ORIGINAL ARTICLE

# Mid to Long-term Outcome of Anterior Cervical Discectomy with Fusion

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## *ABSTRACT*

**Background:** *Cervical degenerative conditions such as intervertebral disc prolapse and degenerative cervical spondylosis results in pain and disability, especially in the middle age and elderly. The treatment of choice is surgical decompression once conservative treatment fails. We studied the outcome of anterior cervical decompression with instrumented fusion in order to analyse its effectiveness in terms of pain and disability improvement.*

***Materials and Methods:*** *This is a retrospective descriptive study. 30 patients were operated during June 2013 and May 2015 (2 years). All patients operated for cervical degenerative conditions were included.Data was collected about neck pain and functional impairment preoperatively using visual analogue scale (VAS) and Japanese Orthopaedic Association (JOA) scores. The same scales were used during the follow-period for 6 months. Favourable outcome was defined as 50% reduction in pain and functional improvement to Grade 1 (12 – 15) or normal scores (16 – 17).*

***Results:*** *Mean age was 59.70 years ±8.12SD.Mean preoperative VAS was 6.70 and it was 1.80 ± 0.85 SD at 6 – month follow-up. Mean JOA score was 11.57 preoperatively while at 6-month follow-up, it was 14.97 ± 1.92 SD. There was a significant difference between mean VAS score preoperatively and mean VAS score postoperatively (mean difference; 4.9, 95% CI; 4.48 to 5.32, $p < 0.001$, $t(29)$: 23.86). Similarly, there was statistically significant difference between mean JOA score preoperatively and mean JOA scores postoperatively (mean difference; -3.4, 95% CI; -3.95 to -2.85, $p < 0.001$, $t(29)$: -12.61).*

***Conclusion:*** *Anterior cervical decompression with graft placement and instrumented fusion are safe and effective methods for relieving pain as well functional improvement in patients with cervical radiculopathy and myelopathy.*

***Keywords****: Cervical spondylosis, myelopathy, anterior cervical discectomy, fusion, surgical outcome.*

## INTRODUCTION

Cervical degenerative disorder is a chronic condition affecting usually the elderly and middle aged and impai-ring functional performance, limiting their daily lives.[1] Neck with arm pain, gait disturbance, bowel and bladder dysfunction and hands weakness are usually the presenting symptoms of cervical canal stenosis due to these degenerative conditions.[1,2] The commonest modality after failure of conservative treatment is surgical decompression which is proving beneficial after results of long-term studies emerge.[3, 4]

In our setup, the anterior approaches for cervical degenerative disorders management is faced with several disadvantages which ranges from expertise of the treating surgeons, to availability of operative equipment and affordability of the patient due to high prices of the metallic devices.[5] However, despite all the odds, the practice of anterior decompression in cervical radiculomyelopathies is continuing at many prestigious tertiary care centres.The aim of the anterior cervical decompression procedures is to effectively decompress the cord in order to relieve pain and functional impairments which are the results of chronic nerve root or cord compression. Two fundamental techniques have

been in practice for the anterior approach, which are, the Smith – Robinson technique[6] and Cloward technique.[7]

A diverse variety of anterior surgical techniques have been introduced in order to solve the problems associated with the old techniques and to further improve patient outcomes in terms of pain relief and functional improvement.[8-10] Although very well tolerated by patients, cervical decompression with grafting and fusion have been associated with some adverse events over long-term.[11,12] However, further long-term studies are required to document the long-term positive as well as negative outcomes for this modality of treatment.

Our aim, therefore, was to see the mid to long-term outcome of anterior cervical decompression with instrumented fusion.The primary goals would be to record the long – term pain and disability improvement, and secondary goals of the study are to record any long – term complications.

## MATERIALS AND METHODS

This is a retrospective descriptive study of patients operated between June 2013 and May 2015 (24 months) where we analysed the postoperative outcomes as reported by patients during their follow-up. The study was conducted with the approval by the institute's ethical committee.

### Data Collection

Patient charts were reviewed for preoperatively recorded pain scores and disability indices. Early postoperative improvement in pain was also reviewed in charts. The long – term follow-up data was collected in a prospective manner when the patient presented to the outpatient department for review at three and six monthly intervals. Pain scores were recorded both pre- and postoperatively in terms of VAS and functional impairment or improvement was judged using the JOA scores. Significant pain relief was defined as $\geq$ 50% reduction in VAS scores as compared to preoperative score (Effective Pain Relief), while favourable functional improvement was defined as disability reduction to Grade 1 or Normal Grades of the JOA index. Cases where either the function or pain worsened or remained static and those who developed significant postoperative complications were classified as having unfavourable outcome.

