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Speed and quality of interbody fusion in porous bioceramic Al₂O₃ and polyetheretherketone cages for anterior cervical discectomy and fusion – A comparative study

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Background: Anterior cervical discectomy and fusion (ACDF) is one of the most frequently indicated surgical procedures for degenerative cervical spine disorders. To provide fusion, bone grafts or different devices for cervical disc replacement are used. The most widely used cage materials are titanium and polyetheretherketone (PEEK). Implants made of bioactive materials (e.g., bioactive glass, calcium phosphates, aluminium oxide, etc.) are relatively newer. When efficacy evaluation studies are performed, new implants are very often compared to PEEK or titanium cages

Research question: Comparison of the speed and quality of interbody fusion of implanted porous Al₂O₃ (aluminium oxide) cages with PEEK cages in ACDF

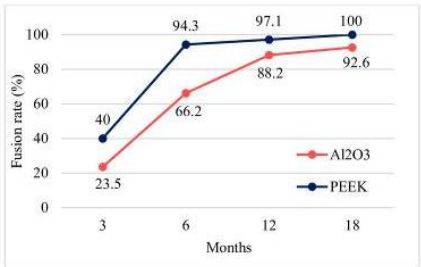
Design: Prospective randomized monocentric descriptive study

Methods: A total of 111 patients were enrolled in the study, which was carried out between 2015 and 2021. The 18-month follow-up (FU) was completed in 68 patients with an Al₂O₃ cage and 35 patients with a PEEK cage in one-level ACDF. Initially, the first evidence (initialization) of fusion was evaluated on computed tomography (CT). Subsequently, interbody fusion was evaluated according to the fusion quality scale, fusion rate and incidence of subsidence

Results: Signs of incipient fusion at 3 months were detected in 23,5% of cases with the Al₂O₃ cage and 40% with the PEEK cage. At 12-month FU, the fusion rate was 88.2% for Al₂O₃ 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 Al₂O₃ and PEEK cages, respectively

Discussion: Al₂O₃ cages demonstrated a lower speed and quality of fusion in comparison with PEEK cages. However, the fusion rate of Al₂O₃ cages was within the range of published results for various cages. The incidence of subsidence of Al₂O₃ cages was lower compared to published results. We consider the porous Al₂O₃ cage as safe for a stand-alone disc replacement in ACDF

Fig. 1



Fusion rate over time

Fig. 2

Subsidence and osteolysis (count (%) of cases)

Study group	Al ₂ O ₃	PEEK	p value
	(N = 68)	(N = 35)	
	n (%)	n (%)	
Subsidence	8 (11.8%)	8 (22.9%)	0,159
Osteolysis	3 (4.4%)	5 (14.3%)	0,117
Subsidence in cases of osteolysis	none	3 out of 5	