Factors Affecting Tip Placement

ARROW® VPS G4™ Device

Objectives

The clinician will be able to:

- Verbalize factors that affect catheter tip placement
- State the optimal catheter tip placement in accordance with standards
- Specify conditions that affect catheter tip movement

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Guidelines – Catheter Tip Placement

Group	Guideline
AVA (1998) Association of Vascular Access	Lower 1/3 SVC-CAJ – RA Junction
ONS (2004) Oncology Nursing Society	Lower 1/3 SVC-CAJ
INS (206) Infusion Nursing Society	Lower 1/3 SVC-CAJ
FDA, CVC Working Group (1994) Food and Drug Administration	Lower 1/3 SVC Catheter should not be placed in, or allowed to migrate into RA
SIR (2000) Society of Interventional Radiology	SVC/RA Junction
NKF/KDOQI™ (2001) National Kidney Foundation, Inc.	SVC/RA Junction or RA

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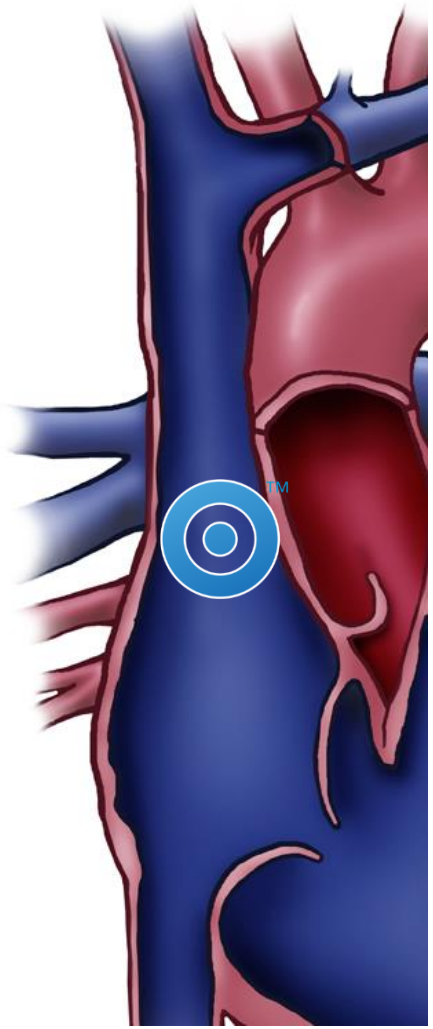
Catheter Tip Placement

Lower 1/3 of the Superior Vena Cava – Cavo-Atrial Junction

- The ideal position for tip placement



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Tip Positioning and Flow

Ideal Tip Positioning Characteristics

- Best drug distribution and dilution
- Lowest occlusion rates
- Lowest tip related DVT
- Least catheter tip interference with venous and RA walls
- Lowest migration

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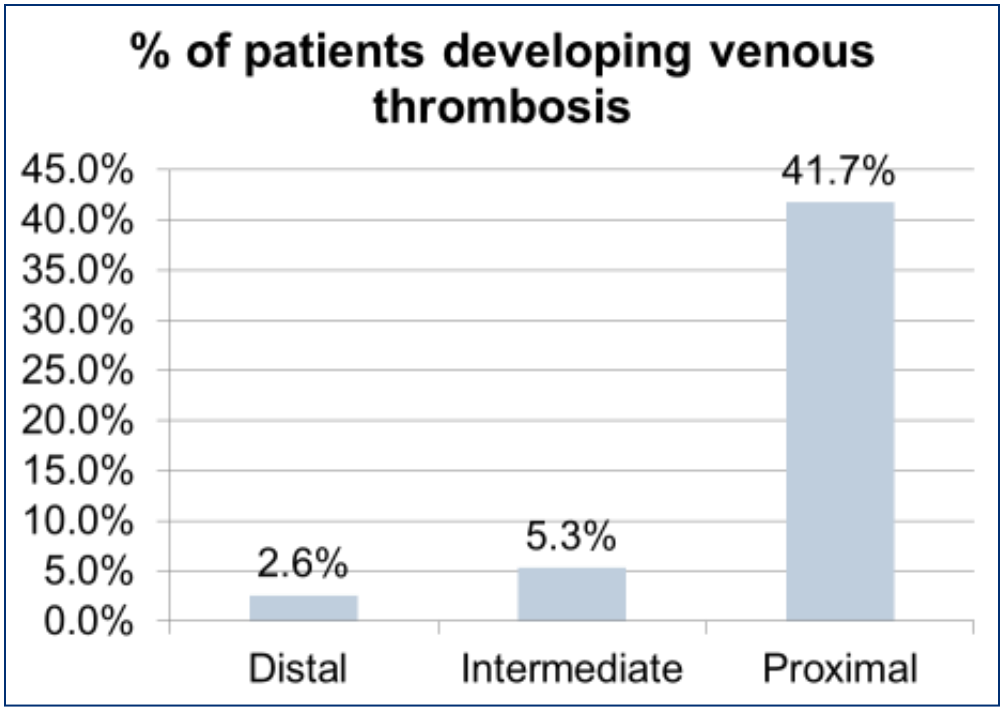
Cadman: Tips and Venous Thrombosis



