In Reply—We owe Drs. Ganesh and Jobes a great debt of gratitude regarding our study.1 Their comments surely reinforced our point of view about the usefulness of real-time ultrasound-guided central venous catheterization. First, we agree with their suggestion about the need for informed consent. Although our institutional ethics committee did not request that we obtain formal written consent, we explained the details of our study to the parents or guardians of each patient design and obtained verbal informed consent. Because the application of the ultrasound technique per se had already become our standard measure for central venous catheterization in pediatric cardiac surgery, the informed consent was only focused on the possible application of the real-time technique. All procedures were directed and supervised by the two experienced attending anesthesiologists (N.S. or Y.K.) who also manipulated the ultrasonography probe during the real-time procedure. An attempt was defined as a single needle pass, and if one trainee failed more than three attempts (which did not happen in the real-time group), the supervising attending decided the next procedure. In our study, 3 of 27 cases in the skin-marking group were regarded as unsuccessful (2 complications and 1 with more than 20 min). These cases were replaced by real-time guidance that was performed successfully from another puncture point by another fellow (appointed by the supervising attending who also handled the probe) who is more familiar with the procedure. Four other cases in the skin-marking group were performed with a total of four to six attempts. In these cases, all replaced second fellows completed the procedure within 20 min; therefore, these were counted as successful. Another 20 cases in the skin-marking group and all cases in the real-time group were successfully punctured and cannulated with no more than three attempts by the first trainee. During the procedure, the two experienced attending physicians were ready anytime to take over a role if the second trainee was unsuccessful, but there was no chance for them to show off. All selected 10 trainees who conducted this study were more or less accustomed to the use of ultrasonography and well experienced with the real-time procedure with adult cardiac patients (after at least 6 months training) and were closely guided by two attending physicians during the study. As suggested, it is true that trainee failure and dismissal is usually followed by the attending physicians in the training program, even at our institute, but if the attending notes that it is relatively safe, the second trainee with more skill could be appointed with care. Also, we now believe that the success of this procedure is largely dependent on who manipulated the ultrasound-guided technique. Because we dealt with the small children, whose veins were small and collapsible, meticulous handling of the probe was the key to successful puncture. Therefore, if the inexperienced trainee handled the probe, our success rate might not have achieved 100%. We are sorry that we forgot to mention that the device we applied in this study was not so cumbersome compared with the one that was used in the study of Grebenik et al.2 and that we did not use a needle guide or needle guide bracket.

We also agree with the authors’ suggestion that the two-person approach enabled the trainee to use both of his or her hands and concentrate on the puncture site and the aspiration of blood. Therefore, our two-person approach with trainee (as operator) and attending (as supervisor and manipulator of the probe) might be the key for the success in this study. And this should be one of the best examples for hands-on training.

Because Grebenik et al.2 previously demonstrated poor outcomes associated with the real-time method compared with the anatomical landmark method, we thought to conduct this trial comparing the two ultrasound-guided techniques. In this sense, as suggested, the reference of “old dog and new trick” might have been inappropriate because the ultrasound was manipulated by the well-trained “old dog.” We do believe that ultrasound-guided central venous puncture should be an absolute prerequisite for every anesthesiologist. And we would like to stress that seeking appropriate methodology with new technology that especially focuses on operator friendliness and patient safety is crucial in critical care settings.

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