Impact of body habitus on fluoroscopic radiation to the surgeon

TO THE EDITOR: We took great interest in the study by Kukreja et al. (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 not be 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 between BMI and the effective radiation exposure to the patient or the spine surgeon in our center (Fig. 1). The radiation exposure to the surgeon was measured by a thermoluminescence dosimeter attached to the surgeon, as described in our prior study. The whole-body effective dose for the surgeon was calculated according to the following formula: Surgeon’s effective dose = (0.5 × dose for chest below lead apron) + (0.025 × dose for chest above lead apron).

Both of these studies found that BMI was significantly correlated with tube voltage at the anteroposterior projection ($r^2 = 0.1339$, $p = 0.0467$; $r^2 = 0.4273$, $p = 0.0013$; Fig. 1A), and at the lateral projection ($r^2 = 0.2546$, $p = 0.0045$; $r^2 = 0.2259$, $p = 0.0295$; Fig. 1B). Tube current at the lateral projection was also found to be significantly correlated with BMI in the study by Ahn and colleagues ($r^2 = 0.1616$, $p = 0.0277$) and in our study ($r^2 = 0.2390$, $p = 0.0245$; Fig. 1C), but tube current at the anteroposterior projection was only found to be significantly correlated with BMI in our study ($r^2 = 0.3148$, $p = 0.0081$) and not in the study by Ahn et al. ($r^2 = 0.0335$, $p = 0.3323$; Fig. 1D). Moreover, we also found that fluoroscopic time was not significantly correlated with BMI in the study by Ahn et al. ($r^2 = 0.0004$, $p = 0.9277$), which was different from the findings of Ahn et al. ($r^2 = 0.1532$, $p = 0.0325$; 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 ($r^2 = 0.1275$), 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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References


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