

A Cost-Benefit Analysis of Regional Anesthesia Blocks in Patients Undergoing Elective Single- and 2-Level Lumbar Fusion

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INTRODUCTION: The number of lumbar spine fusions performed annually has increased in parallel with the cost of these procedures, and balancing fiscal responsibility with successful outcomes is increasingly important for orthopedic spine surgeons. Poorly controlled postoperative pain following lumbar fusion can not only increase complications rates, recovery time and cost, but also decrease patient satisfaction. Recent studies have suggested that regional anesthesia techniques, such as the Erector Spinae Plane block (ESP) for posterior and transforaminal approaches and Transversus Abdominis Plane block (TAP) for anterior approaches, can provide significant pain control in the immediate postoperative period following lumbar fusions, potentially limiting need for narcotics and reducing hospital length of stay. However, other studies have suggested the medical benefits of these blocks are limited. Therefore, this study sought to determine both the clinical benefit and cost-effectiveness of the TAP and ESP block for patients undergoing elective lumbar fusions.

METHODS: This retrospective study included patients that underwent elective 1- or 2-level lumbar fusions between January 2021 and June 2024 and completed their preoperative and postoperative Oswestry Disability Index (ODI). Patients were excluded if they underwent their fusion due to trauma or oncological condition, or had a known history of illicit drug use or preoperative opioid use dependence. Matched controls, matching on age, sex, surgical level, and surgical approach, were created based on the patients that received an ESP and TAP block. Univariate analyses (i.e. T-tests and Chi-square tests) were used to assess differences between the control and corresponding block group, and a multivariate regression controlling for possible confounding variables (i.e. year of surgery, Charlson comorbidity index (CCI), levels fused, patient age, and length of stay) was performed to determine cost associated with the blocks.

RESULTS:

A total of 606 patients were included in this study, 460 in the ESP analysis (230 received an ESP block) and 146 in the TAP analysis (73 received at TAP block). There were no significant demographics differences between the study groups (Table 1). Results were similar between block and control group regardless of the block received (Table 2). Patients receiving a plane block experienced longer surgical times, shorter post-anesthesia care unit (PACU) recovery times, and reported less pain with activity. The ESP block did not significantly reduce opioid consumption and patients receiving the ESP block ambulated shorter distances on day of discharge compared to those that did not receive an ESP block. Patients receiving the TAP block consumed significantly less opioid than the control, and ambulation distance was similar between groups. Regression based cost analysis controlling for the confounding variables indicated that patients receiving the ESP block cost \$6,000 more per episode of care than those not receiving a block ($p < 0.001$), those receiving a TAP block cost \$5500 more per episode of care than those not receiving a block ($p = 0.048$).

DISCUSSION AND CONCLUSION: While there were some benefits to using the regional plane blocks for elective lumbar fusions, the clinical significance for patient in the acute postoperative period appears to be quite minimal. However, there was significant increase in hospital episode cost of care with implementation of the ESP and TAP blocks. Taken together, these findings would suggest that the use of regional anesthesia blocks for lumbar fusion necessitate re-evaluation from a clinical and value perspective.

Table 1: Demographic comparison between patients that received blocks versus those that didn't.

	ESP BLOCK			TAP BLOCK		
	Block	No Block	P-value	Block	No Block	P-value
N	230	230		73	73	
Age	65.6 ± 10.4	65.7 ± 11.3	0.986	57.3 ± 12.4	59.7 ± 10.3	0.110
BMI	31.9 ± 6.8	30.9 ± 5.8	0.256	30.0 ± 5.2	29.8 ± 4.7	0.769
CCI	3(2)	3(2)	0.171	2(2)	2(2)	0.381
Sex						
Male	104 (45.2%)	104 (45.2%)	0.999	42 (57.5%)	42 (57.5%)	0.999
Female	126 (54.7%)	126 (54.7%)		31 (42.5%)	31 (42.5%)	
Race						
White	197 (85.7%)	181 (79.3%)	0.148	63 (86.3%)	62 (84.9%)	0.942
Black	16 (7.0%)	20 (8.7%)		4 (5.5%)	5 (6.9%)	
Other	17 (7.3%)	29 (12.0%)		6 (8.2%)	6 (8.2%)	
Insurance						
Commercial	3 (1.3%)	2 (0.9%)	0.821	4 (5.5%)	4 (5.5%)	0.861
Medicare	200 (86.9%)	193 (83.9%)		61 (83.5%)	64 (87.7%)	
Medicaid	8 (3.5%)	11 (4.8%)		4 (5.5%)	5 (6.9%)	
WC	18 (7.8%)	22 (9.6%)		4 (5.5%)	0	
Other	1 (0.4%)	2 (0.9%)		0	0	
Approach						
Posterior	97 (42.1%)	97 (42.1%)	0.999	0	0	..
Transforaminal	133 (57.9%)	133 (57.9%)		0	0	
Anterior	0	0		73	73	
Levels						
1	177 (76.9%)	173 (75.2%)	0.149	55 (75.3%)	47 (64.4%)	0.149
2	53 (23.1%)	57 (24.8%)		18 (24.7%)	26 (35.6%)	
ASA score						
1	0	0	0.108	3 (4.1%)	0	0.155
2	72 (31.3%)	105 (45.6%)		44 (60.3%)	41 (56.2%)	
3	155 (67.4%)	125 (54.4%)		26 (35.6%)	32 (43.8%)	
4	3 (1.3%)	0		0	0	

Table 2: Comparison of outcomes between those receiving a block and those that didn't.

	ESP BLOCK			TAP BLOCK		
	Block	No Block	P-value	Block	No Block	P-value
N	230	230		73	73	
Surgical Time	178 ± 54	157 ± 54	0.002	190.7 ± 110	155.1 ± 64	0.018
PACU Time	119 ± 45	156 ± 131	<0.001	115 ± 75	164 ± 80	0.011
LOS	1.9 ± 1.2	2.5 ± 1.5	<0.001	2.8 ± 1.9	2.9 ± 2.6	0.943
MME	124.8 ± 101	141.2 ± 111	0.103	160.3 ± 106.7	207.4 ± 140.8	0.023
Pain (rest)	4[1]	4[1]	0.266	4[1]	4[1]	0.222
Pain (active)	5[2]	6[1]	0.024	6[1]	6[1]	0.042
Ambulation Distance	260 ± 147	329 ± 218	0.001	289 ± 195	302 ± 186	0.682
Preop ODI	45.1 ± 16.7	43.9 ± 16.9	0.412	44.3 ± 15.0	43.1 ± 15.4	0.634
3-month ODI	27.2 ± 20.2	24.5 ± 19.3	0.266	22.2 ± 19.2	24.4 ± 17.9	0.596
30 Day Readmit	4.1%	5.2%	0.539	4.1%	8.2%	0.247
30 Day ED	6.1%	8.2%	0.336	6.9%	15.1%	0.184
VTE	1.1%	0.3%	0.316	1.4%	1.4%	0.999
Cost	\$92,000 ± 26,000	\$88,000 ± 26,000	0.084	\$118,000 ± 47,000	\$117,000 ± 50,000	0.867