Catheter Tip Position in the SVC

Catheter tips in proximal third of SVC were 16 times more likely to develop thrombosis than those with tips in the distal 1/3 and below[1]

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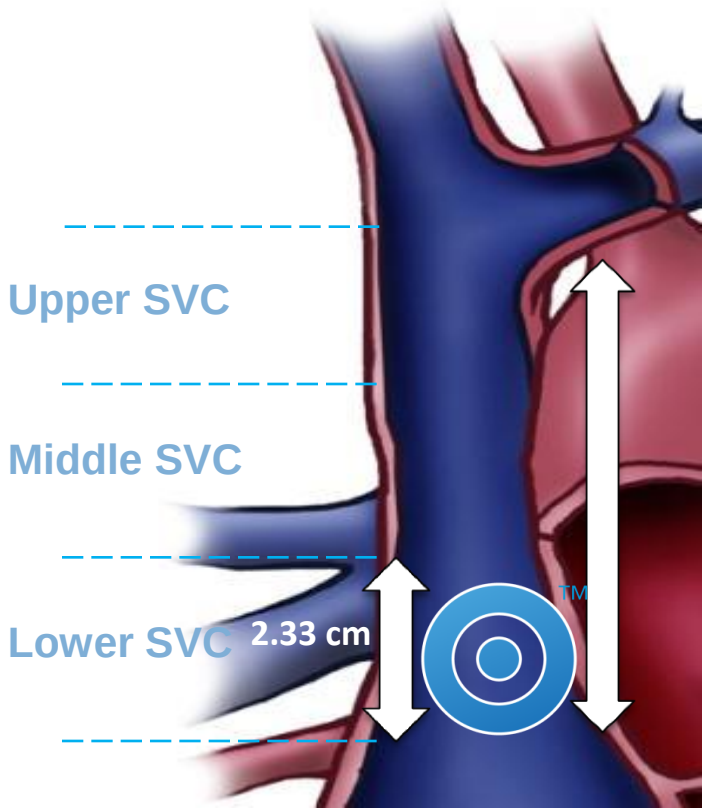
Catheter Tip and Venous Thrombosis

- Average SVC length is 7.0 cm[2]
- Lower 1/3 SVC-CAJ is 2.33 cm long[2]
- Precision of ± 1.1667 cm is needed[2]
- Needs to be reached 85% of the time[2]
- Rates of first time placement success per study ranged from 39% to 75%, with the majority (7/9) being single center studies[2]
- The combined overall proficiency of these studies was calculated using weighted averages and was determined to be 45.87%[2]



