In Reply:

We thank Drs. Moerman and De Hert for their interest and remarks on our article.[1] They provided a possible mechanism accounting for the discrepancy between cerebral oxygen saturation ($SctO_2$) measured by near-infrared spectroscopy and jugular venous bulb oximetry ($SjvO_2$). They also questioned the use of the standard Bland-Altman method to assess the agreement with repeated measures.

It has been recently shown that propofol preserves cerebral oxygen saturation in the cortex through a region-specific alteration of the cerebral blood flow or cerebral metabolic rate of oxygen ratio.[2] In this context, Moerman and De Hert pointed out that propofol may preserve the cerebral oxygen saturation in the frontal cortex, which is the measurement site of near-infrared spectroscopy, thereby increase $SctO_2$, resulting in comparable near-infrared spectroscopy values with those in the sevoflurane–nitrous oxide group. However, we ascribed the discrepancy between $SctO_2$ and $SjvO_2$ to the inherent limitations of the near-infrared spectroscopy technology. Moreover, the agreement between $SctO_2$ and $SjvO_2$ was not acceptable either in the sevoflurane–nitrous oxide or in the propofol–remifentanil group in our study, when assessed separately in each group. The inhomogeneous effect of propofol with an enhanced cerebral oxygenation in the frontal cortex may be responsible for the comparable $SctO_2$ in the two groups, but not the lack of agreement between the $SctO_2$ and $SjvO_2$, if any.

Moerman and De Hert also doubted whether Bland-Altman and linear regression analyses were applicable for repeated measures. We fully agree with them that standard Bland-Altman method may not be ideal for the repeated data. As such, we reanalyzed the data ($SctO_2$ against $SjvO_2$) by using a Bland-Altman plot with multiple measurements per subject.[3] Nevertheless, we found little change in the 95% limit of agreement (from −37.8% to +23.6% with mean difference −7.2) compared with that (−38.2%, 23.8% with mean difference −7.2) of our previous data.[1] In fact, we used a Bland-Altman plot with multiple measurements per subject in another study and demonstrated a lack of agreement of $SctO_2$ and $SjvO_2$ values during the surgery in the beach chair position.[4] If we had used a modified rather than standard Bland-Altman method also in the current study,[1] the conclusion that $SctO_2$ may not be reliable in detecting a low $SjvO_2$ during the surgery in the beach chair position should remain the same.

Kyung Y. Yoo, M.D., Ph.D.,* Hyejin Jeong, M.D., JongUn Lee, M.D., Ph.D. *Chonnam National University Medical School, Dong-gu, Gwangju, South Korea. kyyoo@jnu.ac.kr

References

1. Jeong H, Jeong S, Lim HJ, Lee J, Yoo KY: Cerebral oxygen saturation measured by near-infrared spectroscopy and jugular venous bulb oxygen saturation during arthroscopic shoulder surgery in beach chair position under sevoflurane-nitrous oxide or propofol-remifentanil anesthesia. Anesthesiology 2012; 116:1047–56
2. Klein KU, Fukui K, Schramm P, Stadie A, Fischer G, Werner C, Oertel J, Engelhard K: Human cerebral microcirculation and oxygen saturation during propofol-induced reduction of bispectral index. Br J Anaesth 2011; 107:735–41
3. Bland JM, Altman DG: Calculating correlation coefficients with repeated observations: Part 1–Correlation within subjects. BMJ 1995; 310:446
4. Jeong H, Lee SH, Jang EA, Chung SS, Lee J, Yoo KY: Haemodynamics and cerebral oxygenation during arthroscopic shoulder surgery in beach chair position under general anaesthesia. Acta Anaesthesiol Scand 2012; 56:872–9

(Accepted for publication August 16, 2012.)

Ultrasound Investigation and the Eye

To the Editor:

We read with interest the elegant article by Dubost *et al.*[1] documenting a correlation between increased optic nerve sheath diameters and preeclampsia. At Bascom Palmer Eye Institute we have been studying the potential application of sonography for ophthalmic regional anesthesia.

The application of sonic energy around the eye is not without risk. Thermal and mechanical bio-effects are well described. Multiple international regulatory authorities, including the U.S. Food and Drug Administration[2] and Health Canada* have imposed stricter physical parameters for the use of ophthalmic ultrasound. In particular, limits on Mechanical Index and Thermal Index have been reduced to 0.23 and less than 1, respectively.

We recently published a rabbit model study that compared thermal and mechanical changes induced by exposure to ophthalmic- and nonophthalmic-rated transducers.[3] Our data showed significant changes in intraorbital temperature after exposure to the nonorbital rated Sonosite Micromaxx 6-13 MHz linear transducer (Bothell, WA).

Great benefit may emanate from intra- or perioperative ultrasonic ocular examinations, whether for optic nerve sheath diameters, regional anesthesia, or other applications. Investigators must remain cognizant of the potential deleterious ocular effects of sonic energy, and ensure that only orbital-approved technology is used in future research.

Howard D. Palte, M.B.Ch.B., F.C.A.(SA).,† Steven Gayer, M.D., M.B.A. †University of Miami, Miller School of Medicine, Miami, Florida. hpalte@med.miami.edu

References

1. Dubost C, Le Gouez A, Jouffroy V, Roger-Christoph S, Benhamou D, Mercier FJ, Geeraerts T: Optic nerve sheath diameter used as ultrasonographic assessment of the incidence of raised intracranial pressure in preeclampsia: A pilot study. Anesthesiology 2012; 116:1066–71
2. U.S. Food and Drug Administration. Guidance for Industry and FDA Staff Information for Manufacturers Seeking

*http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/safety-code_23-securite/index-eng.php. Accessed July 13, 2012.