

# Advances in neonatal vascular access

*Fiammetta Piersigilli*

# The venous central line

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**LIFE SAVING**

Allows:

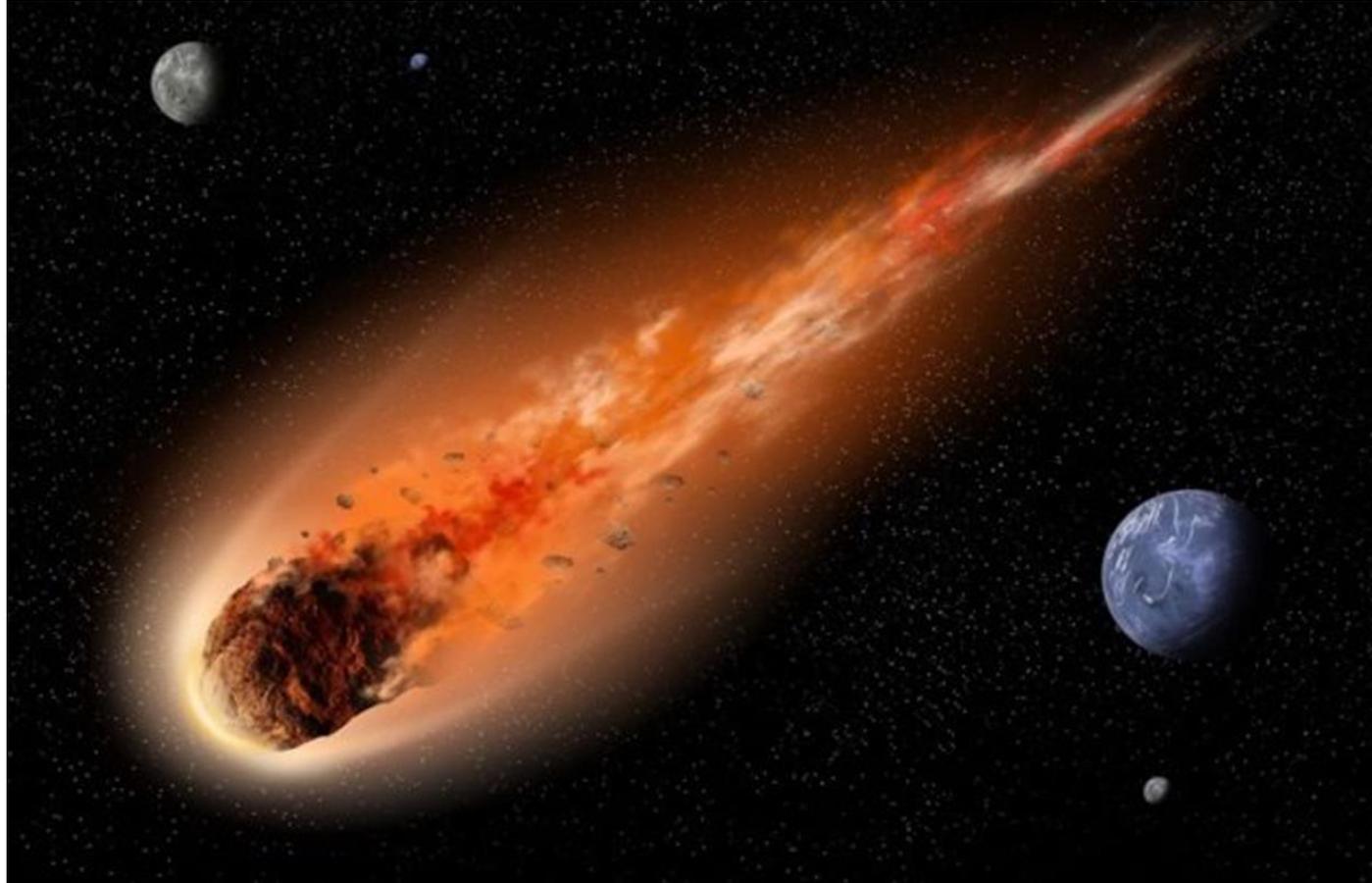
- Administration of drugs
- Parenteral nutrition

But its use can be associated with  
potential lifethreatening  
complications



# Complications

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When we talk about complications we have the perception that they unfortunately « happen »

# Complications

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Complications are not casual - they are mostly provoked and depend on

Materials

Insertion

Maintenance

# The venous central line

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## Neonatal PICC

*Shaw JCL (1973) Parenteral nutrition in the management of sick low birth weight infants. Pediatr Clin North Am 20:333–358*

