

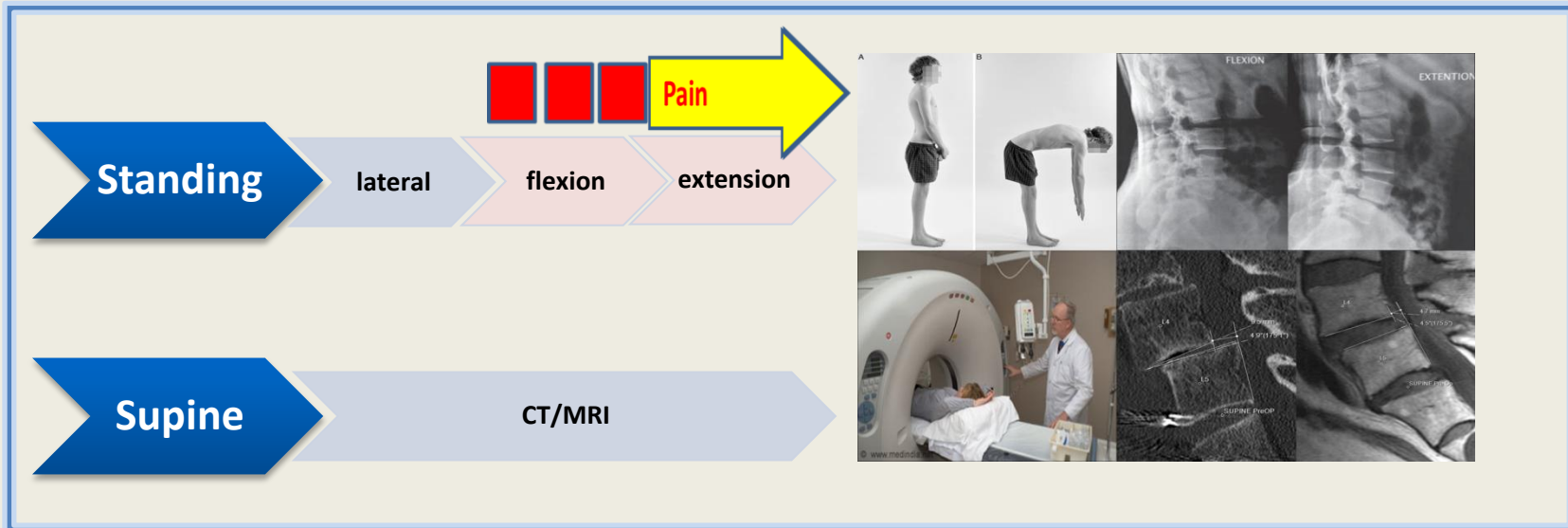
Degree of Mobility at L4-5 in Preoperative and Intraoperative Images in Patients with Lumbar Degenerative Spondylolisthesis

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Background

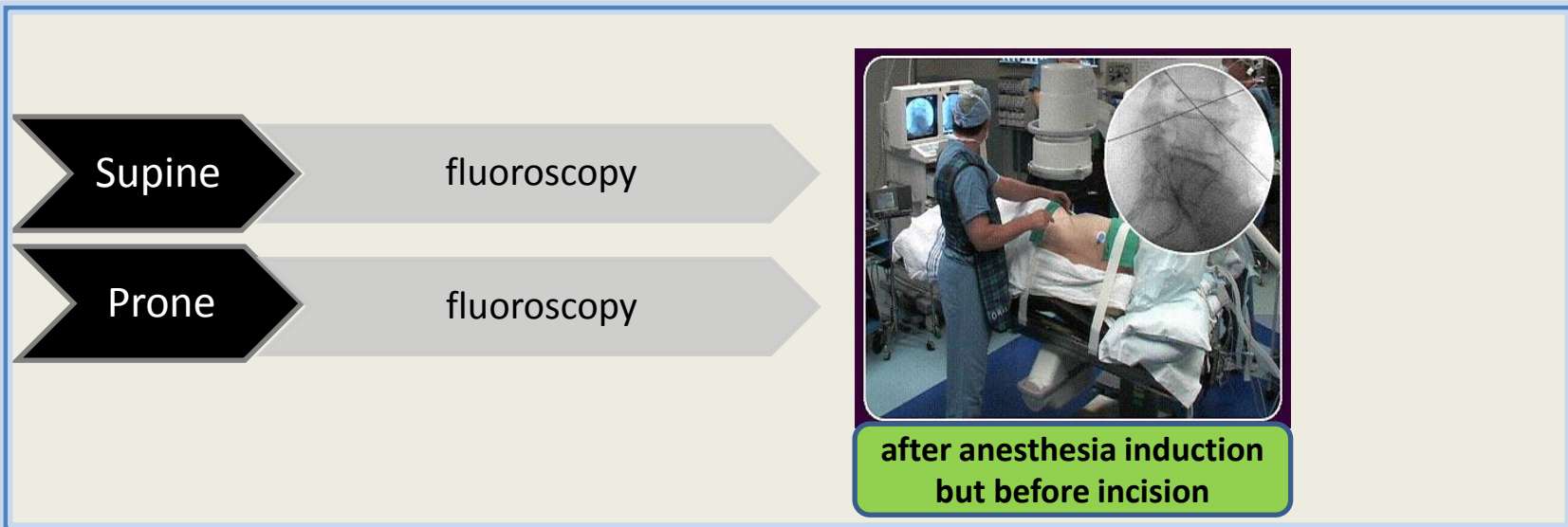
- Lumbar degenerative spondylolisthesis (LDS) is an acquired defect due to disc degeneration and laxity of the three-joint complex of the spinal motion segment leading to instability and the sliding of one vertebra on another vertebra with an intact neural arch.
- Pre-operative images have been used to determine mobility at the level of disease; however, the degree of mobility with respect to intra-operative images has not been characterized.

