



## Assessment of Surgical Treatment Strategies for Moderate to Severe Cervical Spinal Deformity Reveals Marked Variation in Approaches, Osteotomies, and Fusion Levels

Justin S. Smith<sup>1</sup>, Eric Klineberg<sup>2</sup>, Christopher I. Shaffrey<sup>1</sup>, Virginie Lafage<sup>3</sup>, Frank J. Schwab<sup>3</sup>, Themistocles Protopsaltis<sup>4</sup>, Justin K. Scheer<sup>5</sup>, Tamir Ailon<sup>1</sup>, Subaraman Ramachandran<sup>1</sup>, Alan Daniels<sup>6</sup>, Gregory Mundis<sup>7</sup>, Munish Gupta<sup>8</sup>, Richard Hostin<sup>9</sup>, Vedat Deviren<sup>10</sup>, Robert Eastlack<sup>7</sup>, Peter Passias<sup>4</sup>, D. Kojo Hamilton<sup>11</sup>, Robert Hart<sup>12</sup>, Douglas C. Burton<sup>13</sup>, Shay Bess<sup>4</sup>, Christopher P. Ames<sup>14</sup>, International Spine Study Group

■ **OBJECTIVE:** Although previous reports suggest that surgery can improve the pain and disability of cervical spinal deformity (CSD), techniques are not standardized. Our objective was to assess for consensus on recommended surgical plans for CSD treatment.

■ **METHODS:** Eighteen CSD cases were assembled, including a clinical vignette, cervical imaging (radiography, computed tomography/magnetic resonance imaging), and full-length standing radiography. Fourteen deformity surgeons (10 orthopedic, 4 neurosurgery) were queried regarding recommended surgical plans.

■ **RESULTS:** There was marked variation in treatment plans across all deformity types. Even for the least complex deformities (moderate midcervical apex kyphosis), there was lack of agreement on approach (50% combined anterior-posterior, 25% anterior only, 25% posterior only), number of anterior (range, 2–6) and posterior (range, 4–16) fusion levels, and types of osteotomies. As the kyphosis apex moved caudally (cervical-thoracic junction/upper thoracic spine) and for cases with chin-on-chest kyphosis, >80% of surgeons agreed on a posterior-only approach and >70% recommended a pedicle subtraction osteotomy or vertebral

column resection, but the range in number of anterior (4–8) and posterior (4–27) fusion levels was exceptionally broad. Cases of cervical/cervical-thoracic scoliosis had the least agreement for approach (48% posterior only, 33% combined anterior-posterior, 17% anterior-posterior-anterior or posterior-anterior-posterior, 2% anterior only) and had broad variation in the number of anterior (2–5) and posterior (6–19) fusion levels, and recommended osteotomies (41% pedicle subtraction osteotomy/vertebral column resection).

■ **CONCLUSIONS:** Among a panel of deformity surgeons, there was marked lack of consensus on recommended surgical approach, osteotomies, and fusion levels for CSD. Further study is warranted to assess whether specific surgical treatment approaches are associated with better outcomes.

### INTRODUCTION

Although cervical spinal deformity (CSD) can have a profound impact, including pain, disability, and neurologic compromise, there are relatively few reports that detail its surgical treatment.<sup>1-3</sup> Early reports focused on small series of

#### Key words

- Cervical
- Deformity
- Fusion
- Kyphosis
- Osteotomy
- Spine
- Surgery

#### Abbreviations and Acronyms

- CSD:** Cervical spinal deformity  
**PSO:** Pedicle subtraction osteotomy  
**SD:** Standard deviation  
**SRS:** Scoliosis Research Society  
**VCR:** Vertebral column resection

From the <sup>1</sup>Department of Neurosurgery, University of Virginia, Charlottesville, Virginia;  
<sup>2</sup>Department of Orthopaedic Surgery, University of California, Davis, Sacramento, California;  
<sup>3</sup>Department of Orthopaedic Surgery, Hospital for Special Surgery, New York, New York;

<sup>4</sup>Department of Orthopaedic Surgery, NYU Hospital for Joint Diseases, New York, New York;  
<sup>5</sup>University of California San Diego, School of Medicine, San Diego, California; <sup>6</sup>Department of Orthopaedic Surgery, Warren Alpert School of Medicine, Brown University, Providence, Rhode Island; <sup>7</sup>Department of Orthopaedic Surgery, San Diego Center for Spinal Disorders, La Jolla, California; <sup>8</sup>Department of Orthopaedic Surgery, Washington University, St. Louis, Missouri; <sup>9</sup>Department of Orthopaedic Surgery, Baylor Scoliosis Center, Plano, Texas; Departments of <sup>10</sup>Orthopaedic Surgery and <sup>11</sup>Neurological Surgery, University of California, San Francisco, San Francisco, California; <sup>12</sup>Department of Neurosurgery, University of Pittsburgh, Pittsburgh, Pennsylvania; <sup>13</sup>Department of Orthopaedic Surgery, Oregon Health & Science University, Portland, Oregon; and <sup>14</sup>Department of Orthopaedic Surgery, University of Kansas Medical Center, Kansas City, Kansas, USA

