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CORR Insights®: Preventing Fusion Mass Shift Avoids Postoperative Distal Curve Adding-on in Adolescent Idiopathic Scoliosis**Kent A. Reinker MD****Where Are We Now?**

When a scoliotic curve extends into the lumbar spine, the surgeon is faced with a natural desire to straighten the entire curve, permanently and completely. However, numerous authors [3–5] have shown that preservation of motion segments is important for long-term painless function, particularly in the low lumbar spine. Complicating the decision-making process is the phenomenon of adding-on, in which

segments that may appear to be uninvolved in the curve become part of the lumbar curve after surgery. In the current study, Shigematsu and colleagues outline one factor, fusion mass shift, which appears related to the phenomenon of adding-on. Moreover, this factor is controllable by the surgeon, both in preoperative surgery level selection and in the conduct of surgery intraoperatively. As such, fusion mass shift has the potential to improve patient results by minimizing the risk of postoperative adding-on.

Selecting the levels of scoliotic surgery remains an art, but it is an art that is dependent upon the application of basic concepts such as the

stable vertebra, the neutral vertebra, preservation of both sagittal and coronal balance, the influence of curve type and stiffness, and (now) fusion mass shift as defined by the authors. Our instrumentation is powerful, but good results still rely upon their artful application.

Where Do We Need To Go?

All good research answers old questions while simultaneously raising new ones. The current study by Shigematsu and colleagues is no exception. While the authors have shown that fusion mass shift is one factor that influences postoperative adding on, they have not shown that minimizing fusion mass shift eliminates the problem. In fact, their own series still had a 21% incidence of adding-on, well within the incidence range (21% to 51%) they cite from other authors [1, 7]. Clearly, other factors are at work. What are these factors?

Shigematsu and colleagues describe a reasonable way of assessing curve mobility using lateral fulcrum bending

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views. Is this the best way? How does it stack up against traction films and/or supine-bending films in choosing the ideal levels of fusion and predicting the correction obtained by surgery?

Often, surgeons are faced with an undesirable choice between fusing an additional level or accepting a few degrees less correction. While the negatives of fusing deep into the lumbar spine are well-documented, the long-term effects of residual deformity are not. Is it just cosmesis that is sacrificed when deformity is accepted, or does it lead to long-term progression of deformity, functional deficits, and pain? Which is better: A fusion to L3 with 20° residual deformity or a fusion to L4 with 10° residual deformity?

How Do We Get There?

We need to determine how the patient's maturity, the residual Cobb angle of the fusion mass, the tilt of the upper instrumented vertebra (UIV), trunk shift, and deformity above the UIV might influence the risk of adding-on. Ideally, these factors could be

investigated in a multicenter prospective study that compares the efficacy of bending films, traction films, and fulcrum bending films in guiding the surgeon's choice of instrumented levels and amount of correction. This would be a reasonable project for the Harms Study Group [2] or the Scoliosis Research Society [6], both of which have the reach and resources for such a study.

Finally, a long-term retrospective study should evaluate the influence of residual lumbar deformity upon functional outcomes. Such a study might have to be multi-institutional in order to obtain adequate numbers of patients.

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