

Outcome Evaluation of Anterior Cervical Discectomy with fusion Versus Corpectomy in Spondylotic Myelopathic Patients

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Abstract

Background Data: Anterior cervical discectomy and fusion and anterior cervical corpectomy and fusion both are used as a surgical technique in the cervical spondylotic myelopathic cases but yet no comparison was done of which is superior, and has a better outcome even after long term follow up.

Purpose: To evaluate the outcome of surgical interference for cervical myelopathy either using anterior cervical discectomy versus corpectomy.

Study Design: This is a prospective comparative clinical case study

Patients and Methods: Cervical spondylotic myelopathy patients who underwent two levels anterior cervical discectomy and fixation (ACDF) or one level Anterior cervical corpectomy and fixation (ACCF) between 2007 and 2010 were recruited for this study. Before and 6 months after surgery, patient satisfaction was scaled on 5-point Likert scales. Neck pain, segmental height, and fusion rate were assessed radiographically before and immediately and after 6 months after surgery.

Results: Twenty one patients with ACDF and 10 patients with ACCF were included. Age, sex, symptoms, radiographic data, operation duration, and complications were similar between the two groups but the blood loss was less in the ACDF group ($P < 0.034$). Postoperative mean segmental height was greater for ACDF ($P = 0.003$) than for ACCF. Fusion rates for ACDF were 20 patients sound fusion (95.2%), and for ACCF were 9 patients sound fusion (90%). The 6-month follow up surgical outcomes were almost similar in both groups, and 61.2% had a good outcome (operation helped/helped a lot), 85.7% and 80% were satisfied/very satisfied with care. Improvement in the intensity of pain was marked in both groups with almost equal results on the pain scale.

Conclusion: Cervical myelopathy treated either by ACDF or ACCF is considered an effective treatment with good long term outcome. ACDF has a less blood loss and a better fusion rate yet both techniques are giving satisfactory results for the patient regarding clinical outcome and pain levels. (2013ESJ039)

Keywords: Anterior cervical discectomy, anterior cervical corpectomy, Fusion, Pain Scale, Spondylotic Myelopathy

Introduction

In reviewing the patient-rated outcomes and the physician-rated outcomes differences in surgical techniques it was found that ACCF is associated with good fusion rates, but with higher complication rates, a longer duration of surgery time, and more blood loss compared with ACDF.^{7,8,9} CSF leaks is also reported more frequently for ACCF.^{5,8}, while ACDF showed better stability of the spinal column after fusion.¹⁰ However, the more limited surgical exposure compared with ACCF may risk a higher rate of incomplete decompression, and the increased number of fusion surfaces in multilevel ACDF can lead to an increased rate of pseudarthrosis.^{8,10} In this comparative study, we analyze the surgical outcomes and radiographic outcomes of patients who had undergone ACDF or ACCF for the treatment of cervical spondylotic myelopathy.

Patients and Methods

Cervical spondylotic myelopathy patients who underwent two levels Anterior cervical discectomy and fixation (ACDF) or one level Anterior cervical corpectomy and fixation (ACCF) between 2007 and 2010.

Inclusion criteria were the following: consecutive patients between 2007–2010 presenting with signs of myelopathy undergoing anterior cervical decompression with fusion due to degenerative stenosis, treated with either 2-level ACDF or 1-level ACCF. Exclusion criteria were the following: ACDF performed at nonconsecutive levels, prior cervical fusion surgery, and additional posterior instrumented fusion. Before and after 6 months after surgery, patient satisfaction was scaled on 5-point Likert scales. Segmental height, and fusion

rate were assessed radiographically before and immediately surgery and after 6 months after surgery as described by Song et al.⁸ Segmental height was measured on plain lateral radiographs with the patient in the neutral position. Measurements were made before and within the first week after surgery and at the last follow-up. To assess segmental height, the distance between the midpoint of the involved cranial and caudal vertebral bodies was measured. Fusion rate was defined either by the absence of motion between spinous processes on functional lateral plain radiographs (flexion/extension) or by bridging of the bone anterior or posterior to the cage or at the graft-endplate junction in cases where iliac bone had been implanted.⁸

Surgical Technique: The ACDF and ACCF techniques were performed via a standard cervical anterior approach.^{1,7} After discectomy or corpectomy, either an iliac bone graft or a cage with or without plates was used for fusion. PEEK (polyetheretherketone) cages were used for ACDF. (Figure 1,2,3) Follow up of the patients was done by the physician including detailed history, pre-operative neurological examination and post-operative examination, affected levels, time of surgery, blood loss during surgery, formal x-ray and CT spine was done to determine the fusion rate and the level height, also post-operative complications were reported for pain and motor functions through a questionnaire. Pre-operative and post-operative and after 6 months after surgery evaluation was done using a questionnaire and data analysis between the ACDF and ACCF groups using unpaired Student t-test, analyses with chi-square or Fisher exact test were used to analyze the association between surgical group and categorical variables, and correlation to radiographic data.



