Anterior Bridging Cage With Bone Substitute Versus Localized Autobone in Transforaminal Lumbar Interbody Arthrodesis

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Study protocol

Consecutive patients aged 18-80 years with spinal stenosis or spondylolisthesis who planned to undergo single-level lumbar transforaminal interbody fusion (TLIF) with pedicle screw fixation were included. All operations were performed at a single institution by a single surgeon. The enrolled patients had plain radiographs at postoperative 3, 6, and 12 months and fine-cut multiaxial reconstructed CT scan at postoperative 12 months to evaluate for bone-bridging patterns. The clinical outcomes were assessed by the Oswestry Disability Index (ODI) scores preoperatively and 12 months after surgery.

Operation Methods

After disc preparation following bilateral decompression with facetectomies, extra-cage bone grafting, consisting of half- mixed each 6 cc of local autobone and synthetic bone (OSTEON, Genoss, Korea), was performed on the prepared anterior disc space bilaterally; then, bilateral polyetheretherketone cages (ABB cage, Genoss, Korea) with different graft compositions (left cage: filled with local autobone, right cage: filled with local autobone + synthetic bone) were inserted.

Radiographic Fusion Criterion

We used the concept of InCBB and ExCBB to evaluate the fusion status. InCBB was defined as the bridging bone between the upper and lower vertebrae through the void of the cage(s) and divided into right (Rt.) and left (Lt.) InCBB according to the cage position. ExCBB was defined as the bridging bone between the 2 vertebrae in extra-cage areas of the disc space and divided into 5 zones based on their relative positions to the cages in the disc space: anterior ExCBB: front of the cage; posterior ExCBB: back of the cage; intermediate ExCBB: between 2 cages; right: at the right side of the right cage; and left ExCBB: at the left side of the left cage. We graded bridging scores from 0 to 2 based on the degree of completion of the bridging bone in InCBBs and ExCBBs (grade 0: no bridging at the superior and inferior endplates; grade 1: incomplete bridging; bridging at the superior or inferior endplate, but with a clear radiolucent line; grade 2: complete bridging). We defined ABB as the bridging bone between the extra-cage grafted bone and intra-cage grafted bone through the medial, lateral, superior, and inferior holes in each cage.

InCBB, ExCBB and ABB were evaluated using a software program (Extended Brilliance Workspace 4.5 workstation, V4.5.2.4031, Philips Healthcare Nederland BV, the Nether- lands) that allows users to control the axis of the image planes. Three planes were set at each level as follows: the axial plane was set parallel to the operated disc space on coronal and sagittal views; the sagittal plane was set perpendicular to the disc space on coronal view and the posterior margin of the vertebrae on axial view; and the coronal plane was set per pendicular to the disc space on sagittal view and parallel to the posterior margin of the vertebrae on the axial view. The sagittal and coronal views were then serially examined for ExCBBs and InCBBs. The fusion was defined as meeting the following 3 criteria: no subsidence of 3 mm or more on serial postoperative 3, 6, 12 months radiographs until postoperative 12 months; at least having one or more grade 2 among InCBBs or ExCBBs (InCBB/ExCBB: 0/2, 1/2, 2/2, 2/1, 2/ 0); and the complete bridging bone, graded 2, should be con- firmed on both sagittal and coronal views simultaneously. After three planes (sagittal, coronal, and axial) were set at each level, the sagittal and coronal views were serially examined for ExCBBs, InCBBs, and ABBs. To evaluate medial and lateral ABBs, we adjusted the sagittal plane on the axial view in a direction parallel to the diagonal axis of the cage.

Statistical Analysis

The differences between the fused and non-fused groups based on our suggested criterion were examined using independent t-tests for continuous variables. A P value <0.05 was considered statistically significant. All statistical analyses were per- formed using SPSS version 23.0 (SPSS, Chicago, IL, USA).