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# Surgical technique verification with the use of new bioactive titan cage in the treatment of degenerative disease of the lumbar spine – experimental study

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The authors performed experimental PLIF operations on cadavers to verify the appropriate shape and size of a cage to be made from bioactive titanium material. The suitable approach for application in the intervertebral region of the lumbar spine and appearance on X-ray and CT scans was also investigated.

In experiment on cadavers five implantations of interbody cages were performed, two of them in interbody space L3/L4 and three of them in L4/L5. Subtotal discectomy and end plates preparation was undertaken before cage insertion. The cage is made from bioactive titan material and fastened using an application instrument developed specifically for this purpose.

To verify the operational approach we used midline incision and opened the spinal canal through laminectomy, partial hemilaminectomy or partial medial facetectomy. This phase was followed by discectomy and end plates preparation. Stability of inserted cages in intervertebral space is ensured by rotation and anchorage of the cage wings in the end plates. Operated motion segment was removed and evaluated by X-rays and CT scans.

The operational approach through partial hemilaminectomy and partial medial facetectomy was fully sufficient for cage application with respect to the operated segment. All implantations were successful and position of cages satisfactory. Due to the use of a less robust gripping instrument, the approach was more efficient compared to a glass-ceramics cage and comparable with commercially produced cages with which we have experience (Spine Tech, Stryker, cage Comesa). Due to cage being radio opaque, proper position of cages is easy to control on X-ray and CT scans and allows good per-operative monitoring by X-ray magnifier.

Use of bioactive materials in spinal surgery began with of glass ceramics. Based on our experience we determined suitable indications. To eliminate some of the disadvantages of glass ceramics (mainly mechanical properties), a cage made from bioactive material was developed. This type of cage does not require bone harvesting to fill the cage. This fact results in for better comfort for the patient in postoperative the post-operative and eliminates complications from bone graft harvesting. The bioactive surface of the cage with osseo-conductive and aseointegrative features creates prerequisites for solid fusion without bone grafts. Titanium material guarantees mechanical strength and makes it possible to produce a wide range of shapes and sizes. The strength of the material enables more secure gripping of the cage with the application instrument. The cage is easily visible in X-ray and in MRI scans artefacts are considerably reduced. The operational approach and technique are similar to those employed for other commercially produced cages and the extent of destabilization is limited to a minimum.

Experimentally we repeatedly verified the operational approach, and the suitable shape and applicability of a bioactive titanium cage into intervertebral space. For clinical use bioactive titanium could be a possible method for replacement of bone grafts. For spinal surgeons it represents a chemically and mechanically stable material capable of interaction with environment in which it is implanted. Even in difficult conditions the level of osseo-integration is high.

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