

Abstract

Title: A randomized controlled trial (RCT) with extended long-term follow-up: quality of cervical spine motion after anterior cervical discectomy (ACD) vs. anterior cervical discectomy with arthroplasty (ACDA).

Background: The underlying mechanism of adjacent segment pathology (ASP) remains a matter of debate. In addition to natural progression of degeneration, compensation for the loss of motion in the fused segment is thought to cause overstraining of the adjacent segments. ACDA was developed in an effort to reduce the incidence of ASP by preserving motion in the operated segment. The sequence of segmental contributions during flexion and/or extension dynamic X-rays of the cervical spine is a more consistent parameter to analyze motion.

Research question: The aim is to analyze the sequence of segmental contributions of the lower cervical spine during the second half of extension in patients with ACDA, and compare these to patients with ACD. The secondary objectives are to assess other radiological and clinical outcomes.

Design/Methods: A RCT with long-term follow-up was conducted. Patients referred to our neurosurgical department with radiculopathy due to single level cervical degenerative disc disease (CDDD) and eligible for surgery were asked to participate. Patients were randomized with a 1:1 allocation to ACDA or ACD. In each patient dynamic X-ray recordings were made before surgery, 1-year and at long term follow-up. Images were analyzed using computer software that uses an image recognition-based algorithm to follow motion of the vertebrae during complete flexion and extension.

Results: A total of 27 patients were included, of which 3 were operated in a pilot group for ACDA and 24 were randomized for ACDA (N=12) or ACD (N=12). At baseline, the average age was 41.4 years and 41% was female. Preoperatively, 2/13 (15%) patients in the ACDA group and 7/12 (58%) patients in the ACD group had a normal sequence of segmental contributions. At one year after surgery 8/13 (62%) showed a normal sequence of segmental contributions in the ACDA group versus 3/11 (27%) in the ACD group. After an average of 11-years follow-up, a normal sequence was only observed in 1/11 (9.1%) patients in the ACDA group and 0/7 (0%) of patients in the ACD group. Fusion of the index level was observed in 3/12 patients (25%) of the ACDA group and 5/7 (71.4%) of the ACD group after long term follow-up. Clinical outcomes were similar between groups, there is a trend towards higher reoperation rates after ACD.

Discussion: We observe that one year postoperative, ACDA restores and preserves a sequence of segmental contributions similar to that of young, healthy individuals. However, after 11 years neither fused nor mobile cervical spines move according to that pattern. Throughout the process of ageing, not only the quantity, but also the quality of motion changes. Possibly, the fact *that* ACDA preserves motion transcends the importance of *how* it is preserved in the prevention of ASP.