Figure 1. ACCF patient post-operative with H plate fixation.



Figure 2. ACDF Patient Post-Operative with PEEK and H plate (Single level).



Figure 3. ACCF Patient post-operative with H plate fixation (2 levels).

Results

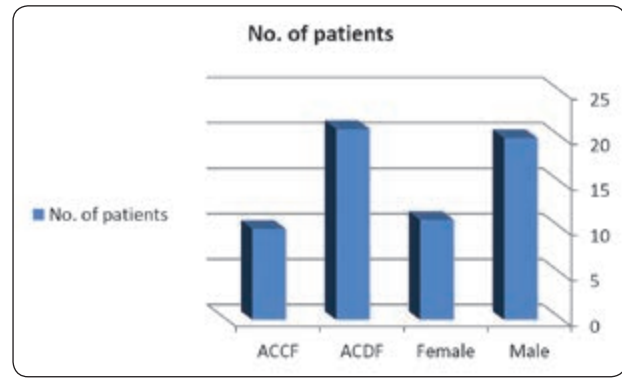
Thirty one patients 20 males (64.5%), and 11 females (35.5%) who had undergone ACDF (N=21) and ACCF (N=10) for cervical spondylotic myelopathy (graph 1), 18 patients (58%) were treated with consecutive 2-level ACDF, and 3 patients (9.7%) with a single level ACDF, while 10 patients were treated with ACCF. The distribution of the cervical segments operated on is shown in Table 1.

We used the PEEK (polyetheretherketone) cage for fusion in all ACDF patients (100%) with iliac crest bone graft while we used H plate and screws in (66.7%) of ACDF patients, and in all ACCF patients (100%). The duration of surgeries did not differ significantly between the 2 groups (P=0.21), and time of surgery was between 150 to 200 minutes.

The two groups were almost equal in statistical difference (P>0.065) regarding sex, age and pre-and post-operative morbidity (Table 2). Blood loss during surgery was significantly lower (P=0.061) in the ACDF group than in the ACCF group, and no significant difference between post-operative complications.

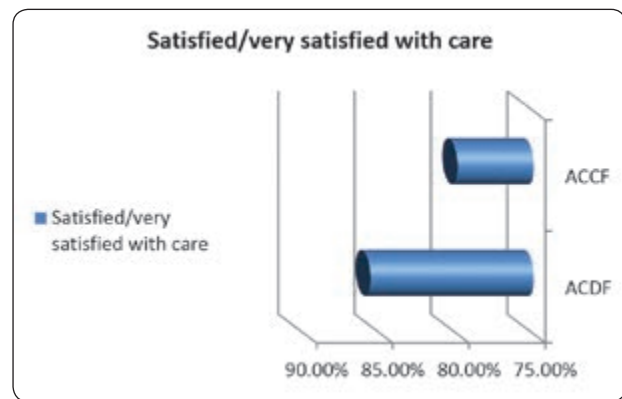
Radiographic Outcome: the segmental height in the 2 groups was almost similar. Follow-up was carried out after 6 months after which a statistical significance was found between the ACDF group with much improvement than the ACCF group. (P=0.003). In both groups, there was 2-3 mm increase in segmental height seen postoperatively showed a significant (P<0.05) approximately 2 mm decrease at follow up time. Fusion rates for ACDF were 20 cases sound fusion (95.2%), and for ACCF were 9 cases sound fusion (90%).

All the patient-rated outcomes were slightly but not significantly better in the ACDF group than in the ACCF group. A good global outcome (operation helped/helped a lot) at the 6-month follow-up was reported by 61.2% of both groups, While 85.7% in the ACDF group and 80% of the ACCF were satisfied/very satisfied with care. (Graph 2) Improvement in the intensity of pain was marked in both groups with almost equal results on the pain scale. (Graph 3)

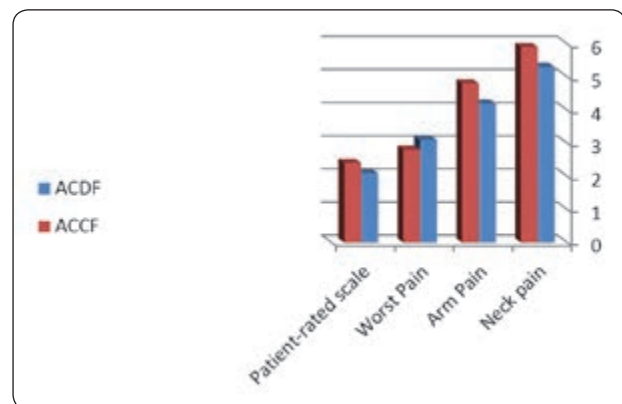


Graph 1. Sex Distribution and Modality of Management.