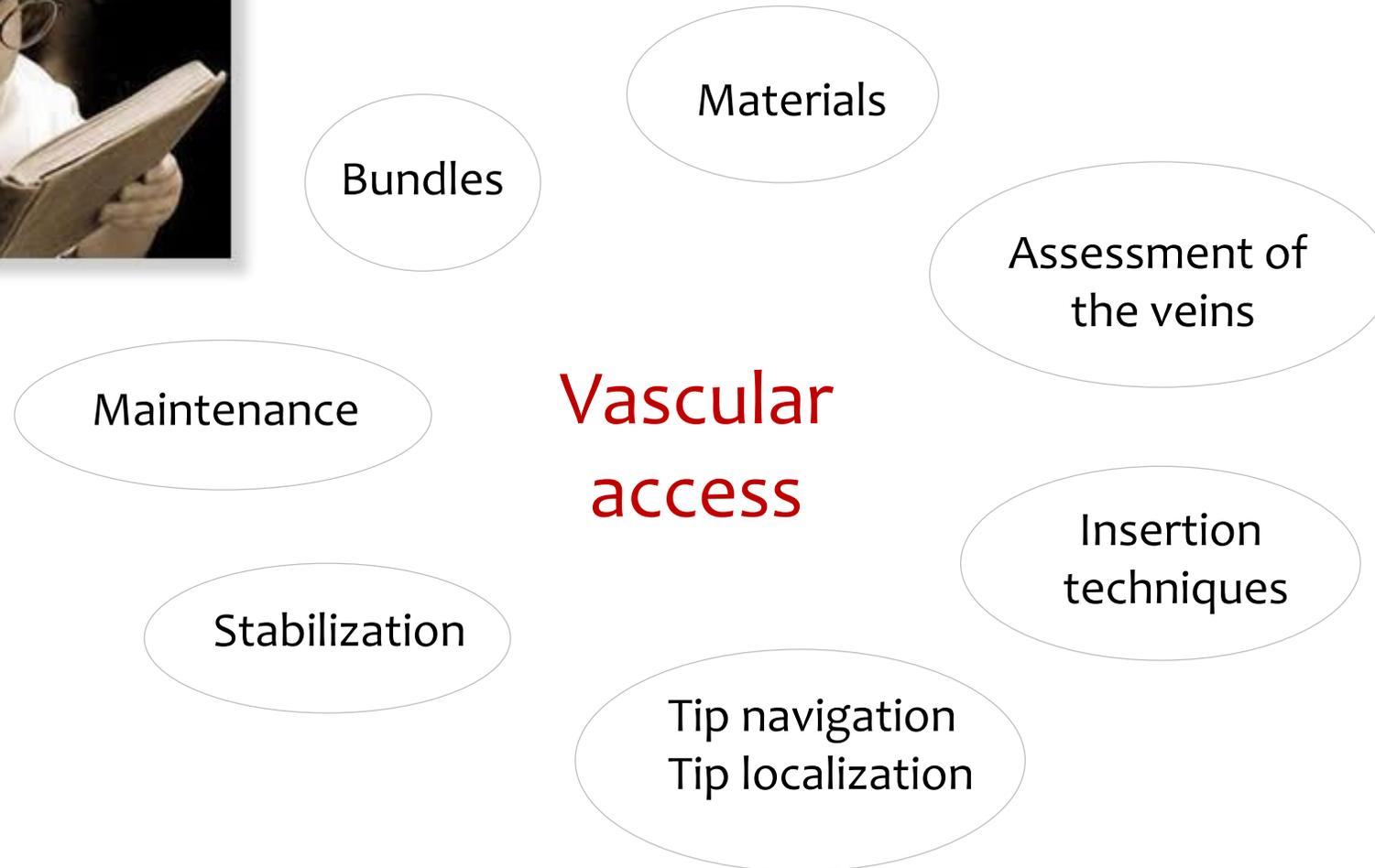


## Pediatric Vascular Access Practice: Time for Evolution or Revolution?

By Amanda J Ullman RN, MAppSci, PhD, Centaur Fellow, Director-at-Large;  
Association for Vascular Access Pediatric Special Interest Group, Senior Lecturer;  
Alliance for Vascular Access Teaching and Research (AVATAR) Group, Griffith University

# What's new???

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# What's new???

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Bundles

Materials

Assessment of  
the veins

Maintenance

**Vascular  
access**

Insertion  
techniques

Stabilization

Tip navigation  
Tip localization

# Insertion Bundles

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THE LANCET  
Infectious Diseases

Effectiveness of insertion and maintenance bundles to prevent central-line-associated bloodstream infections in critically ill patients of all ages: a systematic review and meta-analysis

Dr Erwin Ista, PhD   • Ben van der Hoven, MD • René F Kornelisse, PhD • Cynthia van der Starre, PhD •

The use of insertion bundles has **reduced** the rate of Central Line Associated Blood Stream Infections (CLABSI)

The bundles are a set of rules that have to be followed always and all together

# Hand washing



Always perform a surgical hand washing  
before wearing gloves and gown

After soap hand washing  
also wash with hydroalcoholic gel



# Maximal barrier precautions

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Always wear hat, mask, sterile gloves and gown

Do not cover only the limb,  
but cover the body completely

6 times higher incidence of CLABSI if the patient  
is not fully covered and if operator is not  
wearing a sterile gown

Raad et al. Prevention of central venous catheter related infections by using maximal sterile barrier precautions during insertion. *Infect Control Hosp Epidemiol* 1994; 15: 231



# Chlorhexidine

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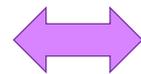
Chlorhexidine 2% in 70% alcohol solution

Meta analysis: the use of chlorhexidine reduces by 50%  
the risk of CLABSI compared to povidone iodine

Chaiyakunapruk N. et al. Chlorhexidine compared with povidone iodine solution for vascular catheter site care: a meta analysis. Ann Intern Med 2002

In neonates with GA < 26 weeks

Chlorhexidine in  
aqueous solution



Chlorhexidine alcohol solution  
Just at the point of insertion, dab  
and not rub, rinse with saline  
solution after disinfection



# Maintenance

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Standard-Aseptic Non Touch Technique when accessing the catheter



Wear masks and sterile gloves in case of:

