Radiation exposure due to CT navigated technique in adolescent idiopathic scoliosis

Background
Pedicle screwing is widely utilized in spinal deformity correction surgery. Computed tomography (CT) navigated techniques were developed to improve the accuracy of pedicle screw placement and could be useful to avoid complication. However, potential cancer risks exist from associated ionizing radiation, in particular for children who are more radiosensitive than adults. The purpose of this study is to measure the radiation exposure dose directly to each organ and verify the reduction effect in scoliosis correction surgery.

Methods
Forty cases of adolescent idiopathic scoliosis had been performed correction and fusion surgery using CT navigated technique (O-arm, Medtronic). All patient was girl, and average age was 15.6 years old. Curve type was Lenke type 1 in all cases. Optically Stimulated Luminescence (OSL) dosimeters had been attached to eyelid, neck, breast, ovary, elbow and lower leg. Normal irradiation protocol (120 kVp, 32 mA) was adopted in first twenty cases, and the reduction protocol (120 kVp, 20 mA) was adopted in second twenty cases. All OSL dosimeter had been collected after the surgery, and radiation exposure doses for each organ were calculated. Average values were used for analysis.

Results
Average fusion vertebrae were 10.8, 11.1, respectively. Radiation exposure doses to eye were 388.4 μSv, 172 μSv, to thyroid were 2833 μSv, 1266 μSv, to breast were 15171 μSv, 8412 μSv, to ovary were 585 μSv, 512 μSv, to elbow were 199 μSv, 114 μSv, to lower leg 96 μSv, 33 μSv, respectively. There was statistically significance in radiation exposure to the eye, thyroid and breast. It stood comparison with the easiness in resolution between two groups.

Discussion and Conclusion
Spine surgeons should be aware of the potential risks as well as the benefits of CT and take these issues into account when using CT navigated technique for children. CT should be performed using every effort to use as low as reasonable dose of radiation while assuring acquisition of high-quality images. As there are few patients who are obese in children with scoliosis, it is thought that reduction protocol is available and useful in scoliosis correction surgery to reduce radiation exposure.

Radiation reduction protocol in CT navigated technique for children’s scoliosis is good enough and available for avoiding potential risks.