An Objective Degenerative Spondylolisthesis Instability Classification System

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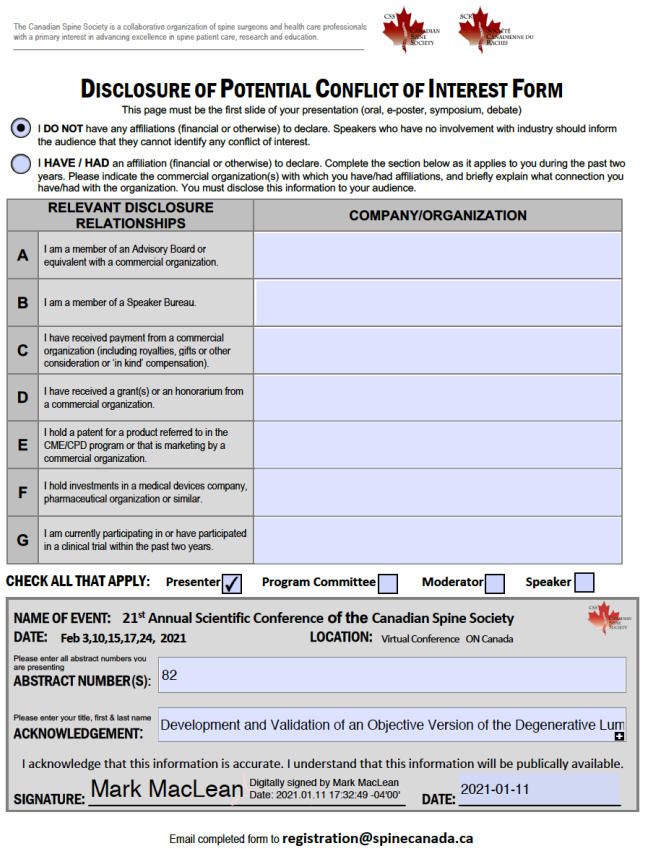

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Research Problem

Assigning **instability** to degenerative lumbar spondylolisthesis (DLS) is currently done **subjectively**, with potential for inconsistent treatment selection and **overuse of invasive procedures**

What's Been Done To Address This Problem?

The **Qualitative** Degenerative Spondylolisthesis Instability Classification (DSIC) System was developed using best available evidence, incorporating clinical/radiographic parameters associated with DLS-related instability

JNS SPINE

LITERATURE REVIEW

J Neurosurg Spine 23:178–189, 2015

Defining the inherent stability of degenerative spondylolisthesis: a systematic review

Andrea M. Simmonds, MD, FRCSC,[1] Y. Raja Rampersaud, MD, FRCSC,[2] Marcel F. Dvorak, MD, FRCSC,[1] Nicolas Dea, MD, MSc, FRCSC,[3] Angela D. Melnyk, MASc,[1] and Charles G. Fisher, MD, MHSc, FRCSC[1]

Qualitative

DSIC

TABLE 2. Degenerative spondylolisthesis instability classification scheme: a qualitative guide for the preoperative assessment of stability in patients with DLS

Parameter	Type I, Stable	Type II, Potentially Unstable	Type III, Unstable
Low-back pain	None or very mild	Primary or secondary complaint	Primary or secondary complaint
Restabilization	Restabilization signs, grossly narrowed disc height	Some restabilization signs, reduced disc height	No restabilization signs, normal to slightly reduced disc height
Disc angle	Lordotic disc angle on flexion radiographs or <3 mm of translation on dynamic films*	Neutral disc angle on flexion radiographs or 3–5 mm of translation on dynamic films*	Kyphotic disc angle on flexion radiographs or >5 mm of translation on dynamic films*
Joint effusion	No facet joint effusions on MRI	Facet joint effusion on MRI w/o joint distraction	Large facet joint effusion on MRI

* Dynamic films include flexion and extension radiographs or supine to standing radiographs.

