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Synergetic Transpedicular Device with Dynamic Beams from the Alloy with Shape Memory Effect

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Summary

The authors present the titanium pedicle screw and Nitinol rod system for spine stabilization.

Keywords: Vertebral instability; Spondylolisthesis; Spinal internal stabilization; Nickel-titanium device spinal surgery; Dynamic stabilization; Nitinol; Nickel-titanium device

Introduction

Recently, several types of devices for the rear dynamic stabilization have been introduced as an alternative to fusion devices for the surgical treatment of lumbar spine degenerative or traumatic [1]. It is hypothesized that the use of elastic materials such as Nitinol can restore the stability of the lumbar spine without the adverse effects of the stress-shielding that are often found with the 'rigid devices' [2-5]. Many studies have shown that the devices made of elastic material can be able to maintain a kinematic behavior of the normal spine with the optimal load sharing between the front and posterior spinal elements [6,7].

Materials and Methods

The innovative component of this system (RodFix) is the material of the bars that possesses two characteristics: the shape memory, for the correction of some deformity of the spine, and superelasticity, for the maintenance of functional mobility of the operated segment (Figure 1). The difference between the RodFix and the other of screws and rods systems, commonly used in spinal surgery, therefore consists in the ability of the RodFix to amortize the loads without transferring them to the plant ends, reducing the distabilità junctional that usually can occur after one / two years after surgery [8]. The system "RodFix" is indicated in the stabilization of the back-lumbar spine in the case of vertebral fracture, traumatic and pathological; olistesi; deformity of the spine and in all cases where there is a condition of instability or distabilità, with or without stenosis of the channel or when you want to realize a bypass of forces [9- 11].

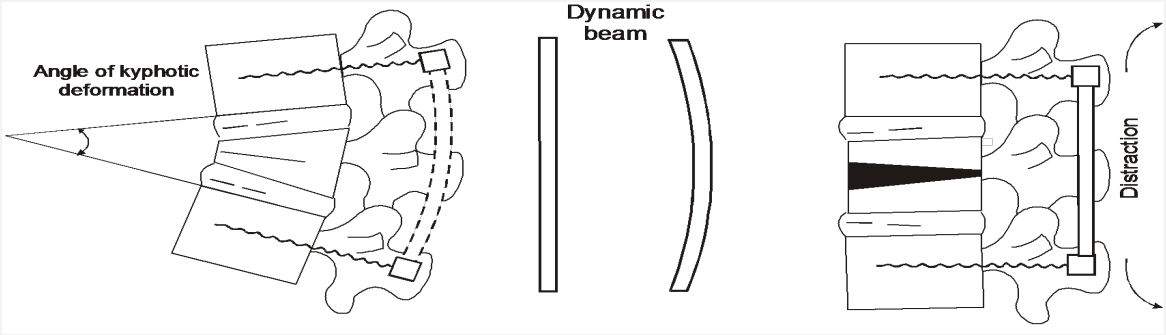

Figure 1: This picture shows the application of RodFix system.

Results

A total of 8 patients (3 males and 5 females) with a mean age of 53.3 years (ages 42 to 68 years) were treated at IRCCS Neuromed Institute, Pozzilli (IS), Italy, during the years 2005-2007, for spondylolisthesis (5 cases), post-traumatic vertebral instability (1), post-surgery vertebral instability (2) (Figure 2).

Figure 2: Illustrative post-operative case. MRI scan showing the application of RodFix system at L4L5 and LumbarFix at L3L4.

Discussion and Conclusions

The main advantages of this stabilization system in compression fractures of the vertebral bodies are represented primarily by the ability to distract the spine injured segment thanks to the effect of the shape memory in each bars Nitinol.

In conclusion conforming to the studies made in laboratory on animals and clinical trial on man it can be said that the nickel-titanium for spinal fixation defined "RodFix" satisfy fully the fundamental structural properties needed to allow a convenient fixation of the vertebral column and a neuroradiological test (CT, Rx, MRI and so on) without artefacts and distorsions of image [11,12].

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