

# Comparison Between Novel Tip Positioning Technology using ECG and Doppler and 2-D Echocardiography for the Placement of Central Catheters

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## Abstract

**Purpose/Design:** To compare the effectiveness of this new technology to position the catheter compared to the gold standard (2-D Echo). **Methods:** Study was conducted for 15 days, between 11 and 26 February 2013, CVC placed through the right jugular vein until the tip positioning machine provided a blue bulls' eye indicating right placement, in patients undergoing cardiac surgery. The distance of the tip of the catheter from the CAJ was measured with 2-D Echo, to measure distance of the tip from the cavo-atrial junction (CAJ). **Results:** Tip positioning was successful, and Blue Bulls Eye was achieved in 12/16 cases, with Distance from the CAJ of 1.16 cm ( $\pm 2.8$  cm), always on the lower 1/3 of the superior vena cava. In 1 case, an orange triangle appeared and was confirmed to be due to tricuspid regurgitation, at 0,27cm from the CAJ. In 2 cases, the catheter selected was too short (16 cm) to get a correct placement. In 1 case, the catheter went looping into the subclavian vein, identified by a red sign on the machine, and a CVC had to be reinserted. **Limitations:** The sensor used was initially designed for PICC but it could be used successfully with CVC, with longer external section, hanging out of the body, on the sterile field. **Conclusion:** The tip positioning technique was very accurate, with a minimum distance from the CAJ and comparable to the gold standard (2-D Echo), and additionally, it could identify 1 CVC going against the flow, retrograde inside the subclavian vein.

### Conflicts of Interest

Dimitris Karampinis works for Teleflex Medical, manufacturer of the novel technology tested, who has participated on the study for providing the training and technology guidance on the equipment. Samples of the new technology were provided free-of-charge from Teleflex Inc. No other conflict of Interest.

## Background

A novel technology equipment for navigation and tip positioning was launched and tests were available to compare it with x-ray diagnostics. There were no studies comparing the positioning of the tip with 2-D echocardiography, which is considered to be the gold standard, although it is not commonly used. This study was initiated in order to measure the distance of the tip of the catheter from the cavo-atrial junction after it was placed through this novel technology.

## Methods

The sensor was placed inside the catheter and the machine calibrated accordingly, and the sensor marked accordingly according to the catheter tip. A central venous catheter was placed in the patient through the internal jugular vein, without the use of ultrasound, and when the catheter was in the vein, the sensor was placed and the catheter was guided through according to the symbols until a steady Blue Bulls Eye, indicating correct placement, was achieved. Then trans-esophageal 2-D Echo was used in order to confirm correct placement and to measure the distance from the Cavo-Atrial Junction.

## Results

Tip positioning was very accurate and Navigation was very easy through out the whole procedure

Case No	Blue Bulls Eye	Green Arrow	Yellow Triangle	Red Wrong Way Sign	Distance to CAJ	Notes
1	YES	NO	NO	NO	2,370 cm	
2	YES	NO	NO	NO	0,292 cm	
3	YES	NO	NO	NO	3,930 cm	
4	YES	NO	NO	NO	1,090 cm	
5	NO	NO	NO	YES	N/A	Catheter retrograde in subclavian vein
6	YES	NO	NO	NO	0,127 cm	
7	NO	YES	NO	NO	2,410 cm	CVC too short
8	YES	NO	NO	NO	0,431 cm	
9	YES	NO	NO	NO	0,358 cm	
10	NO	YES	NO	NO	4,120 cm	CVC too short
11	YES	NO	NO	NO	0,898 cm	
12	YES	NO	NO	NO	1,240 cm	
13	YES	NO	NO	NO	1,300 cm	
14	NO	NO	YES	NO	0,272 cm	Tricuspid Regurgitation
15	YES	NO	NO	NO	0,148 cm	
16	YES	NO	NO	NO	0,672 cm	



## Conclusion

The novel tip positioning technology showed repeatedly accurate performance, distance from the CAJ was minimum, and was also able to provide guidance throughout the whole procedure. Concern should be raised when the catheter is placed correctly but no Blue Bulls Eye is apparent, since it could be an indicator of tricuspid regurgitation

# Comparison between novel tip positioning technology and 2-D Echocardiography for the placement of central catheters

*Performed at Brno Cardiac and Transplant Center,  
Brno, Czech Republic*



To compare the effectiveness of the VPS® Technology to the gold standard (2-D Echocardiography)



16 CVC's placed in IJ with VPS® Technology until a Blue Bullseye was achieved

- Cardiac patients undergoing surgery



To confirm if the ARROW® VPS® G4™ Device accurately placed the catheter tip, 2-D Echo measured the distance of the catheter tip from the CAJ

