Case report

Two-level artificial disc placement for spondylotic cervical myelopathy

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Summary This report describes a 49-year-old woman who presented with a myeloradiculopathy with two-level spinal cord compression. She underwent C5-6 and C6-7 anterior cervical decompressions and placement of two Bryan® disc (Medtronic Sofamor-Danek. Memphis, TN) prostheses. Whilst single-level cervical arthroplasty using the Bryan disc prosthesis has been described before, this is the first two-level case reported in the literature and opens the way for the possible future management of multilevel cervical cord compression in a way that maintains cervical motion, avoids donor site bone graft problems, and may reduce the incidence of adjacent segment disease.
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INTRODUCTION

Cervical anterior interbody fusion is widely accepted as leading to a reduction in normal cervical spine motion and increasing the stress at adjacent levels.[1,2] Hilibrand et al.[3] confirmed a 2.9% per year of developing adjacent segment disease after anterior interbody fusion requiring cervical intervention. Recently, Goffin et al.[4] described a new technique of cervical arthroplasty using the Bryan® Cervical Disc Prosthesis (Medtronic Sofamor-Danek, Memphis, TN) in an attempt to maintain cervical motion and avoid arthrodesis after decompression. In their study, 60 patients underwent single-level anterior cervical decompression and placement of an artificial disc prosthesis. This case report describes a 48-year-old woman with cervical myeloradiculopathy who underwent two-level anterior cervical decompression and placement of two artificial disc prostheses.

CASE REPORT

This 48-year-old woman presented with a 3 month history of weakness in the left arm and pain. She also noted difficulty in fine motor control of both hands. There was no previous history of trauma. Her pain and paraesthesia were in the left C6 dermatomal distribution. Her history was otherwise unremarkable. On exam-

ination there was weakness in left elbow extension, wrist and finger extension and there was numbness over the thumb and index finger of the left hand. Her left biceps and triceps jerk could not be elicited but in her lower extremities she was diffusely hyperreflexic, with upgoing plantar reflexes and poor tandem gait (Nurick[5] Grade II).

Initial plain X-rays of the cervical spine revealed loss of cervical lordosis and degenerate C5-6 and C6-7 segments (see Fig. 1). Subsequent MR scanning of the cervical spine demonstrated spinal cord compression secondary to disc/osteophyte complex at both the C5-6 and C6-7 levels. There was a suggestion of high signal in the spinal cord on the T2-weighted studies (see Fig. 2). In view of the clinical picture of a myeloradiculopathy and the presence of a spinal cord compression at two levels on the MR scan, surgical intervention was offered. As most of the compression arose anteriorly, it was felt that an anterior approach at both the C5-6 and C6-7 levels was required, but in order to maintain motion and negate the need for an iliac crest autograft, placement of an artificial disc prosthesis was offered.

On October 18, 2002 the patient underwent surgical intervention. General anaesthesia was administered and an oral endotracheal tube was placed. The head was secured in extension on a soft headrest with the body in an overall neutral position. The case was performed using fluoroscopic guidance. The precise operative technique has been described elsewhere.[4] A paramedian incision was made parallel to the medial border of the left sternocleidomastoid muscle and via an extensile approach the C5-6 and C6-7 disc spaces were ventrally exposed. Using the Bryan® Cervical Disc Prosthesis (Medtronic Sofamor-Danek. Memphis, TN), an anterior cervical discectomy was performed and then an artificial disc prosthesis was placed at the C5-6 level. This was then repeated at the C6-7 level. Prior to placement of the prosthesis at each level, the spinal cord was thoroughly decompressed and the posterior longitudinal ligament removed along with removal of all offending osteophyte. At both the C5-6 and C6-7 levels, 16-mm implants were placed. There were no complications with the surgical procedure. Blood loss was minimal and total operating time was 3 h and 15 min. At the conclusion of the case, the patient was transferred to the intensive care unit for overnight observation. No cervical collar was placed. Her pain had settled and numbness improved. The following day flexion extension X-rays of the cervical spine demonstrated maintenance of normal motion at the levels of instrumentation with satisfactory placement of the prostheses. Postoperative CT scanning (see Figs. 3A and B) and MR scanning confirmed decompression of the neural structures with satisfactory placement of the prosthesis. The patient was discharge 48 h after surgery and at follow-up 6 weeks after surgery is neurologically intact with no pain or paraesthesia and normal neck motion (Nurick[5] Grade 0). She returned to work 2 weeks after surgery and reported no adverse events. The patient was reviewed in September, 2003, approximately 11 months after placement of the artificial disc prosthesis. Repeat static and dynamic X-rays and CT scanning showed no evidence of complications (see Figs. 4A and B). Postoperative MR scanning showed adequate cord decompression, although there was artifact associated with the titanium shells of the implant (see Fig. 5). There was no evidence of ectopic calcification, good motion, and no evidence of osteophyte formation.

