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LETTER TO THE EDITOR

A novel cannula-over-needle system for ultrasound-guided central venous catheterization

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To the Editor:

Ultrasound (US) guidance for central venous catheterization (CVC) is widely used to enhance patient safety and is performed using a needle alone or a needle/cannula combination [1]. The cannula may be difficult to image on US, as plastic weakly reflects the US signal. We developed a novel cannula-over-needle device (CV Legaforce® EX, Terumo Co. Japan) to provide an easily visible, strongly reflected US signal that may facilitate US-guided CVC. Figure 1 shows the structure of the Legaforce® EX. The purpose of this study was to evaluate the ability to image this new cannula-over-needle device using US imaging during CVC.

We invited participants to engage in hands-on training for US-guided CVC. They were informed that their evaluation would be used in a research study. A needle or cannula/needle combination was inserted into a simulator (Real-vessel®, Kyoto Kagaku Co. Japan) [2] at a 45° angle by a single nonparticipant to hide the identity of the device from the participant. We then compared visibility of the EX needle (EXN) and catheter (EXC) with the Legaforce® SX needle (SXN) and catheter (SXC) (structure shown in Fig. 1). The SX devices have a standard smooth design. Participants evaluated US visibility of the devices on a scale from 1 (= invisible) to 10 (= clearly visible) on longitudinal views. Data were evaluated with the Kruskal–Wallis test for scores and the Mann–Whitney U test for comparing devices. A p value <0.05 was considered statistically significant.

Nineteen people participated in this study, with longitudinal imaging of all devices. There were no differences between EXN (mean 7.4 ± 2.2) and SXN (5.5 ± 2.4, $p > 0.05$). However, EXC (5.2 ± 2.5) was significantly more visible than SXC (3.2 ± 2.4, $p < 0.05$). Using the combined needle/cannula combination, EX (6.9 ± 2.6) was significantly more visible than with SX (3.5 ± 2.5, $p < 0.05$).

The effectiveness of US to facilitate CVC and improve patient safety has been demonstrated [3]. Guidelines recommend the routine use of US [4, 5]. There are no specific recommendations regarding the type of needle and/or cannula that should be used. A novel device with improved US cannula visibility was developed (Fig. 1). The EX device was significantly more easily imaged on the longitudinal view than was the SX device, and was most pronounced with the cannula alone. Other tested combinations

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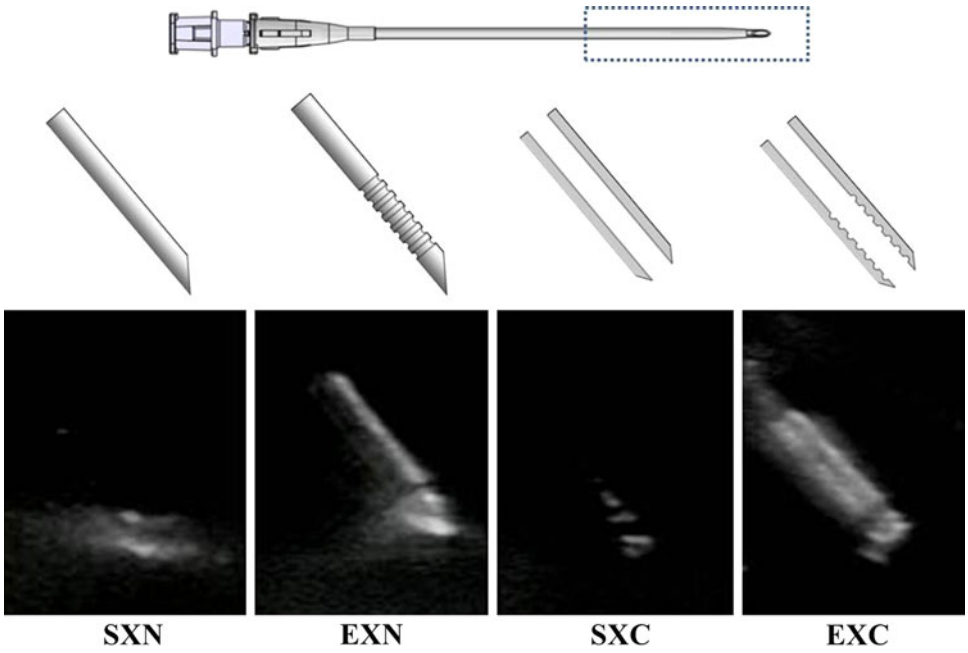

Fig. 1 Ultrasound (US) images of needles and cannulas showing the longitudinal view in water at 45°. *SX* Legaforce® *SX, EX* Legaforce® EX, *N* needle, *C* cannula. The EX inner needle has a tip with an irregular outer surface, but the SX tip has a smooth outer surface. The inner surface of the EX cannula is irregular, but that of the SX cannula is smooth

included a metal needle, which may have led to a smaller difference, as the difficulty on imaging is seeing the cannula. In this simulation study, the needle did not move, and the needle and/or cannula was inserted in a double-blinded fashion, which differs from usual clinical practice. This new device provides excellent visibility on US during placement, supporting the use of a cannula-over-needle, which some clinicians prefer over a needle-only technique. These results support the need for clinical trials to further define the potential advantages of this device.

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Conflict of interest Mr. Toshiya Asai is an employee of Terumo Corporation. All other authors have no conflicts of interest.

References

1. Morimoto Y, Yoshikawa C. Current state of central venous catheterization in the operating theater in Japan. Masui. 2010;59:662–6.
2. Tokumine J, Nitta K, Ishimori K, Hasegawa M, Nakae Y, Sugahara K. A novel simulator for ultrasound-guided venipuncture training "Real-vessel®". J Clin Anesth (Jpn) 2008;32:1081–4.
3. Rothschild JM. Ultrasound guidance of central vein catheterization. Making health care safer: a critical analysis of patient safety practices. Evidence report/technology assessment, no. 43. AHRQ Publication No. 01-E058, 2001. Agency for Healthcare Research and Quality, Rockville. http://www.ahrq.gov/clinic/ptsafety/chap21.htm
4. National Institute for Health and Clinical Excellence: NICE Technology Appraisal Guidance—no. 49. http://www.nice.org.uk/nicemedia/live/11474/32461/32461.pdf
5. CDC Guidelines for the prevention of intravascular catheter-related infection, 2011, p. 11. http://www.cdc.gov/hicpac/pdf/guidelines/bsi-guidelines-2011.pdf