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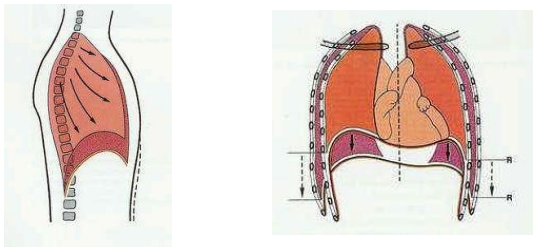
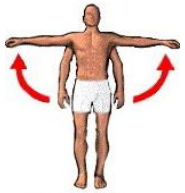
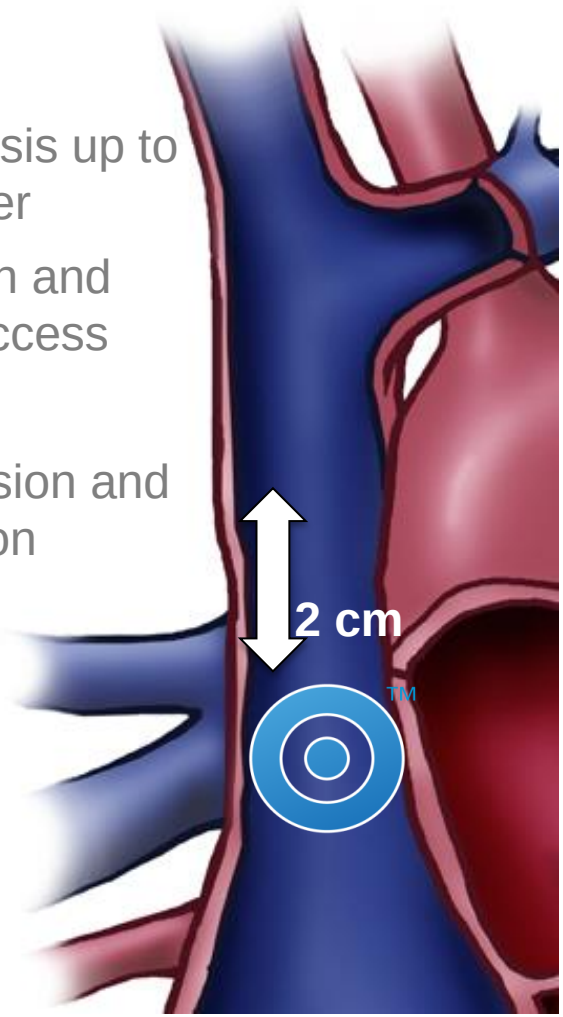
Mid-SVC Placement Increases Risk

Factors Moving Tip Upwards	
3-5 cm	
2 cm	
2-4 cm	 

- Thrombosis up to 16x higher
- Occlusion and loss of access
- CRBSI
- SVC erosion and perforation



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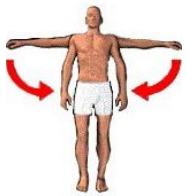
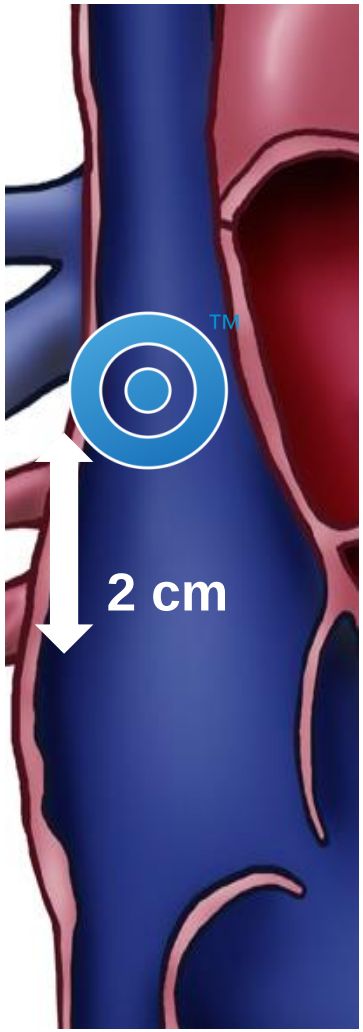
Upper RA Placement Increases Risk

Factors Moving Tip Downwards	
2 cm	 Adduction
2-4 cm	  Supine
1-2 cm	 Supine 

- Catheter-induced arrhythmia
- Tricuspid valve dysfunction
- Atrial thrombus formation / embolism
- RA wall erosion and perforation



