The Efficacy of Plate Construct Augmentation versus Cage Alone in Anterior Cervical Fusion

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Abstract: Aim: to compare and analyze the radiologic and clinical outcomes of anterior cervical discectomy and fusion (ACDF) using cages alone or cages and anterior plating for the surgical treatment of multilevel degenerative cervical disk disease to evaluate short-term efficacy of metal plate augmentation. Material and Methods: A retrospective randomized controlled study on 20 cervical disc disease patients. Results: The patients were classified into group I using cages alone (ACDF-CA) and group II with cages and plate construct (ACDF-CPC). There were no complications related to the surgical approach. All patients achieved good overall pain and disability improvement within the first 3-month follow-up. This shows that carefully selected patients can achieve the desired levels of pain relief and functional improvement. Conclusion: Although plate method was superior to cage alone method in terms of preserving alignment and disc height achievement, Short-term outcome were almost the same.
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Key words: Cervical plating, Neck pain, Radiculopathy, Stand-alone PEEK cage

1. Introduction:

ACDF has become a standard surgical procedure for treating degenerative disk disease associated with radiculopathy or myelopathy. (Assietti et al, 2012).

Although stand-alone ACDF using cages alone can provide favorable outcomes, many surgeons have mentioned about the development of cage subsidence which may cause segmental kyphosis, acceleration of adjacent segment disease, and a decreased rate of fusion. (Abdelwahab et al, 2014).

Therefore some surgeons prefer to add an anterior plate to enhance stabilizing properties.

We are going to compare and analyze the radiologic and clinical short outcomes of ACDF-CA and ACDF with cage and plate construct (ACDF-CPC) for the surgical treatment of multilevel degenerative cervical disk disease to evaluate the efficacy of metal plate augmentation.

2. Patients and methods:

Study design:

A comparative study of a clinical series of 20 patients with degenerative cervical disc treated by ACDF using either cages alone ACDF-CA or cages and anterior plating ACDF-CPC.

Inclusion criteria are patients who present with radicular or myelopathic symptoms due to herniated cervical discs or cervical spondylosis and failed to respond to medical treatment.

We exclude from this study Patients with trauma, infection, neoplasms, or those with history of prior cervical surgery.

Surgical procedure:

Surgical procedures were carried out using the common anterolateral approach according to Smith-Robinson via a right-sided skin incision. The posterior osteophytes and any sub-ligamentous fragment were removed. Gentle decortication of the endplates was performed with a drill or curette. Interbody fusion is achieved using cervical cages alone or cages with anterior plating. Closure was done in the usual manner. Postoperatively, all patients wore a hard neck collar for approximately 6-8 weeks.

Postoperative Outcome assessment included:

Patients were assessed postoperative for both neck pain and brachialgia. Patients had immediate postoperative X-ray (AP and Lateral views) to assess proper instrumentation placement. The postoperative clinical and radiological results were compared with preoperative status. Functional outcome also assessed according to odom criteria which was classified into excellent, good, satisfactory and poor.

3. Results:

The study was done upon 20 patients, 10(50%) underwent cage and plating, while 10(50%) underwent cage alone fusion.

Among the plate group, there was 9 males (90 %) and 1 female (10 %), while regarding the cages alone group, there was 4 males (40 %) and 6 females (60 %.).

In the studied group the age ranged from 35 to 64 years with a mean of 53.65 year and SD 7.98. In the plate group the age ranged from 47 to 64 years with a mean of 57.4 year and SD 6.12, while in the cage group the age ranged from 35 to 61 years with a mean

of 49.9 year and SD 7.85.

Regarding the distribution of the clinical picture among the two studied groups, there was 3 patients (15%) of the plate group complaining of radiculopathy, while in the cage alone group 8 patients (40%) complained of radiculopathy.

In comparison of levels of decompression in this study, 17 patients underwent decompression of double level (85%) and 3 patients underwent decompression of three levels (15%).

The most common operated level was C5-6 (39.53%) followed with C4-5 (27.91%) and C6-7 (18.60%). In the plate group the most common level was C5-6 (42.2%) followed by C4-5 (21.1%), while in the cage group the most common level was C5-6(46.2%), followed by C6-7 level (23.1%).

Regarding the functional outcome in the plate group 6 patients had excellent outcome, 3 patients had good outcome, 1 had satisfactory and none had poor outcome, while in the cage group 8 patients had excellent outcome, 2 had good outcome and none had satisfactory nor poor outcome.

