



Clinical study of management of cervical degenerative disease by anterior cervical discectomy with or without fusion versus anterior microforaminotomy

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ABSTRACT

Introduction- Anterior cervical discectomy with or without fusion and anterior microforaminotomy serves as a relatively recent minimally invasive approach that can prevent cervical degeneration and thus improving functional motion segment. The aim of present study was to assess the management of cervical degenerative disease by anterior cervical discectomy with or without fusion versus anterior microforaminotomy.

Material and methods- The present interventional study was conducted at department of neurosurgery of a tertiary care center among 30 patients diagnosed with cervical degenerative disc disease during the study period of one year. The patients were divided into three groups on the basis of approach used. Pain score and radiographic parameters were analyzed pre and post operatively.

Results – The mean age of patients was between 50-60 years and male patients were higher in number as compared to female patients. After surgery the pain score reduces significantly in each group ($p < 0.05$). The comparison of radiographic parameters were non significant with p value > 0.05 pre operatively and follow up period.

Conclusion- ACD with or without fusion and microforaminotomy helped cervical disc disease patients recover. This study found substantial VAS differences for arm and neck pain, but no significant radiographic differences.

Keywords – anterior cervical discectomy, anterior microforaminotomy, cervical degenerative disease, fusion, management, outcome.

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INTRODUCTION

Cervical spine degenerative disc commonly occurs in the elderly population without any significant difference between males and females. The predominant symptom observed in patients is pain. Surgical intervention may be necessary in cases where pain, either alone or in conjunction with other neurological signs, is present. Treatment options vary from nonoperative methods to decompression, instrumented fusion, or a combination of both laminoplasty and instrumentation.[1]

Anterior cervical microdiscectomy (ACD) is a commonly employed surgical procedure for the treatment of cervical disease. Nevertheless, the act of surgically fusing the vertebrae together following decompression is still a subject of debate. Multiple investigations have shown that ACD without fusion produces good outcomes.[2,3] In the majority of these cases, there is a natural fusion of the vertebrae, and there are no difficulties or issues related to the use of instruments or the insertion of graft material (such as complications from using the patient's own bone or the graft material coming out). Subsidence is a common occurrence following Anterior Cervical Discectomy (ACD) without fusion. This leads to a decrease in both the height of the disc and the foraminal height at the level where the surgery was performed. Changes of this nature can result in enduring symptoms. On the other hand, the placement of graft material following ACD achieves the immobilization and distraction of vertebrae at the operated level. This can help avoid the decrease in disc space and size of the intervertebral foramen.[4-6]

These effects have the potential to result in a more favorable outcome. However, multiple studies have demonstrated that surgical fusion following anterior cervical discectomy (ACD) does not effectively prevent subsidence. Additionally, clinical outcomes remain same regardless of whether fusion is performed.[7,8] Microsurgical anterior cervical foraminotomy is a surgical treatment used to treat cervical disc diseases by removing the compressive

pathology while preserving the disc and avoiding the need for fusion surgery. This procedure specifically targets the uncovertebral joint. The development of microendoscopic surgeries by Smith and Foley [9] led to the use of microendoscopic endoscopy systems for the treatment of cervicalopathy [10]. This was motivated by the presence of excessive post procedural discomfort and muscle spasm associated with these surgeries.

Which technique is better for patients has always been a topic of debate hence the present clinical study was done to assess the management of cervical degenerative disease by anterior cervical discectomy with or without fusion versus anterior microforaminotomy.

MATERIAL AND METHODS

The present interventional study was conducted at department of neurosurgery of a tertiary care center among patients diagnosed with cervical degenerative disc disease during the study period of one year. Ethical clearance was taken from institutional ethics committee before commencement of study. Patients were asked to sign an informed consent form after explaining them the procedure.