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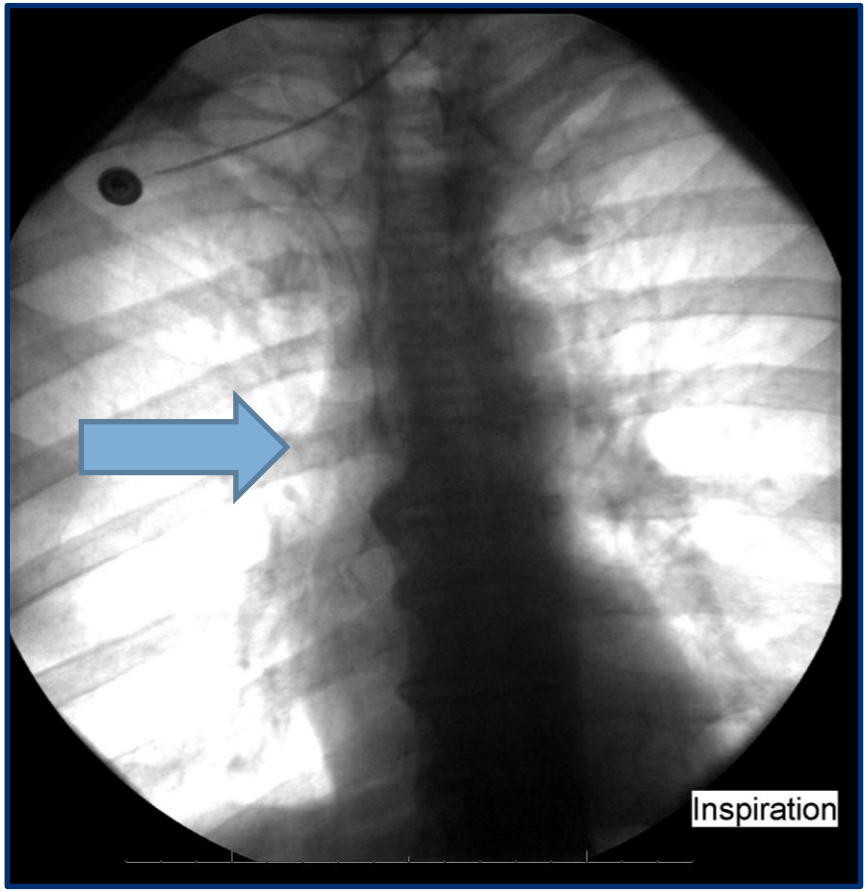
Effect of Respiration