### Inclusion Criteria

Patients of either gender and age and with one to two levels of cervical spine involvement, who were operated for cervical degenerative disorders with the anterior approach with fusion were included in the study.

### Exclusion Criteria

Patients with more than two levels, those with other pathologies such as tumours, ossification of posterior longitudinal ligament, syringomyelia or those who were operated without metallic fusion were excluded.

### Procedure

After aseptic measures a bicortical bone graft was harvested from iliac crest of the patient. After incision a layer by layer dissection was used to reach the level of the intended intervention. Vertebral level was confirmed using intraoperative fluoroscopy. After the decompression foraminal patency was confirmed. Haemostasis was established using spongestone and cottonoids. Graft or cage with bone graft was placed in the resected space. Anterior fixation with interlocking plates was done where indicated. Position of the plate and sagittal alignment was confirmed intraoperatively using fluoroscopy. Wound was closed in layers after adequate washing and haemostasis.

### Data Analysis

IBM SPSS Statistics (version 22.0) was used for data entry and analysis. P value $\leq$ 0.05 was defined as statistical significance level. Independent sample t-test and paired sample t-tests were run to determine the significance of difference between pre- and postoperative scores.

## RESULTS

30 patients with 20 (66.7%) males and 10 (33.3%) females were included in the study **(Table 1)**. Mean age was 59.7 years ± 8.12 SD. The mean symptoms duration was 13.83 months ± 9.10 SD. The overall mean postoperative length of stay was 4.17 days ± 1.0 SD **(Table 2).**

### Clinical Features

Neck pain was present in 20 (66.7%) patients, radicular symptoms in 16 (53.3%) cases and 13 (43.3%) patients presented with sensory deficits. Myelopathy was noted in 13 (43.3%) cases with 13 (43.3%) cases

**Table 1:** *Clinical Features and their Frequencies.*

| Clinical Features | Frequency | Percentage |
|---|---|---|
| **Gender** | | |
| Male | 20 | 66.7% |
| Female | 10 | 33.3% |
| **Neck pain** | 20 | 66.7% |
| **Arm pain** | 16 | 53.3% |
| **Sensory deficits** | 13 | 43.3% |
| **Hand weakness** | 13 | 43.3% |
| **Reduced neck ROM** | 16 | 53.3% |
| **Gait disturbance** | 14 | 46.7% |
| **Cervical level** | | |
| C5 – C6 | 13 | 43.3% |
| C4 – C5 | 11 | 36.7% |
| C3 – C4 | 6 | 20.0% |
| **Complications** | | |
| Bleed | 3 | 10.0% |
| Dysphagia | 13 | 43.3% |
| Hoarseness | 2 | 6.7% |
| Transient Weakness | 3 | 10.0% |

of hand weakness and 14 (46.7%) cases with gait disturbance. Clinical features are presented in **Table 1**.

### Prognostic Scores

The mean procedure time was 247.00 minutes ± 20.45 SD **(Table 2)**. Mean preoperative VAS was 6.7 ± 1.05 and mean postoperative VAS at 6 months was 1.8 ± 0.85. Similarly, mean preoperative JOA score was 11.57 ± 2.81 and mean postoperative JOA score was 14.97 ± 1.92. A linear correlation was noted between preop and postop JOA scores ($R^2$: 0.76) **(Figure 1).**

### Pre- and Postoperative Comparative Analysis

Paired samples t-test was run in order to determine any significant mean differences between the preoperative and postoperative VAS pain scores and JOA scores. There was a significant difference between mean VAS score preoperatively and mean VAS score postoperatively (mean difference; 4.9, 95% CI; 4.48 to 5.32, $p < 0.001$, t(29): 23.86). Similarly, there was statistically significant difference between mean JOA score preoperatively and mean JOA scores postoperatively (mean difference; -3.4, 95% CI; -3.95 to -2.85, $p < 0.001$, t(29): -12.61). These results show that overall outcome for anterior surgical intervention with fusion in cervical degenerative disorders is good with significant impact both in terms of pain relief and functional improvement.

