Cervical disc arthroplasty indications

- Intraoperative Conversion of Primary Cervical Total Disc Replacement to Fusion: Incidence and Reasons
- Current Trends in the Use of Cervical Collar Immobilization After Cervical Spine Surgery: A Global Survey Analysis
- Cervical disc replacement in athletes: a modified Delphi Consensus Survey of expert opinion
- Choosing the right treatment for degenerative cervical myelopathy
- Cervical Disc Arthroplasty for the Treatment of Adjacent Segment Disease After Anterior Cervical Discectomy and Fusion
- Cervical disc arthroplasty is safe across various obesity levels
- Cervical disc herniation : Symptomatology, diagnostics, therapy
- High Preoperative Expectations May Not Need to be Feared

Introduction

Cervical disc arthroplasty, also known as artificial disc replacement or cervical disc replacement, is a surgical procedure used to treat certain cervical spine conditions. It involves removing a damaged or degenerated cervical disc and replacing it with an artificial disc. The indications for cervical disc arthroplasty typically include:

Cervical Disc Degeneration: The most common indication for cervical disc arthroplasty is the presence of symptomatic cervical disc degeneration. This condition often leads to neck pain, arm pain, and neurological symptoms due to the compression of spinal nerves or the spinal cord.

Radiculopathy: When cervical disc degeneration causes compression or irritation of the nerve roots exiting the spinal cord, it can result in radiculopathy. Symptoms may include shooting pain, numbness, tingling, or weakness in the arms, shoulders, or hands.

Myelopathy: Cervical myelopathy occurs when the spinal cord itself is compressed or damaged. This can lead to a range of symptoms, including weakness, loss of coordination, balance issues, and changes in fine motor skills. Cervical disc arthroplasty may be considered when myelopathy is caused by disc-related issues.

Failed Conservative Treatment: Cervical disc arthroplasty is typically considered after conservative treatments such as physical therapy, medication, and injections have failed to provide relief from symptoms.

Single-Level Disease: Cervical disc arthroplasty is often recommended for patients with single-level cervical disc disease. It is less commonly used for multi-level cervical spine conditions.

Good General Health: Patients considered for this procedure should generally be in good health and not have significant medical comorbidities that would increase the surgical risks.

Age Considerations: While there is no strict age limit for cervical disc arthroplasty, it is often considered for younger and more active individuals. Older patients with extensive cervical spine degeneration may be better candidates for other surgical procedures like anterior cervical discectomy

and fusion (ACDF).

Patient Preference: In some cases, patient preference may also play a role in the decision to undergo cervical disc arthroplasty. Some individuals prefer this procedure over fusion because it preserves motion at the operated level.

It's important to note that the suitability for cervical disc arthroplasty is determined on a case-by-case basis, and the final decision should be made after a thorough evaluation by a spine specialist who considers the patient's specific condition, medical history, and individual needs. This procedure is not appropriate for all patients with cervical spine issues, and alternative surgical options may be considered when necessary.

Reviews

CDA is a proven, motion-sparing surgical option for the treatment of myelopathy or radiculopathy secondary to cervical degenerative disc disease. As is the case with any operation, a small percentage of CDA will require revision, which can be a technically demanding endeavor [1)]

The widespread success of cervical disc arthroplasty (CDA) has led to an interest in expanding indications beyond those outlined in the initial Food and Drug Administration investigational device exemption studies. Some of these off-label indications currently include 3-level and 4-level CDA, hybrid constructs with adjacent segment anterior cervical discectomy and fusion or corpectomy constructs, pre-existing kyphosis, revision of a failed anterior cervical discectomy and fusion to a CDA, CDA in the setting of significant degenerative disc disease and/or facet joint arthropathy, CDA for congenital cervical stenosis, and CDA in the presence of ossification of the posterior longitudinal ligament [2)].

Epstein and Agulnick performed a focused review to determine the “non-inferiority”, potential superiority, and relative safety/efficacy for performing cervical disc arthroplasty (CDA)/total disc replacement (TDR) in carefully selected patients vs. anterior cervical diskectomy/fusion (ACDF). Notably, CDA/TDR was devised to preserve adjacent level range of motion (ROM), reduce the incidence of adjacent segment degeneration (ASD), and the need for secondary ASD surgery.

