

Artifact in Central Venous Pressure Waveform Due to Central Venous Catheter Tip Abutting the Wall of Superior Vena Cava

To the Editor,

Malposition of central venous catheter (CVC) tip leads to an inconsistent waveform with erroneous central venous pressure (CVP) readings. We describe a case where the transduction of a malpositioned CVC tip displayed a waveform simulating an electrocardiographic rhythm.

A 60-year-old male with coronary artery disease was posted for minimally invasive direct coronary artery bypass grafting through left thoracotomy. After induction of anesthesia, trachea was intubated with a 37 Fr left-sided double lumen tube for lung isolation. Under ultrasound guidance, a triple-lumen CVC (7 Fr, 16 cm, Vygon, Germany) was placed in the left internal jugular vein (IJV) and fixed at 14 cm at skin level. On transducing the distal port, a waveform resembling electrocardiographic signal with pressure of 7 mm Hg was displayed [Figure 1a]. The correct position of CVC was confirmed with free aspiration of dark blood from all the three ports. Transesophageal echocardiography examination also revealed the presence of CVC in superior vena cava (SVC) [Figure 1b]. After completion of surgical procedure, patient was shifted to intensive care unit for postoperative management. The postoperative chest radiograph showed the tip of CVC abutting the lateral wall of SVC [Figure 1c]. On withdrawing the CVC by 1 cm, a normal CVP waveform was obtained [Figure 1d]. The postoperative course of the patient was uneventful.

Malposition of CVC tip is a relatively common complication.^[1] Malposition is defined as placement of CVC in a vein other than the SVC, or impingement of CVC with the lateral wall of the SVC.^[2] Placement of CVC under ultrasound guidance can even result in malposition of the CVC tip. Aspiration of venous blood and a good waveform with respiratory variations confirms the correct placement of CVC. The placement of CVC in left IJV has an increased chance of the catheter tip abutting the SVC wall as the brachiocephalic vein inserts at an angle into the SVC.^[3] In our patient, the CVP waveform had a resemblance of electrocardiographic rhythm [Figure 1a]. The p wave (corresponding to actual “a” wave) in CVP waveform is because of increased transmural pressure in SVC during atrial contraction which led to CVC tip yielding away from the vessel wall. The artifactual QRS complex is because of fall in transmural pressure in SVC during atrial relaxation causing the CVC tip to abutt the vessel wall producing sharp spike in CVP waveform. Late perforation of the SVC after insertion of CVC through the left IJV has been reported.^[4] Identification of the CVC tip grazing the wall of SVC is necessary to prevent SVC perforation. Analysis of artifactual CVP waveform and careful interpretation of chest radiograph may serve to identify the catheter tip abutting the wall of SVC, thereby avoiding untoward complications resulting from SVC perforation in the postoperative period.

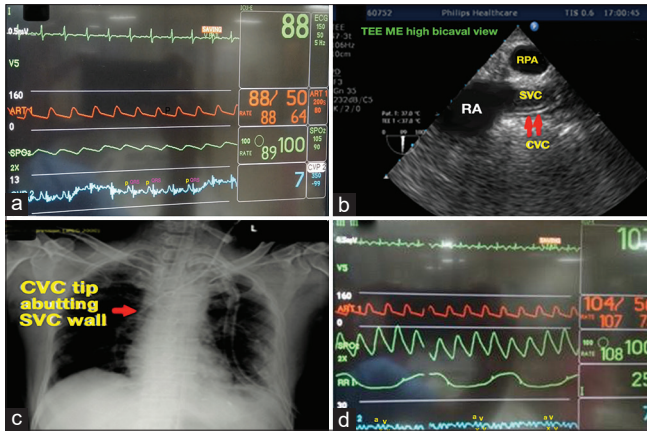


Figure 1: (a) Multipara monitor showing central venous pressure waveform mimicking as electrocardiographic rhythm with p and QRS waves. (b) Transesophageal echocardiography imaging in midesophageal high bicaval view shows the presence of the CVC in the SVC. (c) Post-operative chest radiograph showing the CVC tip abutting against the lateral wall of SVC. (d) Multipara monitor showing return of normal central venous pressure waveform (a, v, x and y waves) after withdrawing the CVC by 1 cm. Abbreviations:- CVC- central venous catheter; ME, mid esophageal; RA, right atrium; RPA, right pulmonary artery; SVC – superior vena cava; TEE, transesophageal echocardiography

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Chennakeshavallu G. N, S. Sruthi, Saravana Babu¹

Division of Cardiothoracic and Vascular Anesthesia, Meenakshi

Multi Speciality Hospital, Tanjore, Tamil Nadu, ¹Division of Cardiothoracic and Vascular Anesthesia, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, Kerala, India

Address for correspondence: Dr. Saravana Babu, Division of Cardiothoracic and Vascular Anesthesia, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum - 695 011, Kerala, India.
E-mail: saravanababu4u@gmail.com

Submitted: 21-Sep-2020 **Revised:** 28-Apr-2021
Accepted: 16-May-2021 **Published:** 11-Apr-2022

REFERENCES

- Gibson F, Bodenham A. Misplaced central venous catheters, Applied anatomy and practical management. *Br J Anaesth* 2013;110(3):333-46.
- Roldan CJ, Paniagua L. Central venous catheter intravascular malpositioning: Causes, prevention, diagnosis, and correction. *West J Emerg Med* 2015;1:658-64.
- Mukau L, Talamini MA, Sitzmann JV. Risk factors for central venous catheter-related vascular erosions. *JPEN J Parenter Enteral Nutr* 1991;15(5):513-6.
- Kurabe M, Watanabe T, Kohno T. Perforation of the superior vena cava 5 days after insertion of a central venous catheter through the left internal jugular vein. *J Clin Anesth* 2016;31:193-6.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Access this article online	
Quick Response Code:	Website: www.annals.in
	DOI: 10.4103/aca.aca_241_20

How to cite this article: Chennakeshavallu GN, Sruthi S, Babu S. Artifact in central venous pressure waveform due to central venous catheter tip abutting the wall of superior vena cava. *Ann Card Anaesth* 2022;25:243-4.
© 2022 Annals of Cardiac Anaesthesia | Published by Wolters Kluwer - Medknow