Background: Standard Pre-operative Images



- Translation and/or change in angulation of vertebrae in dynamic flexion-extension radiographs have been classic guidelines for instability
- Severe back pain may not allow full flexion and extension

Background: Intra-operative Images



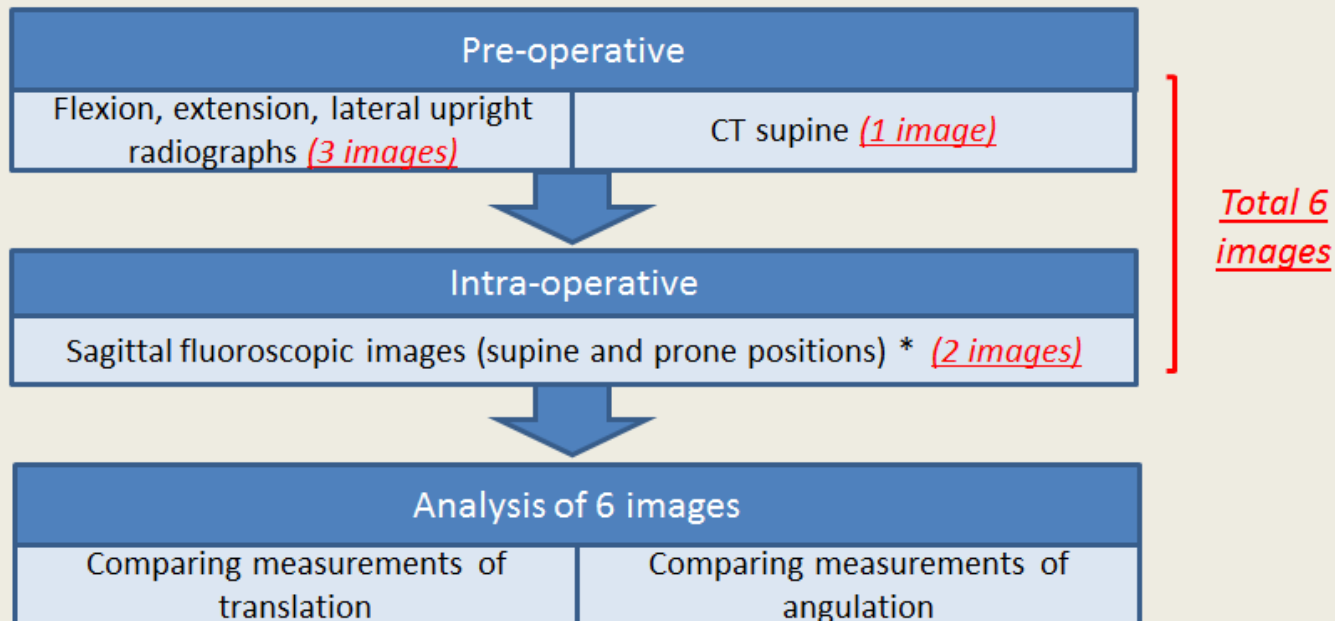
- Radiographs done under anesthesia just prior to surgery provide a more accurate assessment of mobility

Objectives

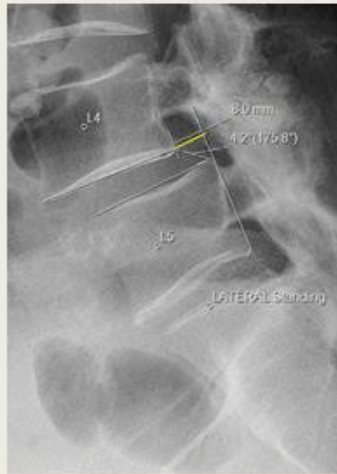
Characterize and compare the degree of mobility noted on pre-operative and intra-operative images in patients undergoing surgery for L4-L5 lumbar degenerative spondylolisthesis (LDS).

