Anterior cervical discectomy and fusion (ACDF)

Without special modifications, a routine anterior cervical approach is usually able to access levels C3-C7. In patients with short thick necks, access may be even more limited. In some cases, with long thin necks, up to C2-C3 or as low as C7-T1 can be approached anteriorly.

In addition, to enhance fusion, anterior cervical plates have been developed. They provide immediate stability and maintain spinal alignment.

Advantages

Advantages over posterior (nonfused) approach:

Safe removal of anterior osteophytes

Fusion of disc space affords immobility (up to 10% incidence of subluxation with extensive posterior approach).

Only viable means of directly dealing with centrally herniated disc.

Disadvantages

Disadvantages over posterior approach: immobility at fused level may increase stress on adjacent disc spaces. If a fusion is performed, some surgeons prescribe a rigid collar (e.g. Philadelphia collar) for 6-12 weeks. Multiple level ACDF can devascularize the vertebral body (or bodies) between discectomies.

Indications

Anterior cervical discectomy and fusion (ACDF), without and with cervical plating (ACDF+CP) are accepted surgical techniques for the treatment of degenerative cervical disc disorder and cervical laminoplasty (LP) are the most commonly performed procedures for degenerative cervical spondylosis.

Interbody fusion is performed with bone grafts or interbody cages, and may be supplemented with anterior cervical plates.

A study demonstrates that 3- and 4-level ACDF can potentially be performed safely on an outpatient basis, allowing patients to spend less time in the hospital.

History

The earliest descriptions of the technique have always been attributed to Ralph Bingham Cloward, George W. Smith, and Robinson. However, in the French literature, this procedure was also described by others during the exact same time period (in the 1950s). At a meeting in Paris in 1955, Belgians Albert Dereymaeker and Joseph Cyriel Mulier, a neurosurgeon and an orthopedic surgeon,
respectively, described the technique that involved an anterior cervical discectomy and the placement of an iliac crest graft in the intervertebral disc space. In 1956, a summary of their oral presentation was published, and a subsequent paper—an illustrated description of the technique and the details of a larger case series with a 3.5-year follow-up period—followed in 1958. The list of authors who first described ACDF should be completed by adding Dereymaeker's and Mulier's names. They made an important contribution to the practice of spinal surgery that was not generally known because they published in French.

Epidemiology

From 1999 to 2008, the annual number of cervical discectomies with subsequent fusion for degenerative disc diseases in the USA increased by 67%.

Indications

Once conservative treatment for cervical radiculopathy, cervical spondylotic myelopathy, or both, has failed, surgical intervention is indicated.

It has been shown that ACDF induces biomechanical changes leading to modifications of intradiscal pressure recordings in the cervical spine and to increased stress and motion of vertebral segments adjacent to the fused ones.

see Anterior cervical discectomy and fusion for cervical spondylotic myelopathy.

Technique

see Anterior cervical discectomy and fusion technique.

Video

Interbody spacer

see Interbody spacer for anterior cervical discectomy and fusion.

Follow up

Following ACDF, imaging modalities such as standard radiography and computed tomography (CT) are used to assess the fusion, instrumentation failure, and postoperative change such as adjacent segment disease.

No standard algorithm for postoperative imaging following ACDF has been defined formally, and the frequency and type of imaging obtained is left to the surgeon's discretion. Due to their relatively low cost and ease of administration, standard radiographs are often ordered for all patients following ACDF to assess fusion status.
However, the use of such “routine” postoperative radiographs has been found to be unwarranted in asymptomatic patients \(^{13}^{14}^{15}\).

The ACDF procedure itself can induce regional slope change (C5-s and C7-s) directly at the surgical level and can also influence upper cervical slope change (C1-s and C2-s) indirectly. Then the change in the upper cervical spine can induce a change in the sagittal vertical axis (St-SVA) and spino-cranial angle (SCA) \(^{16}\).

**Flexion-extension radiographs**

Flexion-extension radiographs are obtained 6 weeks after the operation in patients with a fusion construct. If evidence of fusion is present and there are no signs of pseudarthrosis, patients are started on exercise therapy at that time. Patients who do not undergo a fusion procedure can start exercise 2 to 3 weeks after surgery.

**CT**

CT is a more sensitive alternative to plain radiography when assessing fusion because of its ability to detail bridging trabecular bone \(^{17}\).

CT scans following ACDF are not routinely ordered. A CT results in alteration of the treatment in 60% of patients with an abnormal MRI and/or radiograph and persistent symptoms. In contrast, if the patient only has persistent symptoms, only 39% of them will go onto further intervention, suggesting that CT has a limited utility in this population. The probability of detecting abnormal findings on CT subsequent to ACDF is significantly greater when the patient presents with persistent symptoms or abnormal preliminary imaging. Alterations in the treatment course based on abnormal postoperative CT are dependent on postoperative symptoms. Those patients who undergo CT without indication (i.e., without preimaging symptoms or abnormal imaging) are significantly more likely to have negative findings on CT, and even with abnormal CT findings, they are less likely to have an alteration in the treatment course. As such, postoperative CTs following ACDF should be limited to patients who have persistent debilitating symptoms or those with abnormal imaging. This practice will avoid unnecessary cost and patient exposure to ionizing radiation \(^{18}\).

For patients who undergo a fusion procedure, anterior and lateral radiographs are obtained in the recovery room to verify the position of the graft, the plate, and the screws. Patients without an internal fixation device wear a rigid collar for 4 to 6 weeks. In patients who receive internal fixation and in those who undergo no fusion, external orthosis is not applied routinely, except to control pain. Patients are discharged the day after surgery. A problem with swallowing is the usual reason why patients are kept longer in the hospital. Within 7 to 10 days of discharge, patients are seen in the office for a “wound check.”

**Complications**

see Anterior cervical disectomy and fusion complications.

**Outcome**

see Anterior cervical disectomy outcome.
Case series

see Anterior cervical disectomy and fusion case series.

References


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Last update: 2019/09/25 17:46