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Cervical Laminoplasty:
Evolution of Surgical Technique and Results in Twenty-six Myelopathic Patients.

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Twenty-six patients with cervical myelopathy and multilevel involvement underwent posterior cervical laminoplasty at Rancho Los Amigos between 1992 and 1995. All patients had congenital stenosis with superimposed trauma, degenerative spondylosis, or OPLL. These conditions had previously been approached surgically by anterior decompression.

The technique for maintaining the laminoplasty has been revised over time. Current technique utilizes open side struts held in place at alternate levels by mitered cuts at each end of the strut, locked in position by appropriate hinge-side tension. No internal fixation is utilized at present.

At 77 day follow-up, mean increase in ASIA Motor Score was 15 points over preop exam. Mean increase in Pavlov Ratio was 0.27. Postoperative plain lateral x-rays correlated with axial CT measurements. Canal area increased an average of 30%.

Complications were few. Motor root palsies were observed in two patients, and serve as the basis of future study to determine the optimum degree of canal expansion.

USE OF COMPOSITE SECTION TRANSFORMATIONAL ANALYSIS TO CALCULATE STRESS DISTRIBUTIONS IN VERTEBRAL BODIES

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Introduction: Previous research has demonstrated that spinal stiffness increases after instrumented fusion. The magnitude of which, to date, has not been experimentally nor mathematically shown. The purpose of this study is to create a mathematical model illustrating the change in section properties of an instrumented vertebral body. A composite section is a structural member that is composed of two or more materials of different moduli of elasticity. Introduction of a different structural material to a member of constant elastic modulus creates a member which has distinctly different structural properties than the original, homogenous section. The magnitude of the alterations in these structural properties can be calculated by creating a fictitious section which represents the amount and dimensions of a homogenous section needed to produce a member of equivalent stiffness. The addition of spinal instrumentation causes the instantaneous axis of rotation (IAR) to migrate towards the instrumentation. An analysis by composite section transformation demonstrates this principle mathematically as well as graphically. Materials and Methods: Seven adult L3 disks were harvested from fresh cadaveric specimens, and their topographies and morphologies were carefully measured and recorded. This data was averaged and utilized to draw a mid-body cross-section of the non-instrumented vertebral body. Utilizing three different stainless steel posterior instrumentation systems (5 mm, 6.5 mm, and 7 mm diameters), the aforementioned technique was applied and the resulting changes in section properties were calculated. Results: As the diameter of instrumentation increased, the IAR migrated progressively posteriorly, resulting in increased bending stress in the anterior aspect of the vertebral body. Conclusions: Large diameter rods placed posteriorly on vertebral bodies create large, non-physiological anterior stress distributions as a result of the displacement of the vertebral body's neutral axis. This implies that rigid fixation with large diameter rods may contribute to the population of posterior fixation failures.