



Online Article Abstracts

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■ Estimating the Compressive Strength of the Porcine Cervical Spine

An Examination of the Utility of DXA

Robert J. Parkinson, Jennifer L. Durkin,
and Jack P. Callaghan

Study Design. The failure strength of porcine spinal units was correlated with vertebral size and bone mineralization. The accuracy of the resulting predictive equations was tested with an independent sample of spinal units.

Objectives. To determine if dual energy x-ray absorptiometry (DXA)-obtained measures of bone mineralization can be used to accurately predict the compressive tolerance of porcine spinal units.

Summary of Background Data. Porcine spinal units are often used in place of cadaveric tissues, and normalization is used to improve the transferability of model results. In compressive testing, normalization can be performed to the estimated compressive strength. Bone mineralization measures have been shown to be positively correlated with compressive tolerance and have been used to predict the tolerance of human spinal units. However, the accuracy of these predictive equations has not been assessed with an independent sample.

Methods. Twenty porcine cervical spinal units were scanned (DXA) to obtain measures of bone mineral content (BMC) and bone mineral density (BMD). The units were compressed to failure, and the failure loads were correlated with the measured bone mineralization and endplate area of the spinal unit. The regression equations were used to predict the compressive tolerance of an independent sample of spinal units.

Results. BMC ($P = 0.078$) and BMD ($P = 0.2834$) were not significantly correlated to compressive strength. Endplate area was the most highly correlated variable, with an r^2 of 0.5329. The use of a predictive equation including BMC on the second independent sample resulted in errors of estimation of 1.4 ± 1.2 kN, corresponding to 13% of the average compressive strength. In comparison, the use of an equation employing endplate area alone resulted in estimation errors of 11%.

Conclusions. Measures of BMC/BMD did not enhance predictions of compressive strength and will not reduce errors in compressive load normalization in a porcine model. The poor correlations found between BMC and compressive strength may be due to the non-load-bearing anterior processes of the porcine cervical spine.

Key words: compression, accuracy, DXA, porcine, animal model, normalization. **Spine 2005;30:E492-E498**

■ Paraspinal Electromyography: Age-Related Normative Values in Asymptomatic Subjects

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and Jennifer A. Miner

Study Design. Cross-sectional study.

Objectives. To determine if the amount of lumbar paraspinal denervation increases with age and present normative data on the amount of denervation present in asymptomatic subjects.

Summary of Background Data. To our knowledge, there are no data on the relationship of paraspinal denervation with age or normative data on the amount of denervation expected in asymptomatic older adults.

Methods. We combined the data from our current study of asymptomatic adults, age 55–79 years, and a previous study of asymptomatic adults, age 18–58 years, who underwent lumbar paraspinal muscle needle electromyography using a validated needle electromyography (MiniPM) technique. We then compared the results of the age group 55–79 to that of the age group 18–54.

Results. The older group scored significantly higher than the younger group by 1.7 ($P = 0.008$, 95% confidence interval 0.5–3.0). Linear regression showed that age was a significant predictor of the MiniPM score ($\beta = 0.04$, and $P = 0.04$). For subjects 55 years and older, mean MiniPM score on one side was 2.3 (standard deviation 3.6). The upper range of the 95th percentile was 10.

Conclusions. The amount of lumbar paraspinal muscle denervation does increase with age. Understanding the range of findings in asymptomatic subjects will help us interpret lumbar paraspinal needle electromyography findings in patients with spinal disorders.

Key words: electromyography, muscles, spine, normality. **Spine 2005;30:E499-E502**

■ Intervertebral Motion After Incremental Damage to the Posterior Structures of the Cervical Spine

Taylor Brown, Charles A. Reitman, Lyndon Nguyen,
and John A. Hipp

Study Design. Compare intervertebral motion after incremental damage to posterior cervical structures in whole cadavers to motion in asymptomatic subjects.

Objective. Determine if damage to the posterior structures of the cervical spine can be detected by quantitative analysis of flexion-extension radiographs.

Summary of Background Data. Simulated damage to the posterior structures of the cervical spine can change intervertebral motion, if intervertebral motion before damage is known. It is not known if intervertebral motion measured from flexion-extension radiographs can be used to detect damage to the posterior structures if motion before damage is not known.

Methods. Incremental injury to posterior ligaments and facet joints was simulated in 12 whole cadavers. Intervertebral motion was measured from flexion-extension images using validated and clinically applicable software. Measurements were compared to previously published measurements for asymptomatic subjects.

Results. Extensive damage could be simulated in all the cervical spines without intervertebral motion exceeding the 95% confidence limits for asymptomatic subjects. After sectioning all posterior ligaments, destroying both facet joints, and then sectioning the posterior longitudinal ligaments, intervertebral motion exceeded the 95% confidence intervals in 69% of the cadavers. Intervertebral shear decreased with incremental damage to posterior structures.

Conclusions. Radiographic assessment of the cervical spine may not be sufficient to exclude even extensive damage to the posterior structures of the cervical spine.

Key words: cervical spine, injury, radiographic, diagnosis.
Spine 2005;30:E503–E508

■ Sensory Motor Learning in Patients With Chronic Low Back Pain

A Prospective Pilot Study Using Optoelectronic Movement Analysis

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Jan A. G. Willén, and Bo E. A. Johnels*

Study Design. The effect of sensory motor learning (SML) on chronic low back pain (CLBP) patients' movement capacity was evaluated with the optoelectronic Posturo-Lo-motion-Manual (PLM) test.