- Change of infusion sets
- Multiple therapies

Remove the catheter as soon as it is not necessary anymore



Reduction of CLABSI when CVC is removed at

100ml/Kg enteral nutrition

# What's new???

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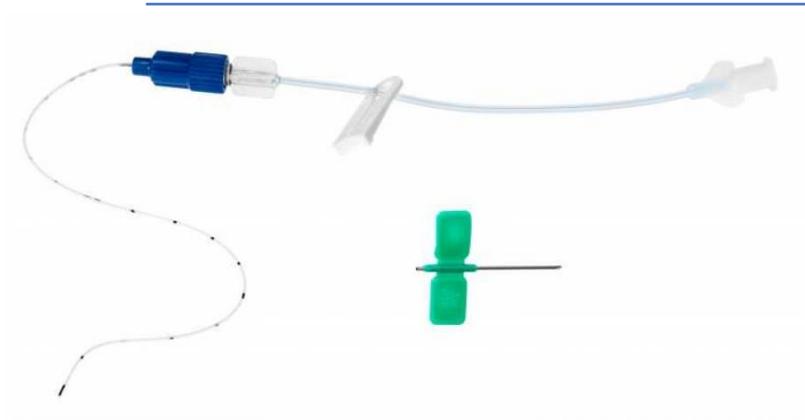
**Vascular  
access**

Insertion  
techniques

Stabilization

Tip navigation  
Tip localization

# Materials



**Silicone** - Epicutaneo cava - 2 Fr

Old catheter

Can break very easily when high pressure flow

2 pieces connected – increased risk of disconnection/ CLABSI



**Polyurethane** - Premicath – 1 Fr  
Nutraline – 2 Fr  
Twin flow – 2 Fr bilumen

Stiffer on insertion, thermosensitive (will soften once in the blood)

Thinner walled catheter, providing higher flow rates for the same external diameter

# Material

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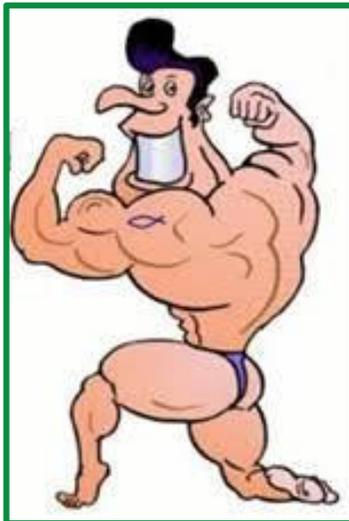
## A comparative study of two different percutaneous venous catheters in newborn infants

C Rudin <sup>1</sup>, P W Nars

## Neonatal percutaneous central venous lines: fit to burst

C Smirk <sup>1</sup>, T Soosay Raj, A-L Smith, S Morris

**Conclusions:** Polyurethane central venous catheters have a greater pressure tolerance than silicone catheters and are less likely to rupture under experimental conditions. Obstructed silicone catheters rupture easily when flushed. Catheters were not tested in human infants.



**Polyurethane is superior to silicone**

# What's new???

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# Near Infrared Technology

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# Size matters!

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The external diameter of the catheter must not exceed  $\frac{1}{3}$  of the internal diameter of the vein

The catheter to vein ratio and rates of symptomatic venous thromboembolism in patients with a peripherally inserted central catheter (PICC): A prospective cohort study

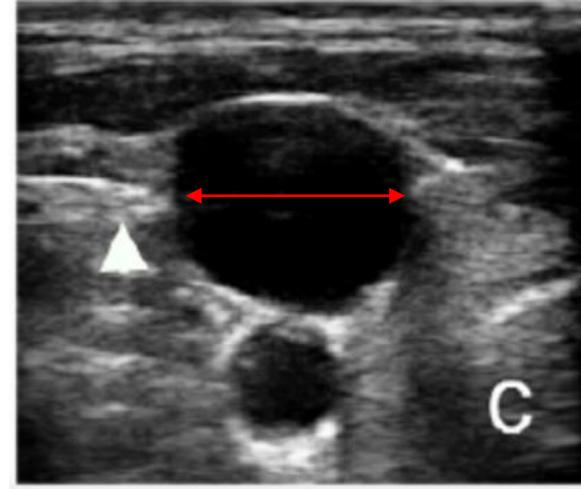
Rebecca Sharp <sup>a,\*</sup>, Melita Cummings <sup>b</sup>, Andrea Fielder <sup>a</sup>,  
Antonina Mikocka-Walus <sup>c</sup>, Carol Grech <sup>a</sup>, Adrian Esterman <sup>d</sup>

<sup>a</sup> School of Nursing and Midwifery, University of South Australia, Adelaide, Australia

<sup>b</sup> PICC Service, Royal Adelaide Hospital, Adelaide, Australia

<sup>c</sup> School of Health Sciences, University of York, United Kingdom

<sup>d</sup> Sansom Institute of Health Research and School of Nursing and Midwifery, University of South Australia, Adelaide, Australia



