Point-of-care ultrasound (POCUS): Determination of fluid responsiveness by measuring left brachiocephalic vein diameter

Dear Editor,

Point-of-care ultrasonography (POCUS) is a non-invasive bedside diagnostic tool used by clinicians for the assessment of patient fluid status, tolerance, and responsiveness to fluid therapy.[1] Calculation of the collapsibility or distensibility index of major vessels, like inferior vena cava (IVC) and internal jugular vein (IJV), has been used as an indirect measure of the patient fluid status.[2-4] Here, we used left brachiocephalic vein (BCV) as a novel site for POCUS measurement. A 40-year-old female patient having locally advanced carcinoma gallbladder with gastric outlet obstruction underwent gastrojejunostomy. Following surgery, the patient was shifted to intensive care unit on noradrenaline infusion. During the intensive care unit (ICU) stay, the patient developed several episodes of hypotension. POCUS measurements of IVC parameters could not be assessed in this case because of the proximity to the operating site. The presence of right central venous catheter precluded proper placement of ultrasound (US) probe to measure IJV

parameters. Hence, we went ahead with the measurement of left BCV for the assessment of fluid status and responsiveness to fluid therapy. A linear probe was placed in the left supraclavicular fossa parallel to the medial end of clavicle, with the patient in supine position. The probe was tilted caudally to identify the venous confluence of "Pirogoff" (Subclavian vein (SCV), Internal jugular vein (IJV), and BCV) [Figure 1]. Doppler power was used to differentiate arteries from the vein. The BCV collapsibility index was calculated by the formula: collapsibility (%) = (maximum diameter − minimum diameter)/maximum diameter. The measured baseline left BCV collapsibility index in our case was 18.2% (maximum and minimum diameters of BCV were 1.32 and 1.08, respectively). This was followed by bolus fluid administration of 20 ml/kg within 30 min, and we detected decrease in BCV collapsibility index to 12.8%. Figure 1 shows the BCV minimum (1.22 cm) and maximum (1.40 cm) diameters after bolus fluid administration. We detected improvement in hypotension following bolus fluid administration. M-mode of ultrasound could not detect any movement of the superior wall of left BCV because of tethering of its superior wall to the adjoining soft tissue.

In our case, we have chosen left BCV over right because of its horizontal course. POCUS measurement of IVC is not possible in 10%–15% of patients due to obesity, abdominal surgical dressings, excessive intra-abdominal gas, large amounts of intrathoracic air, extrinsic structures compressing IVC, increased intraabdominal pressure, increased pulmonary artery pressure, and tricuspid or pulmonary valve disease.[2] In addition, POCUS measurement of IJV has a decreased sensitivity of 80% and specificity of 85% for predicting a fluid response.[3] Patients were termed fluid responders when they had >15% increase in the cardiac index, which is well correlated with the cut-off value of 18% for IJV or IVC distensibility.[3,4] Further studies are required to validate our observations and to find out the correlation between left BCV collapsibility with cardiac index. Left BCV provides a novel site for POCUS measurement of major vessels in patients in whom IVC or IJV measurement is difficult and not practical.

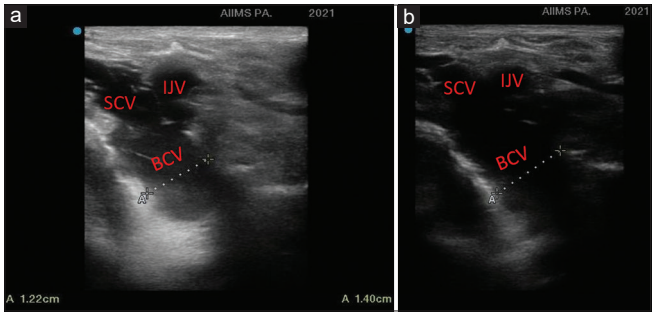

Figure 1: (a and b) Minimum and maximum diameters of left BCV after bolus fluid administration, respectively

Consent

Consent was taken from the patient.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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