



## Biomechanics of the Spire-Z System

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## Introduction

Interspinous devices stabilize the lumbar spine to promote interbody fusion. In this study, authors evaluate the biomechanics of lumbar motion segments instrumented with the CD HORIZON Spire Z plate system (SpireZ) as a stand-alone device and in the presence of secondary fixation.

## Methods

Standard nondestructive flexibility tests were performed in seven L2-5 human cadaveric spines. Spinal stability determined as mean range of motion (ROM) in flexion/extension, lateral bending, and axial rotation. Paired comparisons were between the following conditions: 1) intact/control; 2) SpireZ device alone; 3) SpireZ with unilateral pedicle screw/rod system (UPSR); 3) SpireZ with unilateral facet screw system (UFS); 4) SpireZ with bilateral facet screw system (BFS). Stiffness and range of motion (ROM) data were compared using one-way analysis of variance.

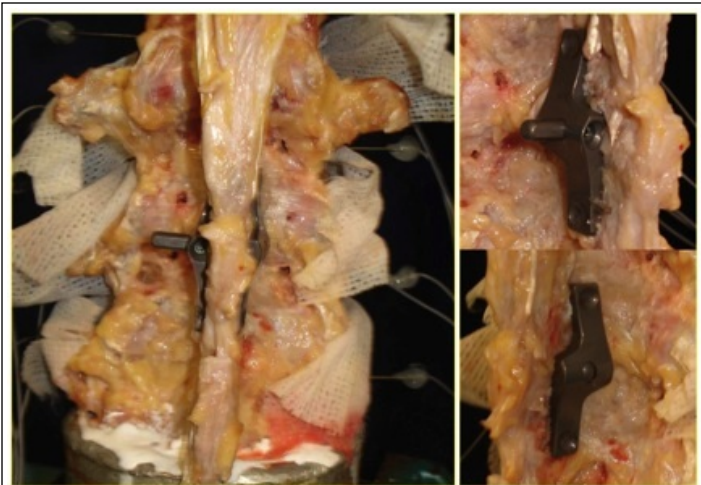


Table 1

Mean	Intact	SpireZ	SpireZ+UPS	SpireZ+UFS	SpireZ+BFS
Flexion	4.10±0.74	0.83±0.18	0.79±0.21	0.93±0.22	0.66±0.25
Extension	-3.63±0.77	-0.88±0.29	-0.86±0.25	-0.94±0.34	-0.80±0.38
Left Lateral Bending	-4.96±0.89	-4.43±0.72	-2.68±0.72	-3.98±1.05	-2.74±1.56
Right Lateral Bending	5.10±0.89	4.36±0.83	2.62±0.63	3.80±1.45	2.64±1.57
Left Axial Rotation	2.12±0.89	1.76±0.77	1.28±0.47	1.37±0.49	0.88±0.55
Right Axial Rotation	-2.15±0.79	-1.78±0.64	-1.37±0.50	-1.71±0.64	-0.98±0.54

Table 3

		SpireZ	SpireZ+UPS	SpireZ+UFS	SpireZ+BFS
Lateral Bending	Intact	0.070	<0.001	0.002	<0.001
			<0.001	0.116	<0.001
	SpireZ			<0.001	0.891
				SpireZ+UFS	<0.001
Axial Rotation	Intact	0.036	<0.001	0.001	<0.001
			0.013	0.181	<0.001
	SpireZ			0.207	0.025
				SpireZ+UFS	0.001

Table 2

		SpireZ	SpireZ+UPS	SpireZ+UFS	SpireZ+BFS
Flexion	Intact	<0.001	<0.001	<0.001	<0.001
			0.840	0.563	0.373
	SpireZ			0.437	0.489
				SpireZ+UFS	0.148
Extension	Intact	<0.001	<0.001	<0.001	<0.001
			0.921	0.746	0.654
	SpireZ			0.672	0.727
				SpireZ+UFS	0.442

## Results

SpireZ was most effective in limiting flexion (80% of normal) and extension (76% of normal), while less effective in reducing lateral bending and axial rotation. In lateral bending, the SpireZ+BFS and SpireZ+UPSR constructs were equivalent and demonstrated greater ROM reduction compared to SpireZ+UFS and SpireZ standalone. SpireZ+BFS demonstrated greatest stiffness in axial rotation in comparison to SpireZ+UPSR (p=0.025), SpireZ+UFS (p=0.001), and SpireZ standalone (p<0.001). SpireZ+UPSR was equivalent to SpireZ+UFS (p=0.21) and superior to SpireZ standalone (p=0.013).

## Conclusions

The SpireZ device provides excellent immediate fixation, particularly for flexion and extension. While the hybrid SpireZ and bilateral facet screw construct afforded the greatest stability, SpireZ with UPS demonstrated considerable promise.

## Learning Objectives

By the end of this session, the participants should be able to (1) describe what the interspinous device SpireZ is, (2) describe the stability of the SpireZ standalone device in a cadaveric model, (3) understand the relative stability of the SpireZ with three differing systems.