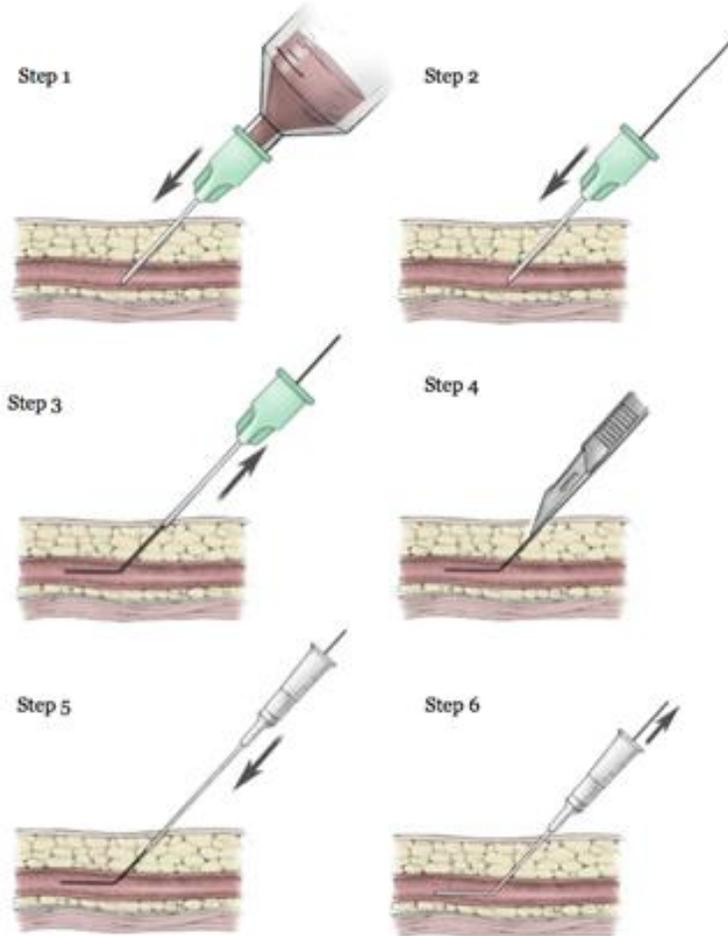
- 1 Fr may be appropriate for a low birth weight infant but maybe not for larger infants due to flow rates
- 2 Fr is appropriate for neonates and infants
- 3 Fr is appropriate for larger infants or those with multiple infusion needs

Use the smallest size possible catheter

# Modified micro Seldinger technique

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Seldinger technique



Modified micro Seldinger technique  
(MMST)

**21G puncture needle, guidewire and a peelable sheath**

Higher placement success rate

Easier to puncture veins difficult to access

Possibility to access scarred veins from previous therapy

Less risk of injuring or tearing the vein than with a big introducer

# Microsite

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# Modified micro Seldinger technique

Original research article

JVA | The Journal of  
Vascular Access

## Modified Seldinger technique for neonatal epicutaneo-caval catheter insertion: A non-randomised retrospective study

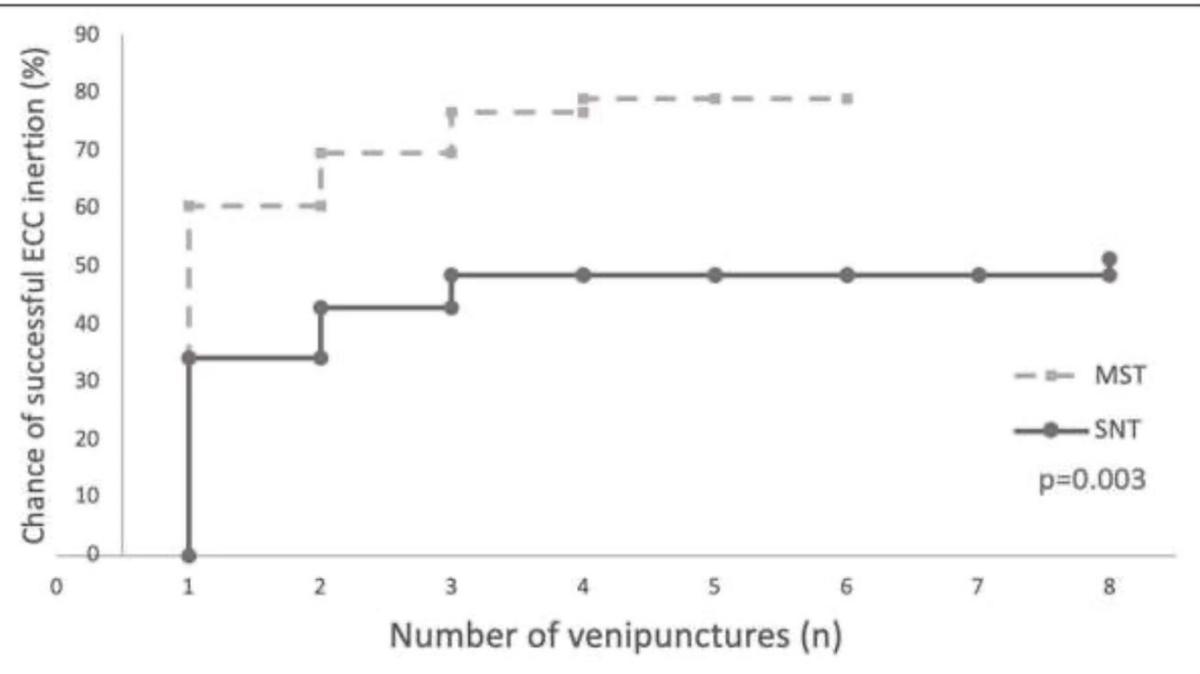
The Journal of Vascular Access  
1-6  
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DOI: 10.1177/11297298211054637  
journals.sagepub.com/home/jva  
SAGE

Jack JC Gibb<sup>1\*</sup>, Rachael MacLeod<sup>2\*</sup>, Liam Mahoney<sup>2</sup> and Ziju Elanjikal<sup>2</sup>

