
Two Different Types of Stooping Posture after Sacropelvic Fixation for Degenerative Sagittal Imbalance

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Introduction

- Long instrumented fusions with sacropelvic fixation are frequently required for degenerative sagittal imbalance (DSI).
- Stooping posture without proximal junctional kyphosis (PJK) can manifest in the form of global sagittal imbalance.

To investigate the differing risk factors between stooping posture without PJK and with PJK in patients treated with long instrumented fusion using sacropelvic fixation for DSI

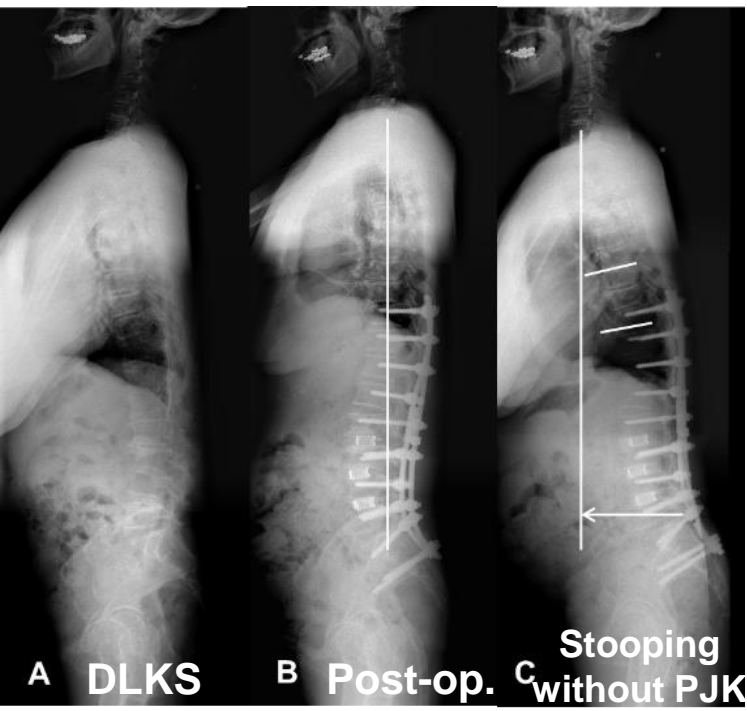
Material and Methods

- **Patients population**
 - **Retrospective cohort study** : From 2006 to 2014 at a single institution
 - **Inclusion criteria**
 - Over 60 years of age at the index surgery
 - Sagittal vertical axis deviation (SVA) > 5cm
 - More than 4 levels fusion with bilateral iliac screw fixation
 - Minimal 24 months of follow-ups
 - **Exclusion criteria**
 - Revision surgery for post-operative infection
 - Short instrumented fusion (≤ 3 levels)
 - Suspected pseudarthrosis

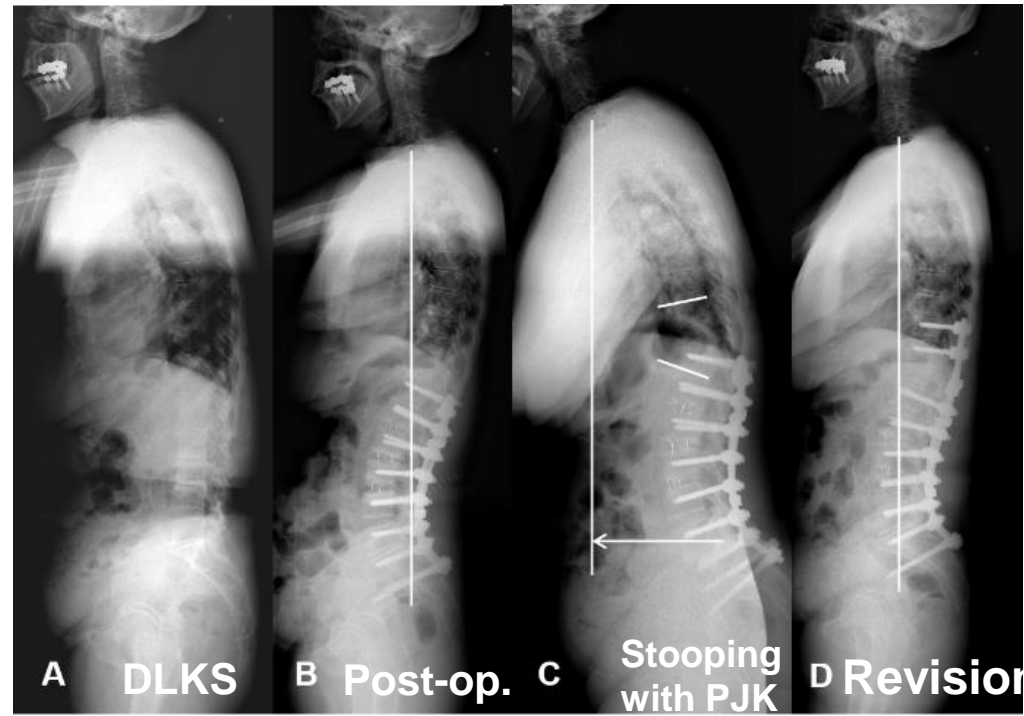
Material and Methods

- **Group 1 (Non-stooping group)**
- **Group 2 (Global stooping group) :** SVA > 5cm without PJK
- **Group 3 (PJK group) :** SVA > 5cm with PJK