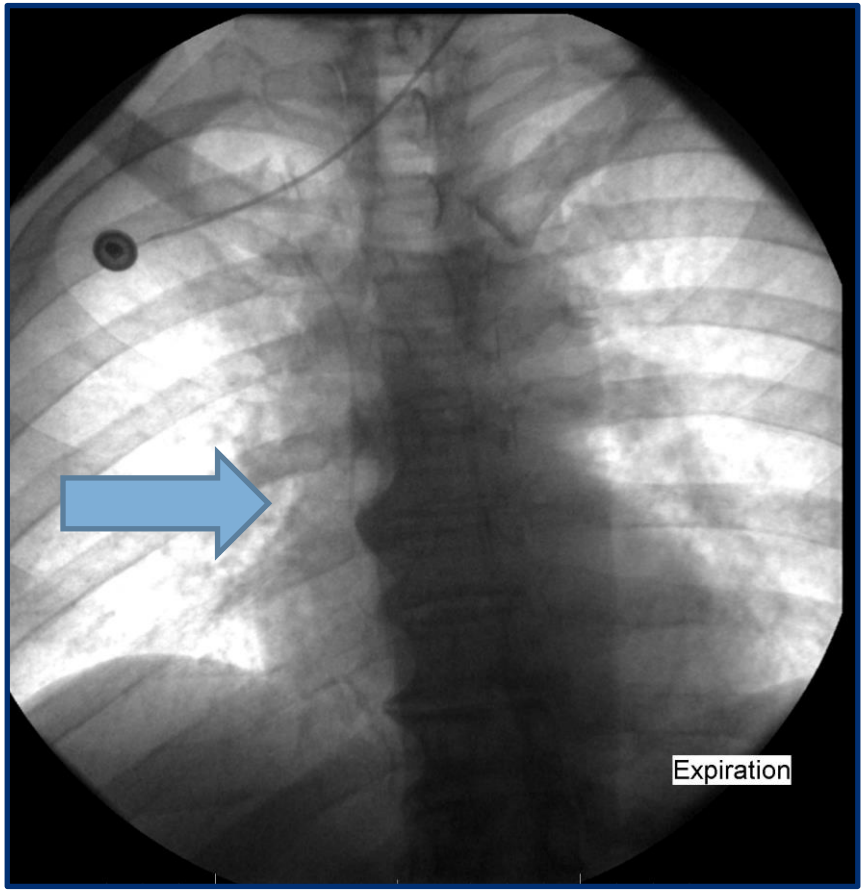


Photo courtesy of Nadine Nakazawa, BS, RN, OCN, CRNI, VA-BC

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Arm Position and Tip Movement