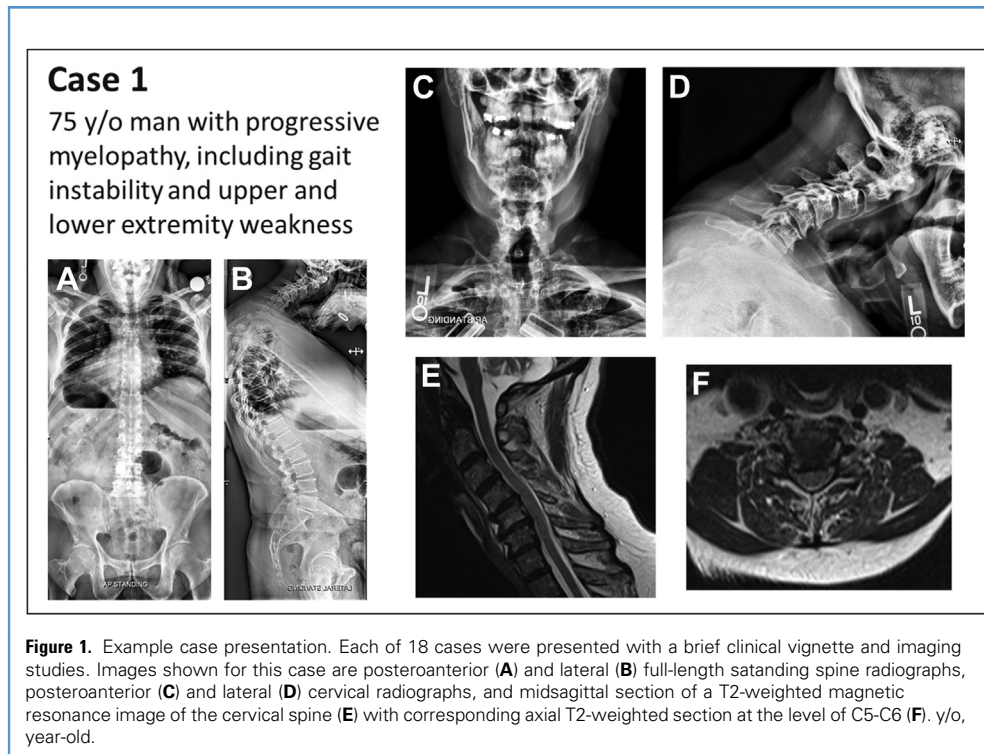
To whom correspondence should be addressed: Justin S. Smith, M.D., Ph.D.  
 [E-mail: [jss71@virginia.edu](mailto:jss71@virginia.edu)]

Citation: *World Neurosurg.* (2016) 91:228-237.  
<http://dx.doi.org/10.1016/j.wneu.2016.04.020>

Journal homepage: [www.WORLDNEUROSURGERY.org](http://www.WORLDNEUROSURGERY.org)

Available online: [www.sciencedirect.com](http://www.sciencedirect.com)

1878-8750/\$ - see front matter © 2016 Elsevier Inc. All rights reserved.



patients who were treated with what were considered high-risk procedures and often had high rates of significant complications.<sup>4-6</sup> Through continued improvements in anesthesia and critical care and marked advancements in surgical techniques and instrumentation over recent decades, there has been a renewed interest in addressing these often challenging deformities.<sup>2,3,7-28</sup>

A broad range of underlying diseases may contribute to the development of CSD, including spondylosis, inflammatory arthropathies, trauma, infection, neoplasm, congenital anomalies, and neuromuscular conditions.<sup>1,2,12</sup> The cause of CSD may also be iatrogenic, resulting directly or indirectly from the effects of previous procedures or surgical treatments.<sup>10,20,29,30</sup> Collectively, these factors can produce a variety of deformities that most commonly include varying combinations of kyphosis, listhesis, and scoliosis. These deformities may prompt patients to seek medical attention for several reasons, including neck pain, radicular pain or weakness, myelopathy, and impaired function. Impaired function may include difficulty holding the head upright, which can compromise the ability to swallow and the fundamental ability to maintain horizontal gaze to ambulate safely and interact socially.<sup>31</sup>

Management of the patient with CSD is highly dependent on the presentation. Patients with primarily neck pain, in the absence of significant or progressive neurologic or severe functional impairment, may benefit from at least a trial of nonoperative treatments, which may include physical therapy, nonsteroidal anti-inflammatory medications, muscle relaxers, and possibly consultation with a pain management specialist. For the subset of patients with CSD who have exhausted nonoperative measures without adequate benefit or who present with concerning neurologic

compromise or functional impairment, surgical treatment may be warranted.

Strategies for the surgical treatment of CSD are often complex and are not standardized. Surgical approaches may be anterior, posterior, or combined (eg, anterior-posterior, posterior-anterior, posterior-anterior-posterior). A variety of soft tissue releases and osteotomies, ranging from simple facet release to vertebral column resection (VCR), may be applied for decompression and deformity correction.<sup>8</sup> To facilitate deformity correction, stabilization, and arthrodesis, an increasing array of anterior and posterior spinal instrumentation may be used, including anterior cervical plates and cages and posterior screws, hooks, rods, wires, and plates. The number of vertebral levels, anterior and posterior, that may warrant instrumentation and arthrodesis is also variable. Although there are no previous reports that have focused on differences in surgical approach(es), use of osteotomies, and extent of instrumentation and fusion for the surgical treatment of patients with CSD, given the wide range of options and the lack of standardization, it is likely that there is at least some degree of variation among surgeons. These variations may have significant impact on complication risk, patient outcomes, and cost. Defining these differences and assessing their impact may prove valuable for surgical planning, improving the safety of care, optimizing patient outcomes, and reducing cost. For example, Shamji et al.<sup>32</sup> and Mohanty et al.<sup>33</sup> have shown that variations in surgical approach for the treatment of cervical spondylotic myelopathy in the context of cervical sagittal alignment can significantly affect neurologic recovery among kyphotic patients.

Download English Version:

<https://daneshyari.com/en/article/3094546>

Download Persian Version:

<https://daneshyari.com/article/3094546>

[Daneshyari.com](https://daneshyari.com)