

Original Article

Activ C cervical disc replacement for myelopathy

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Abstract

Background: Cervical disc replacement is becoming an increasingly popular treatment option for cervical myelopathy. It retains motion at the affected segment, unlike anterior cervical discectomy and fusion. The aim of this study is to assess the outcomes of a series of patients who underwent Activ C disc replacement for cervical myelopathy. **Materials and Methods:** A series of patients at the above Trust with clinical and radiological evidence of cervical myelopathy who were suitable for cervical disc replacement from 2007 to 2009 were included. Implants were inserted by one of two consultant surgeons {IMS, MO'M}. Patients were assessed preoperatively and at six, 12 and 24 months, postoperatively, with a visual analogue score (VAS) for neck and arm pain severity and frequency, the Neck Disability Index questionnaire (NDI) and the Centre for Epidemiologic Studies Depression questionnaire (CES-D). **Results:** Ten patients underwent surgery between May 2007 and July 2009, 6 women, and 4 men. Average age was 54 years (40-64). Disc levels replaced were: four at C4-5; eight at C5-6; seven at C6-7. Three patients had one disc replaced, five patients had two discs replaced, and two patients had three discs replaced. The VAS for neck pain improved from 5.9 pre-operatively to 1.4-24 months postoperatively and the VAS arm pain improved from 5.4 to 2.6. The NDI improved from 51% preoperatively to 26.8% at 24 months postoperatively. The CES-D showed a slight increase from 19.5 preoperatively to 21.7 at 24 months, postoperatively. **Conclusion:** Cervical decompression and disc replacement improves pain and function in patients with cervical myelopathy. This benefit is maintained at 24 months post op, with no cases requiring revision.

Key words: Cervical, disc, myelopathy, replacement

INTRODUCTION

Ulf Fernstrom is credited with implanting the first artificial cervical device, in 1966. The implant was a stainless steel ball bearing prosthesis.^[1] Early disc replacements were associated with unacceptable rates of device subsidence, migration, and adjacent-segment hypermobility.^[2] Therefore, anterior cervical discectomy and fusion {ACDF} became the work horse operation for cervical

discogenic disease. Adjacent segment disease has been noted to be a potential problem after ACDF.^[3] Cadaveric research has shown that ACDF caused a significant increase in intradiscal pressure and segmental motion in the adjacent level during physiological motion. The increased pressure and hypermobility might accelerate normal degenerative changes in the vertebral levels adjacent to the anterior cervical fusion.^[4,5]

Disc replacement surgery has regained popularity in recent years. Part of the reason for this is to minimise degenerative changes at adjacent levels as seen in ACDF. With disc replacement the same surgical approach and neural decompression is carried out as per ACDF, but the motion segment is effectively preserved.^[6,7] Radiological studies support this motion preservation theme, as several studies have shown that movement is maintained within the disc over time, and that the adjacent motion segments continue to move normally.^[7,8]

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Cervical disc replacement has been accepted as an acceptable alternative to ACDF by the National Institute of Clinical Excellence (NICE): 'this procedure is as least as efficacious as fusion in the short term and may result in a reduced need for revision surgery in the long term.'^[9]

Although myelopathic patients have been treated with cervical disc replacement in previous studies, their results are usually mixed in with radiculopathic patients, making it difficult to assess outcomes within this specific cohort. The aim of this study is to assess the clinical outcomes of patients who have undergone cervical disc replacement for myelopathy at 2-year follow-up.

MATERIALS AND METHODS

A prospective trial was carried out on patients presenting with cervical myelopathy from September 2007 to June 2009.

Inclusion criteria

- Clinical features of cervical myelopathy
- Radiological features of discogenic cervical myelopathy as seen in Figure 1.

Exclusion criteria

- Active malignancy
- Active infection
- Previous cervical spine surgery
- Cervical instability

All operations were carried out by two surgeons (IMS/MO'M). This was performed under general anaesthetic, with the head of the bed elevated approximately 30 degrees. A transverse incision at the appropriate level was made on the left side (due to the more predictable course of the recurrent laryngeal nerve) and the operation was carried out via a standard Smith-Robinson anterior approach to cervical spine.^[10] Fluoroscopic guidance was used throughout.