ACDF=Anterior cervical discectomy and fusion, ACCF=Anterior cervical corpectomy and fusion



Graph 2. Percentage of Satisfaction Regarding Surgical Modality.



Graph 3. Comparison between ACDF and ACCF as for pain levels pre- and post-operative.

Arm and Neck pain are pre-operative, worst and patient-rated pain are post-operative

Table 1. Operated Cervical Segments.

Operated Levels	ACDF	ACCF
C3–5	3 (14.3%)	2 (20%)
C4–6	14 (66.7%)	6 (60%)
C5–7	4 (19%)	2 (20%)
Total	21	10

Table 2. Characteristics of the 2 Groups Pre- and Post Operative

Variable	ACCF (N=10)	ACDF (N=21)
*Baseline neck pain on 0–10 scale	5.3±4.7	5.9/ ±4.8
*Baseline arm pain on 0–10 scale	4.2±3.1	4.8/ ±3.4
+Baseline worst pain on 0–10 scale	3.1±2.1	2.8/ ±1.9
++Patient-rated evaluation scale 1-3	2.1±1.1	2.4/ ±1.2

*: pre-operative, +: post-operative, Visual Analogue Scale 0-10 (VAS)
 ++: post-operative 1–3 scale (patient-rated evaluation):
 1=very satisfied; 2=satisfied; 3=not satisfied

Discussion

We compared 2 surgical techniques, ACDF and ACCF, for the treatment of spondylotic myelopathy and our result of outcome depended on patient rated satisfaction and radiographic outcome. We also compared pre- and post-operative pain scale to obtain a comprehensive patient evaluation of the procedures. In the literature, there is still ongoing discussion about the superiority of one technique over the other, and previous studies^{2,3,4,8} have mostly compared groups with different numbers of operated levels and without any patient-rated outcomes. Only a few studies^{10,6,9} have focused on specific comparisons including only patients with 2-level ACDF or 1-level ACCF. Our results suggest that both techniques are safe and effective in the treatment of cervical spondylotic myelopathy and that they result in similarly good patient-oriented outcomes.

The 2 groups had similar demographic/clinical characteristics. In a study including 14 two-level ACDF and 17 one-level ACCF patients, Oh et al,¹⁰ reported a significant improvement in neck and arm pain visual analog scale scores in each group without significant differences in these scores between the groups. We also showed an improvement in neck pain and arm pain in each group, together with significant improvements in function, quality of life. In a meta-analysis, Jiang et al,⁵ reported that 6 out of 9 studies (including some studies with multilevel ACDF and ACCF) using a variety of outcome measurements found similar outcomes for the 2 treatments. 3 other studies described a slightly but not significantly better clinical outcome for ACCF than for ACDF. For instance, Nirala et al,⁸ reported that a “good” or “excellent” clinical outcome was found in 87.0% of ACCF and 81.1% of ACDF patients.

There was a higher pseudoarthrosis rate in

the ACDF group in their study, and patients with pseudoarthrosis had significantly poorer clinical outcomes, which might have explained the slightly better outcomes after ACCF. In our study, there was a similarly good outcome in each group and the 2 groups showed similarly high fusion rates.

Blood loss was significantly higher in the ACCF than in the ACDF treatment. This difference has been described in the literature before and is probably due to the more invasive surgical approach involved in removing a vertebral body.^{5,7} Since in ACDF 2 segments need to be fused whereas in ACCF only 1, Some studies have reported a significantly longer time of surgery for ACCF although most of these studies involved multilevel ACDF and ACCF.^{5,10}

The radiographic findings in our study were comparable to those reported in previously published studies.^{6,9} Compared with ACCF, segmental height was significantly greater in the ACDF group, both immediately after surgery and at the last follow-up. Oh et al. also described a postoperative increase in segmental height in both ACDF and ACCF groups with a significantly greater increase and a better improvement in lordosis angle in the ACDF group.¹⁰ Segmental height showed a significant reduction in both groups over time, from immediately after surgery up to the last follow-up. Park et al. also described subsidence over time in 52 ACCF and 45 ACDF cases, with a peak occurring within the first 6 weeks after surgery and no significant difference between the 2 groups.⁶ Our nonunion rate was comparable to that reported for the same procedure in recent studies⁵ The achievement of solid fusion was not significantly associated with a good clinical outcome, although the patient number in the pseudoarthrosis group were likely too low to allow valid analysis.