Thorough convenience sampling a total of 30 patients who were diagnosed with cervical degenerative disc disease was selected. Patients were divided into three groups i.e Group I (n=10) those undergoing anterior cervical discectomy with fusion, Group II those undergoing anterior cervical discectomy without fusion and Group M (n=20) those undergoing microforaminotomy. Inclusion and exclusion criteria are as follows- Inclusion criteria- first cervical surgery, symptoms of cervical disc disease, magnetic resonance imaging findings correlated with clinical picture; single level affected; and either urgent need for surgical intervention or no response to at least 2 weeks of conservative treatment.

Exclusion criteria- Multilevel disc herniation, significant degenerative spinal disorder, The patients with kyphotic posture and any prior percutaneous procedure to address cervical

and/or radicular pain (nucleotomy, chemonucleolysis, epidural steroid injection, or others).

Surgery was done according to protocol prescribed. Preoperative and postoperative static and dynamic radiographs, CT scans, and MRI were collected for all patients. Subsequent static and dynamic radiographs of the cervical spine were taken to evaluate various measurements at the outpatient clinic. These measurements included the C2-7 sagittal Cobb angle (C2-7 CA) at neutral, anterior, and posterior flexion, the C2-7 sagittal vertical axis (C2-7 SVA), T1 slope, cranial tilting, cervical tilting, and the height of the vertebrae and discs in the upper and lower adjacent segments to the treated level. Surgery was done according

to protocol prescribed. VAS score of arm and neck pain was calculated for each group pre and post operatively.

Statistical significance was calculated by using SPSS version 25.0. All data were presented as the mean ± SD. To compare the difference between samples, we used Student’s t-tests; values of P < 0.05 were considered statistically significant.

RESULTS

The demographic data of three group with respect to mean age, gender and mean follow up period was established and represented in table 1. The comparison was non-significant with p value >0.05.

Table 1 Demographic data of patients in three groups

Variable	Group I	Group II	Group III	P value
Mean age (years)	53.23±7.8	54.89±3.9	56.98±4.9	0.067
Male/Female	7/3	6/4	8/2	0.071
Mean Follow up (months)	39.4±2.1	40.2±3.9	38.3±4.1	0.082

The pain score on visual analogue scale was higher for all patients pre operatively. After surgery the pain score reduces significantly in each group (p<0.05) as shown in table 2.

Table :2 Comparison of VAS score among three groups pre and post operatively

Mean VAS	Preoperatively	Group I	Group II	GROUP III	P value
Neck	4.1±1.4	2.13±0.7	2.10±1.2	1.98±0.5	0.034
Arm	8.17±1.9	3.12±1.0	3.03±1.3	2.9±0.9	0.021

Radiographic parameters like C2-7 sagittal Cobb angle (C2-7 CA) at neutral, anterior, and posterior flexion, the C2-7 sagittal vertical axis (C2-7 SVA), T1 slope, cranial tilting, cervical tilting, and the height of the vertebrae and discs in the upper and lower adjacent segments were recorded preoperatively and post operatively at the time of follow up as shown in table 3. The comparison were non significant with p value >0.05.

Table :3 Comparison of radiographic results among three groups preoperatively and post operatively

Radiographic parameter		Preoperatively	Group I	Group II	GROUP III	P value
C2-7 Cobb angle	Neutral	11.8±9.0	12.9±8.5	13.0±8.3	13.5±8.7	0.43
	Anterior flexion	19.5±8.6	17.9±12.0	16.9±11.4	14.9±11.3	0.18
	Posterior flexion	26.1±12.8	26.5±11.6	27.1±10.9	27.9±15.4	0.56
C2-7 SVA		22.3±9.8	21.7±8.8	20.7±7.6	19.8±8.4	0.35
T 1 Slope		22.4±8.9	23.6±8.7	24.1±4.8	24.9±8.5	0.48
Cranial tilting		18.8±5.4	18.9±3.2	19.0±3.9	19.2±7.1	0.87
Cervical tilting		13.4±6.5	14.7±2.7	15.8±6.1	16.4±8.1	0.13