DISCUSSION

Spondylotic cervical myelopathy is a common spinal disorder with controversy over the role and timing of surgical intervention as well as the optimal treatment.[6–13] Various combinations of anterior and posterior instrumented surgeries have been tried in

Fig. 1 Lateral C spine X-ray showing spondylotic changes in both the C5-6 and C6-7 intervertebral disc spaces. Loss of normal cervical lordosis has occurred.

the past and continue to be utilized. In the absence of instrumentation, kyphotic deformity is always a feared complication.[14,15] The problem with an instrumented fusion is that typically a reduction in effective motion occurs and there are significant morbidities associated with bone graft harvest.[16] Consequently, there has been much emphasis on surgical techniques such as cervical laminoplasty or cervical disc arthroplasty to maintain motion, avoid deformity, and allow for an adequate decompression without having to use bone graft.

Spinal disc replacement surgery has historically concentrated on the lumbar spine.[17–19] Fernstrom[20] in 1966 introduced an intracorporal endoprosthesis that consisted of a stainless steel ball inserted into the center of a lumbar disc after laminectomy. Fernstrom focused on lumbar discs, but also placed these prostheses in the cervical spine. Cummins more recently has described his experience with the Cummin's artificial cervical joint.[17] This prosthesis was basically a stainless steel ball-and-socket joint. A major shortcoming of this design has been the inability to instrument more than one level.


Fig. 2 Sagittal T2-weighted MR scan of the cervical spine. The the two-level focal compression at the C5-6 and C6-7 disc spaces is evident secondary to a combination of osteophyte and disc compression. High signal is present in the cord and the cord is moderately compressed.

The Bryan® Cervical Disc Prosthesis (Medtronic Sofamor-Danek. Memphis, TN) was first reported as being used for the management of cervical spondylotic disease in 2002 by Goffin et al.[4] This cervical disc prosthesis consists of a polyurethane nucleus designed to fit between two titanium alloy shells. Each shell has an outer titanium porous coating to encourage bony ingrowth and long-term stability. A polyurethane sheath surrounds the nucleus and is attached to the shells with titanium wire,

Fig. 3 (A) Axial and (B) coronal CT scan of the cervical spine performed postoperatively showing accurate placement of the disc prosthesis. He C5-6 level is shown on the axial study. Spinal cord compression has been relieved and the prosthesis occupies most of the space taken by the resected intervertebral disc.
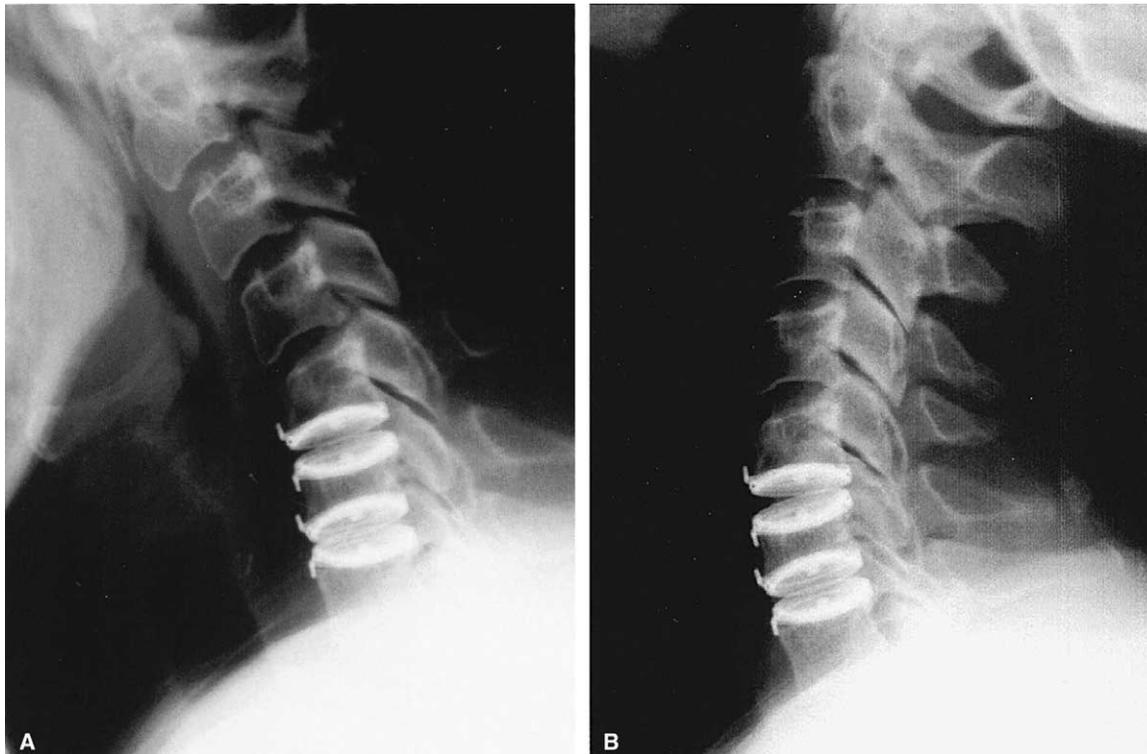
Fig. 4   (A) Flexion and (B) extension lateral radiographs performed 11 months postoperatively showing the artificial disc prostheses at the C5-6 and C6-7 levels. Note that in both flexion and extension, normal motion occurs at the instrumented levels evident by the crowding and subsequent splaying of the spinous processes.

