

Arterialization of central venous pressure waveform

The Editor,

A 60-year-old female known diabetic and hypertensive presented with fever since 5 days. She was diagnosed to have urinary tract infection with left ventricular systolic dysfunction. Noradrenaline infusion was started to maintain hemodynamics. Right subclavian vein was punctured, and triple lumen central venous catheter (CVC) was inserted for infusion of vasopressor drugs. Central venous pressure (CVP) monitoring was attached to CVC. Monitor showed unusual CVP waveform - resembling arterial upstroke and downstroke [Figure 1]. However, waveform tracing was not showing peak pressure more than 20 mmHg. Noninvasive blood pressure in the right arm was 104/66 mmHg. Blood gas analysis of blood sample derived from CVC confirmed venous origin of blood. Why was there arterial waveform in venous catheter? Chest X-ray of the same patient revealed course of the right subclavian venous catheter into right internal jugular vein (IJV) [Figure 2]. Ultrasound of right side of the neck showed pulsating internal carotid artery (confirmed by ultrasound Doppler) just beside IJV with CVC [Figure 3]. Arterial pulsation of carotid artery might be transmitting to IJV, which was reflected in waveform [Video 1].

CVP waveform normally consists of three positive waves (a, c, and v waves) and two negative waves (x and y descents). Abnormalities in these waves can be produced by varieties of clinical cardiac conditions.^[1,2] Venous catheter can give arterial waveform as it travels through right ventricle to pulmonary artery, for example, Swan-Ganz catheter. However, in the present case, venous catheter gave arterial waveform even in the absence of its entry into cardiac structures or artery. CVC showing airway pressure waveform



Figure 1: Monitor display showing central venous pressure waveform resembling arterial waveform

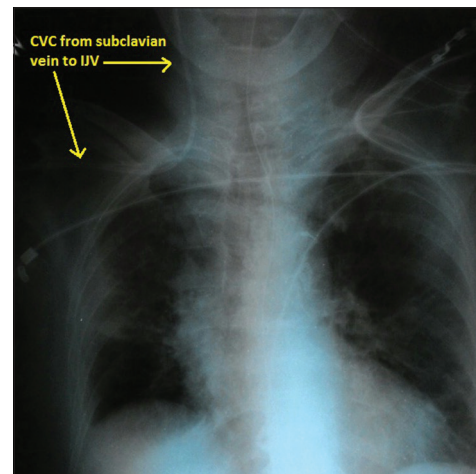


Figure 2: Chest X-ray showing the course of central venous catheter from subclavian to internal jugular vein

due to catheter migration has been reported.^[3] Arterial waveform showed by a CVC generally indicates inadvertent arterial insertion.^[4] Accidental position of CVC in the left internal thoracic vein or the pericardiophrenic vein mimicking as arterial waveform has also been reported.^[5] The author concluded the “arterial” waveform by CVC was due to transmission of pulse waves of adjacent cardiac contraction and filling.^[5]

Waveform analysis, chest X-ray, and blood gas interpretation can diagnose misplacement of CVC. Pulsatile vascular structure such as artery in the immediate vicinity of vein with catheter can give arterial waveform due to

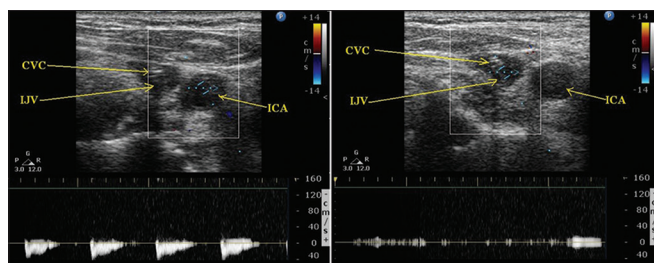


Figure 3: Ultrasound image showing internal jugular vein with central venous catheter adjacent to internal carotid artery. Left panel - internal carotid artery with Doppler waveform. Right panel - internal jugular vein with Doppler waveform

transmissible pulsation. The present case demonstrated arterial waveform in CVC does not always imply arterial placement of catheter.

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Conflicts of interest

There are no conflicts of interest.

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