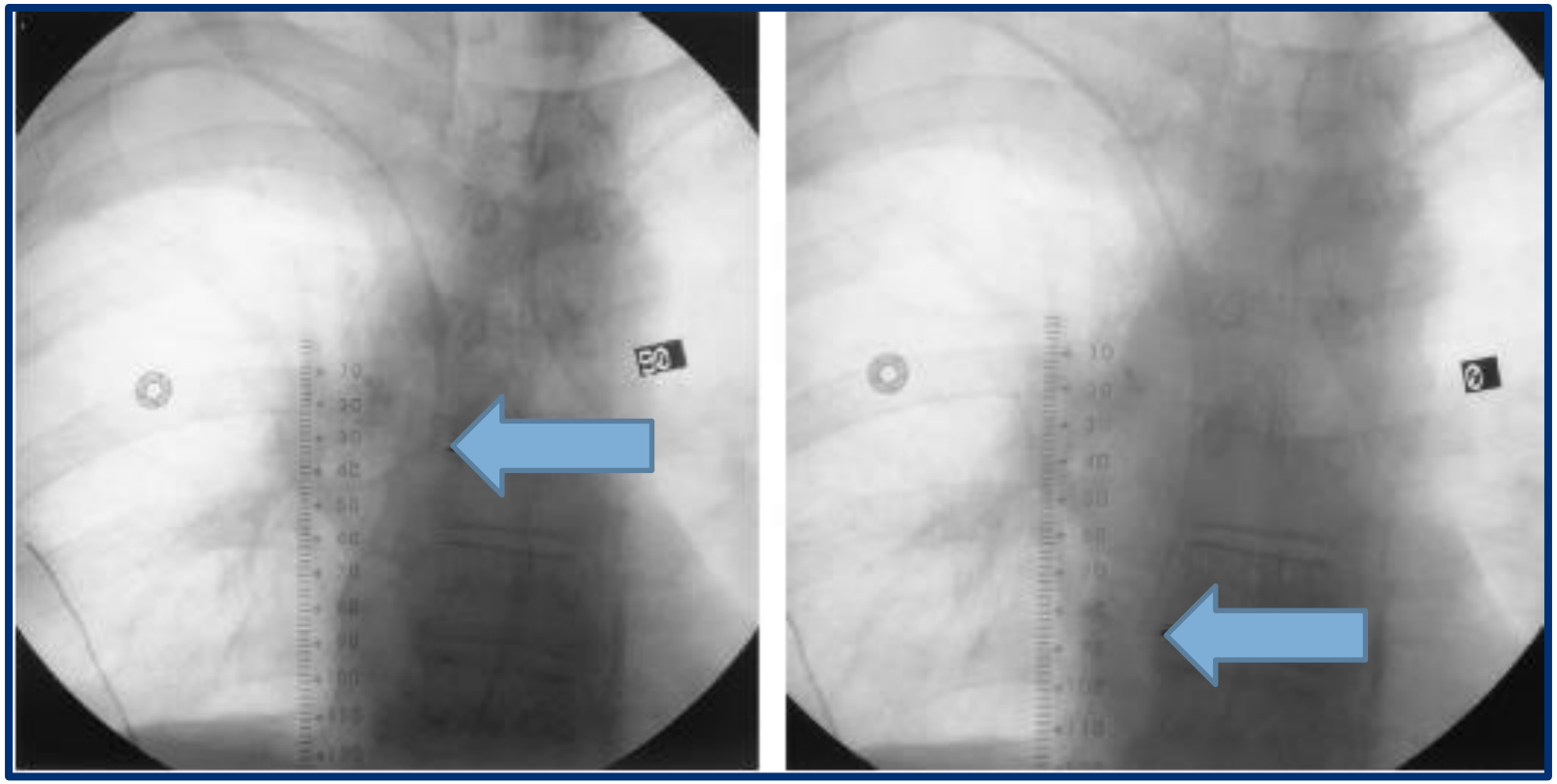

Photo courtesy of Nadine Nakazawa, BS, RN, OCN, CRNI, VA-BC

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Issues Well Documented

Precision in Central Venous Catheter Tip Placement: A Review of the Literature

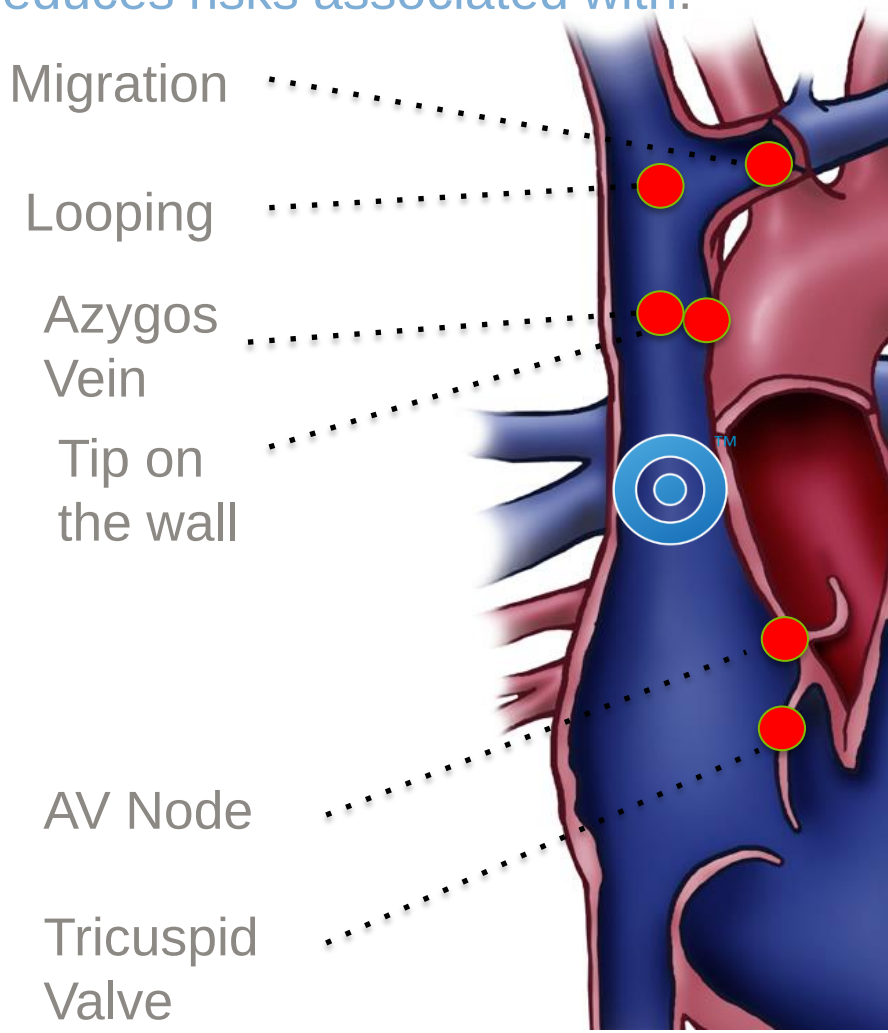
- 9 studies analyzed in a literature review
- Thrombotic complications may lead to deadly complications as:
  - Pulmonary embolism
  - Infection
  - Catheter malfunction
  - Loss off access
  - Delay in delivery of critical therapies

These adverse events associated with thrombosis can be directly linked to catheter tip location. Precise, accurate determination of tip location will achieve best patient outcomes[2].

Why the Lower 1/3 SVC-CAJ?

- Far enough from higher risk areas
- Large vein diameter
- High blood flow velocity
- Significant turbulent blood flow elements
- Catheter tip distant from the vessel wall

Reduces risks associated with:



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