

Abstract **Development and evaluation of new cementless revision acetabular components for total hip arthroplasty / type TC /**

Objective: The aim of the clinical part of the study was to introduce a new revision oval cup type TC, and evaluate its reliability and utility in revision endoprosthesis. Due to the different structure of the implant, we aimed to objectively demonstrate the remodeling of bone tissue in its vicinity. In the experimental part of the work we verified the hypothesis that the use of locking screws has an effect on the bond strength of the implant with bone tissue, and therefore on the primary stability of the acetabular component.

Method: We evaluated 31 patients that underwent revision hip surgery between 2004 and 2008. The mean follow-up was 7.1 years (range 5.3 to 9.3 years, minimum 5 years after surgery). Osteointegration of the implant and remodeling of bone tissue around the implant and its ribs were evaluated by digital radiography and computed tomography, and clinical results according to Harris. The experiment was based on the execution of pull-out tests after the implantation of TC cups in cadaveric bovine pelvises. We evaluated the dependence of tensile forces in the axis of the implant on extraction of the metal cup from the bone bed. Four tests were conducted with the cup fixed by 2 and 4 conventional titanium or locking screws. The measured values were processed on an Instron-3382.

Results: The mean Harris hip score increased from a preoperative value of 39.8 to 85.3. Excellent results were obtained in 9 patients, very good in 16 patients, and satisfactory and poor results each in 3 patients. According to radiological evaluation, osteointegration of the revision cup was good 25 cases, in 5 cases the cup was stable with ingrowth of fibrous tissue in the extent of the distal third of the implant, and in 1 case proximal migration was detected. Periacetabular osteolysis was recorded only in failure of the cup. CT examination of the pelvis was performed in 10 patients. In all cases we detected bone remodeling in the space between the ribs of the implant. Kaplan-Maier survival curves for type TC revision cups reached 94.2% 7.1 years after surgery. In the experimental part of the work, measured values in cup fixation by conventional screws revealed overloading of screws with gradual failure of bony fixation with increasing tensile force. Locking screws showed only plastic deformation. In the fixation of revision cups, 4 screws ensured significantly greater implant stability than 2 fixation screws when exposed to tensile forces in the axis of the implant.

Conclusion: Based on the results of clinical part of the study, the oval cup type TC meets the main requirements for a modern revision implant. Perioperatively, the safe bridging of bone defects after their thorough treatment with bone grafts was always achieved. Radiological evaluation showed reliable osteointegration of the cups and remodeling of transplanted bone tissue between the ribs of the proximal part of the implant. Experimental data confirmed the hypothesis that the use of locking stable screws also contributes significantly to rigid fixation in revision endoprosthesis.

The results of medium-term functional evaluation in a rather inhomogeneous group of 31 patients are comparable with similar results in the literature. The construction of oval cup type TC contributes to the improvement of conditions requiring further reoperation in the region of the acetabulum.