



Physical Therapy Update

The clinical staff at Frederick Sport and Spine Clinic regularly reviews articles, discusses the content and implements the information into our patient treatments. As a service to the local medical community, we are offering a summary of these articles to Physicians and Medical Practitioners. It is our intention to provide only the most pertinent info in these ½ page summaries. Further info is available at the clinic. Please take a moment to peruse the information below and contact us if you have any questions about the subject matter. Enjoy!

Loads on an Internal Spinal Fixation Device During Physical Therapy

By Rohlman, Graichen, Bergmann; Physical Therapy. Vol. 82,2002:pages 44-52

When Treating Patients with an internal fixation device, neutral spine stabilization exercises, postural education, and Back School form a foundation for treatment. But, have we stopped to consider the spinal loads these exercises actually create on the hardware, and the amount of load pedicle screws can undergo prior to failure?

This study examined the loads created on internal fixation devices by various physical therapy activities. This was contrasted with the amount of load pedicle screws can undergo prior to breakage and identified those exercises that pose the greatest risk of failure.

While pedicle screw breakage occurs in only 6-7% of patients, it is important to realize that this primarily occurs with repetitive bending moments that lead to fatigue failure. Please note that the percentage of breakage increases as the distance between the screws increases and that breakage may occur greater than six months after surgery. "Therefore, pedicle screw breakage has nothing to do with bony fusion or psuedarthrosis."

In order to report the risk of pedicle screw failure, the spinal loads present while standing were set equal to 100%, and the percentages reported for the various movements are in relation to this value. The implant strength, per the manufacturer, is 7.5 Nm. This corresponds to 110% of the load measured while standing. Therefore, exercise with corresponding bending moments less than 110% have low associated risks of screw failure.

The corresponding values of screw failure for static positions, including prone, supine, side lying, sitting relaxed, and sitting erect are all less than 110% the value of standing. All implant loads measured during exercises completed while lying down were less than 110% with the highest load occurring with bilateral SLR (101%); therefore, these exercise do not increase the risk of failure. Exercises completed in sitting also fell below the 110% standard; however, trunk ROM executed while seated came close at 107-108%. Flexing and extending the spine in the quadruped position (hands and knees), and extending one arm or one leg to horizontal did not increase forces greater than 100%. Extending opposite arm and leg together in this position increased forces to 106%; still falling below the standard. Walking caused the greatest bending moments at 128% (speed influences are negligible), and therefore "plays the major role concerning pedicle screw breakage," secondary to the high repetition of movement. Rohlman, et al. also report that a brace or harness will not decrease the load upon the implants, and "carrying a load has only a slight effect on the bending moments."

In conclusion, the results of this study directly support the need for skilled Physical Therapy intervention following surgery. Neutral spine exercises, along with patient education, are essential factors in successful rehabilitation, and protection of the pedicle screws. These exercises should be completed in a sitting, lying, or kneeling position to lessen the loads on the hardware. Walking should be continued as a means of locomotion. However, patients should be educated to avoid excessive walking, and instead, encouraged to utilize cycling for cardiovascular fitness.

Reviewer: Lisa Perkins, PT

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