## Comparison between novel tip positioning technology and 2-D Echocardiography for the placement of central catheters

Tip positioning  
successful, BBE 12/16

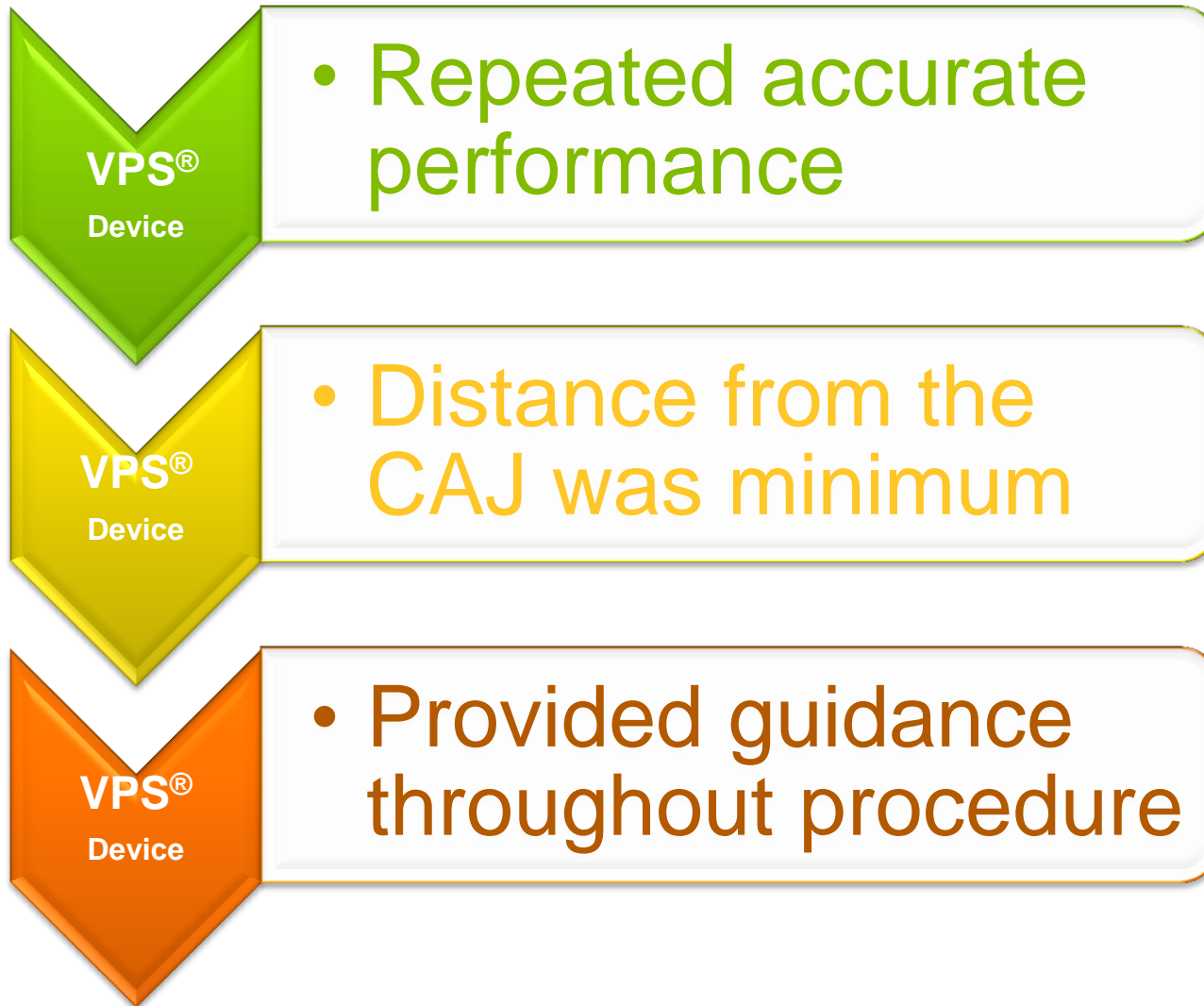
In 1 case, an orange  
symbol appeared and  
was due to tricuspid  
regurgitation, at 0.27cm  
from the CAJ

Distance from the CAJ of  
1.16 cm ( $\pm 2.8$  cm),  
always on the lower 1/3  
of the SVC

In 1 case, the catheter  
looped in the subclavian  
vein, identified by the  
orange symbol on the  
machine, and the CVC  
was reinserted.

In 2 cases, the catheter  
selected was too short  
(16 cm) to get a correct  
placement

## Comparison between novel tip positioning technology and 2-D Echocardiography for the placement of central catheters



# Comparison between novel tip positioning technology and 2-D Echocardiography for the placement of central catheters



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NEVER SETTLE™

Thank You

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