## DISCUSSION

Clinical symptoms such as neck and limbs pain, movement restriction and weakness are frequently associated with cervical degenerative disorders.[13] Positive results have been described in various studies for anterior cervical decompression and fusion.[14] The main goals of cervical decompression and fusion are to relieve pain and improve functional impairment.[1]

Surgical approach in cervical stenosis due to disc or osteophytes formation is dependent upon the site of compression.[15] Favours for anterior cervical decompression are due to its efficacy in relieving pain and functional impairment and at the same time reduced occurrence of complications such as adjacent segment degeneration, kyphosis development and failure of decompression.[14,16] In a long – term prospective rando-

**Table 2:** *Quantitative Variables and Related Statistics.*

| | Patient Age | Symptoms Duration | Preop JOA Score | Preop VAS | Procedure Time in Min | Length of Hospital Stay | VAS at 6 Months Postoperative | JOA At 6 Months Postoperative |
|---|---|---|---|---|---|---|---|---|
| Mean | 59.70 | 13.83 | 11.57 | 6.70 | 247.00 | 4.17 | 1.80 | 14.97 |
| Median | 63.00 | 12.00 | 11.00 | 6.50 | 250.00 | 4.00 | 2.00 | 15.50 |
| Mode | 63 | 4[a] | 11 | 6 | 260 | 4 | 1 | 17 |
| Std. Deviation | 8.129 | 9.109 | 2.812 | 1.055 | 20.452 | 1.053 | .847 | 1.921 |

