

GRIP FOR IN VITRO STRENGTH TESTS OF SPINES OR SPINE-INTERNAL SPINE FIXATOR SETS

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The article presents new concept of grip for in vitro strength tests of spines or spine-internal spine fixator sets. This grip does not need dividing the tested spine into tested segments (FSU and larger ones) according to the accepted testing plan. This is important because dividing makes spine useless for further examinations. They enable 'adjusting' the grip to the spine characteristic individual features e.g. lordosis or if necessary, scoliosis. The mechanical fixing system should guarantee stable fixing of extreme vertebrae (from the accepted testing program point of view – compression/distraction, bending or torsion) as well as provide a possibility of positioning the spine on the required planes and axes. For the presented solution the load system can be any strength testing machine providing compression/distraction applied with the required accuracy preferably in a programmed way.

Key words: spine grip, strength tests spine, spine fixator

1. Introduction

In spine surgery there occur various diseases caused by inflammatory processes, traumas, cancers or congenital malformations which require surgical treatment. This treatment should ensure appropriate conditions for restoration of stability as well as proper functioning of the spinal cord within the damaged movement segment. Realization of these purposes often involves a necessity of using various internal spine fixators which have to be tested in order to yield the best results. Especially, new designs must be tested in respect of the fixator strength in conditions approximate to the real ones including static and fatigue conditions. For such tests vertebrae made of wood or polymeric materials with their macro geometry more or less similar to natural vertebrae were used, e.g. [1]. However, the most reliable results are obtained when the tested fixator is mounted on a natural spine that is when the spine-internal spine fixator set is being tested. These examinations are of course in vitro and their basic problem is the way of the spine fixing and loading. The most frequent way of the spine fixing – usually of two adjacent vertebrae with a working spine unit the so called FSU – is fixing them in quick setting epoxy mould [6–7], unsaturated polyester resin [2, 12] as well as dental plaster of Paris [3–4] and PMMA [8–10]. In all those cases containers are used – often additionally enhancing the fixing with: wooden screws [2], Steinman pins [8], self-tapered screws [9], or nails [12]. Definitely less frequently spines are fixed through flooding the extreme parts of vertebrae with low-melting bismuth alloys (melting temperature 70 °C) [5, 11]. In all the above cases the fixing was configured in such a way that the plane running through the vertebra height center was horizontal (possibly maximum horizontal). Tests in which the spine is fixed in a mechanical way with the use of

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