INTRODUCTION

Adult spinal deformity

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It has been recognized for more than 35 years that adult spinal deformity (ASD) is a common condition in the elderly that can frequently cause significant pain and disability.^{2,6} Adults with painful and disabling spinal deformity appear to benefit from surgical treatment when compared with nonsurgical treatment, given the proper indications, but the surgery is costly and is associated with a high rate of complications.^{1,5,7,11,12} For many years it was thought that the principal cause of the pain and disability associated with ASD was the severity of the scoliosis in the coronal plane.² More recently, it has been clearly demonstrated that the greater the mismatch of spinopelvic parameters compared to normal values, the greater the pain and disability associated with the deformity.^{3,13} Improvement of a mismatch of spinopelvic parameters to more normal values has been shown to improve multiple health-related quality of life measures.^{9,10,12} Recent advances in preoperative evaluation and risk modification, predictive analytics for accurate risk calculation, better intraoperative anesthetic and surgical management techniques, and improvement in postoperative care have permitted the successful management of increasingly more severe spinal deformities in patients with associated medical comorbidities.^{4,8}

This issue of *Neurosurgical Focus* includes cutting-edge research on the latest concepts of evaluation and utilization of spinopelvic parameters in ASD. Several articles identify new techniques for evaluation of patients with ASD, along with medical optimization and risk stratification, with the goals of making the outcomes of deformity surgery safer and more predictable. This issue also includes several articles highlighting new surgical techniques used for treatment of complex deformity that have promise for reducing surgery-related morbidity. Factors associated with the cost-effectiveness of the surgical management of

ASD were analyzed, with recommendations on measures to reduce the financial consequences of these episodes of care. Due to the maturation of several national and international patient databases aggregating the management data on hundreds of patients, the evaluation and management of patients with ASD is rapidly evolving. Several of the articles include the information gleaned from these sources. In this issue we have tried to present a spectrum of the latest research in the field of ASD, with the hope that this will lead to fewer complications and improved outcomes in patients with ASD.

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References

1. Glassman SD, Carreon LY, Shaffrey CI, Polly DW, Ondra SL, Berven SH, et al: The costs and benefits of nonoperative management for adult scoliosis. *Spine (Phila Pa 1976)* **35**:578–582, 2010
2. Jackson RP, Simmons EH, Stripinis D: Incidence and severity of back pain in adult idiopathic scoliosis. *Spine (Phila Pa 1976)* **8**:749–756, 1983
3. Lowe T, Berven SH, Schwab FJ, Bridwell KH: The SRS classification for adult spinal deformity: building on the King/Moe and Lenke classification systems. *Spine (Phila Pa 1976)* **31**:S119–S125, 2006
4. Naik BI, Pajewski TN, Bogdonoff DI, Zuo Z, Clark P, Terkawi AS, et al: Rotational thromboelastometry-guided blood product management in major spine surgery. *J Neurosurg Spine* **23**:239–249, 2015
5. Paulus MC, Kalantar SB, Radcliff K: Cost and value of spinal deformity surgery. *Spine (Phila Pa 1976)* **39**:388–393, 2014
6. Robin GC, Span Y, Steinberg R, Makin M, Menczel J: Scoliosis in the elderly: a follow-up study. *Spine (Phila Pa 1976)* **7**:355–359, 1982

7. Scheer JK, Hostin R, Robinson C, Schwab F, Lafage V, Burton DC, et al: Operative management of adult spinal deformity results in significant increases in QALYs gained compared to non-operative management: analysis of 479 patients with minimum 2-year follow-up. **Spine (Phila Pa 1976)** [epub ahead of print], 2016
8. Scheer JK, Osorio JA, Smith JS, Schwab F, Lafage V, Hart RA, et al: Development of validated computer based pre-operative predictive model for proximal junction failure (PJF) or clinically significant PJK with 86% accuracy based on 510 ASD patients with 2-year follow-up. **Spine (Phila Pa 1976)** **41**:E1328–E1335, 2016
9. Smith JS, Klineberg E, Schwab F, Shaffrey CI, Moal B, Ames CP, et al: Change in classification grade by the SRS-Schwab Adult Spinal Deformity Classification predicts impact on health-related quality of life measures: prospective analysis of operative and nonoperative treatment. **Spine (Phila Pa 1976)** **38**:1663–1671, 2013
10. Smith JS, Lafage V, Shaffrey CI, Schwab F, Lafage R, Hostin R, et al: Outcomes of operative and nonoperative treatment for adult spinal deformity: a prospective, multicenter, propensity-matched cohort assessment with minimum 2-year follow-up. **Neurosurgery** **78**:851–861, 2016
11. Smith JS, Shaffrey CI, Berven S, Glassman S, Hamill C, Horton W, et al: Operative versus nonoperative treatment of leg pain in adults with scoliosis: a retrospective review of a prospective multicenter database with two-year follow-up. **Spine (Phila Pa 1976)** **34**:1693–1698, 2009
12. Smith JS, Shaffrey CI, Glassman SD, Berven SH, Schwab FJ, Hamill CL, et al: Risk-benefit assessment of surgery for adult scoliosis: an analysis based on patient age. **Spine (Phila Pa 1976)** **36**:817–824, 2011
13. Terran J, Schwab F, Shaffrey CI, Smith JS, Devos P, Ames CP, et al: The SRS-Schwab adult spinal deformity classification: assessment and clinical correlations based on a prospective operative and nonoperative cohort. **Neurosurgery** **73**:559–568, 2013

Disclosures

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