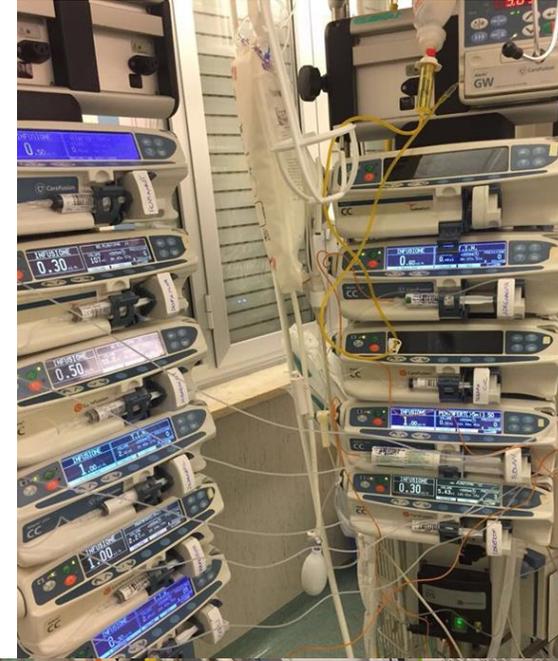
	MST		SNT	
Attempts (n)	43		35	
	1 Fr = 10	2 Fr = 33	1 Fr = 4	2 Fr = 31
Venipunctures (n)	76		78	
Successful ECCs (n (%))	31 (72)	14 (40)	1 Fr = 0	2 Fr = 14
First pass success (n (%))	23 (53)		9 (26)	
Venipunctures/successful ECC	2.5		5.6	
Dwell time (days)*	7 (11.5–18.3)		10.5 (13.5–21.5)	

BW: birth weight; CI: confidence interval; Fr: French; GA: gestation split needle technique; GA: gestational age.

\*Median (IQR)



# Sometimes we need other catheters...



High performing catheter

# Centrally inserted central lines

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Withdrawals

High flow infusions

Transfusions

Hemodynamic monitoring

Reduced rate of occlusion



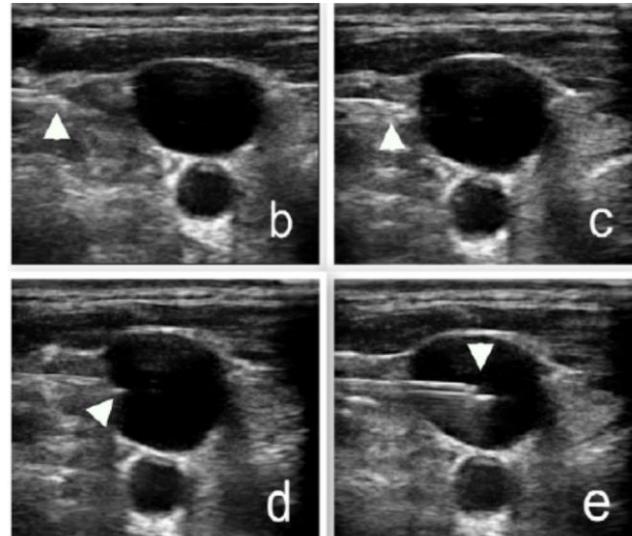
Jugular vein

Subclavian vein

Femoral vein



Ultrasound-guided central venous catheter insertion



# Ultrasound-guided central venous catheter

Efficacy and safety of ultrasound-guided internal jugular vein catheterization in low birth weight newborn

Fernando Montes-Tapia <sup>a,\*</sup>, Antonio Rodríguez-Taméz <sup>a</sup>, Idalia Cura-Esquivel <sup>a</sup>, Itzel Barreto-Arrovo <sup>a</sup>, Adolfo Hernández-Garduño <sup>a</sup>, Isaías Rodríguez

## A Retrospective Analysis of the Clinical Effectiveness of Supraclavicular, Ultrasound-guided Brachiocephalic Vein Cannulations in Preterm Infants

Christian Breschan, M.D., D.E.A.A., Gudrun Graf, M.D., D.E.A.A., Robert Jost, M.D., Haro Stettner, Ph.D., M.D., Christian Stadik, M.D., Markus Koestenberger, M.D.,

## Ultrasound-Guided Percutaneous Central Venous Access in Low Birth Weight Infants: Feasibility in the Smallest of Patients

Seth D. Goldstein, MD, MPhil,<sup>1</sup> Howard Pryor, MD,<sup>1</sup> Jose H. F. Dylan Stewart, MD,<sup>1</sup> Fizan Abdullah, MD, PhD,<sup>1</sup> and Jeffrey R. Lukish, MD, F

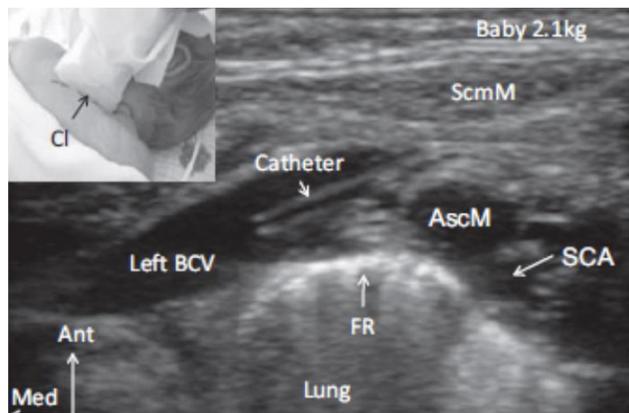
## Pediatric Anesthesia

Pediatric Anesthesia ISSN 1155-5645

ORIGINAL ARTICLE

## Ultrasound-guided supraclavicular cannulation of the brachiocephalic vein in infants: a retrospective analysis of a case series

