Role of Anterior Cervical Discectomy and Titanium Cage Fusion in patients with Degenerative Cervical Spine Disease.

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ABSTRACT

Objective: To determine the functional and radiological outcome of anterior cervical discectomy and titanium cage fusion in patients with degenerative cervical spine disease.

Methods: This descriptive study was conducted in Orthopaedic and spine unit Ziauddin Hospital Karachi from 23rd January 2017 to 23rd March 2022.All patients with painful single level degenerative cervical spine disease fulfilling the inclusion criteria were treated with anterior cervical discectomy and titanium cage fusion. Post operative functional outcome at one year follow up was assessed with Neck Disability Index (NDI) score and compared with pre operative score. The pre operative and post operative quality of life and pain intensity was measured with EQ-5D-5L score and Visual Analogue Scale (VAS) respectively. Post operative radiographs were assessed for fusion, cage subsidence and kyphosis.

Results: We operated 38 patients of degenerative cervical spine disease with anterior cervical discectomy and titanium cage fusion. The mean NDI improved from a pre-operative score of 43/60 (moderate disability) to 21/60(mild disability) post operatively($p<0.05$). The VAS significantly improved($p<0.05$)from pre operative 8 (severe pain) to post operative 3(mild pain).The average EQ-5D-5L index increased from 0.52 (12/25) to 0.77 (7/25) (Mild pain). Radiographically fusion was achieved in all patients. No kyphosis was noted in any patient. Segmental subsidence(1.5 mm /2.6%) was noted in 1(2.63%) patient.

Conclusion: We achieved excellent functional and radiological outcome with anterior cervical discectomy and titanium cage fusion in patients with symptomatic degenerative cervical spine disease. We therefore recommend this technique as treatment of choice for single level degenerative cervical spine disease.

Keywords: Cervical Discectomy**,** Cervical Fusion, Degenerative Spine Disease, Titanium Cage.

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INTRODUCTION

Anterior Cervical Discectomy and Fusion (ACDF) is believed to be the utmost trusted and experimentally proven surgical process for advanced degenerative cervical spine disease.[1] Spine surgeons use various graft materials to enhance the fusion in ACDF surgery.[1,2] Auto grafts are usually the first choice but their associated morbidities can not be overlooked.[2] To minimize the complications of auto grafts cages have been introduced in ACDF surgery for the purpose of inter body fusion and a variety of cages are available in the market.[3] The most frequently used cages are Polyetheretherketone (PEEK) and Titanium cages. The PEEK cage is a radiolucent biocompatible.[4] It is composed of carbon fibre reinforced polymers, titanium, and polyetheretherketone.[5] Titanium cages(TTN) are dome-shaped construct with 80 percent porosity content and have diamond pores of 60µm diameter.[6]

It has a solid and cellular implant architecture.[7] TTN cages exhibit hydrophilic property which contribute to maximum blood contact in vivo and accelerate the attachment of proteins, mesenchymal cells and bone cells and ultimately lead to an improved fusion.[8] Excellent functional and radiological outcome has been reported with TTN when used for cervical fusion in patients with anterior cervical discectomy.[9,10]

The objective of our study was to determine the functional and radiological outcome of anterior cervical discectomy and titanium cage fusion in patients with degenerative cervical spine disease.

METHODS

We conducted this descriptive study in Orthopaedic and spine unit Ziauddin Hospital Karachi from 23rd January 2017 to 23rd March 2022.All adults patients with both gender and symptomatic single level degenerative cervical spine disease with failed conservative treatment were included in this study. Patients with traumatic spine injuries, previous cervical spine surgeries, infections, tumours and multilevel instability were excluded. The study protocol was approved by the Institutional Review Board of our hospital. Informed consent for surgery and publications of the results were taken from all study participants. Complete history and physical examination was undertaken in all patients. Relevant radiographs, MRI spine and laboratory investigations were done in all patients.

All the surgeries were performed under general anaesthesia and by the same surgical team using standard Smith-Robinson approach. Intra-operative image intensifier was used for identifying the diseased level. In all cases micro discectomy was carefully carried out after which removal of posterior cervical osteophyte and decompression of the neural elements by excision or opening of the posterior longitudinal ligament was performed. Haemostasis was achieved after titanium cage was used for interbody fusion. Post operatively soft cervical collar was applied to every patient. Follow up visits were scheduled at 2 weeks initially and then fortnightly till one year. In each visit cervical radiographs were assessed for fusion, cage subsidence and kyphosis. The fusion criteria included solid bone ingrowth visible at the cage with pain free neck movement and negligible tenderness at posterior column. Subsidence was positive if a segmental height drop of at least 3 mm and cervical kyphosis progression of at least 5° at six months following surgery was noted. Functional outcome was assessed with Neck Disability Index (NDI) score.[11] The NDI is a 10-item valid survey that assesses a patient's self-reported neck discomfort in relation to the impairment and results are interpreted as no disability (0–4 points), mild disability (5–14 points), moderate disability (15–24 points), severe disability (25–34 points), and complete disability (35-50 points).The quality of life was assessed using the EQ-5D-5L score.[12] The EQ-5D-5L is a descriptive system that evaluates patient Mobility,Self care, Usual Activities, Discomfort and Anxiety/Depression. The results of EQ-5D-5L score are graded as No problems, Slight problems, Moderate problems, Sever problems and Extreme problems by ticking in the appropriate box in each of the 5 statements. The pain intensity of neck and arm was measured with Visual Analogue Scale (VAS) from 0 to 10 where 0 represents no pain and 10 represents the extreme pain.[13]

