The Case for Deformity Correction in the Management of Radiculopathy with Concurrent Spinal Deformity

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KEYWORDS

• Adult spinal deformity • Treatment strategies • Decompression alone
• Decompression with limited fusion • Multilevel fusion • Appropriate use criteria • Clinical outcomes

KEY POINTS

- Adult spinal deformity may present with a spectrum of clinical presentations, including radiculopathy, back pain, and deformity.
- The appropriate management of symptomatic adult deformity is the strategy that optimizes the clinical outcome of care while limiting the risk and costs of care.
- In the setting of spinal deformity that contributes to the clinical presentation of radiculopathy, decompression alone presents significant risk for poor outcomes, including revision surgery, due to inadequate creation of space for the neural elements, inadequate realignment of the spine, and progression of deformity.
- Decompression with limited fusion is most appropriate for patients with focal radicular pain and deformity that is stable, with good global sagittal and coronal alignment.
- Decompression with more extensive fusion and realignment of the spine is most appropriate for patients with focal radicular pain, and deformity that is progressive or that involves global malalignment in the sagittal or coronal planes.

INTRODUCTION

Adult spinal deformity is a common and important pathologic condition affecting the spinal column. The impact of spinal deformity on the health status of affected patients is significant, It affects domains of health, including pain, function, mental health, and self-image.[1,2] The burden of disease that is encompassed by spinal deformity may be measured by both the prevalence of the disorder, and the impact of the disorder on affected patients.[3] The prevalence of deformity in the aging spine is common, and spinal deformity contributes to the clinical presentation of back pain in most women older than age 60 years.[4,5] The impact of deformity on health-related quality of life is significant. Patients presenting with symptomatic spinal deformity self-report their health status preference as significantly worse than other common medical conditions, including cardiopulmonary disease, mental health disorders, and other musculoskeletal disorders.[6,7] An evidence-based approach to the appropriate management of deformity is

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Neurosurg Clin N Am 28 (2017) 341–347
http://dx.doi.org/10.1016/j.nec.2017.03.002

important because of the prevalence, impact, and burden of adult deformity. The management of patients with radiculopathy and adult deformity is characterized by significant variability, with options encompassing decompression alone, decompression with a limited fusion, and decompression with a multilevel fusion for realignment of the spine. This article reviews the spectrum of surgical approaches for the management of symptomatic lumbar deformity with radiculopathy and provides guidance for an evidence-based approach to when less invasive procedures may be appropriate and when more invasive procedures, including deformity correction, are appropriate.

The Relationship Between Deformity and Symptomatic Radiculopathy

Spinal deformity encompasses a spectrum of malalignments of the spine, including segmental, regional, and global deformity. There is a significant correlation between deformity of the spine and health status, with significant compromise of pain, function, and self-image associated with global, regional, and segmental malalignment.[8,9]

Adult spinal deformity commonly presents with both back pain and radicular symptoms.[10–12] The cause of low back pain in adult spinal deformity is multifactorial and related to symptomatic degeneration of the functional motion segment, asymmetric loading of the spinal column, and soft tissue imbalances. Musculoligamentous strain, facet arthropathy, disc degeneration, and compression of neural elements can all contribute to axial back pain.[13] Disc degeneration and loss of height causes a loss of lordosis, whereas asymmetric degeneration leads to a scoliotic curvature.[14] Therefore, advanced degenerative scoliosis is characterized by both lumbar hypolordosis and coronal deformity, including rotational subluxation. The low back pain in adult spinal deformity tends to correlate with a loss of lumbar lordosis,[15] whereas the presence of a scoliotic curve itself is not sufficient to cause pain but can contribute to it in the presence of symptomatic degeneration.[5]

Neural symptoms are an important part of the clinical presentation of adult deformity, and an important reason that patients choose to pursue operative care for deformity.[16] Deformity of the spine contributes directly to neural compression and symptoms attributable to compression of neural structures, commonly radiculopathy or neurogenic claudication.[10–13,17] A scoliotic curve can lead to central stenosis, which is greatest at the apex.[11] Nerve roots can be compressed on either side of a curve. Roots on the concave side are compressed by foraminal or extraforaminal stenosis. Foraminal stenosis may be especially severe at the concavity where adjacent pedicles are in close proximity. An adequate decompression requires removal of most or all of the facet joint and realignment of the spine to create foraminal volume. Roots on the convex side are more affected by stenosis in the lateral recess and an increase in tension of the exiting roots on the side of the convexity.[18] Olisthesis decreases dural sac cross-sectional diameter, leading to central canal stenosis and claudication. Disc bulging, reactive hypertrophy of the ligamentum flavum, and bony overgrowth exacerbate the stenosis centrally, foraminally, and in the lateral recess.[19] Treatment of symptomatic radiculopathy often requires realignment of the spine for adequate decompression of the neural elements. A decompression alone with facet preservation and unchanged alignment of the spine is often inadequate for neural decompression.

VARIABILITY IN APPROACHES TO CARE

The management of lumbar radiculopathy in the setting of spinal deformity is characterized by significant variability. The presence of variability is clear evidence of the absence of an evidence-based approach to care. The appropriate management of adult degenerative scoliosis is the treatment that leads to the most reliable improvement of health-related quality of life while limiting the risks of complications and harm.[20] In a value-based health care economy, the cost of care is also an important consideration. Appropriate care is the strategy that optimizes the clinical outcome while minimizing both risk and costs of care.[21] An evidence-based approach to the management of symptomatic radiculopathy with spinal deformity may include decompression alone, decompression with limited fusion, or decompression with extensive realignment of the spine. The most appropriate treatment requires an understanding of the type of deformity, curve characteristics, and alignment of the spine.

DECOMPRESSION ALONE

Decompression procedures have relatively low costs and complication rates.[22] When performed in a patient with a stable spine, a simple decompression has been shown to be cost-effective.[23] However, the removal of bony elements and soft tissue disruption required for decompressive procedures have the potential to exacerbate existing deformity. A classic study by Herkowitz and colleagues[24] demonstrates significantly improved