Anterior cervical discectomy and fusion technique

J.Sales-Llopis

Neurosurgery Department, Alicante University General Hospital, Alicante, Spain.

Latest News

- Application of V-shaped stealth decompression technique using ultrasonic bone scalpel in anterior surgery for adjacent two-level cervical spondylosis
- Microvascular free tissue transfer repair of pharyngoesophageal perforation following anterior cervical discectomy and fusion
- Intraoperative Conversion of Primary Cervical Total Disc Replacement to Fusion: Incidence and Reasons
- Beyond Fusion: Assessing the Horizon of 3-level Cervical Disk Arthroplasty Outcomes
- Rates of Venous Thromboembolism and Mortality Have Not Improved in Elective Cervical Spine Surgery From 2012 to 2021
- Patients Show Similar Recovery Metrics Measured by Health-related Quality-of-life Scores Despite Differences in CT-graphic Fusion Status One Year After 1-level and 2-level Anterior Cervical Discectomy and Fusion
- Durability of Anterior Cervical Discectomy and Fusion: A Survivorship Analysis Based on Revision Surgery Rates
- Evaluation of the Congruency of National Surgical Quality Improvement Program Outcomes With a Propensity Matched Anterior Cervical Discectomy and Fusion, Posterior Lumbar Decompression and Fusion Cohort From an Institutional Registry

History

Several modifications have been described to the original procedure developed by Smith and Robinson for ACDF [1)]

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 cortical iliac crest autograft 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 [2)].

Anterior cervical instrumentation was initiated by Bagby [3] in a horse using a cage, in 1988.

Consent

(in lay terms for the patient – not all-inclusive):

a) procedure: surgery through the front of the neck to remove the cervical disc and bone spurs, and to place a graft where the disc was, and possibly place a metal plate on the front of the spine. Some surgeons take bone from the hip to replace the removed disc.

b) alternatives: nonsurgical management, surgery from the back of the neck, artificial disc (in some cases).

c) complications: swallowing difficulties are common but usually resolve, hoarseness of the voice (<4% chance of it being permanent), injury to: foodpipe (esophagus), windpipe (trachea), arteries to the brain (carotid), spinal cord with paralysis, nerve root with paralysis, possible seizures with MEPs

Patient Positioning

The patient is placed in the supine position with the head slightly reclined and stabilized in a head holder. Once the lordotic cervical spine has been supported, the thorax may be placed on a pillow to emphasize the reclination of the cervical spine. The arms are fixed along the sides of the body.

Exposure of the Intervertebral Space

After the skin incision and preparation, a cervical retractor system is applied. The blades are available in PEEK and Titanium. A counter retractor can be used. The subcutaneous tissue is separated from the platysma cranially, caudally and medially, and the platysma is also separated following the direction of its fibres. The margins of the platysma can be held apart with the retractor or with two surgical forceps.

Now the medial edge of the sternocleidomastoid muscle is located and prepared with the index finger in the connective tissue space over the ventral surface of the cervical spine and under lateralization of the vascular nerve bundle and medialization of the trachea, esophagus and thyroid gland.

After the Langenbeck hooks have been inserted, the ventral surface of the cervical spine, still covered by a thin prevertebral layer of connective tissue, is revealed. This layer can now be exposed by either a blunt scissors or alternatively through bipolar coagulation in order to expand the tissue cranially and caudally using a swab. A wire is set under X-ray monitoring to mark the intervertebral disc space.

Distraction/Discectomy / Preparation of the Endplates

The distraction screws are placed in position and the CASPAR distractor is applied following the CASPAR technique.

Complete discectomy is performed using various rongeurs, rectangular curettes and bone curettes. While using a high speed drill to remove the posterior rim and / or dorsal osteophytes, care must be taken to avoid damaging the vertebral body endplates.

Equipment

a) microscope (not used by all surgeons)

b) C-arm

Cages

see Cervical cage.

Anterior cervical plating

see Anterior cervical plating.

BMP

see BMP

Use of BMP in cervical interbody grafting

Current evidence does not support the routine use of rhBMP-2 for cervical arthrodesis (Level C Class II)19 (note: italics added. Use with precautions (see text) may be indicated in cases with high risk of nonunion).

Use of BMP in anterior cervical discectomies is not FDA approved but has been used off-label. Complication rates as high as 23–27% have been reported (including post-op swallowing or respiratory difficulties as a result of edema which is usually temporary) compared to 3 % without BMP.19 If used, it is recommended that a smaller dose be employed than in the lumbar spine (25% has been advocated) and to avoid contact of BMP with soft tissues in the neck.

Technique

see Anterior cervical discectomy technique.

Intraoperative neurophysiological monitoring

see Intraoperative neurophysiological monitoring for anterior cervical discectomy and fusion.

Anterior cervical discectomy and fusion complications

Anterior cervical discectomy and fusion complications.

1)
Smith GW , Robinson RA . The treatment of certain cervical-spine disorders by anterior removal of the intervertebral disc and interbody fusion. The Journal of Bone & Joint Surgery. 1958;40(3):607–624. doi:10.2106/00004623-195840030-00009
2)
Bartels RHMA, Goffin J. Albert Dereymaeker and Joseph Cyriel Mulier's description of anterior cervical discectomy with fusion in 1955. J Neurosurg Spine. 2018 Jan 12:1-6. doi: 10.3171/2017.7.SPINE17182. [Epub ahead of print] PubMed PMID: 29327972.
3)
Bagby GW. Arthrodesis by the distraction-compression method using a stainless steel implant. Orthopedics. 1988;11:931–4.