Comparison of data was performed using one-

Digital radiographic scans were performed

All sheep under went

Surgical technique and postoperative care

Polymer-Calciumphosphate-Composite (PCC, Biomet Merck) bioboreplable cage made of a Polymer-Calciumphosphate-Composite (PCC, Biomet Merck) augmented with IGF-I and TGF-B1 (n = 8); 4: metallic cage augmented with IGF-I and TGF-B1 (n = 8).

Surgical technique and postoperative care: All sheep underwent the surgical procedure under general endotracheal anesthesia. Via a left anterolateral approach discectomy C3/4 was performed. For fixation either an iliac crest bone graft of 8 mm height, a PCC- cage or a metallic cage of identical size and design were used. After surgery the animals received analgesia for 5 days intramuscularly. They were allowed ad libitum activity for the remainder of the experiment (12 weeks).

Radiographic analysis: Digital radiographic scans were performed pre- and postoperatively and after 1, 2, 4, 8, 12 weeks. At the same time points, intervertebral disc space height (DISH), intervertebral angle (IVA) and lordosis angle (LA) were measured. After 12 weeks fusion sites were evaluated using digital functional radiographic views in flexion and extension and quantitative computed tomographic scans (QCT) to assess bone mineral density (BMD), bone mineral content (BMC) and callus volume (CV).

Biomechanical analysis: Biomechanical testing was performed by a non-destructive flexibility method using a non-constrained testing apparatus described in detail earlier [2]. Stiffness, range of motion (ROM), neutral (NZ) and elastic (EZ) zones were determined.

Histomorphometrical analysis: All C3/C4 motion segments were harvested at 12 weeks for bone histology. For histomorphometrical analysis longitudinal sections in the sagittal plane were cut. Safranin-O/Lightgreen, Safranin-O/lv; Kossa, Astrablue and Masson-Goldner stainings were used. The sagittal diameter distance of C3 and the average preoperative DSH were determined to define the size of the region of interest (ROI) for histomorphometrical evaluation. The complete intervertebral fusion area was included in this ROI. The following structural indices were calculated in the ROI: bone volume / total volume (BV/TV), cartilage volume / total volume (CV/TV), mineralized cartilage volume / cartilage volume (mCV/CV). Foreign body reactions associated with the bioreabsorbable cages were graded according to Hoffmann et al [3].

Statistical analysis: Comparison of data was performed using one-way ANOVA for independent samples followed by TUKEY post-hoc analysis for multiple comparison procedures with Bonferroni correction for multiple measurements.

Results: During the 12 week follow-up both PCC-cage groups and the metallic cage group showed significantly higher values for DISH compared to the tricortical iliac crest bone graft group. Additionally, the PCC-cage group filled with cancellous bone grafts demonstrated a significantly higher stiffness and lower ROM, NZ, EZ in axial rotation and lateral bending than the bone graft group. In comparison to the PCC-cages with bone grafts the PCC-cage with IGF-I and TGF-B1 and the metallic cage with IGF-I and TGF-B1 showed a significantly higher biomechanical stiffness in all test modes and an advanced interbody fusion. However, in comparison to the metallic cage with IGF-I and TGF-B1 the PCC-cage with IGF-I and TGF-B1 showed a higher cartilage (CV/TV) and a lower bone volume (BV/TV) in the intervertebral space. While the tricortical iliac crest bone graft and the metallic cage groups showed no foreign body reactions both PCC-cages groups showed grade I (mild) foreign body reactions in two animals.

Conclusion: In comparison to the tricortical bone graft the bioreabsorbable PCC-cage filled with autologous bone graft showed significantly better distractive properties, a significantly higher biomechanical stiffness and an advanced interbody fusion. The bioreabsorbable cages with and without growth factors showed similar foreign body reactions, suggesting that the growth factors had no effect on the degradation kinetics of the bioreabsorbable cage. Both growth factor groups demonstrated an advanced interbody fusion in comparison to the tricortical bone graft and the biodegradable cage without growth factors. However, the metallic cages with growth factor showed a more progressed interbody fusion compared to bioreabsorbable cages with growth factors. The decreased osteoinductive effect of the growth factors in combination with the bioreabsorbable cage was due to the acid degradation products of the bioreabsorbable implants.

During the 12 week follow-up the bioreabsorbable cages demonstrated considerable effectiveness as an interbody fusion device, however, a decreased osteoinductive effect of growth factors in combination with bioreabsorbable cages should be considered.