

Comparative Utility of Dynamic and Static Imaging in the Management of Lumbar Spondylolisthesis

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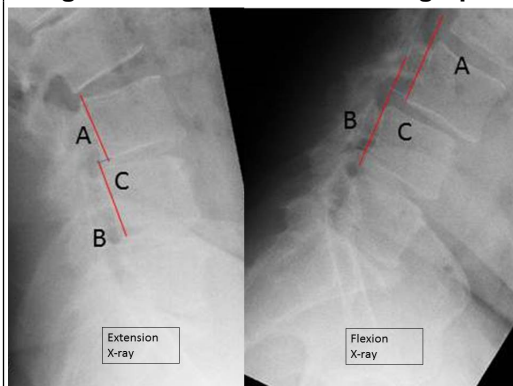
Introduction

Spinal instability refers to the inability of the spine to withstand daily stresses without incapacitating pain or neurologic deficit. Instability is traditionally investigated with flexion and extension (F-E) X-rays. Recently, abnormal spinal motion between supine and standing (S-S) views has been proposed as another diagnostic tool.

Methods

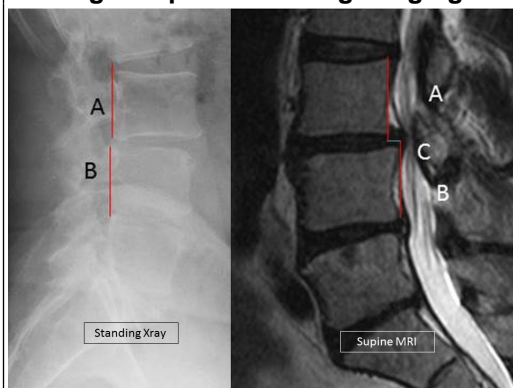
Between February 2010 and August 2016, 97 consecutive patients were identified that underwent either one- or two-level instrumented arthrodesis for degenerative lumbar instability. Patients were grouped into either Group 1 (=3 mm difference in spondylolisthesis between F-E X-rays) or Group 2 (=3 mm difference in spondylolisthesis between S-S imaging and otherwise not meeting Group 1 criteria). Pre-operative and post-operative clinical and radiologic data were collected ambispectively and compared between groups at a minimum of 1-year follow-up.

Fig 1 Flexion-Extension Radiograph



Lines A and B: Tangents to posterior vertebral border Line of Proximal and Distal Vertebrae, respectively Line C: Sagittal Translation

Fig 2 Supine- Standing Imaging



Lines A and B: Tangents to posterior vertebral border Line of Proximal and Distal Vertebrae, respectively Line C: Sagittal Translation

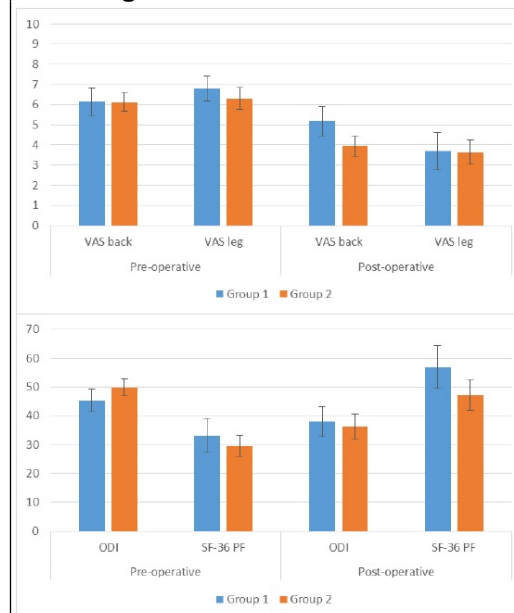
Results

Seventy-seven of 97 identified patients (80%) achieved at least one-year follow-up (average 32.4 months). Group 1 (n=27) and Group 2 (n= 50) patients did not differ in average age (p=0.351), percent male (p=0.806), BMI (p=0.953), percent smoker (p=0.712), average spondylolisthesis (p=0.711), percent with severe index level foraminal stenosis (p=0.155). Average follow-up for Group 1 and Group 2 was 32.7 and 32.2 months, respectively (p=0.485). deltaSlipFE (average change in flexion-extension) was 4.8 mm for Group 1 and deltaSlipSS (average change in supine-standing) was 5.3 mm for Group 2. Posterolateral fusion was graded using the Lenke classification and found to be 88.9% A/B for Group 1 and 94.0% A/B for Group 2 (p=0.659). For both Group 1 and Group 2, VAS back (p=0.043 and p=0.001), VAS leg (p<0.0001 and p=0.001), ODIv2.1a (p=0.024 and p=0.002), and SF-36 RAND (p=0.016 and p=0.004) improved significantly. deltaVAS back (p=0.580) and leg (p=0.577), deltaODIv2.1a (p=0.585), and deltaSF-36 RAND (p=0.404) were not significantly different between the two groups.

Conclusions

No differences were noted in outcomes between Group 1 and 2 patients. These data suggest that assessment of instability based on static S-S imaging may identify a distinct group of patients that similarly benefit from surgery.

Figure 2: Clinical outcomes



Comparison of pre-operative and post-operative VAS (Back and Leg), ODIv2.1a, and SF-36 RAND (Physical Functioning) between Group 1 and Group 2

Learning Objectives

1. Patients with instability on F-E and S-S imaging appear to benefit similarly from lumbar decompression/fusion surgery
2. Movement on S-S imaging may represent a distinct form of spinal instability
3. S-S imaging may represent an alternative diagnostic modality in lumbar spondylolisthesis