forming a closed compartment. Sterile saline is placed into the prosthesis and titanium alloy seal plugs provide for its retention. In the Goffin study, 97 patients with predominantly radiculopathy

Fig. 5   Postoperative MR scanning showing adequate decompression of the spinal cord. There is a degree of artifact associated with the titanium shells of the implants.

(93%) underwent anterior cervical decompression at one level and placement of the cervical disc prosthesis. They reported follow-up at 12 months with clinical success reported at between 85% and 90%. No subsidence of the devices was noted but possibly two patients had device migration. No spondylotic bridging occurred at the implanted disc space. Range of motion was preserved and no device had been explanted or surgically revised. There was no randomization in Goffin's study and no direct comparison with interbody fusion was done. Coupled with this, their criteria for a good or excellent outcome may be viewed as overly generous. Finally, only 30 patients had 12 month data. With a relatively short follow-up time, the effects on adjacent segments still needs to be evaluated over time, although their report has ushered in a new era in the management of cervical spondylotic disease. The use of the Bryan® disc prosthesis has also been recently described for the management of spondylotic myelopathy in single-level disease, with Sekhon[21] describing six cases successfully managed with this technique.

This case represents a continuation of the work introduced by Goffin et al.[4] This reports shows that cervical disc replacement represents an exciting new technology that will allow for the management of multilevel spinal cord compression and associate cervical cord compression with the maintenance of motion and with the avoidance of the need to arthrodese, avoid donor harvest site complications, and hopefully avoid adjacent segment deterioration associated with more standard anterior interbody fusion techniques.

CONCLUSION

This case report is the first documented use of cervical arthroplasty for the management of multilevel cervical spondylotic myelopa- thy. By placement of artificial disc prostheses after anterior cer- vical decompression, fusion was avoided, no orthosis was required,

and no bone graft harvest was required. The early result is excellent and only time will tell if the most troublesome long-term problems with anterior cervical fusion have been avoided.

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Progressive symptomatic kyphotic deformity after decompressive surgery for lumbar destructive spondyloarthropathy

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Summary Destructive spondyloarthropathy (DSA) is a serious complication of haemodialysis for end stage renal failure. We present a case of a patient who complained of back pain and cruralgia due to L2–3 disc degeneration with instability, and was treated with posterior decompression and bone grafting. Soon after surgery, the kyphotic deformity progressed and the symptoms deteriorated. A correction of the deformity and posterior fusion was required six years after initial surgery. Pathological findings showed characteristic findings of DSA. Our findings indicate that in some cases with unstable DSA, spinal decompression as well as spinal fixation may be necessary.
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INTRODUCTION

Hemodialysis (HD) is an effective treatment for patients with end-stage renal failure (RF). The lifespan of patients with RF has been remarkably prolonged by HD. On the other hand, complications associated with HD such as a hyper-parathyroidism, soft-tissue calcification, and dialysis related amyloidosis (DRA) have also increased.[1–4] Destructive spondyloarthropathy (DSA) is a recently recognized complication of long term HD.[5]

The deposition of β2 MG to the discs, apophysial joint and ligamentum flavum can cause spinal instability, deformity and compression of the spinal cord or the nerve roots with neurological deficits and/or pain. Decompression surgery is sometimes required to alleviate these symptoms.[6–11] However, posterior decompression surgery for symptomatic DSA may lead to instability and/or deformity of the spine. As a result, these factors may cause a deterioration of the symptoms and the development of neurological deficits after surgery. Although several reports have described the pathogenesis and appearance of DSA, only a few have so far reported on the surgical treatment for lumbar DSA. Furthermore, no reports have reported on the post-operative long-term results. Herein we report a case of progressive kyphotic deformity which arose after decompressive lumbar spine surgery.

CASE

A 53 years old female patient had RF as a complication of diabetes mellitus (DM) and started to receive HD in 1987 at 45 years of age. After eight years of HD, she was examined for a 1-year history of increasing lower back pain and an inability to walk due to cruralgia.

Radiologic examinations showed disc degeneration with L2–L3 disc space narrowing and erosion of the adjacent vertebral endplates. Flexion and extension dynamic radiographs revealed an instability at this level. (Fig. 1(a) and (b)) Myelography showed a complete obstruction to the flow of contrast medium at the L2–L3 level (Fig. 1(c)) and computed tomography (CT) revealed compression of the thecal sac due to thickening of the ligament flavuvum and disc protrusion. Magnetic resonance imaging (MRI) confirmed anterior and posterior compression of the lumbar thecal