Conclusion

Both ACDF and ACCF techniques were almost equal in outcome, apart from the less blood loss in ACDF and higher segmental height. This does not preclude the superiority of this technique but regarding the segmental rate and blood loss and patient-rated satisfaction, ACDF might be preferable than ACCF in certain selected cases.

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الملخص العربي

تقييم نتائج استئصال الغضروف العنقى من الامام مع التثبيت ضد نتائج استئصال جزء من الفقره و التثبيت في تقدم العلاج لحالات اعتلال النخاع الفقاري العنقى.

البيانات الأساسية: استئصال الغضروف العنقى من الامام مع التثبيت و استئصال جزء من الفقره و التثبيت تستخدم على حد سواء باعتبارهما من التقنيات الجراحية في الحالات الخاصة باعتلال النخاع الفقاري العنقى ولكن حتى الآن لم يجر أي مقارنة من الذي هو أعلى ، ولها نتائج أفضل حتى بعد فترة متابعة طويلة .

الغرض من البحث: تقييم نتائج التدخل الجراحي لاعتلال النخاع العنقى بعد استئصال الغضروف و التثبيت او استئصال جزء من الفقره و التثبيت على المدى القريب و البعيد.

تصميم الدراسة: هذه الدراسة السريرية التي أجريت بين عامي ٢٠٠٧ حتى ٢٠١٠.

المرضى و الطرق: مرضى اعتلال النخاع الفقاري الذي خضع لجراحة مستويين من الامام بعد استئصال الغضروف و تثبيت (ACDF) أو جراحة مستوى واحد أمامي بأستأصال جزء من الفقرة العنقيه و تثبيت (ACCF) بين عامي ٢٠٠٧ و ٢٠١٠ . قبل وبعد ٦ أشهر بعد الجراحة ، تم تحديد رضا المرضى عن نتيجة الجراحة على مقياس ليكرت ٥ نقاط . تم تقييم آلام الرقبة ، المسافة بين فقرتين ، و معدل اللحم باستعمال الاشعه قبل وبعد الجراحة و بعد ٦ أشهر بعد الجراحة. تم إدراج ٢١ مريضا مع استئصال الغضروف و التثبيت بالقفص الكربوني ACDF و ١٠ المرضى الذين يعانون من استئصال جزء من الفقرة مع التثبيت بشريحة ACCF.

النتائج: كان نتائج تحليل بيانات العمر والجنس ، والأعراض ، والبيانات الاشعيه ، مدة العملية، والمضاعفات مماثلة بين المجموعتين ولكن كان فقدان الدم أقل في المجموعة (ACDF) . كانت نتائج بعد العملية الجراحية في مجموعة (ACDF) من حيث المسافة بين فقرتين أكبر من المجموعة الأخرى. وكانت معدلات الالتحام العظمى في ACDF بنسبة (٩٥.٢%) ، و كانت ل ACCF ٩ حالات بنسبة (٩٠%) . وكانت نتائج المتابعة بعد ٦ أشهر من العمليات الجراحية كانت تقريبا متشابهة في كلا المجموعتين ، وكانت نتائج الرضا عن الجراحة ٦١.٢% نتيجة جيدة (العملية ساعدت / ساعد كثيرا) ، ٨٥.٧% و ٨٠% كانوا راضين / راض جدا مع الرعاية . ولوحظ وجود تحسن ملحوظ في شدة الألم في كل من المجموعتين مع نتائج متساوية تقريبا على مقياس الألم.

الاستنتاجات: يعتبر اعتلال النخاع الشوكى المعالج جراحيا إما عن طريق استئصال الغضروف و القفص الكربوني ACDF أو استئصال جزء من الفقرة و التثبيت باستعمال الشريحة ACCF علاج فعال مع وجود نتائج جيدة لما بعد الجراحة على المدى الطويل. ACDF تعطى نتائج أقل بالنسبة لفقدان الدم اثناء الجراحة ومعدل الالتحام العظمى أفضل و كذلك تعطي نتائج مرضية للمريض بخصوص النتائج السريرية ومستويات الألم.