



Cervical Disc Replacement

Goals of cervical disc replacement

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The goals of cervical arthroplasty are reviewed against a backdrop of adjacent segment disease, restoring normal kinematics to the motion segment, and avoidance of fusion in situations where fusion may be difficult to obtain or unwanted. © 2004 Elsevier Inc. All rights reserved.

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Cervical disc replacement; Arthroplasty; Adjacent segment degeneration

Anterior cervical discectomy and fusion for radiculopathy or myelopathy at one to two levels is one of the most successful surgical procedures available in terms of reversal of symptoms and outcomes in spinal surgery [1–3]. With the success of this procedure, why then would so much effort go into designing alternatives for the same indications, in particular cervical disc arthroplasty? There are certainly some downsides to performing fusion for radiculopathy and myelopathy. These include adjacent segment degeneration/disease, the potential need for plate fixation, which can increase the risk of dysphasia, and difficulties in obtaining successful fusion results, particularly in the treatment of adjacent segment degeneration after fusion. Although a certain rate of adjacent segment disease, as well as adjacent segment degeneration, has been reported after cervical fusion, as well as after nonfusion surgery [1,3–8], it is not entirely clear that the degeneration is the result of the fusion or the natural aging process of the spine.

It is still possible that by restoring more normal motion to an already diseased spinal segment in the cervical spine, cervical disc replacement will alter the natural rate of adjacent segment degeneration and, in fact, lessen it. This certainly is the first goal of cervical disc replacement surgery, that of a decrease in the rate of adjacent segment degeneration and disease of the cervical spine. Food and Drug Administration Investigational Device Exemption studies comparing cervical disc replacement with anterior cervical discectomy and fusion will help elucidate over the long term if there is a

fundamental difference in the rate of degeneration between these two groups of patients.

It has been documented that anterior cervical discectomy and fusion as treatment for adjacent segment disease is a challenging surgery. There is an increased rate of swallowing problems and increased risk of pseudarthrosis [9–11]. Part of the difficulty with this surgery is that the disc space adjacent to a solid fusion is a challenging environment in which to obtain a solid fusion because of a biomechanical differential in stiffness between the fusion below and the adjacent open disc space. Cervical disc replacement, by not requiring a fusion other than adhesion of the arthroplasty surfaces, may be a better answer for the treatment of adjacent segment disease. In fact, there is some experience with this in Pimenta's series in Brazil using the Porous Coated Motion (PCM, Cervitech, Roundhill, NJ) prosthesis for the treatment of adjacent segment degeneration in approximately 15 patients. Results have been reported as excellent in short-term follow-up of 6 months to 1 year (Pimenta L, personal communication, February 5, 2004) [12].

Finally, the goal of any new technology should be improvement and/or diminishment of the postoperative restrictions that patients are subjected to. With anterior cervical discectomy and fusion and/or corpectomy and fusion, the patient is subjected to external immobilization in addition to their internal fixation. Presently, performing adjacent level procedures requires the index plate to be removed and replating performed at the adjacent level. Ultimately, this requires more dissection and again an increased risk of swallowing dysfunction.

Differences will be needed in the approach for certain pathologies. In patients with soft disc herniations, cervical disc replacement may be the perfect intervention in that there will be retention of motion in these typically younger patients. However, in those with spondylosis, there have

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already been problems pointed out with cervical disc replacement in terms of recurrent radiculopathy resulting from spondylotic progression and/or ossification [13]. Theoretically, in patients with cervical spondylotic radiculopathy or myelopathy, wider unciniate resection and spondylotic ridge removal will need to be performed because retention of motion may lead to recurrence of spondylosis when compared with cervical fusion procedures. After obtaining a solid fusion, it is difficult for the spurs to recur. Theoretically, with the retention of motion, spur formation can return, and therefore wider resection will be necessary. Additionally, heterotopic ossification has been noted in some of these procedures [13], and consideration will need to be given to postoperative treatment with Indocin (Merck, Whitehouse Station, NJ) and/or decreased use of burring and increased use of irrigation during the procedures.

Much is not yet known about the ultimate results of cervical disc replacement or the long-term effects of such motion-sparing procedures. It is hoped that they will reduce the rate of dysphasia now seen after cervical fusion and plating, reduce the incidence of adjacent segment degeneration, ultimately be easier to implant and obviate the problems associated with fusing adjacent to a solid fusion, specifically that of increased pseudarthrosis rate.

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