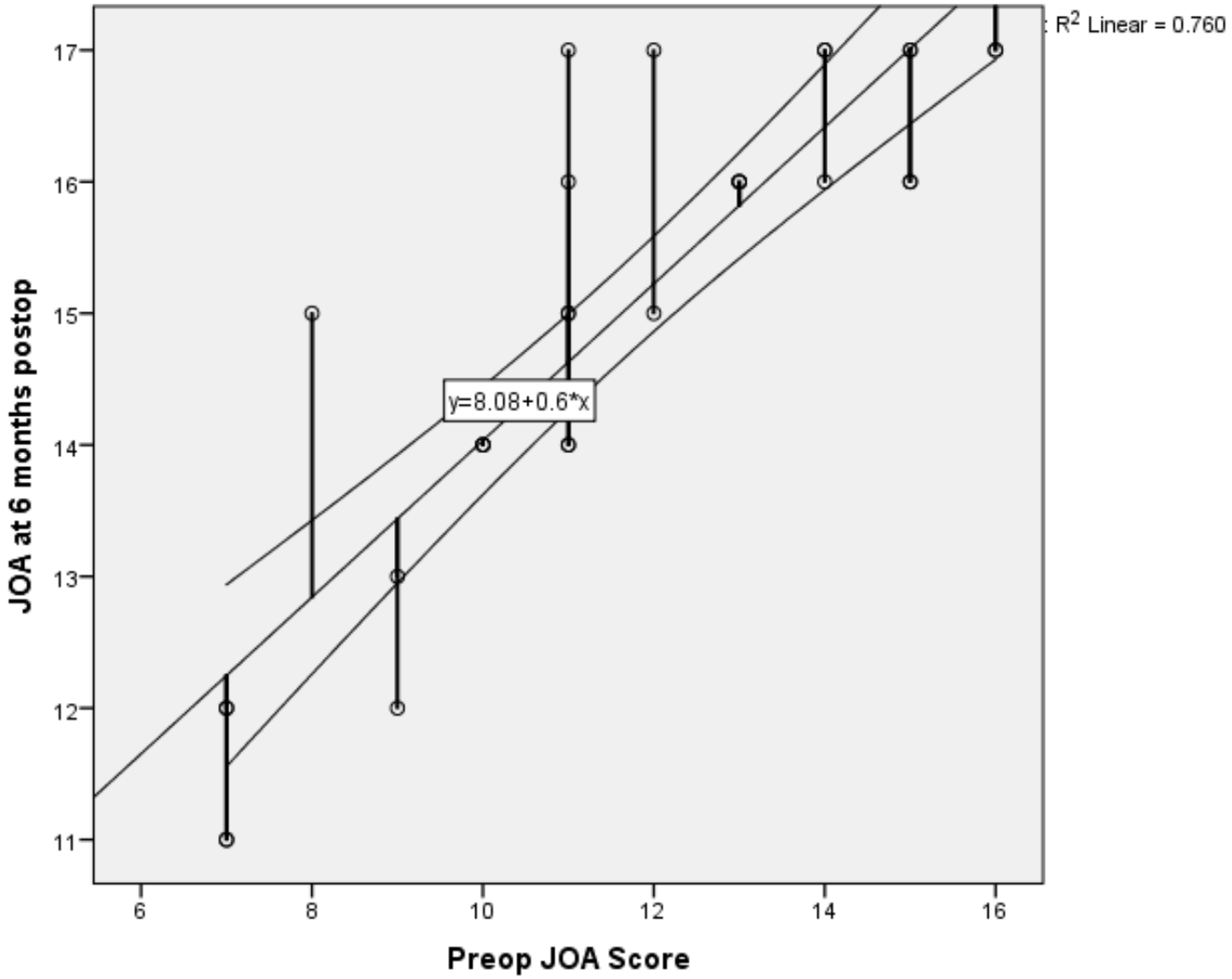


**Figure 1:** *Pre- and Postoperative JOA Scores at 6 – Month Follow-up (Correlation Plot).*

mised study, Abd – Al-Rahman N et al[17] evaluated the clinicoradiological outcomes for patients undergoing ACDF versus going only ACD. Their findings were, a significant association of ACD without fusion with kyphosis ($p = 0.02$), decreased union rates and less patient satisfaction as compared to ACDF. However, they found good clinical improvement in pain and disability. Similarly, Oktenoglu T et al,[18] reported that both ACD and ACDF were comparable in achieving pain relief and functional improvement, however, ACDF was superior to ACD in terms of neck pain improvement and disc space plus neural foramen height achievement.[18] In our subset of patients, good overall pain and disability improvement was achieved within the 6 – month follow-up. This shows that carefully selected patients can achieve the desired levels of pain relief and functional improvement.

Bjarne L et al,[19] has compared the effects of different fusion techniques for the achievement of pain relief, their conclusions were that EPR was achieved in all patients irrespective of fusion technique application. They also noted that 48% of the operated patients returned to work within 6 months of surgery and only 11% of patients were rated as treatment failures.[19] Treatment success in terms of pain relief and functional recovery is a very encouraging factor, however, failure or deterioration after surgical intervention is particularly alarming and should be looked into very carefully. In our study, 50% achieved normal function scores (16 and 17 points on JOA scale), 43.3% patients achieved grade 1 scores (12 – 15 points on JOA scale) while 6.7% fell under grade 2 (JOA scores: 8 – 11). We noted a strong correlation ($R^2$: 0.76) between preoperative JOA scores and functional outcome in terms

of postoperative JOA scores improvement. This shows that higher the myelopathic findings of a patient, the lesser are the chances of postoperative improvement. However, from our study we cannot draw a cause and effect relationship due its retrospective nature.

Although we face many constraints in terms of equipment, higher patient loads and somewhat compromised in-patient care facilities, the outcome goals in our study are encouraging and particularly important with respect to proper patient selection. In our study, as discussed earlier, the only drawbacks of ACDF is longer operation times (mean: 247.00 minutes) and somewhat higher costs of fusion instruments (plates and cages). Recent evidence favours ACDF for managing patients of cervical spondylosis, and most studies have advised to go for at least some kind of instrumented fusion procedure, once the graft has been place.[20,21] There are several benefits of instrumented fusion and patients should not be deprived of these benefits. Chesnut RM et al[20] in their study has particularly advised to utilise the benefits of fusion procedures in order to give the patients longer term benefits and reduce complications.

In our study there was no mortality with majority (43.3%) of patients experiencing dysphagia, hoarseness, transient weakness and intra- and postoperative bleed from the wound. We however, did not record any cases of urinary problems, postop CSF fistula or significant recurrent laryngeal nerve palsies. Fountas KN et al,[22] in a large retrospective study and systematic analysis has enumerated several kinds of complications which are particularly associated with ACDF, namely postoperative dysphagia (9.5%), postoperative haematoma (5.6%), 3.1% cases of recurrent laryngeal nerve palsy, 0.5% of CSF fistulas and oesophageal perforations. They noted a procedure related mortality of 0.1%. An emphasis should be placed by every neurosurgeon to reduce the occurrence of these complications as they are very bothersome and although the surgery may relief pain and disability but a new kind of disability may be introduced in the form of these complications. However, if complications do occur, then they should be managed promptly and with great care.

Smaller sample size and retrospective nature of our study are its main weaknesses. Larger studies with prospective randomised and long-term follow-up are advised in order to better delineate the benefits of this procedure.

## CONCLUSION

ACDF is a safe procedure for anterior cervical decompression in various degenerative disorders with good mid – to long – term results of pain relief and functional improvement. The procedure should be given priority over other procedures once indicated and if the patient can afford it.

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