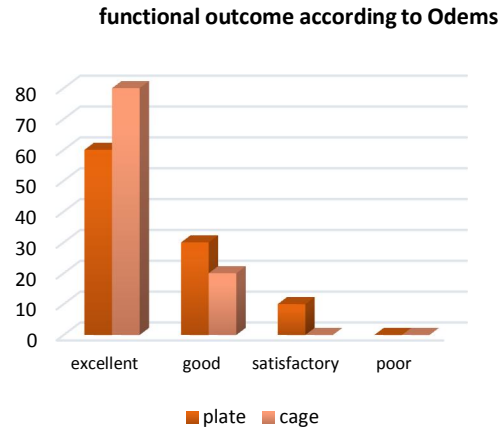

Fig 1: functional outcome according to Odom.

A 58 years old male with history of gradual onset of weakness on the left upper limb 2 months ago associated with left brachialgia. The weakness was progressive in course. No urinary or stool incontinence. On examination there was weakness grade 4 at elbow flexion and hand grip. Immediately Post-operatively the radiating pain improved. On the 3rd month visit weakness was improved.

Fig 1: MRI image showing prolapsed C4-5, C5-6, c6-7 discs.

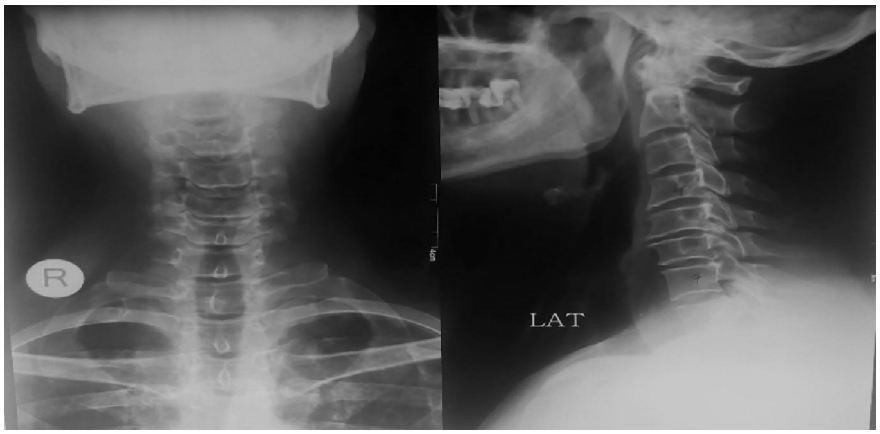

Fig 2: Pre-operative X-ray (AP & Lateral view)

