequences at the last follow-up. Nurick grade was found to be improved in 46 patients at the last follow up. 50 patients reported of a decrease in the neck pain at the 6 month follow up. 20 patients reported of an improvement in the autonomic symptoms.

Feature	**No. of patients (%)**
Dysphagia	
1 month	3(4.76)
3 month	0
6 month	0
Nurick grade at last follow up	
Nurick grade 0	35(66.63)
Nurick grade I	11(20.7)
Nurick grade II	2(3.77)
Nurick grade III	1(1.88)
Nurick grade IV	2(3.77)
Nurick grade V	1(1.88)

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Nurick gradeVI	1(1.88)

Table 4: Follow up and outcome

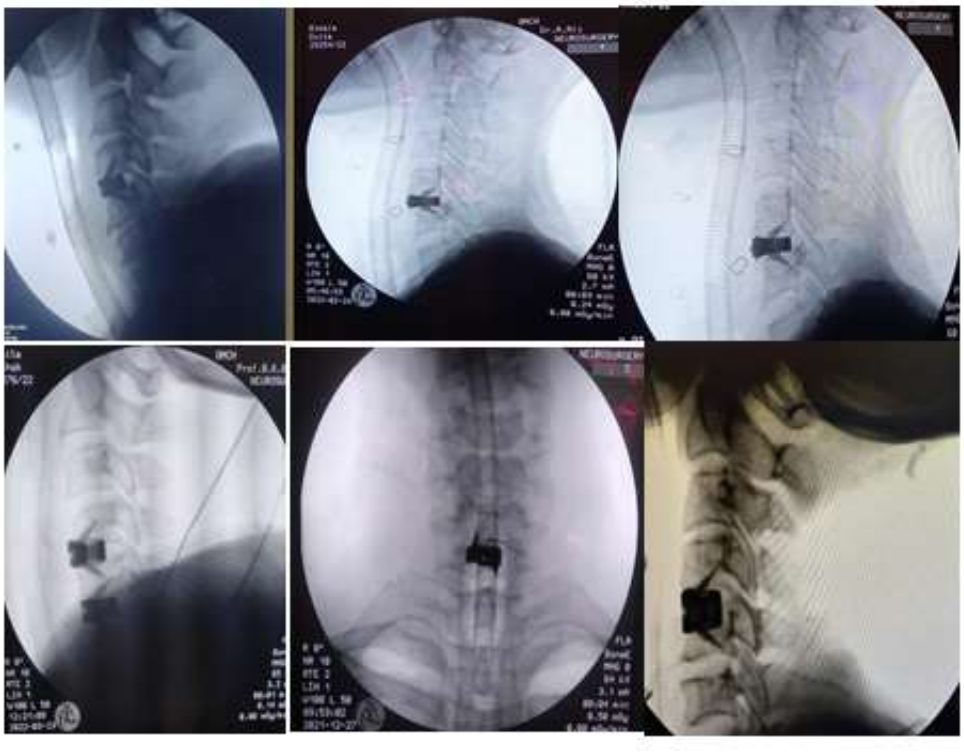

Fig 1: Post op images following Zero profile spacer application

DISCUSSION

ACDF is a well-established surgical treatment for anterior degenerative cervical pathology.ACDF is often done with the use of an anterior vertebral body plate, with the goal of maintaining stability, promoting fusion, preventing graft extrusion, preventing graft subsidence, and maintaining desired cervical lordosis.However, a known morbidity of ACDF with cervical plating is post-operative dysphagia, ranging from 2 to 67% in the post-operative period.[12]With the goal of reducing dysphagia and other perioperative morbidities, stand-alone (SA) ACDF systems like zero profile spacer were developed.Additional potential benefits of SA devices include that they can provide lordotic correction and are anchored with screw fixation. The latter aspect may be relevant in patients with segmental degenerative instability.Despite the introduction of stand-alone cages as an alternative to cervical plating, clinical outcomes appear to be similar between the two groups.

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Scholz et al in their study of 38 patients all operated using zero profile spacer reported of mild dysphagia in only 1 female patient at 3 month and 6 month follow up.[13] Njoku I et al in their study of 41 patients reported of immediate dysphagia in 54.8% patients which completely subsided at 3 month follow up interval.[14]Yan et al in their study of 82 patients reported that none of the 37 patients in the zero profile spacer group reported of dysphagia in the 3 month follow up period.[15] In our study, we found 3 patients with complaints of dysphagia to solids only at 1 month follow up which subsided by conservative measures at the latest follow up.

Scholz et al in their study reported of a reduction in the symptoms mainly neck pain in 90% patients involved in the study in the 3 month follow up period.[13] Njoku et al[14] in their study also report of a statistically significant decrease in the neck pain over the 3 month follow up period. In our study, 98.03% patients reported of a reduction in the neck pain at 6 month follow up which is similar to their studies.

Sommaruga et al in their study reported of an improvement in the Nurick grading in 85% of their patients.[16]In our study, 46 patients (86.7%) had an improvement in the Nurick grading at the follow up period of 1 month.

In our study, stand-alone zero profile application was able to obtain accepted levels of improvement and lesser incidence of dysphagia similar to previous studies[13, 14, 16].

CONCLUSION:

The zero-profile implant for the treatment of CSM patients produced positive outcomes with a low rate of morbidity, indicating that the zero-profile implant is a good substitute for traditional cages and plate fixation.

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