



Can a Minimal Clinically Important Difference Be Achieved in Elderly Patients with Adult Spinal Deformity Who Undergo Minimally Invasive Spinal Surgery?

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■ **BACKGROUND:** Older age has been considered a relative contraindication to complex spinal procedures. Minimally invasive surgery (MIS) techniques to treat patients with adult spinal deformity (ASD) have emerged with the potential benefit of decreased approach-related morbidity.

■ **OBJECTIVE:** To determine whether a minimal clinically important difference (MCID) could be achieved in patients ages ≥ 65 years with ASD who underwent MIS.

■ **METHODS:** Multicenter database of patients who underwent MIS for ASD was queried. Outcome metrics assessed were Oswestry Disability Index (ODI) and visual analog scale (VAS) scores for back and leg pain. On the basis of published reports, MCID was defined as a positive change of 12.8 ODI, 1.2 VAS back pain, and 1.6 VAS leg pain.

■ **RESULTS:** Forty-two patients were identified. Mean age was 70.3 years; 31 (73.8%) were women. Preoperatively, mean coronal curve, pelvic tilt, pelvic incidence to lumbar lordosis mismatch, and sagittal vertical axis were 35° , 24.6° , 14.2° , and 4.7 cm, respectively. Postoperatively, mean coronal curve, pelvic tilt, pelvic incidence to lumbar lordosis, and sagittal

vertical axis were 18° , 25.4° , 11.9° , and 4.9 cm, respectively. A mean of 5.0 levels was treated posteriorly, and a mean of 4.0 interbody fusions was performed. Mean ODI improved from 47.1 to 25.1. Mean VAS back and leg pain scores improved from 6.8 and 5.9 to 2.7 and 2.7, respectively. Mean follow-up was 32.1 months. For ODI, 64.3% of patients achieved MCID. For VAS back and leg pain, 82.9% and 72.2%, respectively, reached MCID.

■ **CONCLUSIONS:** MCID represents the threshold at which patients feel a meaningful clinical improvement has occurred. Our study results suggest that the majority of elderly patients with modest ASD can achieve MCID with MIS.

INTRODUCTION

Older age has long been considered a relative contraindication to spinal fusion, given the concern for possible increased morbidity and poorer outcomes compared with decompression alone. In recent years, however, studies have shown that elderly patients older than 65 years of age can derive

Key words

- Adult spinal deformity
- Elderly
- Minimally invasive surgery
- Spine

Abbreviations and Acronyms

- ASD:** Adult spinal deformity
CC: Coronal curve
cMIS: Circumferential minimally invasive surgery
LL: Lumbar lordosis
LLIF: Lateral lumbar interbody fusion
MCID: Minimal clinically important difference
MIS: Minimally invasive surgery
ODI: Oswestry Disability Index
PI: Pelvic incidence
PRO: Patient-reported outcome
PT: Pelvic tilt
SCB: Substantial clinical benefit
SD: Standard deviation
SVA: Sagittal vertical axis
VAS: Visual analog scale

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significant benefit from decompression and fusion for degenerative spinal disease without significantly increased morbidity.¹⁻³ These studies have focused primarily on short segment fusions for degenerative conditions such as stenosis and spondylolisthesis.

Spinal deformity also can be a cause of significant pain and disability in the elderly patient that often requires more complex, multilevel spinal surgery to treat appropriately. Reports regarding outcomes involving the elderly patients with adult spinal deformity (ASD) who undergo spinal surgery are scarce, although in 1 study Daubs et al.⁴ showed that significant clinical improvement could be obtained in patients ages 60 years and older. Recently, minimally invasive surgery (MIS) approaches have been used to treat patients with ASD, with the potential benefit of decreased approach-related morbidity.⁵⁻⁸ Similar to the relative paucity of literature focusing on the elderly and traditional open spinal surgery, there has been little investigation involving the elderly with ASD who undergo MIS. The objective of this study was to determine whether a minimal clinically important difference (MCID) could be achieved in patients 65 years of age and older who underwent MIS for ASD.

METHODS

In this study, each participating site received institutional review board approval before submitting data to create a multicenter database of patients who underwent MIS for ASD. Inclusion criteria for this database were a diagnosis of ASD with at least 1 of the following radiographic parameters: coronal curve (CC) $\geq 20^\circ$, sagittal vertical axis (SVA) > 5 cm, pelvic tilt (PT) $> 25^\circ$, or thoracic kyphosis $> 60^\circ$. A total of 190 patients were entered into the database, which was composed of those who underwent circumferential minimally invasive surgery (cMIS) and those who underwent a hybrid procedure. Patients in the cMIS group underwent lateral lumbar interbody fusion (LLIF), minimally invasive transforaminal lumbar interbody fusion, and/or transsacral interbody fusion in conjunction with percutaneous pedicle screw fixation and/or minimally invasive posterior fusion (Figure 1). Patients in the hybrid group underwent LLIF in conjunction with a traditional open posterior approach for pedicle screw insertion and fusion. The database was queried to identify patients 65 years of age and older who underwent cMIS procedures. A total of 42 patients were identified, and all were included for analysis.