Group 2



Group 3



Material and Methods

- **Outcome parameters**

- **Radiological outcomes**

- Pelvic incidence (PI), pelvic tilt (PT), sacral slope (SS), lumbar lordosis (LL), thoracic kyphosis (TK), SVA
 - Cross-sectional area (CSA) and fatty change of paravertebral muscles on pre-operative MRI

- **Clinical outcomes**

- Oswestry Disability Index (ODI)
 - Visual analog scale (VAS) of back and leg pain

- **Statistical analysis**

- Student's t-test and paired t-test
 - Fisher's exact test or Pearson's chi-square test
 - Logistic regression test
 - Analysis of variance (ANOVA) test

Results

- **Patient demographics**

- 80 patients
- Mean age : 67.7 ± 6.8 years
- Mean fusion level : 6.0 ± 1.6 [4-10]
- Combined anterior-posterior surgery : 26/80 (32.5%)
- Pedicle subtraction osteotomy : 22/80 (27.5%)

Results

- **Univariate analysis**

- **Non-stooping/PJK group (40/80, 50%)**

- **Global stooping group (18/80, 22.5%)**

- More fusion levels (5.5 ± 1.4 vs. 6.9 ± 1.3 , $p=0.0001$) and fusion ending above thoracolumbar junction ($p=0.001$)

- **PJK group (22/80, 27.5%)**

- Higher BMI (23.6 ± 3.5 vs. 24.4 ± 3.9 , $p=0.027$)

Results

- **Multivariate analysis**

- **Global stooping group**

- More fusion levels (hazard ratio (HR)=3.109, $p=0.044$), less change in SS (HR=1.221, $p=0.003$), less change in TK (HR=1.264, $p=0.049$)

- **PJK group**

- Great post-operative PT (HR=1.105, $p=0.026$), less change in SS (HR=1.084, $p=0.036$)

Results

- **Comparison of radiological parameters between global stooping group and PJK group**

	Global stooping (n=18)	PJK (n=22)	<i>p</i>
Age	68.8 ± 4.8	69.1 ± 8.0	0.254
Sex, female : male	13 : 5	22 : 0	0.013
UIV, at : above thoracolumbar junction (D11- L1)	6 : 12	16 : 6	0.013
Change in LL <30°	17 (94.4%)	14 (63.6%)	0.020
≥ 30°	1 (5.6%)	8 (36.4%)	
Post-operative PI-LL < ±10°	4 (22.2%)	12 (54.5%)	0.038
≥ ±10°	14 (77.8%)	10 (45.5%)	
Post-operative SVA < 50mm	10 (58.8%)	18 (90%)	0.028
≥ 50mm	7 (41.2%)	2 (10%)	
Optimal correction No	14 (82.4%)	10 (50%)	0.04
Yes	3 (17.6%)	10 (50%)	
CSA of paravertebral muscles, m ²	1566 ± 350	1776 ± 332	0.05
Ratio of CSA-muscle/CSA-disc	76.2 ± 16.1	95.8 ± 23.3	0.005
Degree of fatty changes	40.5 ± 14.9	38.9 ± 11.2	0.698
Pfirschmann grade, 1,2,3 vs. 4,5	11 : 4	13 : 6	1.000

Results

- **Clinical outcomes among the non-stooping/PJK, global stooping, and PJK groups**

		Non-stooping/PJK		Global stooping		PJK	
Back VAS	Initial	7.08 ± 2.28	0.0001	7.47 ± 2.58	0.022	7.15 ± 2.74	0.220
	Last follow-up	4.11 ± 2.75		5.29 ± 2.76		6.20 ± 2.65	
Leg VAS	Initial	6.39 ± 3.00	0.001	6.53 ± 3.04	0.163	5.60 ± 3.71	0.151
	Last follow-up	4.34 ± 3.15		4.65 ± 3.52		4.30 ± 3.25	
ODI	Initial	57.3 ± 19.7	0.002	55.6 ± 22.5	0.06	48.0 ± 20.8	0.811
	Last follow-up	45.5 ± 22.3		42.5 ± 21.9		49.1 ± 21.5	

Conclusions

- **Under-correction of sagittal parameters was a risk factor of both stooping posture without and with PJK.**
- **Global stooping posture was significantly associated with lesser correction of sagittal alignment in conjunction with weakness of the paravertebral muscles.**
- **Clinical outcomes were also significantly different between two groups.**

Disclosure

We have no financial relationships to disclose.