

Abstract

Introduction: (Experimental part). Hypothesis evaluates the quasi-static risk of transpedicular fixation failure in the spinal cadaver with anterior column defect due to the fixation extension and defines the risk of transpedicular fixation failure due to screw convergence in cyclic loading. (Clinical part). Hypothesis evaluates the risk of isolated dorsal approach to ventral lumbar spondylodiscitis due to clinic and radiographic results and the risk of anterior radical debridement due to using titanium implant in the site of bone infection.

Methods: (Experimental part). Four anatomically prepared spinal cadavers with anterior spinal column defect transpedicular instrumented were quasi-statically tested on MTS 858,2 Mini-Bionix. Concept of cyclic loading part were based on ASTM standard F1717. (Clinical part). The group A consisting of 23 patients was treated only by dorsal transmuscular approach and the second group B consisting of 8 patients was treated by two-stage postero-anterior surgery in lumbar spondylodiscitis.

Results: (Experimental part). There were progress in all assessed parametres with considerable asymmetry direction in extension to flexion and duction in spinal column loading with anterior defect during quasi-static loading. The rod deformation decrease with extent of transpedicular instrumentation. The construction with maximum convergence failed during the smallest number of loading cycles in ASTM standard F1717 during cyclic loading. (Clinical part). Differences ($p < 0,001$) in the group A were found between JOA values before ($\emptyset 9.30$), 6w ($\emptyset 11.82$), and 12m after the surgery ($\emptyset 13.27$) and VAS differences before ($\emptyset 7.39$), 6w ($\emptyset 3.82$), and 12m after surgery ($\emptyset 2.36$) and in the group B the JOA values before ($\emptyset 9.38$), 6w ($\emptyset 11.75$), and 12m after surgery ($\emptyset 13.63$) and VAS before ($\emptyset 7.38$), 6w ($\emptyset 4.63$), and 12m after surgery ($\emptyset 2.25$). Radiographic examinations of the Group A was found before ($\emptyset 1.75$), 6w after surgery ($\emptyset -3.73$), and 12m after surgery ($\emptyset -0.79$) and in the group B before ($\emptyset 3.71$), 6w ($\emptyset -8.21$), and 12m after surgery ($\emptyset -6.45$).

Conclusions: (Experimental part). The rigidity of the spinal transpedicular instrumentation in spinal cadavers during quazi-static loading increase continuously without any skip transmutations and there is no risk factor of possible loosening of constructions in calibrated conditions in quasi-static loading. Cyclic loading experiment shows the higher risk of assembly loosening with higher initial rigidity in ASTM standart F1717. The study provides evidence that the change in convergence of pedicular screws affects the rigidity and longevity of the model as a whole in conditions of cyclic loading. This factor increases in importance with regard to the pathology of a skeleton with reduced bone density. (Clinical part). Results demonstrate the minimum serious surgical complications and greater loss of sagittal balance without clinical correlation in the group A. We did not find any relapse or persistence of the infection in the post-operative period in the group B.