Letter to the editor

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Arrhythmia during central catheter placement: Avoiding complications and increasing optimal tip placement

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Real time ultrasound as a guide during centrally inserted central catheter (CICC) puncture, introduction, and confirmation of normal placement, is widely used in different clinical and surgical scenarios.[1,2] The multiple advantages are clearly recognized, which include the possibility of wire visualization during its advancement and the use of the saline flush test to confirm the correct positioning.[2] Based on its benefits, transthoracic echocardiography (TTE) analyzed in real time is a good bedside alternative when other techniques such a transesophageal echocardiography (TEE), fluoroscopy and intracavitary ECG (IC-ECG) are not available. Although the previously mentioned techniques represent safe and accurate methods for catheter placement, the cost and availability in common settings may limit their use.[3] TTE enables advancement and tip location of the wire and catheter; this maneuver can be used as an indirect measure of wire and tip catheter depth to avoid excessive insertion (Figure 1(a)), since it depends on additional variables such as the type of the catheter, zone of the puncture, patient height, or female gender.

During wire advancement, any type of arrhythmic waveforms should caution against incidental wire contact with endocardium. Stimulation of different regions of the endocardium might trigger multiple arrhythmias. Although early or late severe complications are very rare, they may cause hemodynamic disturbances, life-threatening events (myocardial perforation), and fatal outcomes.[4,5]

IC-ECG reduces the risk of arrhythmias during the procedure and ensures a correct tip position.[1,6] Traditional CICC placement techniques instruct the operator to limit wire advancement to 15 cm, however TTE view should be strongly considered to support length of insertion along with direct visualization of wire advancement from the superior vena cava (SVC) to the right atrium (RA) (Figure 1(b)). The previously, may mitigate tip malpositioning related to individual anthropometric characteristics and anatomical variants.

Real-time TEE allows for safe wire advancement near the RA, and a saline flush test may also be performed as a complimentary method to confirm adequate tip placement.[2] The intravascular contrast should be identified immediately or in less than 1 s, emerging from the SVC and not directly from the RA (Figure 1(c) and (d)). These findings reassure tip catheter placement in the cavoatrial junction or SVC.

This technique is not free of limitations; the adequate equipment is needed in order to achieve an optimal view so it can evaluate cardiac structures and wire detection. Real-time assessment to confirm catheter placement with the saline flush test requires a second operator with TTE training and appropriate probes, in order to avoid sterile field contamination and enhance the precision of the assessment. Additionally, factors such as subcutaneous emphysema or thoracic anatomy secondary to chronic obstructive pulmonary disease (COPD) can reduce the quality of the images. Despite the above, TTE and saline test flush, when practiced appropriately may reduce catheter malposition, and therefore reduce costs (X-ray control) and lower operator induced cardiac events. In conclusion, both IC-ECG and TTE with saline flush are both feasible and safe bedside alternatives for wire advancement and tip position confirmation.

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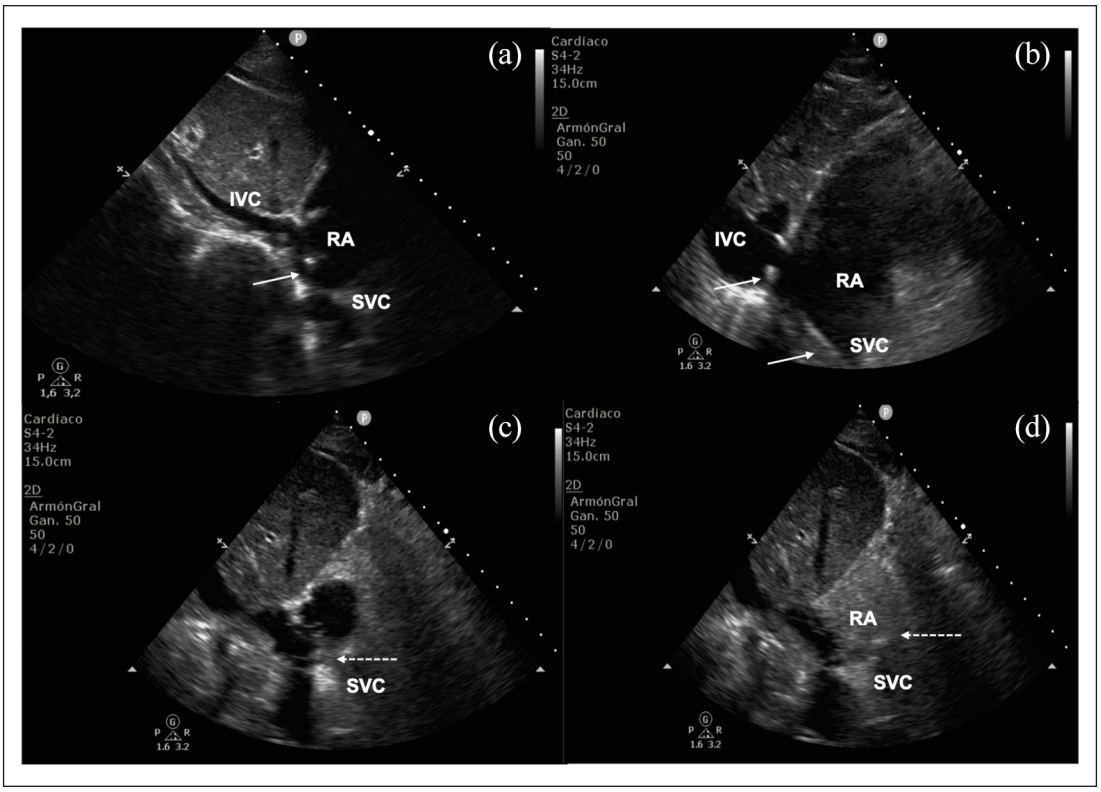

Figure 1. Subcostal view of wire advanced and saline flush test: (a) visualization of wire tip advanced from superior vena cava (SVC), close to the right atrium (RA), (b) visualization of wire into the inferior vena cava (IVC), (c) saline flush test entering from superior vena cava, and (d) saline flush test positive.

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