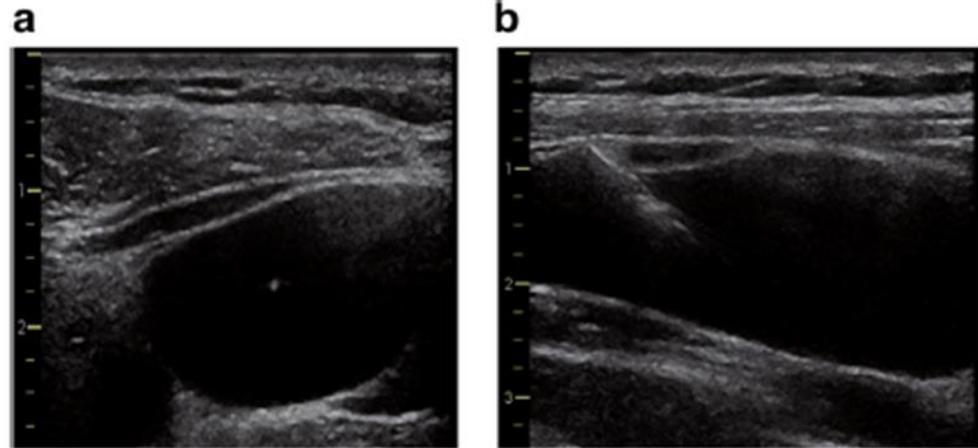
Christian Breschan<sup>1</sup>, Manuela Platzer<sup>1</sup>, Robert Jost<sup>2</sup>, Haro Stettner<sup>3</sup>, Georg Feigl<sup>4</sup> & Rudolf Likar<sup>1</sup>



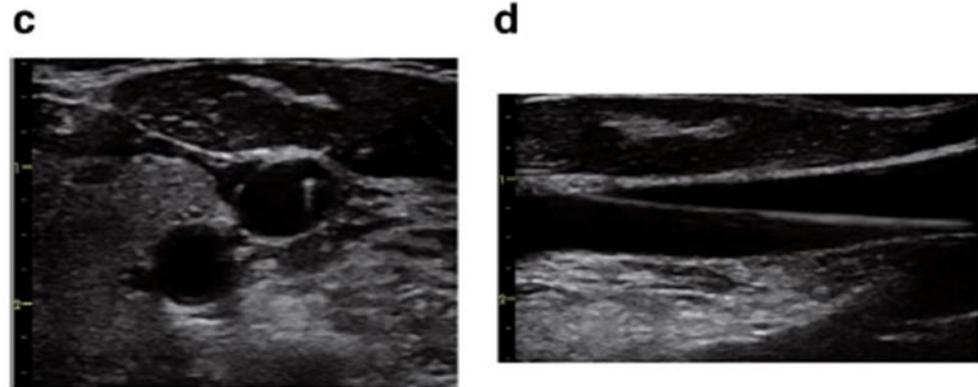
# Ultrasound

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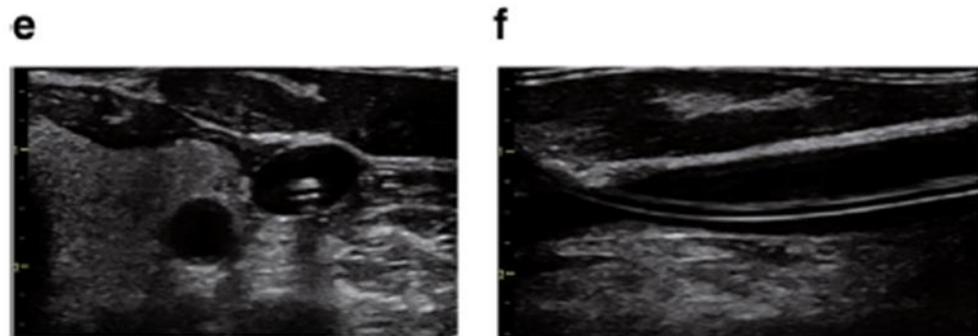
Direct visualization of the vein



