

Is Osteoporosis an Independent Risk Factor for Sacral Fracture after Lumbosacral Spinal Fusion in Adults? A Retrospective Cohort Study

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INTRODUCTION:

Sacral fracture is a rare complication following lumbosacral fusion that is potentially driven by post-surgical biomechanical changes. Prior studies suggest osteoporosis may contribute to such a risk. This study aims to determine whether osteoporosis independently increases the risk of sacral fracture after lumbosacral fusion.

METHODS:

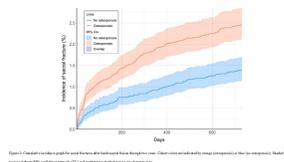
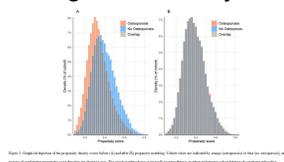
A pre-registered (Open Science Framework), propensity-matched retrospective cohort study using the TriNetX database from 2005-2023 was conducted. Adults (≥ 18 years old) who underwent primary lumbosacral fusion were included and divided into two cohorts based on osteoporosis diagnosis. After propensity-matching for key factors, each cohort included 7151 patients (total $n=14,302$; 82% female; mean age 64 years). The primary outcome measure was the risk ratio (RR) of sacral fracture through two years after lumbosacral fusion. RR for pelvic fixation with instrumentation was secondarily explored. Lastly, negative control outcomes such as further imaging and major trauma, targeting near-null point estimates, were assessed.

RESULTS:

There were 261 (1.8%) sacral fractures in the entire patient population ($n=14,302$). Comparing the osteoporosis cohort to no osteoporosis cohort, there was a statistically significant increase in risk of sacral fracture (RR: 1.75 [1.36, 2.24]; $p<0.001$; 166 [2.3%] versus 95 [1.3%] cases), with a median time to event of 154 and 181 days in each cohort, respectively. There was also a statistically significant increase in risk of pelvic fixation with instrumentation (RR: 1.87 [1.25, 2.78]; $p=0.002$). The likelihood of polytrauma (RR=0.98), subdural hemorrhage (RR=1.24), and diagnostic imaging (RR: 930) approximated the null between cohorts, suggesting findings would not be explained by differences in these variables.

DISCUSSION AND CONCLUSION:

Osteoporosis appears to be independently associated with a statistically and clinically significant risk of sacral fracture through two years after lumbosacral fusion. Further research is needed for corroboration.



Outcome	Patients	Events	HR	95% CI	P
Sacral fracture	14,302	261	1.75	1.36-2.24	<.001
Pelvic fixation with instrumentation	14,302	166	1.87	1.25-2.78	.002
Polytrauma	14,302	95	0.98	0.85-1.13	.85
Subdural hemorrhage	14,302	124	1.24	1.05-1.46	.01
Diagnostic imaging	14,302	930	0.93	0.85-1.02	.15

Outcome	Patients	Events	HR	95% CI	P
Further imaging	14,302	1,234	1.01	0.95-1.07	.88
Major trauma	14,302	45	0.99	0.88-1.11	.95

Table 3. Primary and secondary outcomes after propensity matching.

Table 1. Patient characteristics before and after matching. Abbreviations: Standardized mean difference; SD, standard deviation; CI, confidence interval; HR, hazard ratio; CI, confidence interval; P, p-value.