A New Classification for Complex Lumbosacral Injuries

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Introduction

The optimal classification for complex lumbosacral injuries, in particular high-energy sacral fractures and lumbosacral dissociation injuries, remains controversial. Currently used classification systems for complex lumbosacral injuries are largely descriptive; lacking validity, reproducibility, treatment considerations and prognostic information. We set out to develop a comprehensive, yet practical, classification system for complex lumbosacral injuries that assists in clinical decision-making.

Methods

We developed a new classification system and injury severity scoring system for complex lumbosacral injuries derived through extensive literature review, expert opinion and our clinical experience treating combat casualties over the past 10 years. We have seen an increased incidence of complex sacral fractures and lumbosacral dissociation injuries after combat related high-energy blast trauma, motor vehicle collisions and aircraft crashes. A pilot validation study was performed with 4 spine surgeons familiar with lumbosacral injuries and 10 case scenarios. Inter- and intra-observer reliability was analyzed using Intraclass Correlation Coefficient (ICC).

Injury morphology	Points
• Flexion compression	
○ ≤20° Kyphosis	1
○ >20° Kyphosis	2
• Axial compression (comminution of upper sacrum)	
○ Without sacral canal or neuroforaminal encroachment	2
○ With sacral canal or neuroforaminal encroachment	3
• Translation/rotational	3
○ Anterior or posterior translation of upper sacrum	
○ Lumbosacral facet injury or dislocation	
○ Vertical translation or instability	
• Blast/shear (severe comminution or segmental bone loss)	4

Results

A new classification system was devised based on three injury characteristics: 1) Fracture morphology (Flexion compression, Axial compression, Translation/Rotation, Blast/Shear), 2) Posterior ligamentous complex (PLC) integrity (Intact, Indeterminate, Disrupted) and 3) Neurologic status (Intact, Paresthesias only, Lower extremity motor deficit, Progressive neurologic deficit). A composite injury severity score (CISS) was calculated by summing a weighted score from each category with increasing score associated with increased injury severity. Treatment recommendation is then based on CISS less than 4 (non-operative), greater than 4 (operative), equal to 4 (either). We found good to excellent ICC for inter-observer reliability (Injury Morphology=0.757; PLC integrity=0.720; Neurologic Status=0.990; CISS=0.934), and good to excellent ICC for intra-observer reliability (range 0.712 to 1 for all CISS components).

LSICS Inter-rater Reliability

Variable	Round 1	Round 2	Average
ISS	0.935	0.933	0.934
Morphology	0.715	0.798	0.757
Neurology	1.000	0.979	0.990
PLC	0.789	0.650	0.720

LSICS Intra-rater Reliability

Variable	Evaluator #1	Evaluator #2	Evaluator #3	Evaluator #4
ISS	1.000	0.979	0.911	0.943
Morphology	0.959	1.000	0.712	0.855
Neurology	1.000	1.000	0.957	1.000
PLC	0.901	0.773	0.800	0.943

Conclusions

We propose the Lumbo-Sacral Injury Classification System (LSICS), which provides a comprehensive and practical approach for evaluating injury severity and guiding clinical decision-making. A multi-center study with application of LSICS to a large number of cases is necessary to determine the reliability and validity of this new classification system.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe lumbpelvic dissociation injury, 2) Describe the lumbosacral injury classification system

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Illustration of lumbosacral injury morphologies: (A) flexion compression, (B) axial compression, (C) translation/rotation, and (D) blast/shear.