Decreased number of punctures  
of the vein



Direct visualization of the needle/  
guidewire and of the catheter



# The brachiocephalic vein

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560 gr

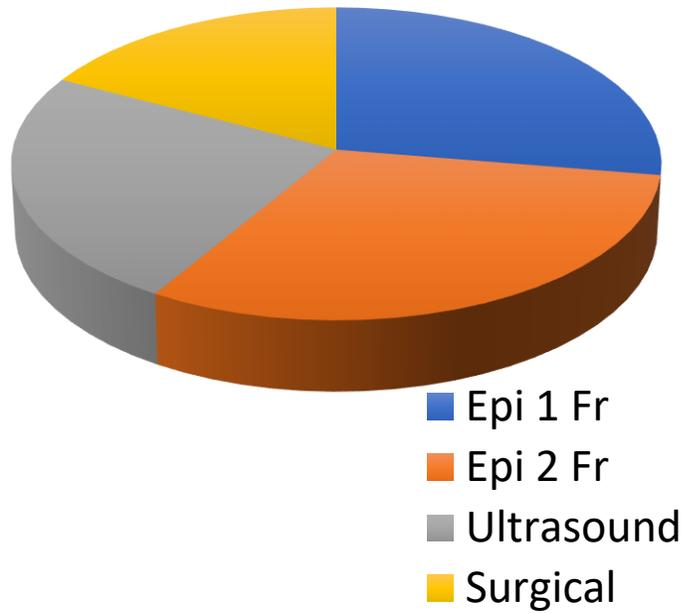
Dr C. Breschan



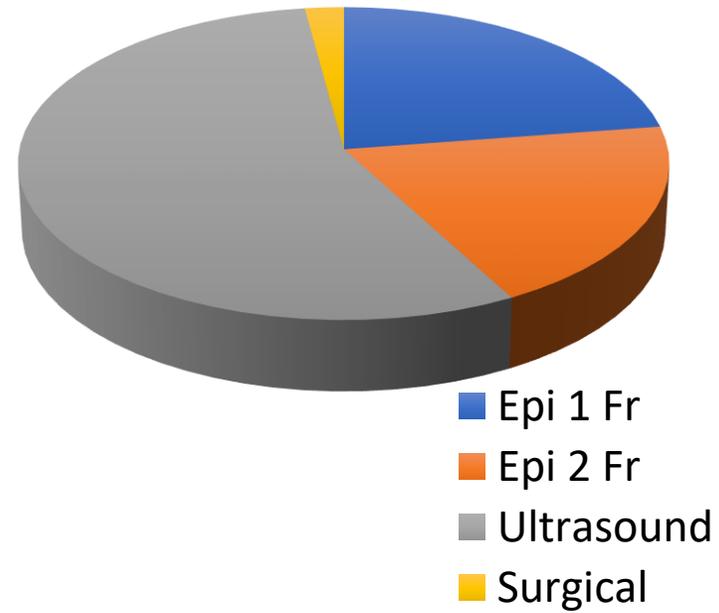
# Our experience

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2016



2019



# The brachiocephalic vein

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LILA  
23+5 Weeks  
600 gr

CICC  
2 Fr 4 cm

# What's new???

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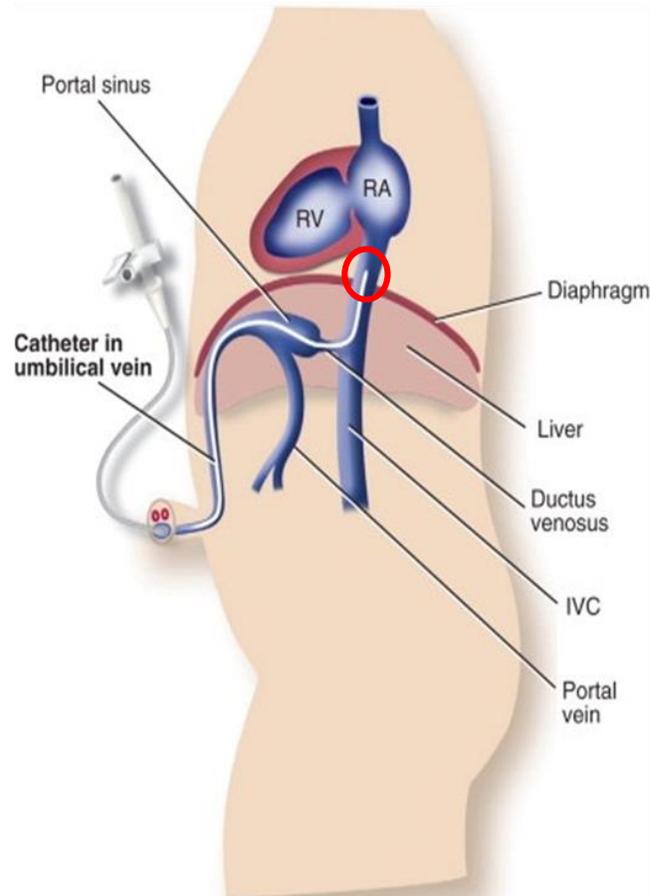
**Vascular  
access**

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Tip navigation  
Tip localization