The data was analysed with SPSS software version 24.Descriptive statistics were used for calculating frequency, percentages, means and standard deviations while inferential statistics were used for calculating *P* value. Numerical data were compared using paired t- test. One factor analysis of variance (ANOVA) was used to compare scores of NDI, EQ-5D-5L and VAS. *P* value<0.05 was considered significant.

RESULTS

In this study 38 patients were included. Female patients were 25(65.78%) and males were 13(34.21%).The mean age was 55±3.1.The most common site was C5C6 in 20(52.63%) patients followed by C4C5 in 18(47.36%) patients.Pre operative cervical radiculopathy was noted in 24(63.15%) and myelopathy in 14(36.84%).

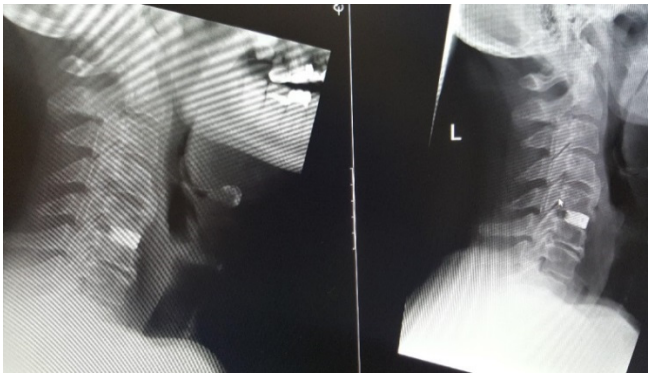

Figure I: Post operative radiographs of a 45 years old man who underwent anterior cervical discectomy and fusion using titanium cage.

The cage size varied from 5 to 7 with 6 size being the most frequent size used.(Fig I)The mean NDI improved from a pre-operative score of 43/60 (moderate disability) to 21/60(mild disability) post operatively ($p<0.05$). The VAS statistically improved ($p<0.05$) from pre operative 8 (severe pain) to post operative 3 (mild pain). The average EQ-5D-5L index increased from 0.52 (12/25) to 0.77 (7/25) (Mild pain). Radiographically fusion was achieved in all cases. No kyphosis was noted in any patient. Segmental subsidence (1.5 mm/2.6%) was noted in 1(2.63%) patient. No major complication or revision was reported in our series.

DISCUSSION

Interbody spacers are available in a variety of forms and sizes and are constructed from a variety of materials.[14,15] We used titanium cage for fusion and achieved successful fusion in all cases. Moreland *et al* [16] achieved fusion in 78% patients in their series with improvement in VAS and Oswestry pain and disability index. Hauerberg[17] compared anterior cervical discectomy with or without fusion with Ray titanium cage and documented no statistically significant difference in both groups in terms of severity of pain and patient satisfaction. The rate of fusion however was found to be slightly higher in cage group.Kim[18] evaluated the clinical and radiological outcome of anterior cervical disc fusion using Hydroxyapatite spacer and noted complete interbody fusion with correction of prekyphotic deformities. Our follow up period was one year. Rohe[19] treated 44 patients with single level titanium cage and followed for seven years and noted excellent clinical outcome in his series. Junaid[20] compared cervical titanium cage with PEEK in 149 patients and noted no significant difference in functional and radiological outcome at one year follow up. Sugawara and colleagues [21] treated 41 patients with ACDF and titanium cages and noted 95% fusion rates and excellent and good outcome in 80% of their patients as per Odom's criteria at 5 years follow up, These authors however noted adjacent symptomatic disc degeneration in about 5% in their series with 2% of their patients requiring additional surgeries. Singh[22] is of the opinion that titanium cage filled with cancellous bone graft is a safe and effective alternative to tricortical autograft and plating with cessation of symptoms and provision of adequate stability. Mark[23] compared 49 patients of titanium cage and 23 patients of PEEK. At one year follow up NDI of titanium group improved from 41.2 to 19.4 with 77.1% patients had complete recovery. The fusion rate was 91% in titanium group and 90% in PEEK group at the end of one year. The titanium group had faster consolidation than PEEK group.

There are few limitation of our study. Our sample size was small. The follow up period of our study was short. Further studies are therefore recommended to confirm our results.

CONCLUSION

We achieved excellent functional and radiological outcome with anterior cervical discectomy and titanium cage fusion in patients with symptomatic degenerative cervical spine disease. We therefore recommend this technique as treatment of choice for single level degenerative cervical spine disease.

Conflict of Interest: None

Grants/Funding: None

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