

Long Term Maintenance of Deformity Correction After Posterior Spinal Fusion for Adolescent Idiopathic Scoliosis

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BACKGROUND

Adolescent Idiopathic Scoliosis (AIS) when reaching operative Cobb angles (greater than 45 degrees in the coronal plane) requires posterior spine instrumented fusion (PSIF) to help prevent progression of the spinal curve. However deciding how far down the lumbar spine to extend the construct can be challenging. Going too far makes the spine very stiff and not going far enough can cause the correction to fail or progress.

PURPOSE

Evaluate surgical treatment of patients with adolescent idiopathic scoliosis (AIS) to determine if the lowest instrumented vertebrae (LIV) has any effect in maintaining curve correction and spinal balance in long term follow

METHODS

- Retrospective cohort review
- Patients treated with posterior spinal instrumented fusion (PSIF) for AIS over a three year period at a single institution.
- All patients included had a minimum of two years post-operative follow up with radiographs.
- Outcome measures were radiographic measurements including thoracic and lumbar Cobb angle, coronal and sagittal shift, LIV, shoulder balance, thoracic kyphosis and lumbar lordosis.

L1	Thoracic Curve	Lumbar	Coronal Shift	Sagittal Shift
Pre op	58	32	10	-50
Post op (2-8 wks.)	24	19	18	-21
Final	27	19	13	-35
Δ (Post-Final)	-3	0	5	15
L2	Thoracic Curve	Lumbar	Coronal Shift	Sagittal Shift
Pre op	54	32	18	-31
Post op (2-8 wks.)	23	14	15	-17
Final	20	15	12	-41
Δ (Post-Final)	4	-1	3	25
L3	Thoracic Curve	Lumbar	Coronal Shift	Sagittal Shift
Pre op	64	37	31	-60
Post op (2-8 wks.)	29	15	21	-28
Final	30	16	14	-47
Δ (Post-Final)	-1	-1	7	19
L4	Thoracic Curve	Lumbar	Coronal Shift	Sagittal Shift
Pre op	55	51	17	-42
Post op (2-8 wks.)	23	18	17	0
Final follow up	24	22	9	-37
Δ (Post-Final)	-1	-4	8	37



Fig 1: 13 year old female with right thoracic curve 53 degrees, left lumbar curve 42 degrees, thoracic kyphosis 34 degrees, lumbar lordosis 51 degrees

Fig 2: 13 year old female s/p PSIF T3-L4 with right thoracic curve 21 degrees, left lumbar curve 18 degrees, thoracic kyphosis 39 degrees, lumbar lordosis 57 degrees

RESULTS

- 38 patients had minimum 2 year radiographic follow up.
- LIV was L1 for 7 patients (7 female, mean age 12), L2 for 9 patients (8 female, 1 male, mean age 14), L3 for 13 patients (11 female, 2 male, mean age 14), and L4 for 8 patients (8 female, mean age 14).
- The average curve correction after surgery for thoracic and lumbar curves was 59% and 40% for L1 LIV, 57% and 56% for L2 LIV, 55% and 59% for L3 LIV and 58% and 65% for L4 LIV.
- There was no significant change in curve magnitude between early and final post-operative radiographs.
- The average change in coronal shift was +8mm (worsened shift) for group L1, -3mm (improved shift) for group L2, -10mm for group L3, and zero for group L4. Coronal shift improved between early and final post-operative radiographs for all groups.
- The average post-operative change in sagittal shift was 29mm for group L1, 14mm for group L2, 32mm for group L3, and 42mm for group L4.
- Sagittal shift in all groups tended to revert back towards pre-operative values at final follow up.

CONCLUSION

Average percent curve correction remains stable at long term follow up regardless of LIV. For all LIV groups, there is little to no improvement in coronal balance in the early postoperative period but there is gradual improvement over time. For all LIV groups there is early improvement in sagittal balance which tends to revert to pre-operative magnitude at long term follow-up.

REFERENCES

Sun Z, Qiu G, Zhao Y, Wang Y, Zhang J, Shen J. Lowest instrumented vertebrae selection for selective posterior fusion of moderate thoracolumbar/lumbar idiopathic scoliosis: lower-end vertebra or lower-end vertebra+1? Eur Spine J. 2014 Jun;23(6):1251-7.