Radiographic Outcome Assessment

All patients had baseline and postoperative 36-inch standing radiographic films. The CC was measured using the Cobb angle method. Lumbar lordosis (LL) and pelvic incidence (PI) were measured so that the mismatch of LL versus PI could be quantified by calculating the difference between LL and PI (i.e., pelvic incidence to lumbar lordosis). PT and SVA also were measured. All films were sent to a central site, where independent measurements were made to maintain consistency between sites.

Clinical Outcome Assessment

Outcomes were assessed at baseline and postoperatively by use of the Oswestry Disability Index (ODI) to measure functional

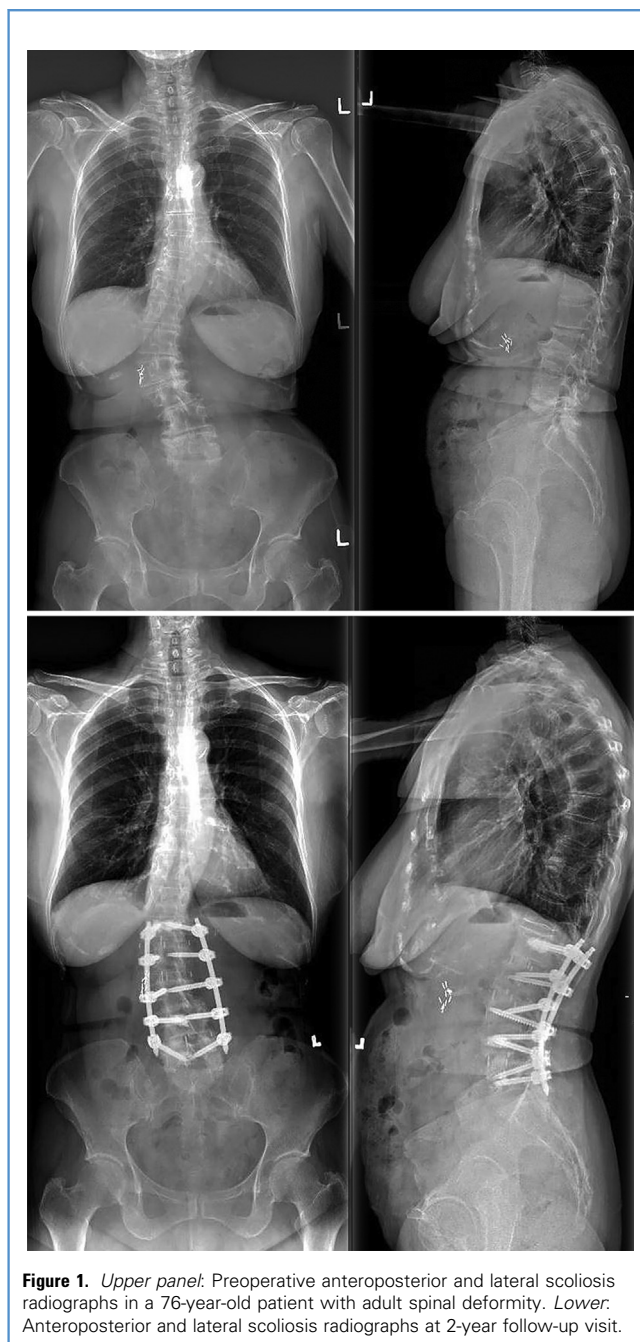


Figure 1. Upper panel: Preoperative anteroposterior and lateral scoliosis radiographs in a 76-year-old patient with adult spinal deformity. Lower: Anteroposterior and lateral scoliosis radiographs at 2-year follow-up visit.

disability and the visual analog scale (VAS) to measure back and leg pain. All 42 patients had baseline and postoperative ODI data. Forty-one and 36 patients had complete baseline and postoperative VAS back and leg pain data, respectively.

Minimal Clinically Important Difference

MCID was based on previously published criteria and defined as a positive change of 12.8 for ODI, 1.2 for VAS back pain, and 1.6 for VAS leg pain.⁹ To evaluate relative change, the percentage of

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