Impact of body habitus on fluoroscopic radiation to the surgeon

TO THE EDITOR: We took great interest in the study by Kukreja et al.4 (Kukreja S, Haydel J, Nanda A, et al: Impact of body habitus on fluoroscopic radiation emission during minimally invasive spine surgery. J Neurosurg Spine 22:211–218, February 2015). The study investigated the impact of body habitus on fluoroscopic radiation emission during minimally invasive spine surgery, and the authors found that body mass index (BMI) was closely associated with the increase of fluoroscopic radiation emission. The findings may be not a big surprise for us, because when we set the fluoroscope in automatic mode in clinical practice for image acquisition, the C-arm machine will automatically regulate fluoroscopic radiation emission to obtain adequate resolution according to the patient’s body habitus. However, the integration of WHO criteria for obesity will certainly increase the awareness of radiation hazards to the patient and operating staff when treating obese patients with minimally invasive spine surgery.

We have some concerns regarding the study design and data. First, the authors did not use dosimeters to measure the actual radiation exposure to the patient or the spine surgeon. Fluoroscopic radiation emission might be closely correlated with BMI, but emission data are not an accurate measure of the actual radiation dosage the patient or the surgeon is exposed to. Secondly, the authors did not record more specific data for exposure parameters, such as fluoroscopic time and tube voltage and current at the anteroposterior and lateral projection. It would be more interesting and convincing to see an investigation of the correlations between BMI and these exposure parameters. Moreover, the radiation exposure to the body and fluoroscopic radiation emission are 2 different concepts, and no significant correlation was identified with BMI in the study by Ahn and colleagues (r² = 0.03359, p = 0.3323; Fig. 1D). Moreover, we also found that fluoroscopic time was not significantly correlated with BMI (r² = 0.0004, p = 0.9277), which was different from the findings of Ahn et al. (r² = 0.1616, p = 0.0277) and in our study (r² = 0.2390, p = 0.0245; Fig. 1C), but tube current at the anteroposterior projection was only found to be significantly correlated with BMI in our study (r² = 0.3148, p = 0.0081) and not in the study by Ahn et al. (r² = 0.0004, p = 0.9277), which was different from the findings of Ahn et al. (r² = 0.1532, p = 0.0325; Fig. 1E). That is to say, tube current and fluoroscopic time were not always highly correlated with body habitus in PELD. Although we found that the effective radiation exposure to the surgeon was mildly correlated with BMI (r² = 0.1275), the correlation was not statistically significant (p = 0.1120; Fig. 1F). Therefore, when we found that body habitus was closely associated with the increase in fluoroscopic radiation emission, it was not always the same in terms of other exposure parameters. Moreover, the radiation exposure to the body and fluoroscopic radiation emission are 2 different concepts, and no significant correlation was identified between BMI and the effective radiation exposure to the surgeon. Nevertheless, more robust data might be needed to clarify this issue in the future.

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Disclosures

The authors report no conflict of interest.

Response

We are thankful to Dr. Fan and colleagues for the insightful comments and the opportunity to clarify a number of points with regard to our work. We presented our study based on the radiation emission dose available in our database for the patients who underwent minimally invasive spine surgery (MISS) over the period of approximately 4 years. Using a WHO obesity classification, our study identifies a specific BMI level beyond which the radiation emission increased significantly during MISS.

As we retrospectively analyzed our data on radiation emission, we did not use a dosimeter. For the same reason, we have specifically discussed radiation emission rather than radiation exposure. However, we noted this in our
Failure of single-level percutaneous endoscopic lumbar discectomy: a challenging clinical dilemma


Complications following percutaneous endoscopic lumbar discectomy (PELD) for lumbar disc herniation (LDH) are directly related to poor prognosis and medicolegal problems. Recurrence and the need for reoperation are the most frequently reported negative outcomes, and their causes are multifactorial. Undoubtedly, various risk factors contribute to surgical failure, such as age, sex, and obesity. Although some studies have been carried out to investigate the predictive risk factors, they are still not clearly elucidated in literature. We unani-mously applaud Wang et al. for their significant work and the diligence with which they handled this controversial topic.

In the article, Wang et al. reported their experience using PELD for single-level LDH to provide insights into the rates of surgical failure and identified potential risk factors.11 Specifically, the authors retrospectively reviewed the medical records of 350 patients who underwent PELD for single-level LDH and provided insight into the rate of surgical failure following PELD. Furthermore, the authors identified the associated risk factors for surgical failure, including demographic, clinical, and radiologically identified factors. The authors found that the surgical failure rate following PELD for LDH was 10.3%; and as expected, older patients, elderly patients (age ≥ 60 years), and patients with diabetes were at increased risk, particularly in the early years of the procedure’s use. Although numerous risk factors were determined in this study, the authors did not analyze some previously identified significant predictors of surgical failure. Kim et al. found that disc height and segmental motion showed a significant correlation with recurrent LDH.4 Miwa et al. reported that the seques-trated type of herniation showed a 15.4% LDH recurrence rate, which was much higher than the rates of other types (which ranged from 7% to 10%).8 Choi et al. revealed that improper surgical indications and inappropriate working channel position were the dominant reasons for the surgical failure of PELD.1 Lee et al. demonstrated that the rate of surgical failure following PELD was significantly increased in the high-grade migration group, and the centrally located high-canal compromised herniation showed the highest rate of failure in the non-migrated group.7

Accurate knowledge of the risk factors of surgical failure following PELD for single-level LDH is crucial for guiding decision-making strategies. However, several potential risk factors for surgical failure have not been investigated yet. First, recent biomechanical studies have revealed distinct behavior at the different lumbar levels;9 and the study of lumbar intervertebral disc morphology using MR images has shown segment-dependent geometric features.12 Moreover, different clinical outcomes following surgical treatment at the different lumbar levels have been reported.10 Notably, the segment-dependent discrepancy may be an inherent risk factor in the development of surgical failure, and specific comparison at different segment levels is necessary to investigate this. Further, Harrington et al. demonstrated that the vertebral endplate shape is a critical factor contributing to the development of LDH.2 In addition, asymmetries in the lumbar facets and facet tropism have been shown to be associated with LDH.3,5 It is unclear whether these factors contribute to surgical failure. Finally, different abnormal vertebral motions are closely associated with different lumbar disc degenerations graded by Pfirrmann’s criteria, while altered vertebral motion has been widely accepted as a mechanical factor for spinal pathology;6 however, the different lumbar disc degenerations that emerge as risk factors for surgical failure are poorly understood.

In the end, we are deeply grateful to Wang et al. for highlighting the risk factors for surgical failure following PELD for single-level LDH. Currently, it is still a challenging clinical dilemma. Moreover, the risk factors of surgical failure following PELD for multi-level LDH are also unclear. Consequently, substantial work to determine the potential risk factors of surgical failure following PELD is essential in the near future.

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References

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Response
No response was received from the authors of the original article.