Summary

Use of porous aluminum oxide interbody cages for interbody fusion of the cervical spine

Introduction: Anterior cervical discectomy and fusion (ACDF) is one of the most commonly used methods of surgical treatment for degenerative disease of the cervical spine. The primary goal of the surgery is to decompress the nerve structures. A secondary but equally important goal of the surgery is to provide intervertebral fusion as a prevention of subsequent instability or deformity. The selection of the optimal cage for disc replacement in ACDF takes into account the requirements for the speed and quality of interbody fusion and places demands on its safety.

Aims: The objective of this prospective randomized monocentric study was to evaluate the speed and quality of interbody fusion of implanted porous aluminium oxide (Al_2O_3) cages, and compare with parameters of fusion of polyetheretherketone (PEEK) cages for anterior cervical discectomy and fusion (ACDF). Another aim was to compare the clinical results.

Methods: A total of 111 patients were enrolled in the study. The 18-month follow-up was completed in 68 patients with an Al_2O_3 cage and 35 patients with a PEEK cage in one-level ACDF. Initially, the first evidence (initialization) of fusion was evaluated on computed tomography. Subsequently, interbody fusion was evaluated according to the fusion quality scale, fusion rate and incidence of subsidence or peri-implant osteolysis. Clinical outcomes were assessed by Neck Disability Index (NDI) score.

Results: NDI score decreased in the Al_2O_3 and PEEK groups from baseline values corresponding to complete disability (35.4 and 34.1) to moderate disability at 3 months (22.0 and 20.4) and to the mild disability level at the final follow-up (13.9 and 13.4 points). Signs of incipient fusion at 3 months were detected in 22% of cases with the Al_2O_3 cage and 37.1% with the PEEK cage. At 12-month FU, the fusion rate was 88.2% for Al_2O_3 and 97.1% for PEEK cages, and at the final FU at 18 months, 92.6% and 100%, respectively. The incidence of subsidence was observed to be 11.8% and 22.9% of cases with Al_2O_3 and PEEK cages, respectively. Peri-implant osteolysis at the caudal vertebral body endplate was observed in 4.4% and 14.3% of cases in Al_2O_3 and PEEK groups, respectively.

Conclusion: Both groups showed clinically and statistically significant improvements in clinical outcomes. There was no difference in NDI between the groups. Porous Al_2O_3 cages demonstrated a lower speed and quality of fusion in comparison with PEEK cages. However, the fusion rate of Al_2O_3 cages was within the range of published results for various cages. The incidence of subsidence of Al_2O_3 cages was lower compared to published results. In an alumina cage, this study is the first prospective study to evaluate qualitative and quantitative fusion parameters to this extent. We consider the porous Al_2O_3 cage to be safe and effective for stand-alone disc replacement in ACDF.

Key words: quality of fusion, fusion rate, subsidence, peri-implant osteolysis, PEEK, Al_2O_3, NDI