

Segmental Stiffness Achieved by Three Types of Fixation for Unstable Lumbar Spondylolytic Motion Segments

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Abstract

Objective The objective of this study was to compare the relative stability in lumbar spondylolysis (SP) of a rigid anterior plate (with a novel compression slot) versus traditional posterior pedicle screw (PS) fixation.

Summary of Background Data Arthrodesis has been a mainstay of treatment for symptomatic isthmic spondylolisthesis in adults. Posterior PS fixation has become a commonly used adjunct. Some have advocated anterior lumbar interbody fixation (ALIF) plate as an alternative. The relative stability afforded by ALIF in SP has not been well characterized, nor has the contribution afforded by a compression screw slot in an ALIF plate.

Methods Calf spine segments were characterized in the normal state, after sectioning the pars (SP model), then after reconstruction with an interbody spacer and either PS/rods, or an ALIF plate, or both.

Results ALIF plate conferred stability on the spondylolytic segment only comparable to that of the normal functional spinal unit (FSU). Posterior fixation was more stable than anterior fixation in all testing modes. Addition of an ALIF plate conferred a significant additional stability in those that already had posterior fixation. The utilization of an anterior compression screw conferred additional stability in extension testing only.

Conclusions ALIF plate reconstruction in the setting of SP may not confer enough segmental stability to predictably encourage fusion beyond that of the uninstrumented intact FSU. The utilization of an integral compression screw in an ALIF plate may not confer clinically significant additional construct stability in SP.

Keywords

lumbar spine - spondylolysis - fixation – biomechanics

由三種固定方法治療不穩定腰椎峽部裂的活動部分所達至的分段硬度

目的 本研究的目的是比較使用堅硬前路鋼板（有一種新的壓縮插槽）與傳統的後路椎弓根螺釘固定（PS）在治療腰椎峽部裂（SP）的相對穩定性。

背景資料摘要 關節融合術一直是治療成年狹部脊椎滑脫症患者的主要方法。後路 PS 固定已成為一種常用的輔助方法。有些人主張的前路腰椎椎體間融合（ALIF）板作為替代品。在 SP 中使用 ALIF 所提供的相對穩定或在 ALIF 板中壓縮螺釘插槽的幫助也沒有充分定性。

方法 小牛脊柱分段被界定是正常的狀態下，切除關節間部（SP 模型）後，再以椎間融合器和 PS /棒，或 ALIF 板，或兩者進行重建。

結論 使用 ALIF 板重建 SP 可能沒有提供足夠的分段穩定性給預期鼓勵的融合，這並不超出沒有內固定和完整 FSU。在 ALIF 板使用加壓螺釘可能未能在 SP 的情況下提供臨床顯著額外的結構穩定性。

結果 在腰椎峽部裂部份，以 ALIF 板固定所達到的穩定性只可與脊髓的正常功能單位（FSU）相比。在所有的測試模式中，後路固定比前路固定更穩定。以後路固定再加上 ALIF 板能顯著增加額外的穩定性。使用前方加壓螺釘只是在伸展測試中提供額外的穩定性。