They compared the incidence of ASD, reoperations for ASD, safety/efficacy, and outcomes for cervical CDA/TDR vs. ACDF. Indications, based upon the North American Spine Society (NASS) Coverage Policy Recommendations (Cervical Artificial Disc Replacement Revised 11/2015 and other studies) included the presence of radiculopathy or myelopathy/myeloradiculopathy at 1-2 levels between C3-C7 with/without neck pain. Contraindications for CDA/TDR procedures as quoted from the NASS Recommendations (i.e. cited above) included the presence of; “Infection…”, “Osteoporosis and Osteopenia”, “Instability…”, “Sensitivity or Allergy to Implant Materials”, “Severe Spondylosis…”, “Severe Facet Joint Arthropathy…”, “Ankylosing Spondylitis” (AS), “Rheumatoid Arthritis (RA), Previous Fracture…”, “Ossification of the Posterior Longitudinal Ligament (OPLL)”, and “Malignancy…”. Other sources also included spinal stenosis and scoliosis.

Cervical CDA/TDR studies in the appropriately selected patient population showed no inferiority/occasional superiority, reduced the incidence of ASD/need for secondary ASD surgery, and demonstrated comparable safety/efficacy vs. ACDF.

Cervical CDA/TDR studies performed in appropriately selected patients showed a “lack of inferiority”, occasional superiority, a reduction in the incidence of ASD, and ASD reoperation rates, plus comparable safety/efficacy vs. ACDF [3].

Nunley et al. from the Spine Institute of Louisiana, Shreveport, and Carolina Neurosurgery & Spine Associates, Charlotte, conducted a thorough literature review published in the United States (US) and outside the US to report the current global state of cTDR research and clinical use. Search criteria were restricted to publications with a clinical patient population, excluding finite element analysis, biomechanical studies, cadaver studies, surgical technique-specific papers, and case studies. US publications mostly encompass the results of the highly controlled Food and Drug Administration Investigational Device Exemption trials. The predominantly level I evidence in the US literature supports the use of cTDR at 1 and 2 surgical levels when compared to anterior cervical discectomy and fusion. In general, the outside the US studies typically have smaller patient populations, are rarely controlled, and include broader surgical indications. Though these studies are of lower levels of evidence, they serve to advance patient indications in the use of cTDR. Complications such as secondary surgery, heterotopic ossification, and adjacent segment degeneration also remain a focus of studies. Other external challenges facing cTDR technology include regulatory restrictions and health economics, both of which are beginning to be addressed. Combined, the evidence for cTDR is robust supporting a variety of clinical indications [4].

Case series

Pouleau et al. compared 81 patients treated with CDA and systematic total bilateral uncuscectomy versus 42 patients treated with ACDF for symptomatic radicular or medullary compression. Patients treated with CDA and uncuscectomy showed greater improvements in VASb, VASc, NDI, and Odom's criteria than those treated with ACDF, with statistically significant results. Moreover, no difference was found between the severe spondylosis subgroup and the non-severe spondylosis subgroup treated with CDA and uncuscectomy.

This study assessed the value of systematic total bilateral uncuscectomy for cervical arthroplasty. Our prospective clinical results suggest a surgical technique to reduce cervical pain and improve function one year after surgery, even in cases of severe spondylosis [5]

Several large-scale clinical trials demonstrate the efficacy of 1- and 2-level cervical disc arthroplasty (CDA) for degenerative disc disease (DDD) in the subaxial cervical spine, while other studies reveal that during physiological neck flexion, the C4-5 and C5-6 discs account for more motion than the C3-4 level, causing more degenerative disc disease (DDD).

The results of a observational study were in accordance with those of the published randomized controlled trials (RCTs), suggesting substantial pain reduction both after anterior cervical interbody fusion (AIF) and Cervical total disc replacement, with slightly greater benefit after arthroplasty. The

analysis of atypical patients suggested that, in patients outside the spectrum of clinical trials, both surgical interventions appeared to work to a similar extent to that shown for the cohort in the matched study. Also, in the longer-term perspective, both therapies resulted in similar benefits to the patients [6].

