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Letter to the Editor Regarding "Outcome of Posterior-Only Approach for Severe Rigid Scoliosis: A Retrospective Report" by Mirzashahi et al

Dear editor:

I read with great interest the recent article by Mirzashahi et al[1] describing the outcome of a posterior-only approach with multilevel asymmetric Ponte's osteotomies in the treatment of severe, rigid scoliosis. Such deformities pose a great challenge for the operating surgeon, and I congratulate the authors for their excellent results. However, I wish to register some observations in the belief that it will send out the message expounded in this study with greater clarity.

The authors' surgical technique entails a thorough posterior release by removing the spinous processes, interspinous ligaments, laminae, ligamentum flavum, and facets. I wish to emphasize that in long-standing severe spinal deformity, particularly with the apex in the thoracic region, a component of the deformity is present in the chest wall too, with increased chest wall stiffness altering the biomechanics of the thoracic cavity, leading to compromise in pulmonary function.[2] In such a scenario, mobilization of the spinal column must be accompanied by mobilization of the chest wall as well. In a severe deformity, the ribs on the concave side tend to be crowded together and remain depressed, whereas those on the convex side get widely separated and result in a cosmetically unappealing rib hump. Concave rib osteotomy/resection forms an important part of a surgeon's armamentarium in such severe, rigid deformities, particularly when a less aggressive osteotomy, such as multilevel Ponte's osteotomy, is being performed for correction.[3] Release of the tight costotransverse and costovertebral ligaments on the concave side results in a decreased force required for correcting axial rotation and coronal plane bending.[4] Rib hump correction is also highly related to patient satisfaction with surgery; in case of a residual rib hump after derotation maneuver, the surgeon can consider performing an additional convex rib costoplasty.[5] These surgical steps mobilize the chest wall through the same posterior approach that the authors have used, thus eliminating the need for another anterior procedure. It goes without saying that a meticulous surgical technique is a must to avoid pulmonary complications, such as pleural rent and pneumothorax.

The readers should also note that the morphology of the curve has a great bearing on what osteotomy the surgeon should employ to achieve correction. Multilevel Ponte's osteotomies fetch good results in large, gradual, "rounded" curves. However, in a sharp, angular deformity, most of the correction needs to be concentrated at this sharp apex. These cases are best tackled by a posterior 3-column osteotomy, such as a pedicle subtraction osteotomy or vertebral column resection.[6] The deformity angular ratio is a recently introduced index that reflects the angularity of a severe, stiff curve and is calculated by dividing the maximum Cobb angle by the number of vertebrae involved.[7] This can be used to predict the need for a more aggressive 3-column osteotomy where multilevel Ponte's osteotomies are unlikely to bring sufficient correction. In particular, hyperkyphotic curves with a high sagittal DAR have a tight spinal cord tented over the apex vertebral body. The ventral cord must be freed before correction is attempted to mitigate the risk of neurological complications.[8]

Finally, recent studies have elaborated on the importance of implant density (how many pedicle screws are placed) and implant distribution (where are the pedicle screws placed). Several strategies have been described to afford similar correction while cutting down on the number of pedicle screws used: interval fixation, skipped fixation, periapical-dropout fixation, and "key" pedicle screw placement.[9] The general consensus is to deploy a high implant density at the apex and juxta-apical zones and skipping some points of fixation as one moves cephalad or caudad. However, when correction is being attempted through multilevel Ponte's osteotomies, I feel that a high implant density should be deployed through the entirety of at least the concave side to effectively harness the forces of correction that are going to be distributed at multiple levels.

I once again commend the authors for this study and hope that my comments will benefit this journal's readership.

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