

## Ultrasound observation of the subclavian vein: changes in the diameter with the head tilted down

Makoto Kawano<sup>1</sup> and Kowa Yoshimine<sup>2</sup>

<sup>1</sup>Department of Anesthesia, Kagoshima Medical Center, 8-1 Shiroyama-cho, Kagoshima 892-0853, Japan

<sup>2</sup>Department of Psychiatry, Kagoshima Prefectural Aira Hospital, Kagoshima, Japan

*To the editor:* For subclavian vein cannulation, a larger vein diameter increases the cannulation success rate, and lessens complications. But such changes in the subclavian vein have received little focus [1]. The present study examined changes in the diameter of the subclavian vein at various degrees of Trendelenburg tilt at two sites.

Ten healthy volunteers participated in the study, they were all men, aged  $34.9 \pm 14.6$  years (mean  $\pm$  SD),  $166.4 \pm 5.5$  cm tall, and weighing  $64.7 \pm 6.9$  kg. An ultrasonic longitudinal view of the subclavian vein was obtained using a 5- to 10-MHz linear transducer, and the diameter of the vein was measured at a point below the midpoint of the clavicle and at the most medial site that could be observed with the head, the shoulder, and the arms in the neutral position. Measurements were taken from the healthy volunteers on a table positioned horizontally, and at a Trendelenburg tilt of  $5^\circ$  and  $10^\circ$ . The significance of differences was determined using a paired Student's *t*-test.  $P < 0.05$  was considered statistically significant.

Table 1 shows the results of the measurements. The venous diameter in this volunteer group did not change significantly from neutral ( $0^\circ$ ) when the head was tilted down at  $5^\circ$ , but the diameter was significantly larger at  $10^\circ$  at both sites.

**Table 1.** Measurements of subclavian venous diameter (mm) with the head tilted downwards at  $5^\circ$  and  $10^\circ$

	$0^\circ$	$5^\circ$	$10^\circ$
Medial	$12.1 \pm 1.9$ (1)	$12.6 \pm 1.8$ (2)	$13.3 \pm 1.8$ (3)
Midpoint	$8.8 \pm 1.5$ (4)	$9.1 \pm 1.4$ (5)	$9.6 \pm 2.1$ (6)

(1) vs (3), (4) vs (6),  $P < 0.05$ ; (1) vs (2), (4) vs (5), NS

A larger venous diameter makes the vein easier to hit. Maneuvers that increase central venous return enlarge the venous cross-sectional area. The subclavian vein is not as compliant as the internal jugular vein, but the present study found that the Trendelenburg tilt increased the subclavian venous diameter. A previous study examined the effects of Trendelenburg tilts ranging from  $10^\circ$  to  $30^\circ$  [2]. At an excessive tilt, the subject could slide off the table, which could be detrimental to a patient with increased intracranial pressure. Each participant in the present study noted that he felt as though his head was full of blood when the head was tilted at  $10^\circ$ . The present study found that a Trendelenburg tilt of  $10^\circ$  significantly increased the venous diameter. The maximally optimal clinical degree of tilt could be  $15^\circ$ . This study was performed in healthy normal subjects, but maneuvers to increase the venous diameter could be very important for patients with serious dehydration or malnutrition.

Three insertion points have been described for an infraclavicular approach to the subclavian vein [3]; these are the midpoint and the medial and lateral approaches, of which the midpoint is the most popular. The medial approach is based on the anatomical fact that the vein follows a constant course in this region. The present study revealed that the Trendelenburg tilt is useful for both the midpoint and the medial approaches.

## References

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*Address correspondence to:* M. Kawano  
Kagoshima Prefectural Oshima Hospital, 18-1 Naze-manazu-cho, Amami, Kagoshima 894-0015, Japan

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