

Defining Cervical Sagittal Plane Deformity - When Are Major Sagittal Plane Realignment Procedures Necessary In Patients Who Present Primarily With Radiculopathy and Myelopathy?

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INTRODUCTION:

Cervical sagittal deformity (CSD) is a disabling condition often associated with myelopathy, radiculopathy, or both. Many patients present with radiculopathy or myelopathy in the setting of “imperfect” sagittal alignment, but do not necessarily have a chin-on-chest deformity requiring concomitant correction. As such, we conducted a survey of expert cervical spine surgeons to assess consensus for: 1) the definition of a cervical sagittal plane deformity, and 2) when a myelopathy/radiculopathy patient with radiographic malalignment merits additional CSD correction.

METHODS:

A REDCap survey was distributed to 82 expert cervical spine surgeons (current and past Board Members from the CSRS, CSRS Asia Pacific, CSRS Europe, and those extensively published in CSD), with differing experience, training background, and practice environment. Questions were designed to determine whether current published radiographic criteria were sufficient to establish a diagnosis of CSD or whether other clinical and physical exam factors were necessary. We presented clinical vignettes to determine which radiographic parameters would require correction in the setting of radiculopathy, myelopathy, axial neck pain, and difficulty holding head upright; and when a more extensive “deformity” procedure was warranted.

RESULTS:

41 surgeons responded (33 orthopaedic surgeons, 8 neurosurgeons) with 93% working in academic environments. 59% of surgeons had 16+ years of experience. 80% of surgeons devote greater than 50% of their surgical practice to cervical spine disorders. 93% of the surgeons perform a realignment procedure for CSD at least once every three months.

CSD remains difficult to define, as none of the previously established radiographic criteria reached a 50% threshold as being sufficient to establish a diagnosis of CSD (Figure 1). Even when 3 radiographic criteria were combined with a history of difficulty holding one’s head upright, 68% of surgeons felt that combination was insufficient to establish CSD.

An extensive sagittal deformity correction procedure beyond that needed to treat the neurologic disorder was more likely to be recommended in patients with myelopathy and asymptomatic malalignment (Figure 2) versus those with radiculopathy and asymptomatic malalignment (Figure 3). However, only 51% recommended extensive deformity correction in those with myelopathy and asymptomatic malalignment. Surgeons were also significantly more likely to recommend deformity correction in both radiculopathy and myelopathy patients when they had concomitant clinical symptoms of deformity with malalignment (radiculopathy 85%, myelopathy 91%).

DISCUSSION AND CONCLUSION:

Despite numerous studies defining CSD by radiographic criteria alone, there is no consensus amongst a diverse group of cervical spine surgeons as to what radiographic and/or clinical criteria are necessary to define CSD in patients who present primarily with radiculopathy and/or myelopathy. Surgeons are more apt to perform CSD realignment procedures in patients with myelopathy versus those with radiculopathy alone, and were also more likely to recommend an extensive deformity correction when clinical symptoms of deformity were present with radiographic malalignment. Based on expert opinion, surgeons should not necessarily recommend extensive CSD realignment operations in all patients with radiographic malalignment alone, but may carefully consider doing so when symptoms of deformity are also present. More work is necessary to refine the definition of CSD and what patients will benefit from sagittal realignment.

Figure 1. Is the radiographic criteria or clinical symptom listed below, by themselves, sufficient to establish a diagnosis of CSD?

	C2-C7 SVA > 4cm	C2-C7 kyphosis > 10 deg	CBVA > 25 deg	Difficulty holding head upright
YES	39%	32%	49%	24%
NO	61%	68%	51%	76%

Figure 2. In a patient with myelopathy and with the clinical signs and symptoms listed below, would you offer the patient a “more extensive” operation than what is needed to adequately treat the radiculopathy in order to normalize the sagittal plane radiographic abnormalities (C2-C7 SVA > 4cm, C2-C7 kyphosis > 10 deg, CBVA > 25 deg)?

	YES	NO
Myelopathy alone	51%	49%
Myelopathy with neck pain	54%	46%
Myelopathy with neck pain and difficulty holding head upright	93%	7%

Figure 3. In a patient with radiculopathy and with the clinical signs and symptoms listed below, would you offer the patient a “more extensive” operation than what is needed to adequately treat the radiculopathy in order to normalize the sagittal plane radiographic abnormalities (C2-C7 SVA > 4cm, C2-C7 kyphosis > 10 deg, CBVA > 25 deg)?

	YES	NO
Radiculopathy alone	10%	90%
Radiculopathy with neck pain	17%	83%
Radiculopathy with neck pain and difficulty holding head upright	85%	15%