Methods

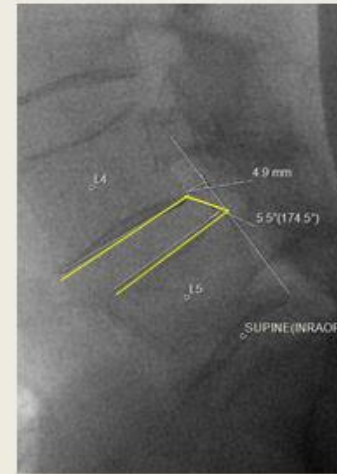
This is a report of enrollment data from a trial to predict clinical and patient-centered outcomes after surgery for LDS



Methods: Measurements of *Instability*



Translation



Angulation

- Translation was measured as the forward displacement of the posterior edge of the superior vertebra compared to the plane of the posterior edge of the inferior vertebra. **Instability: ≥ 3.5 mm**
- Angulation was measured as the angle between the inferior endplate of the superior vertebra and the superior endplate of the inferior vertebra. **Instability: $\geq 11^\circ$**

Methods: Statistical Analysis

Pearson's *chi* square test: to assess overall difference in the degree of movement across images.

Poisson regression: to explore the association between the degree of mobility in pre-operative and intra-operative images (expressed as incidence rate ratio (IRR))

Pre-operative Characteristics (N=100)

Demographics and clinical characteristics	
Mean age	68
Women	56%
BMI	28
Had smoking History	59%
Mean back pain (0 = none, 10 = most)	6.1
Mean leg pain (0 = none, 10 = most)	5.2
Instability Criteria	
Met criteria	54
Translation	42%
Angulation	4%
Both	8%

Comparisons of degree of translation: for pairs of the 6 images

Image pairs	IRR	95% CI	P-value
Flexion-extension		Reference	
CT-lateral	1.15	0.96-1.37	.14
Lateral-supine	1.82	1.55-2.14	<0.001
Lateral-prone	1.78	1.51-2.08	<0.001
Supine-prone	0.99	0.83-1.19	.93
CT-supine	1.20	1.01-.43	.04
CT-prone	1.15	0.96-1.37	.13
Flexion-supine	0.89	0.73-1.07	.21
Flexion-prone	1.11	0.93-1.33	.26
Flexion-lateral	0.65	0.53-0.80	<0.001

With flexion-extension as the reference pair, lateral-supine and lateral-prone are the best pairs with the highest rates identifying degree of translation across all image pairs.

Comparisons of degree of angulation: for pairs of the 6 images

Image pairs	IRR	95% CI	P-value
CT-lateral		Reference	
Lateral-supine	1.57	1.26-1.96	<0.001
Supine-prone	0.98	0.77-1.26	.901
CT-supine	1.69	1.36-2.10	<0.001
CT-prone	2.41	1.97-2.97	<0.001

With CT-lateral as the reference pain, CT-prone is the best pair with the highest rate identifying degree of angulation across all image pairs.

If you were to consider only a single image.....

Translation for 6 images	IRR	95% CI	P-value
CT		Reference	
Lateral	1.42	1.21-1.66	<0.001
Flexion	1.87	1.61-2.17	<0.001
Extension	1.27	1.08-1.49	0.003
Supine	0.51	0.42-0.63	<0.001
Prone	0.48	0.39-0.60	<0.001

Angulation for 6 images	IRR	95% CI	P-value
CT		Reference	
Lateral	0.94	0.77-1.15	0.547
Flexion	0.12	0.08-0.19	<0.001
Extension	1.4	1.21-1.73	<0.001
Supine	2.1	1.79-2.50	<0.001
Prone	2.32	1.97-2.73	<0.001

Translation in flexion and angulation in prone are the single best images.

Conclusions

Pre-operative flexion-extension pair was not sensitive enough to identify the degree of mobility in patients with L4-L5 LDS.

Mobility in other pairs of images such as lateral-supine and lateral-prone gave the highest (best) rate ratio to identify translation mobility.

Mobility in the CT-prone pair gave the highest (best) rate ratio to identify angulation mobility.

Additional future analyses will consider other variables, such as facet morphology, degree of diastasis, and disc height in the identification of instability.

Disclosure

None of the authors has any potential conflict of interest