CORRESPONDENCE

Novel maneuvers to increase the internal jugular vein diameter during ultrasound-guided cannulation

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To the Editor,

Central venous catheterization is routinely performed during the perioperative period. Ultrasound (US)-guided catheterization has been recommended to increase the success rate while decreasing the time to cannulation and the complication rate of internal jugular vein (IJV) cannulation.¹ Despite the potential benefits of using US to guide IJV cannulation, it is often reserved for difficult situations when the traditional anatomical landmark-based technique is unsuccessful. However, strongly worded recommendations have prompted the increased availability of US equipment for this purpose, and its utility as a first choice “go to” method is gaining popularity.²

Even with US, however, cannulation of the IJV can be challenging in patients with hypovolemia, an unstable cervical spine, a short thick neck, increased intracranial pressure, end-stage renal disease, previous IJV cannulations, and/or intraluminal obstruction. Techniques previously suggested to increase the diameter of the IJV, improve the cannulation success rate, and minimize complications include passive leg elevation, application of positive end-expiratory pressure, the Valsalva maneuver, and Trendelenburg positioning.³ We suggest two novel occlusive techniques to increase the IJV diameter that may be helpful when conventional methods have failed.

The spontaneously breathing patient is placed in the supine position with head turned away from the side of the cannulation. A pre-procedural US examination of the neck

is then performed to locate the optimal site for IJV cannulation. Considerations include the location of the carotid artery and its distance from the IJV, IJV size, and luminal occlusion or obstruction. Additionally, the patency of the infraclavicular portion of the IJV and superior vena cava may be assessed by maneuvering the US probe toward the thoracic cavity at the superior end of the clavicle.⁴ Once the optimal cannulation site is located, the US probe is then placed in a perpendicular position over the IJV (Figure A) to obtain a short axis image (Figure B).

The first maneuver involves holding the US probe to obtain a short axis view of the IJV while an assistant applies gentle pressure to occlude the IJV at the superior end of the clavicle and inferior to the scanning plane (Figure C). Pressure should be applied with just enough force to occlude the IJV lumen, which can be confirmed by sliding the US probe inferiorly. The increased IJV diameter—due to obstruction of the outflow of the IJV, leading to increased back pressure and subsequent IJV enlargement—is typically observed within a few seconds (Figure D). A similar technique of distal obstruction to increase the radial artery size has been described.⁵ The second maneuver involves occlusion of the contralateral IJV by an assistant applying gentle pressure (Figure E). We hypothesize that the increase in diameter of the ipsilateral IJV (Figure F) is due to obstruction of the outflow of the contralateral IJV, leading to back pressure and increased flow through the unobstructed IJV. This effect may occur less often in patients with extensive collateral circulation or obstruction within the cerebral venous outflow tract.

The increased size of the IJV, when utilizing these maneuvers, may improve the cannulation success rate. It could also reduce the time to cannulation and avoid the complications associated with multiple attempts at IJV cannulation. These maneuvers may also be combined with

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Figure An ultrasound probe is placed over the internal jugular vein (IJV) in a perpendicular position at the level of the cricoid cartilage (Figure A) producing a short axis image of IJV (Figure B). An assistant applies digital pressure to occlude the ipsilateral IJV at the superior end of clavicle (Figure C). This increases the diameter of the IJV (Figure D). Alternatively, digital pressure is applied to occlude the lumen of contralateral IJV (Figure E) with the corresponding short

axis US image (Figure F) demonstrating the increased size of the IJV. Note: All images were obtained at the same level, immediately following exhalation (prior to inspiration) during spontaneous breathing in the supine, horizontal position. These images only demonstrate the novel maneuvers without regard to the strict sterile technique required during actual ultrasound-guided internal jugular vein cannulation

previously described techniques, such as imaging the IJV in long axis, to improve the success rate of IJV cannulation even further.⁶

Potential drawbacks to these maneuvers include the need for an assistant and the additional challenge to maintain strict sterile technique during the procedure. We acknowledge that compression of the IJV may inadvertently cause compression of the carotid artery. Hence, particular care should be taken in patients with previous carotid artery surgery, cerebral ischemia, increased intracranial pressure,

intraluminal obstruction or thrombus, and/or an unstable cervical spine. Future studies are needed to determine whether these techniques do indeed improve the IJV cannulation success rate and reduce complications. The potential benefits of these maneuvers in mechanically ventilated patients and the effect of the Trendelenburg position also require further assessment.

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