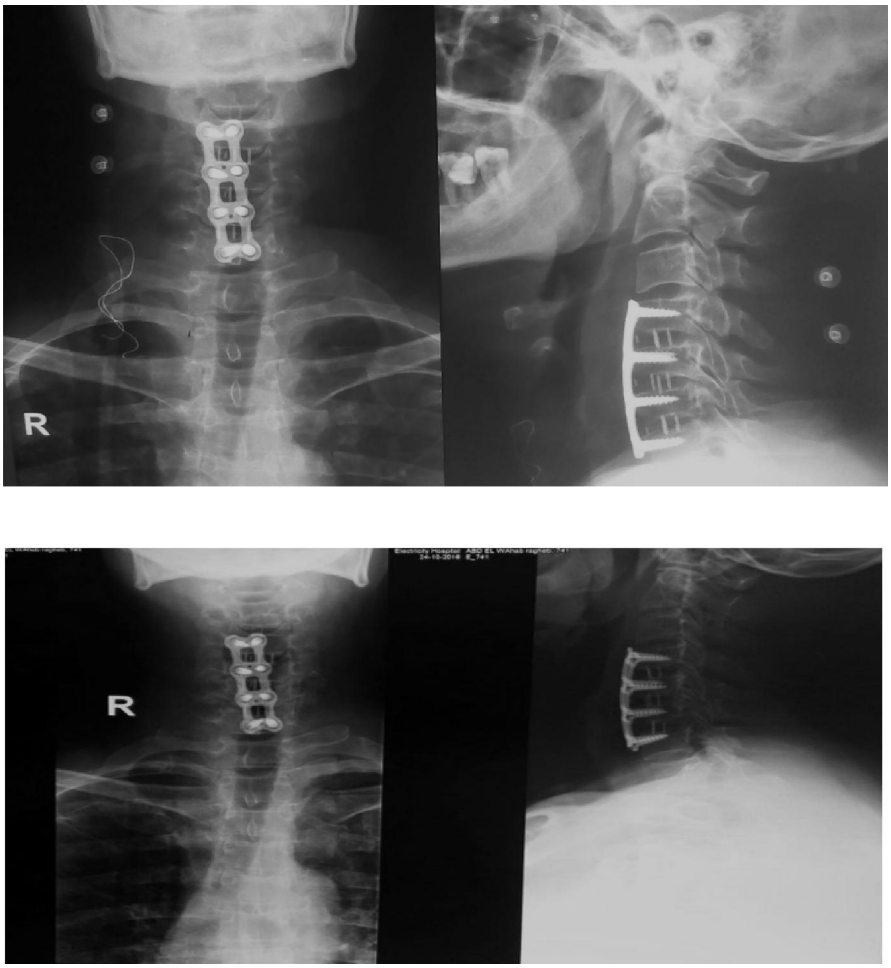

Fig 4: 3months post-operative. (AP & Lateral view).

4. Discussion:

Anterior cervical discectomy and fusion (ACDF) is the gold standard treatment for cervical disc herniation.

Many technical modifications have been reported since its original description by **Smith and Robinson** and the later report by **Cloward in 1958**.

ACDF using an intervertebral cage is credited with promoting instant stability, restoration of the neural foraminal height and interbody fusion.

PEEK cages are currently the most preferred. Compared with titanium and carbon fiber cages, PEEK cages are more biocompatible and radiolucent, which allows good radiological evaluation.

Our study was a prospective study that was conducted on 20 patients with cervical disc prolapse who were surgically treated by ACDF. Patients were classified into 2 groups; group 1 (N=10) in whom interbody fusion was done using stand-alone cage, and group 2 (N=10) in whom interbody fusion was done by cage augmented by anterior cervical plating.

The addition of an anterior plate system reduces the problem of graft extrusion and collapse but is itself associated with problems such as screw or plate dislodgement, dysphagia, and soft-tissue injury.

To decrease the risk of such complications, several types of interbody fusion cage have been developed recently and are used widely in clinical practice.

In the studied group the age ranged from 35 to 64 years with a mean of 53.65 year and SD 7.98. In the plate group the age ranged from 47 to 64 years with a mean of 57.4 year and SD 6.12, while in the cage group the age ranged from 35 to 61 years with a mean of 49.9 year and SD 7.85. There was no statistical significant difference between both groups.

Regarding the clinical picture, the most common presentation was radiculopathy with 55%, after which came myelopathy with 25% and radiculomyelopathy with 20%.

In this study, the distribution of the clinical picture among the two studied groups, there was 3 patients (15%) of the plate group complaining of radiculopathy, while in the cage alone group 8 patients (40%) complained of radiculopathy.

In comparison of levels of decompression in this

study, 17 patients underwent decompression of double level (85%) and 3 patients underwent decompression of three levels (15%).

Regarding the plate group 8 patients (80%) were double level and 2 patients (20%) were three levels. While in the cage alone group there was 9 patients with double levels (90%) and 1 patient with three levels (10%).

The most common operated level was C5-6 (39.53%) followed with C4-5 (27.91%) and C6-7 (18.60%). In the plate group the most common level was C5-6 (42.2%) followed by C4-5 (21.1%), while in the cage group the most common level was C5-6(46.2%), followed by C6-7 level (23.1%).

This prevalence can be explained by the concentration of forces at that level during neck flexion, or the decrease of canal diameter in relation to the cord diameter which makes this level more sensitive to disc prolapse. (vavruch et al, 2002).

All the operated levels showed evidence of starting fusion during our short term follow up.

In this study we followed our patients immediate postoperative, three months and six months post-operative, where we evaluated subjective clinical signs and radiological finding by x-ray.

The aim of our study is to determine the short-term outcome results of cervical decompression techniques with or without instrumented plate. We also aim to evaluate the impact of these surgical procedures in terms of pain relief and improvement in individual function.

In our study there were no complications related to the cages as extrusion, cage sinking at the vertebral bodies. We did not use the known measure to assess cage subsidence as there was no constant scale for all the images.

All patients achieved good overall pain and disability improvement within the first 3-month follow-up. This shows that carefully selected patients can achieve the desired levels of pain relief and functional improvement.

Conclusion:

In conclusion, two surgical procedures for cervical disc herniation were compared, the use of cages alone versus cages and anterior plating. Both procedures were comparable in achieving pain relief and functional improvement. Although plate method was superior to cage alone method in terms of preserving alignment and disc height achievement, Short-term outcome were almost the same.

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