Objective. To study SML changes of an intentional dynamic behavior of daily life in a group of CLBP patients and compare the performance with an age- and sex-matched group of back-healthy individuals.

Summary of Background Data. In a previous study, the PLM test was found reliable when used in CLBP patients. SML addresses dynamic movement capacity. There is little scientific evidence of the effectiveness of educational interventions in improving motor behavior.

Methods. Twelve patients with treatment-resistant CLBP were selected by two orthopedic spine surgeons. Twelve back-healthy age- and sex-matched individuals were included as controls. The patients participated in weekly SML lessons during a maximum of 12 months. All study participants were investigated with the PLM test, before intervention, directly after intervention, and 10 to 12 months after completion of the intervention, and patients were compared with controls.

Results. Before intervention significant differences in performance were found between the group of patients and the healthy control group. After the intervention, the CLBP patients had improved their performance so there were no longer any significant differences between the groups. The results were retained 12 months after intervention.

Conclusions. The study shows that the CLBP patients had learned and retained a more efficient behavior. The results suggest that SML is an effective intervention for nonspecific CLBP patients.

Key words: sensory motor learning, Feldenkrais method, nonspecific chronic low back pain, optoelectronic measurement, quantitative movement analysis, Posturo-Lo-motion-Manual test. **Spine 2005;30:E509–E516**

■ Chance-Type Fractures of the Axis

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Andreas F. Mavrogenis, Ioannis S. Benetos,
Petros Kyriazopoulos, and Ioannis Psycharis*

Study Design. A retrospective study was performed to identify horizontal fractures of the body of the axis, with special attention to their pattern, prevalence, and clinical outcome.

Objective. The prevalence of this type of injury and the long-term clinical behavior are examined.

Summary of Background Data. Although isolated cases have been reported, horizontal Chance-type fractures of the body of the axis are not common cervical spine injuries.

Methods. The medical records of 674 consecutive patients with fractures of the cervical spine admitted to the authors' institute from 1970 to 2002 were reviewed. Of them, 2 (0.3%) had a horizontal Chance-type fracture of the body of the axis. Neurologic deficits were not diagnosed at admission. Mechanism of injury, treatment, and long-term follow-up were evaluated.

Results. Both patients were treated nonoperatively. At the latest follow-up, 3 and 12 years, respectively, both patients had a satisfactory clinical outcome.

Conclusion. Horizontal fractures of the Chance-type of the body of the axis are rare. Conservative treatment proved to be effective.

Key words: Chance-type fracture, upper cervical spine, axis. **Spine 2005;30:E517–E520**

■ Bilateral Traumatic Neuroma of the Anterior Cervical Nerve Root

Case Report

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Celal Bagdatoglu, and Sukru Caglar*

Study Design. Case report.

Objectives. A rare case of anterior cervical second root traumatic neuroma with no history of trauma is reported, and possible etiology is discussed.

Summary of Background Data. Traumatic neuroma is the reactive, nonneoplastic proliferation in the injured nerve. Several atypical locations of traumatic neuroma have been reported. To date, only 4 cervical traumatic neuroma cases with no history of trauma have been reported, and, to our knowledge, there is no case of bilateral cervical traumatic neuroma published in the literature.

Methods. A patient with a history of neck and left upper extremity pain, who had hypoesthesia in left C2 dermatome on neurologic examination is presented. A left C2–C3 hemilaminectomy and tumor extirpation were performed.

Results. A histopathologic study revealed features of a typical traumatic neuroma. The patient had no deficits on her postoperative neurologic examination, and her neck and left arm pain improved. The unusual location of this lesion and possible etiology of such a traumatic neuroma are discussed.

Conclusions. A rare case of anterior bilateral cervical second root traumatic neuroma with no history of trauma is reported. An unnoticed history of trauma may play an etiologic role in the development of these lesions.

Key words: atypical location, cervical nerve, traumatic neuroma. **Spine 2005;30:E521–E523**

■ Epidural Spinal Lipomatosis With Acute Onset of Paraplegia in an HIV-Positive Patient Treated With Corticosteroids and Protease Inhibitor

Case Report

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Christian Herbold, Laszlo Solymosi, and Klaus Roosen*

Study Design. Case report.

Objective. To report a case of HIV-related lipodystrophy with a rapid onset of symptoms from epidural lipomatosis in the wake of protease inhibitor and steroid treatment.

Summary of Background Data. Symptomatic spinal epidural lipomatosis is considered to be a rare condition usually presenting with slowly progressive cord or nerve root compression. Only 2 cases of spinal lipomatosis in HIV-related lipodystrophy have been reported.

Methods. We describe the case of a 41-year-old male with HIV who received protease inhibitor medication and had neurologic deficits rapidly develop.

Results. The patient had complete paraplegia develop within 12 hours from admission following a 1-day history of unsteady gait and a 3-day history of leg numbness. After diagnosis of epidural lipomatosis on magnetic resonance imaging, the patient underwent decompressive thoraco-laminectomy. He recovered well and was able to walk by postoperative day 4.

Conclusion. It is important to maintain an awareness for the possible association between HIV lipodystrophy and symptomatic epidural lipomatosis.

Key words: epidural spinal lipomatosis, HIV lipodystrophy. **Spine 2005;30:E524–E527**