

## **Toward the optimum spinal fusion device**

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Lumbar interbody fusion remains a »golden standard« for treatment of spinal instability, deformity, degenerative disc disease, infection and failed decompressive spinal surgery. Substantial effort has been done to optimise surgical technique and even more substantial to develop suitable implants that would address all three major issues of the procedure: stability, restoration of lordosis and osteointegration.

The focus of spinal surgeons is constantly shifting from one material to another. The reason for this might be in the fact that no optimal material currently exists and in the aggressive, commercial drive from the industry, developing and promoting new products.

The era of interbody fusion began with mesh cages, mainly produced of titanium. This first generation of cages was met with great expectations but little knowledge of anatomical postulates such as sagittal balance and importance of segmental lordosis. Results were relatively favourable in early post-surgical period, with good interbody fusion but deteriorated with years, because of high grade of subsidence and consequently kyphotic alignment of fused segment. That was followed by rapid degeneration of adjacent segment and clinical deterioration. The other problem with titanium cages were metal artefacts, blurring the radiological interpretation and evaluation of solid bone fusion.

The beginning of 21. century brought up the advent of implants made of polyether ether ketone or popular PEEK. Its biomechanical properties were closer to bone than those of the titanium implants, it was perfectly inert, fully radiolucent. The hopes were high again but again short-lived. PEEK implants have indeed improved possibility of anatomical restoration of diseased segment but failed to persuade with its limited osteointegration.

Currently there is a confusion among spinal surgeons. The industry is bringing back titanium cages which are now more anatomically shaped and have Nano roughened surface modification but still possessing different structural properties to bone and again high risk of subsidence. The compromise would be in titanium coated PEEK cage, emerging out of production in to practice, but many evaluation must be done to answer all these questions.

We propose an animal study to test both titanium and Peek cages with different surface roughening, as well as titanium coated implants.