Reliability Assessment of a Novel Cervical Deformity Classification System

Justin S. Smith, MD, PhD, Charlottesville, Virginia
Robert K. Eastlack, MD, La Jolla, California
Donald Blaskiewicz, MD, San Diego, California
Christopher I. Shaffrey, MD, Charlottesville, Virginia
Frank J. Schwab, MD, New York, New York
Shay Bess, MD, Denver, Colorado
Han Jo Kim, MD, New York, New York
Gregory M. Mundis, MD, San Diego, California
Eric O. Klineberg, MD, Sacramento, California
Munish C. Gupta, MD, San Diego, California
Michael F. O’Brien, MD, Plano, Texas
Richard A. Hostin, Jr., MD, Plano, Texas
Justin K. Scheer, BS, Chicago, Illinois
Themistocles S. Protopsaltis, MD, New York, New York
Kai-Ming G. Fu, MD, PhD, New York, New York
Robert A. Hart, MD, Portland, Oregon
Todd J. Albert, MD, Jefferson, Pennsylvania
K. Daniel Riew, MD, St. Louis, Missouri
Michael G. Fehlings, MD, PhD, Toronto, Ontario, Canada
Virginie Lafage, PhD, New York, New York
Christopher P. Ames, MD, San Francisco, California
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Introduction: Despite the complexity of cervical deformity and the significant impact on patient quality of life, there exists no comprehensive classification. An initial novel classification system has been recently designed with a deformity descriptor and 5 modifiers that incorporate sagittal regional and global spino-pelvic alignment and neurological status (Figure). Our objective was to characterize the intra- and inter-observer reliability of this classification.

Methods: A series of 10 cervical deformity cases, broadly representative of the classification system, were selected and sufficient radiographic and clinical history to enable classification were assembled. A panel of deformity surgeons was queried to classify each case twice, with a minimum of 1 intervening week. Inter- and intra-rater reliability measures were based on calculations of Fleiss kappa coefficient values.

Results: Twenty spine deformity surgeons participated in this study. Inter-rater reliability (Fleiss kappa coefficients) for the deformity descriptor rounds 1 and 2 were 0.489 and 0.280, respectively, and mean intrarater reliability was 0.584. For the modifiers, including the SRS-Schwab components, the inter-rater (round 1/round 2) and intra-rater reliabilities (Fleiss kappa coefficients) were: C2-C7 SVA (0.338/0.412, 0.584), horizontal gaze (0.779/0.430, 0.768), TS-CL (0.721/0.567, 0.720), myelopathy (0.602/0.477, 0.746), curve type (0.590/0.433, 0.564), PI-LL (0.554/0.386, 0.826), PT (0.714/0.627, 0.633) and C7-S1 SV A (0.071/0.064, 0.233), respectively. The parameter with the poorest reliability was the C7-S1 SV A, which may have resulted from differences in interpretation of positive and negative measurements.

Conclusion: The proposed classification provides a mechanism to assess cervical deformity within the framework of global spino-pelvic malalignment and clinically relevant parameters. The intra- and inter-observer reliabilities suggest moderate agreement and serve as the basis for subsequent improvement and study of the proposed classification.
Cervical Deformity Classification

**Deformity Descriptor**

- **C**- Primary Sagittal Deformity Apex in Cervical Spine
- **CT**- Primary Sagittal Deformity Apex at Cervico-Thoracic Junction
- **T**- Primary Sagittal Deformity Apex in Thoracic Spine
- **S**- Primary Coronal Deformity (C2-C7 Cobb ≥ 15°)
- **CVJ**- Primary Cranio-Vertebral Junction Deformity

5 Modifiers

- **C2-C7 sagittal vertical axis (SVA)**
  - 0: C2-C7 SVA < 4 cm
  - 1: C2-C7 SVA 4 to 8 cm
  - 2: C2-C7 SVA > 8 cm

- **Horizontal Gaze**
  - 0: CBVA < ° 10
  - 1: CBVA 10 to 25°
  - 2: CBVA > 25°

- **T1 Slope (TS) Minus Cervical Lordosis (CL)**
  - 0: TS-CL < ° 15
  - 1: TS-CL 15 to 20°
  - 2: TS-CL > 20°

- **Myelopathy**
  - 0: mJOA=18 (None)
  - 1: mJOA=15-17 (Mild)
  - 2: mJOA=12-14 (Moderate)
  - 3: mJOA<12 (Severe)

- **SRS-Schwab Classification**
  - T, L, D, or N: Curve Type
  - 0, +, or ++: PI minus LL
  - 0, +, or ++: Pelvic Tilt
  - 0, +, or ++: C7-S1 SVA

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