Simmonds et al. J Neurosurg Spine 2015, 23, 178

Qualitative DSIC

TABLE 3. Proposed treatment guideline with stratification by stability grade

Type of Stability Grade	Treatment
I, stable	Decompression alone
II, potentially unstable	Decompression & posterior fusion
III, unstable	Decompression & posterior fusion + interbody fusion

Subjectively facilitates treatment selection

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Research Objectives

1. Assign quantitative values to instability parameters based on evidence quality **(i.e. quantify the qualitative DSIC system…)**
2. *For a prospective cohort of patients treated for DLS*
    a. Calculate quantitative DSIC scores
    b. Compare calculated (quantitative) and surgeon-assigned (qualitative) DSIC scores
    c. Determining proportion of pts receiving more invasive surgery than warranted based on application of quantitative criteria

Methods

Design

- **Multi-center, prospective cohort study**
- Pts enrolled by CSORN members

Sample

- **Include**: DLS
- **Exclude**: Isthmic spondy, trauma, infection, static stenosis
- 408 pts eligible; 309 patients (76%) included
  - 99 patients not included for missing data required to calculate the quantitative DSIC score

Intervention (Surgeon's choice)

- Single level decompression only
- ***or*** decompression and posterolateral fusion (DPLF)
- ***or*** DPLF + interbody device

CSORN

50 neurosurgical
and orthopedic spine surgeons

18 tertiary academic
and non-academic hospitals

Prospectively collecting data on pts treated for spinal conditions with routine data quality auditing and privacy assurance

Addressing research questions and facilitating best practice implementation

Objective 1: Quantifying the DSIC System

Parameters associated w/ instability

- Facet joint effusion
- Low back pain
- Disc height preserved
- Translation
- Disc angle on flexion XR
- Facet joint orientation
- Age
- Gender
- BMI
- Occupation
- Ligament ossification
- Endplate sclerosis
- Osteophytes

Point-value assigned based on evidence[1] quality

Evidence Level[1]	Points
Very low (**exclude**)	0
Low (**include**)	1
Medium (**include**)	2
High (**include**)	3

Included (1-pt each)

Facet effusion on T2 MRI
Low back pain ≥ 5/10
Disc height ≥ 6.5mm
Translation ≥ 4mm
Disc angle on flexion XR*

Remainder excluded… very-low quality evidence

*Kyphotic or neutral disc angle on flexion XR

[1] Simmonds et al. J Neurosurg Spine 2015, 23, 178

Objective 2a: Calculate Quantitative DSIC Scores

Pts with each parameter	Translation (1 point)	Disc Angle (1 point)	Disc Height (1 point)	Facet Effusion (1 point)	Back Pain (1 point)
n (%)	47 (15%)	88 (28%)	174 (56%)	148 (48%)	272 (88%)

DSIC SCORE

0-2 points →
3 points →
4-5 points →

TABLE 3. Proposed treatment guideline with stratification by stability grade

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SELECT PROCEDURE

CONVERT DSIC SCORE TO "TYPE"

Objective 2b: Compare Quantitative/Qualitative DSIC Scores

	Quantitative DSIC *(objectively calculated)*		
Qualitative DSIC *(surgeon- assigned)*	**Type I**	**Type II**	**Type III**
Type I	70	19	3
Type II	89	63	12
Type III	17	24	12

RED = Surgeons overestimated instability in 42% of cases

Objective 2c: Assess Invasiveness of Procedures

- **Actual surgical procedure received**

Surgery	Decompression	DPLF	DPLF + Interbody Device
N (%)	47 (15)	88 (28)	174 (56)

- **Invasiveness of Actual Procedure vs. Procedure Directed by DSIC**

Much Less Invasive	Somewhat Less Invasive	Actual Procedure Same as Recommended by DSIC	Somewhat More Invasive	Much More Invasive
Based on Qualitative DSIC Type				
%	21	35	**35**	**9**
Based on Quantitative DSIC Type				
%	11	31	**32**	**25**

RED = 57% of pts received more invasive sx than objectively warranted

Summary

Limitations

- Derived from low quality data (however, best available… must make decisions!)
- No defined cutoff for LBP in the literature (5/10 threshold arbitrary)

Take Home Messages

- Surgeons categorize greater degrees of instability than objectively justified
- Significant impact on resource utilization
    - 57% of patients received more invasive surgery than objectively warranted

Future Work

- Validation