The Activ[®] C intervertebral disc prosthesis (B. Braun, Sheffield, UK) was used [Figure 2]. It consists of two components:

- Superior prosthesis plate with spikes for anchoring in the vertebral body
- Inferior prosthesis plate with integrated polyethylene inlay and central anchoring fin for fixation in the vertebral body

The prosthesis plates and the polyethylene inlay together form a ball and socket joint. The polyethylene inlay is anchored to form-fit in the inferior prosthesis plate. It has Cobalt chrome endplates with a plasmapore (titanium) coating to facilitate bone growth.

The patients completed VAS for neck and arm pain severity and frequency, the NDIQ and CES-D preoperatively and at six, 12, 24 months postoperatively. Complications and need for revision surgery were recorded.

Data collection was approved by the trust audit and research department.

RESULTS

Ten patients underwent surgery between May 2007 and July

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2009, six women, and four men. The average age was 54 years with a range of 40-64 years. The levels of cervical disc replacement is outlined in Table 1.



Figure 1: Preoperative T2-weighted sagittal MRI showing signal change within the cord, consistent with myelopathy



Figure 2: Activ C intervertebral disc prosthesis (B. Braun, Sheffield, UK)



Figure 3: Postoperative lateral X-ray of 2-level cervical disc replacement

Table 1: Cervical levels replaced

Level of disc replacement	Number of patients
C5/6	1
C6/7	2
C5/6 and C6/7	3
C4/5 and C5/6	2
C4/5, C5/6 and C6/7	2

Table 2: Outcome measures

	Pre-op n = 7	6 months n = 4	12 months n = 4	24 months n = 7
Neck pain VAS	5.9	4	2.3	1.4
Arm pain VAS	5.4	3	3.3	2.6
Neck pain frequency VAS	6	5.3	1.8	2
Arm pain frequency VAS	5.6	3.5	3.8	3.25
NDIQ	51	25	29.5	26.8
CES-D	19.5	19.5	13.3	21.7

Pre and postoperative scores are outlined in Table 2.

There were no complications among any of the patients.

DISCUSSION

This study indicates that cervical disc replacement effectively improves symptoms of cervical myelopathy. Historically, the role of surgery in treating cervical myelopathy was a controversial issue. Previous studies have shown that mild to moderate myelopathic patients may not benefit from surgery,^[11] while those with more severe myelopathy do poorly with nonoperative treatment.^[12]

Although in recent years there has been a trend toward surgical intervention as shown by the increasing numbers of published articles on the subject. ACDF plus anterior cervical corpectomy and fusion (ACCF) have both been shown to provide clinical improvement in myelopathic patients, with similar outcomes in both groups at 2-year follow-up.^[13,14] Analysis of disc replacement studies which have included myelopathic and radiculopathic patients within the same cohort, have shown an improvement in VAS, NDI and short form 36 (SF-36) scores.^[15,16] (While studies carried out solely on myelopathic patients continued to show improved Japanese Orthopaedic Association (JOA), NDI and Nurick scores after cervical disc replacement.)^[17,18]

In this series of myelopathic patients there is a trend toward significant improvement in symptoms with the NDI decreasing by almost 50%, while neck and arm pain VAS both decreased by greater than 50%. Hence disc replacement appears to be a useful treatment for this cohort of patients.

Interestingly the CES-D score remained fairly static over time, increasing slightly at the 24-month mark. A CES-D score of 27

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or greater was considered positive for depressive symptoms.^[14] The fact that a borderline CES-D score preoperatively did not prevent symptom improvement should not preclude 'depressed' patients from being considered for surgery where appropriate.

Multilevel surgery as seen in Figure 3 was common within our cohort of patients accounting seven of the 10 patients. Huppert *et al.* have shown that multilevel surgery provides similarly satisfactory results between NDI, VAS neck and arm pain scores, this is further supported in a smaller study by Cardoso *et al.*^[19,20]

The absence of revision surgery within this cohort indicates appropriate patient selection and compares favourably with other similar studies.^[21-23]

Several different brands of disc replacement are currently available. Comparative kinematic analysis of 3 of these showed all succeeded in achieving motion preservation.^[24] To our knowledge this is the largest series available on Activ[®] C disc replacement in the treatment of cervical myelopathy.

CONCLUSIONS

Cervical disc replacement with Activ[®] C prosthesis for cervical myelopathy provides consistent improvement in pain and function postoperatively. This benefit is maintained at 2-year follow-up.

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