**Answer to the Letter to the Editor of A. Gardner concerning
“Loss of apical vertebral derotation in adolescent idiopathic
scoliosis: 2-year follow-up using multi-planar reconstruction
computed tomography” (by G. Cui, K. Watanabe, Y. Nishiwaki,
N. Hosogane, T. Tsuji, K. Ishii, M. Nakamura, Y. Toyama,
K. Chiba, M. Matsumoto; Eur Spine J (2012) Jun;21(6):1111–20.
doi:10.1007/s00586-012-2633-0)**

K. Watanabe

Accepted: 16 December 2012 / Published online: 29 January 2013
© Springer-Verlag Berlin Heidelberg 2013

We thank Dr. Gardner for the interest in our work and the letter to the editor. In the letter, Dr. Gardner commented that the correction loss in Cobb angle should be less significance, since the value was within the range of error based on the previous reports [1–4]. In our study, the mean correction loss between the Cobb angle of immediate after surgery and that of postoperative 2 years was $2.5 \pm 1.5^\circ$ [5]. The loss was significant when analyzed using paired *t* test. However, the change had no clinical impact when evaluated by SRS-22 scores. Based on our previous study, the coefficient of variations for intra-observer measurement was 2.3 % for the MT curve [6] using a digital measurement software on appropriately adjusted X-ray films [7, 8], and by selecting the same end vertebra in each patient at different time course [9]. In this study, we also used CT scans to demonstrate the correction loss in the axial plane and, in doing so, we tried to minimize measurement errors caused by patient positioning during CT examination using the relative AVR (rAVR), which was defined as the difference between the axial rotation angle of the upper instrumented vertebra and the apical vertebra. As a result, we also found a small but significant time-interval difference in rAVR.

As Dr. Gardner mentioned, some error will occur at the time of taking X-ray caused by positioning of the trunks, which is somewhat unavoidable. However, combining the results of radiographic and CT measurements, we can

conclude that some correction loss may occur even if we use biomechanically stable pedicle screw constructs for adolescent idiopathic scoliosis. Although this small correction loss does not have significant clinical impact, we should be aware of this phenomenon.

Acknowledgments Finally, we would like to appreciate to Dr. Gardner for his comments again.

Conflict of interest None.

References

1. Adam CJ, Izatt MT, Harvey JR, Askin GN (2005) Variability in Cobb angle measurements using reformatting computerized tomography scans. *Spine (Phila Pa 1976)* 30:1664–1669
2. Carman DL, Browne RH, Birch JG (1990) Measurement of scoliosis and kyphosis radiographs. Intraobserver and interobserver variation. *J Bone Joint Surg Am* 72:328–333
3. Dutton KE, Jones TJ, Slinger BS, Scull ER, O'Connor J (1989) Reliability of the Cobb angle index derived by traditional and computer assisted methods. *Australas Phys Eng Sci Med* 12:16–23
4. Goldberg MS, Poitras B, Mayo NE, Labelle H, Bourassa R, Cloutier R (1988) Observer variation in assessing spinal curvature and skeletal development in adolescent idiopathic scoliosis. *Spine (Phila Pa 1976)* 13:1371–1377
5. Cui G, Watanabe K, Nishiwaki Y, Hosogane N, Tsuji T, Ishii K, Nakamura M, Toyama Y, Chiba K, Matsumoto M (2012) Loss of apical vertebral derotation in adolescent idiopathic scoliosis: 2-year follow-up using multi-planar reconstruction computed tomography. *Eur Spine J* 21:1111–1120
6. Watanabe K, Kawakami N, Nishiwaki Y, Goto M, Tsuji T, Obara T, Imagama S, Matsumoto M (2007) Traction versus supine side-bending radiographs in determining flexibility: what factors influence these techniques? *Spine (Phila Pa 1976)* 32:2604–2609
7. Aubin CE, Bellefleur C, Joncas J, de Lanauze D, Kadoury S, Blanke K, Parent S, Labelle H (2011) Reliability and accuracy

K. Watanabe (✉)
Department of Orthopedic Surgery,
Keio University School of Medicine, 35 Shinanomachi,
Shinjuku, Tokyo 160-8582, Japan
e-mail: morio@a5.keio.jp

- analysis of a new semiautomatic radiographic measurement software in adult scoliosis. *Spine (Phila Pa 1976)* 36:E780–E790
8. Kuklo TR, Potter BK, O'Brien MF, Schroeder TM, Lenke LG, Polly DW Jr (2005) Reliability analysis for digital adolescent idiopathic scoliosis measurements. *J Spinal Disord Tech* 18: 152–159
 9. Gstoettner M, Sekyra K, Walochnik N, Winter P, Wachter R, Bach CM (2007) Inter- and intraobserver reliability assessment of the Cobb angle: manual versus digital measurement tools. *Eur Spine J* 16:1587–1592