

# High Rates of Successful Return to Competitive Athletics Following Posterior Spinal Fusion for AIS Regardless of Distal Fusion Level: A Prospective Cohort Study

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## INTRODUCTION:

Historically, the concept of “saving a level” during posterior spinal fusion (PSF) for adolescent idiopathic scoliosis (AIS) has been used to refer to limiting the lowest instrumented vertebra (LIV) so as to allow for more spinal mobility and return to activity, as well as minimizing risk of degenerative disc disease. This prospective cohort study followed athletically active adolescents with AIS undergoing PSF to determine if distal spinal fusion level is associated with lower postoperative sport participation. The authors hypothesized that more distal fusion would be associated with a lower rate of return to preoperative sport and level of competition.

## METHODS:

Adolescent patients undergoing posterior spinal fusion for adolescent idiopathic scoliosis between 2009 and 2019 were approached at their pre-surgical visit to participate in this prospective study. Participants were followed for a minimum of two years following surgical intervention. Sports participation, patient reported outcome questionnaires, and radiographic data was collected at the initial visit and each follow-up visit. Sport participation was categorized by type of sport (contact vs. noncontact) and ranked in order of increasing competitiveness (recreational, travel, junior varsity, varsity and professional). At each post-operative visit, it was noted whether subjects returned to the same or higher level of competitiveness. It was also noted whether participants returned to the same sport and same type of sport (contact vs. noncontact). Mann-Whitney U and Kruskal-Wallis Tests were used to compare continuous variables which were normally distributed. Pearson Chi Square and Fischer Exact tests were used to compare categorical variables. All statistical analyses were performed using SPSS (version 23.0, SPSS Inc., Chicago, IL, USA) with a two-tailed p-value of 0.05 as threshold for significance.

## RESULTS:

A total of 107 participants were included in the analysis with a mean age of 14±2 years. 77% of subjects were female. Distal fusion levels ranged from T11 to L4. There was no significant association between distal fusion level and return to the same level of competition (p=0.134). 96% of participants were cleared for contact sport with no significant differences by distal fusion level (p=0.557). Furthermore, distal fusion level demonstrated no difference in return to preoperative sport (p=0.490) or in return to the same type of sport (contact vs. non-contact) (p=0.768).

## DISCUSSION AND CONCLUSION:

This study found no differences in postoperative return to sports regardless of distal fusion level, suggesting that distal fusion level does not influence short term athletic participation. When counseling patients and families during the preoperative visit, these findings suggest that following PSF for AIS, patients will be successful in returning to their preoperative sport at a competitive level, regardless of the lowest instrumented vertebra. Future studies following these patients will allow for a better understanding of the influence LIV has on long term degenerative disc disease.

Table 1. Return to sport 2 years postoperatively for patients with AIS who underwent PSF.

Distal Fusion Level	T11/T12	L1	L2	L3	L4	P-value
<b>Number</b>	24	22	22	33	6	
<b>Age</b>	14.9 ± 2.3	14.9 ± 1.8	14.3 ± 1.4	15.0 ± 2.4	15.4 ± 2.6	0.231
<b>Sex (Female)</b>	23 (95.8%)	15 (68.2%)	19 (86.4%)	22 (66.7%)	3 (50%)	0.025*
<b>Race:</b>						
White	18 (75%)	19 (86.4%)	16 (72.7%)	28 (84.8%)	5 (83.3%)	0.547
African American/Black	2 (8.3%)	3 (13.6%)	3 (13.6%)	3 (9.1%)	0 (0%)	
Asian	2 (8.3%)	0 (0%)	0 (0%)	1 (3%)	0 (0%)	
Other	1 (4.2%)	0 (0%)	3 (13.6%)	1 (3%)	1 (16.7%)	
Refused to Answer	1 (4.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
<b>Ethnicity:</b>						
Non-Hispanic/Latino	23 (95.8%)	20 (90.9%)	19 (86.4%)	30 (90.9%)	6 (100%)	0.518
Hispanic/Latino	0 (0%)	2 (9.1%)	3 (13.6%)	3 (9.1%)	0 (0%)	
Refused	1 (4.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
<b>BMI</b>	19.6 ± 3.5	19.8 ± 3.7	19.5 ± 5.4	20.1 ± 4.4	18.5 ± 2.5	0.606
<b>Sport Classification:</b>						
Contact	7 (29.2%)	7 (31.8%)	8 (36.4%)	14 (42.4%)	2 (33.3%)	0.868
Non-Contact	17 (70.8%)	15 (68.2%)	14 (63.6%)	19 (57.6%)	4 (66.7%)	
<b>Follow up Time (Months)</b>	25.0 ± 34.4	21.7 ± 27.6	24.3 ± 27.3	24.1 ± 27.4	29.4 ± 18.9	0.687
<b>Return to same level of Competitiveness (Or Higher)</b>						0.134
Cleared for Contact Sports	12 (50%)	8 (36.4%)	16 (72.7%)	15 (45.5%)	4 (66.7%)	
<b>Cleared for Contact Sports</b>						0.557
Return to Same Sport	24 (100%)	20 (90.9%)	21 (95.5%)	32 (97%)	6 (100%)	
<b>Return to Same Sport</b>						0.490
Return to Same Type of Sport (Contact vs. Noncontact)†	14 (58.3%)	12 (54.5%)	13 (59.1%)	15 (45.5)	5 (83.3%)	
<b>Return to Same Type of Sport (Contact vs. Noncontact)†</b>						0.768
Return to Same Type of Sport (Contact vs. Noncontact)†	20 (83.3%)	19 (86.4%)	18 (81.8%)	25 (75.8%)	4 (66.7%)	

\*Indicates p≤0.05.

†Subjects who returned to a sport with a similar or higher degree of contact were considered to have returned to the same type of sport, while those who switched from contact to noncontact sports were not.