

Global Spine J 2012; 02(04): 213-220

DOI: 10.1055/s-0032-1331460

Construct Rigidity after Fatigue Loading in Pedicle Subtraction Osteotomy with or without Adjacent Interbody Structural Cages

Abstract

Introduction Studies document rod fracture in pedicle subtraction osteotomy (PSO) settings where disk spaces were preserved above or adjacent to the PSO. This study compares the multidirectional bending rigidity and fatigue life of PSO segments with or without interbody support.

Methods Twelve specimens received bilateral T12-S1 posterior fixation and L3 PSO. Six received extreme lateral interbody fusion (XLIF) cages in addition to PSO at L2-L3 and L3-L4; six had PSO only. Flexion-extension, lateral bending, and axial rotation (AR) tests were conducted up to 7.5 Newton-meters (Nm) for groups: (1) posterior fixation, (2) L3 PSO, (3) addition of cages (six specimens). Relative motion across the osteotomy (L2-L4) and entire fixation site (T12-S1) was measured. All specimens were then fatigue tested for 35K cycles.

Results Regarding multiaxial bending, there was a significant 25.7% reduction in AR range of motion across L2-L4 following addition of cages. Regarding fatigue bending, dynamic stiffness, though not significant ($p = 0.095$), was 22.2% greater in the PSO + XLIF group than in the PSO-only group.

Conclusions Results suggest that placement of interbody cages in PSO settings has a potential stabilizing effect, which is modestly evident in the acute setting. Inserting cages in a second-stage surgery remains a viable option and may benefit patients in terms of recovery but additional clinical studies are necessary to confirm this.

在有或沒有相鄰椎體間護架的經椎弓根椎體截骨術疲勞載荷後建構堅固性

引言 研究記錄了在經椎弓根椎體截骨術 (PSO) 的設置下連接桿斷裂而在 PSO 上方或相鄰的椎間隙得以保存。這項研究對有或沒有椎體間支撐的 PSO 部份比較了多方向的抗彎剛度和疲勞壽命。

方法 12 個樣本是接受了雙側 T12-S1 後路內固定和 L3 PSO。6 個樣本是接受了腰椎側位融合術 (XLIF) 並在 PSO 外額外 L2-L3 和 L3-L4 加了護架; 6 個樣本只接受了 PSO。曲屈-伸展, 側彎和軸向旋轉 (AR) 以直至 7.5 牛頓米 (Nm) 對以下組別進行了測試: (1) 後路內固定, (2) L3 PSO, (3) 加了額外護架 (6 個樣本)。橫跨截骨術位置 (L2-L4) 和整個固定部位 (T12-S1) 的相對運動進行量度。所有標本在 35K 週期試驗後出現疲勞。

結果 在多軸彎曲中，跨 L2-L4 及有額外護架的 AR 活動度顯著減少 25.7%。關於疲勞彎曲及動剛度，雖然並不顯著（ $P = 0.095$ ），但 PSO+ XLIF 組別比 PSO 組別大 22.2%。

結論 結果表明在 PSO 設置放置椎間護架有潛在的穩定作用，在急性情況下更為審慎地明顯。在第二階段的手術加入護架仍然是一個可行的選擇，亦可能對患者的康復有利，但這需要更多的臨床研究去確認。