Cervical cage

HA, coralline HA, sandwiched HA, TCP, and biphasic calcium phosphate ceramics were used in combination with osteoinductive materials such as bone marrow aspirate and various cages composed of poly-ether-ether-ketone (PEEK), fiber carbon, and titanium. Stand-alone ceramic spacers have been associated with fracture and cracks. Metallic cages such as titanium endure the risk of subsidence and migration. PEEK cages in combination with ceramics were shown to be a suitable substitute for autograft.

None of the discussed options has demonstrated clear superiority over others, although direct comparisons are often difficult due to discrepancies in data collection and study methodologies. Future randomized clinical trials are warranted before definitive conclusions can be drawn 1).

There has been an increase in the use of standalone cage devices due to ease of use and studies suggesting a lower rate of acute post-operative dysphagia.

Stand-alone cervical cages aim to provide primary stability, yield solid fusion in the long-term course, and maintain physiologic alignment. However, many implants designed for these purposes fail in achieving these goals.

There is evidence documenting relatively frequent complications in stand-alone cage assisted anterior cervical discectomy and fusion (ACDF), such as cage subsidence and cervical kyphosis 2).

Failure of disc height maintenance may lead to cervical kyphosis and poor alignment of the cervical spine. At the same time, costs for cage implantation are relatively high compared with their unfavorable radiologic performance.

Brenke et al, develop and test mechanically a low-cost polymethylmethacrylate (PMMA) cage with similar mechanical and procedural properties compared with a commercial polyetheretherketone (PEEK) cage.

Following determination of the cage design, a casting mold was developed for the production of PMMA cages. Nine cages were produced and compared with nine PEEK cages using static compression tests for 0 and 45 degrees according to the recommendations of the American Society for Testing and Materials. Mean compressive yield strength, mean yield displacement, mean tensile strength, and mean stiffness were determined. Results At 0 degrees axial compression, the mean compressive yield strength, mean displacement, and mean tensile strength of the PMMA cage was significantly higher compared with the PEEK cage (p < 0.001). Stiffness of both implants did not differ significantly (p = 0.903). At 45 degrees axial compression, PEEK cages could not be investigated because slipping of the holding fixture occurred. Under these conditions, PMMA cages showed a mean compressive yield strength of 804.9 ± 60.5 N, a mean displacement of 0.66 mm ± 0.05 mm, a mean tensile strength of 7.92 ± 0.6 N/mm², and a mean stiffness of 1,228 ± 79.4 N/mm.

The developed PMMA cage seems to show similar to superior mechanical properties compared with the commercial PEEK cage. Considering a preparation time of only 10 minutes and the low price for the PMMA material, the cost-benefit ratio clearly points to the use of the PMMA cage. However, clinical effectiveness has to be proven in a separate study 3).

Case series

Alonso et al. performed a retrospective case-series of patients treated at a single tertiary care
institution between March 2014 and March 2015. Inclusion criteria were age 18-100 years, one or two-level anterior cervical discectomy and fusion with a standalone cervical cage. Data collected included demographics, comorbidities, Charlson comorbidity score, primary diagnosis, and surgical characteristics. Descriptive statistics were performed for risk of readmission, implant failure, revision, and other complications.

They identified 211 patients who met the study criteria. Average surgical time was 107 ± 43 minutes with an estimated blood loss of 84.6 ± 32.4 cc's. There were 11 (5.2%) readmissions. There were 10 (4.74%) implant failures (five involving single-level surgery and five involving two-level surgery), with seven cases of pseudoarthrosis. Mechanisms of failure included a C5 body fracture, fusion in a kyphotic alignment following graft subsidence, and acute spondylolisthesis.

Revision surgery following standalone anterior cervical implants can be complex. Posterior cervical fusion remains a valuable approach to avoid possible vertebral body fracture and loss of fusion area associated with the removal of implants secured through the endplates of adjacent vertebral bodies 4).


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