Comments on "Sarcopenia Is an Independent Risk Factor for Proximal Junctional Disease Following Adult Spinal Deformity Surgery" by Eleswarapu et al

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The paraspinal and psoas muscles have been considered to be essentially important for stabilizing the spinal column and the disruption in the muscle-skeletal balance can lead to spinal deformities such as kyphosis or sagittal imbalance.[1,2] Eleswarapu et al concluded that sarcopenia is an independent predictor of proximal junctional kyphosis (PJK) and proximal junctional failure (PJF) following adult spinal deformity (ASD) surgery.[3] Therefore, preoperative identification of sarcopenia can help with preoperative planning about the methods to strengthen the fixation. Moreover, the physical therapy and exercises can be applied, aiming to strengthen muscles to reduce the risk of PJK/PJF. We appreciate the work by the authors for proving the unique role of psoas in maintaining the spinal sagittal stability. However, there are several issues we would like to discuss with the authors.

First, the muscle degeneration due to fat infiltration usually occurs in adult degenerative scoliosis patients. Fat infiltration (FI) in muscles decreases the proportion of contractile tissue capable of producing force. Subsequently, the ability of muscles to stabilize the spinal-pelvic alignment would be greatly reduced. Eleswarapu et al measured the psoas cross-sectional area (CSA) to evaluate the muscle mass. However, we think that the method of measuring the area of functional cross-sectional area (i.e., lean muscle) or muscle density to assess muscle quality could be more meaningful. This method sets the threshold for lean muscle according to the gray scale which excludes the portion of fat infiltration.[4,5] We think that simply measuring CSA could be reluctantly accepted for psoas in their study, because the FI rate is very low.[1] However, this method may not be suitable for evaluating multifidus and erector spinae with much higher FI rates; because two muscles with similar CSA may have far different FI rates. The muscle with lower FI should have a better performance for stabilizing spinal column compared to the muscle with higher FI. Muscle density is more strongly associated with muscle strength and physical performance than muscle size.[5] Therefore, CSA of muscles may not

be a critical risk factor, but the functional CSA or muscle density instead may play a more important role for predicting PJK/PJF.

Second, except for psoas, multifidus and erector spinae are also key muscles for maintaining the sagittal balance of spine. Moreover, compared to psoas, the functional CSA of multifidus and erector spinae were found to be more correlated to sagittal spinal-pelvic parameters.[1] This is possibly because the psoas muscle is primarily a hip flexor but not a spine stabilizer.[6] Therefore, the evaluation of multifidus and erector spinae could be more meaningful for predicting PJK/PJF, not just psoas.

We again appreciate the work by the authors: it pointed out the critical role of muscles for predicting PJK/PJF. Nowadays, the methods of evaluating paraspinal muscles are still not consistent. Simple evaluating methods should be used with cations and the results should be reasonably explained. The issues mentioned above need to be considered prior to its further application.

Declaration of Conflicting Interests

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