J Anesth (2015) 29:803–804
DOI 10.1007/s00540-015-2021-0

SHORT COMMUNICATION

The use of a needle guide kit improves the stability of ultrasound-guided techniques

Hironobu Ueshima[1] · **Akira Kitamura**[1]

Received: 25 February 2015 / Accepted: 20 April 2015 / Published online: 5 May 2015

Abstract A needle guide kit will be able to improve visibility on ultrasonic images. We examined the degree of stability using a SIVA guide. The SIVA guide is a needle guide kit in which the angle is not restricted, allowing the puncture to be made at any angle. We punctured the Blue Phantom™ with a high-frequency linear probe with a SIVA guide and measured the intensities of the needle at depths of 0.5, 1.0, 1.5, and 2.0 cm on the ultrasound image with Image J software. We set all punctures angles at 45 degrees from the Blue Phantom™. Six anesthesiologists with >7 years experience performed two punctures—one case was punctured with a SIVA guide and the other was punctured without a SIVA guide. Some significant differences were noted in the results between the two punctures at depths of 1.0, 1.5, and 2.0 cm. We were able to prove that the use of a needle guide kit could improve visibility on ultrasonic images.

Keywords Needle guide kit · Ultrasound-guided techniques · Stability

Ultrasound-guided techniques have become increasingly popular in recent years because they are safe and reliable when performing blood vessel punctures and nerve blocks [1, 2]. However, the inability to visualize the needle on the ultrasonic images may lead to the risk of complications such as nerve or organ injury, among other side-effects [3–5]. A needle guide kit will be able to improve visibility on ultrasonic images. We examined the degree of stability using a SIVA guide (Fuji Medical Corporation, Tokyo, Japan). The SIVA is a needle guide kit in which the angle of insertion is not restricted, allowing the puncture to be made at any angle. The purpose of this study was to determine the usefulness of a SIVA guide on ultrasound-guided techniques.

We prepared the S-Nerve™ ultrasound system (SonoSite; Fujifilm, USA) and the Blue Phantom™ for the peripheral nerve blocks (CAE Healthcare, USA). We punctured the Blue Phantom™ using a 50× high-frequency linear (HFL) probe with SIVA-H5001 type (Fig. 1). This type can apply 18-gauge (G) and 22-G needles. The needle was a non-coated 80-mm Tuohy needle (18-G) (B. Braun Aesculap Japan, Tokyo, Japan). We used an image-processing program designed for scientific multidimensional images to measure the intensity of the needle at depths of 0.5, 1.0, 1.5, and 2.0 cm on the ultrasound image (Image J Software). All punctures angles were set at 45 degrees from the Blue Phantom™. Six anesthesiologists with >7 years of experience performed two punctures—one case was punctured with a SIVA guide and the other was punctured without a SIVA guide. As the six anesthesiologists had sufficient experience to perform ultrasound-guided techniques without using a needle guide kit, these anesthesiologists can be considered as beginners for the SIVA techinique. Student's t test was used for statistical analysis, and a significant difference was recorded at $P < 0.05$. The numerical variables of the intensity at the tip of the needle are expressed as mean (standard deviation (cd/m^2).

We recorded the level of intensity of both cases, i.e., with and without a SIVA, at each depth (Fig. 2). Intensity measurements in the case where the Blue Phantom™ was punctured with a SIVA were 200.3 (10.4), 215.1 (10.3), and 221.2

✉ Hironobu Ueshima
ueshimhi@yahoo.co.jp

[1] Department of Anesthesiology, Saitama Medical University International Medical Center, Yamane 1397-1, Saitama, Japan

Fig. 1 50× high-frequency linear probe with SIVA-H5001 type

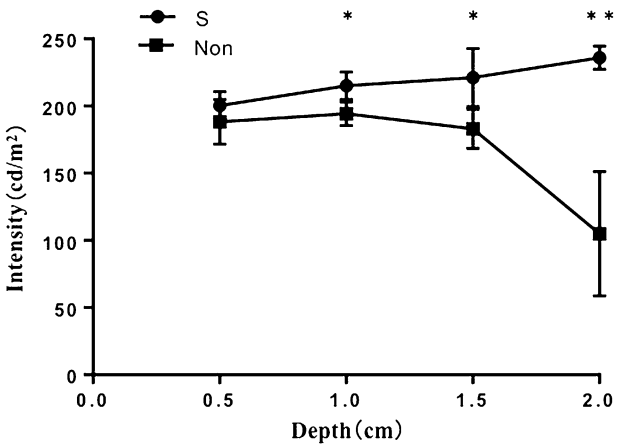

Fig. 2 The intensity of the needle on the ultrasonic images ($n = 6$). Results represent mean with standard deviation. $P < 0.001$, $^{**}P < 0.0001$. *S* puncture with a SIVA, *Non* puncture without a SIVA

(21.9), and 236.0 (8.7) at depths of 0.5, 1.0, 1.5 and 2.0 cm, respectively, on the ultrasound image. The intensity measurements without the SIVA were 188.2 (16.6), 194.3 (8.8), 183.0 (14.7) and 104.8 (46.3) at depths of 0.5, 1.0, 1.5, and 2.0 cm, respectively. As shown in Fig. 2, some significant differences were noted in the results between the two punctures at depths of 1.0 cm ($P = 0.0037$), 1.5 cm ($P = 0.0053$), 2.0 cm ($P < 0.0001$). In the plane technique, it has been generally reported that puncture angles >30 degrees decrease the visualization of the needle [6]. We showed that the use of a needle guide kit could improve the visibility on ultrasonic images for puncture angles >30 degrees. Moreover, anyone may use the SIVA safely and reliably.

The limitation of this study was provided by the restriction of only being able to test with the Blue Phantom™, and not on human subjects. Furthermore, we cannot measure the needle intensity >2 cm depth because the depth of the Blue Phantom™ is 2.5 cm. Future studies need to be performed in a clinical setting to confirm the clinical efficacy of this technique. In addition, this device cannot be used with all ultrasound systems. In conclusion, we recommend the use of a needle guide kit when performing blood vessel punctures and nerve blocks.

Conflict of interest None.

References

1. Tadokoro T, Tokumine J, Lefor AT, Kawabata T, Yoza K, Kinjo T. The three-step method for ultrasound-guided pediatric internal jugular venous catheterization: a clinical trial. J Anesth. 2015;29:131–3.
2. Yoshida H, Kushikata T, Kitayama M, Hashimoto H, Kimura F, Niwa H, Ishihara H, Hirota K. Time-consumption risk of real-time ultrasound-guided internal jugular vein cannulation in pediatric patients: comparison with two conventional techniques. J Anesth. 2010;24:653–5.
3. MacLennan N, Nixon C. Pneumothorax following ultrasound-guided interscalene block: association or complications. Eur J Anaesthesiol. 2014;31:244.
4. Barrington MJ, Kluger R. Ultrasound guidance reduces the risk of local anesthetic systemic toxicity following peripheral nerve blockade. Reg Anesth Pain Med. 2013;38:289–97.
5. Jacob AK, Mantilla CB, Sviggum HP, Schroeder DR, Pagnano MW, Hebl JR. Perioperative nerve injury after total hip arthroplasty: regional anesthesia risk during a 20-year cohort study. Anesthesiology. 2011;115:1172–8.
6. Schafhater-Zoppoth I, McCulloch CE, Gray AT. Ultrasound visibility of needle used for regional nerve block: and in vitro study. Reg Anesth Pain Med. 2004;29:480–8.