**Assessing Vertebral Body Rotation in Minimally Invasive Spine Surgery**

Patrik Suwak, DO; Kirby Bonvillain, MD; Peter D’Amore, MD; Claudia Leonardi, PhD.; Abhishek Kumar, MD.

**Background**

Minimally invasive spine surgery relies on fluoroscopic imaging as bony landmarks used for instrumentation are not exposed. The precision of techniques used to determine vertebral body rotation intraoperatively may be confounded by anatomic variation or pathology. Here, we investigate the physiologic variation in different anatomic structures of the lumbar spine used for percutaneous pedicle screw placement.

**Objective**

The aim of this study is to evaluate the incidence and magnitude of pedicle asymmetry as well as spinous process deviation in the healthy lumbar spine.

**Methods**

100 normal lumbar CT scans, without evidence of acute deformity, significant spondylosis, scoliosis, or spondylolisthesis were reviewed to assess for pedicle height, width and spinous process angle (SPA) to compare symmetry between right and left sided pedicles for each vertebral body. Spinous process deviation of ≥5° in the axial plane was considered a relevant finding and the magnitude of offset from midline was calculated using the deviation angle and spinous process length.

**Results**

Analysis of CT scans found that 17.5% of lumbar spinous processes had an average angular variation ≥5°. This calculates to a clinically significant 3.53 mm average offset of spinous processes from midline in 17.5% of lumbar vertebrae. Pedicle height and width measurements did not show statistically or clinically significant variation when comparing right to left lumbar pedicles.

**Conclusion**

These results suggest that using the spinous process as a fluoroscopic landmark during intraoperative imaging to determine neutral rotation of lumbar vertebrae can be an unreliable technique. Rotational alignment can be determined more reliably by comparing left to right pedicle symmetry. These findings should be considered when selecting an operative technique to assess neutral vertebral alignment during percutaneous pedicle screw instrumentation.