Vertebral body height	Upper	13.4±1.2	13.4±1.1	13.3±1.0	13.3±1.1	0.45
	Lower	13.8±1.2	13.7±1.1	13.5±1.0	13.4±1.5	0.34
Disc height	Upper	6.8±0.9	6.79±0.2	6.75±0.4	6.7±0.3	0.78
	Lower	6.5±1.1	6.4±2.0	6.39±0.8	6.3±1.0	0.75

DISCUSSION

The surgical treatment for cervical spondylosis and discogenic disease is typically categorized into two approaches: the posterior approach and the anterior method. The posterior approach procedures have been in use since 1934. Late in 1950s, and 1990s Robinson and Jho, followed introduced the anterior cervical discectomy and microforaminotomy. This procedure aims to directly relieve compression caused by spondylotic spurs and disc fragments.[11,12]

In our study the pain score decreased in all the groups and results were significant for the pain in neck and arm. In a study done by Oktenoglu T et al they found that The preoperative and 1-year postoperative neck pain scores were 3.18 and 2.81 for group A and 3.22 and 2.0 for group B. The decrease in neck pain VAS values for group A was not significant (P = 0.438). However, the decrease in neck pain scores for group B was significant (P= 0.008) which was comparable with our study.[13]

There were no notable disparities observed in the radiography data before and after surgery across any parameters in our cases . The disc and vertebral height at the upper and lower neighboring segment showed a modest decrease, but there were no significant changes between the preoperative and postoperative states. This observation was consistent throughout the average follow-up period of 18.9 ± 9.9 months. The long-term follow-up assessment was inconclusive. However, we believe that removing a portion of the uncinata process does not impact the alignment change. In 1976, Hakuba [14] proposed the transuncodiscal approach, a surgical technique that involves a combination of anterior and lateral approaches to access cervical discs. Furthermore, other from removing the uncovertebral joint, the complete disc was also

excised, together with the osteophyte on the same side and the uncinata process on the opposite side. In 1989, Snyder and Bernhardt [15] reported a method called anterior cervical fractional interspace decompression for treating cervical radiculopathy. Decompression was executed using a high-velocity 5 mm burr in the outermost third of the intervertebral disc, specifically within a 3 mm range surrounding the nerve root. Jho (1996) introduced a modified method that involves total exposure of the vertebral artery. [16] The complete uncinata process is excised. In 2006, Lee introduced a technique called small keyhole transuncal foraminotomy.[17] The patient has unilateral cervical radiculopathy, with the intervertebral disc remaining intact. The drilling was performed at a slight angle towards the center, approximately 10-20°, and fairly parallel to the space between the vertebrae in the upper direction. Our approach differs significantly from Jho's and Lee's procedure in terms of drilling and conserving the lateral side of the uncinata process. Additionally, the vertebral artery (VA) remains unexposed. We do a partial dissection of the longus colli muscle and begin drilling at the midpoint of the uncinata process, continuing towards its base to fully perform foraminotomy. This procedure is often done through a small opening, measuring 7 mm in diameter.

Multiple authors have documented the effectiveness of different types of anterior foraminotomy. However, Matz conducted a comprehensive review on the criteria and usefulness of anterior cervical nerve root decompression.[18] The success rates ranged from 52% to 99%, although the occurrence of recurring symptoms was as high as 30%. However, the effectiveness of posterior cervical foraminotomy for cervical radiculopathy has been studied. Mc Anany et al conducted a



review and found that there was no significant difference in the overall results between a typical open foraminotomy and a minimally-invasive foraminotomy using a tubular retractor.[19] The combined clinical success rate was 92.7% for open foraminotomy and 94.9% for minimally-invasive foraminotomy.

The present study has some limitations firstly it was the sample size of patients was small and secondly it was single center study with limited staff and surgeon hence results of the study could not be accountable for all individuals and choosing the right approach for each patient is necessary for better results

CONCLUSION

From the present study it was concluded that both the ACD technique with or without fusion and microforaminotomy were helpful in recovering patients with cervical disc disease. This study documented that there were significant difference in outcome of VAS data for arm pain and neck pain while radiographic data does not show significant differences for any parameter.

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