The available evidence showed that most of the pre-selected factors had no effect on outcome after CTDR, and the range of motion (ROM) success rate, incidence of heterotopic ossification (HO) and radiographic adjacent segment degeneration (r-ASD)/adjacent segment disease (ASD), and surgery rate for ASD are acceptable. There is a lack of evidence for some factors [7].

With a significant exception of a Cochrane review, the methodological quality of systematic reviews evaluating the evidence of C-ADR versus ACDF has to be improved. [8].

The clinical and radiographic outcomes in cervical ADR patients using the ProDisc-C device (DePuy Synthes, West Chester, PA, USA) with a 5-9 year follow-up were collected through a prospective registry, with retrospective analysis performed on 24 consecutive patients treated with cervical ADR by a single surgeon. All patients underwent single- or two-level ADR with the ProDisc-C device. Outcome measures included neck and arm pain (visual analogue scale), disability (neck disability index [NDI]), complications and secondary surgery rates. Flexion-extension cervical radiographs were performed to assess range of motion (ROM) of the device and adjacent segment disease (ASD). Average follow-up was 7.7 years. Neck and arm pain improved 60% and 79%, respectively, and NDI had an improvement of 58%. There were no episodes of device migration or subsidence. Mean ROM of the device was 6.4°. Heterotopic ossification was present in seven patients (37%). Radiographic ASD below the device developed in four patients (21%) (one single-level and three two-level ADR). No patient required secondary surgery (repeat operations at the index level or adjacent levels). Fourteen out of 19 patients (74%) were able to return to employment, with a median return to work time of 1.3 months. The ProDisc-C device for cervical ADR is a safe option for patients providing excellent clinical outcomes, satisfactory return to work rates and maintenance of segmental motion despite radiographic evidence of heterotopic ossification and ASD on long-term follow-up [9].

Test

What is cervical disc arthroplasty? a. A non-surgical treatment for cervical spine conditions b. A surgical procedure to replace a damaged cervical disc with an artificial one c. A diagnostic test for cervical degeneration d. A physical therapy technique for cervical pain

What is the most common indication for cervical disc arthroplasty? a. Failed Conservative Treatment b. Patient Preference c. Cervical Disc Degeneration d. Radiculopathy

Which of the following is NOT a symptom of radiculopathy associated with cervical disc degeneration? a. Shooting pain b. Numbness c. Loss of coordination d. Headache

When is cervical disc arthroplasty typically considered? a. As a first-line treatment for all cervical spine conditions b. After conservative treatments have been successful c. When multiple levels of the cervical spine are affected d. Only for patients with osteoporosis

What is one of the key advantages of cervical disc arthroplasty over fusion procedures? a. It is less expensive b. It eliminates the need for postoperative rehabilitation c. It preserves motion at the operated level d. It is a quicker procedure

In which cases may patient preference play a role in the decision to undergo cervical disc arthroplasty? a. It is always the patient's choice b. When the patient has severe osteoporosis c. When the patient prefers fusion procedures d. When the patient values motion preservation

What is one of the off-label indications for cervical disc arthroplasty mentioned in the reviews? a. Cervical disc degeneration b. Failed Conservative Treatment c. 3-level and 4-level CDA d. Osteoporosis

What is one of the challenges facing cervical disc arthroplasty technology, as mentioned in the reviews? a. Lack of patient interest b. Regulatory restrictions c. Low success rates d. Limited surgical expertise

According to the case series by Pouleau et al., what surgical technique was compared with cervical disc arthroplasty for cervical pain and function improvement? a. Lumbar fusion b. ACDF c. Spinal fusion d. Lumbar laminectomy

In the case series discussing the ProDisc-C device, what percentage of patients were able to return to employment after cervical disc arthroplasty? a. 14% b. 37% c. 60% d. 74%

Answers:

b. A surgical procedure to replace a damaged cervical disc with an artificial one c. Cervical Disc Degeneration d. Headache b. After conservative treatments have been successful c. It preserves motion at the operated level d. When the patient values motion preservation c. 3-level and 4-level CDA b. Regulatory restrictions b. ACDF d. 74%

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