# Umbilical Venous Catheter

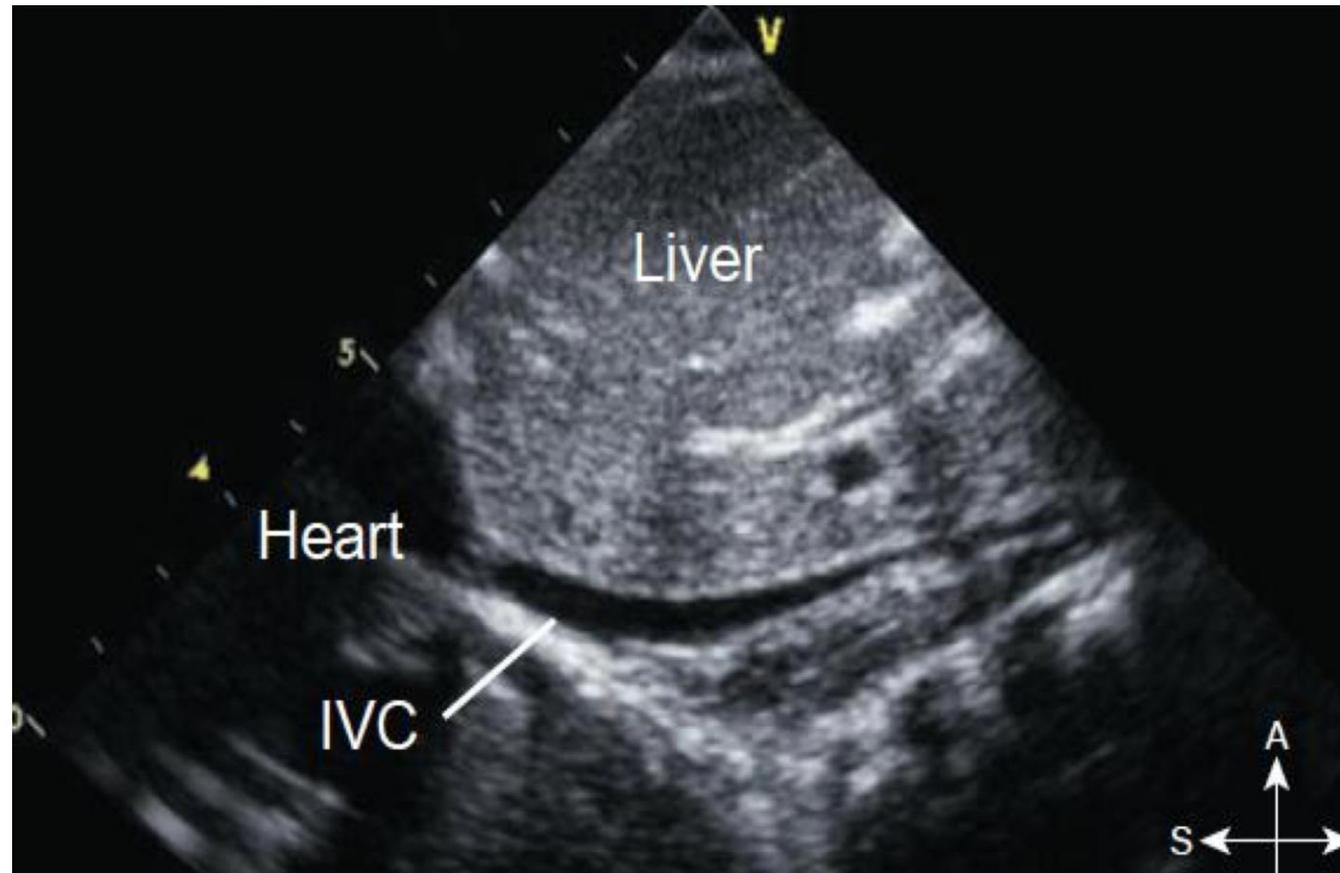


Between suprahepatic outlet in the inferior vena cava and right atrium

# Echocardiography

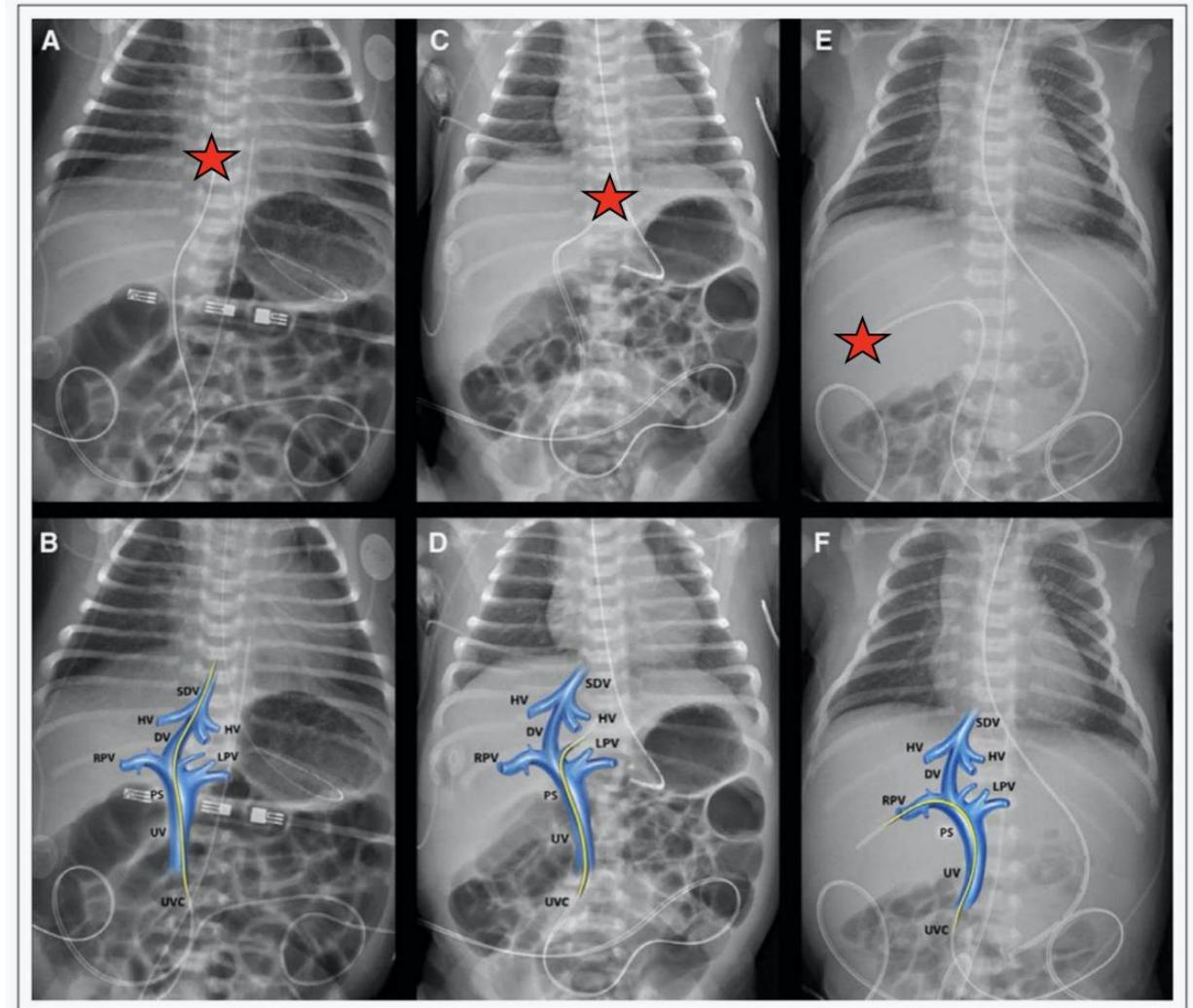
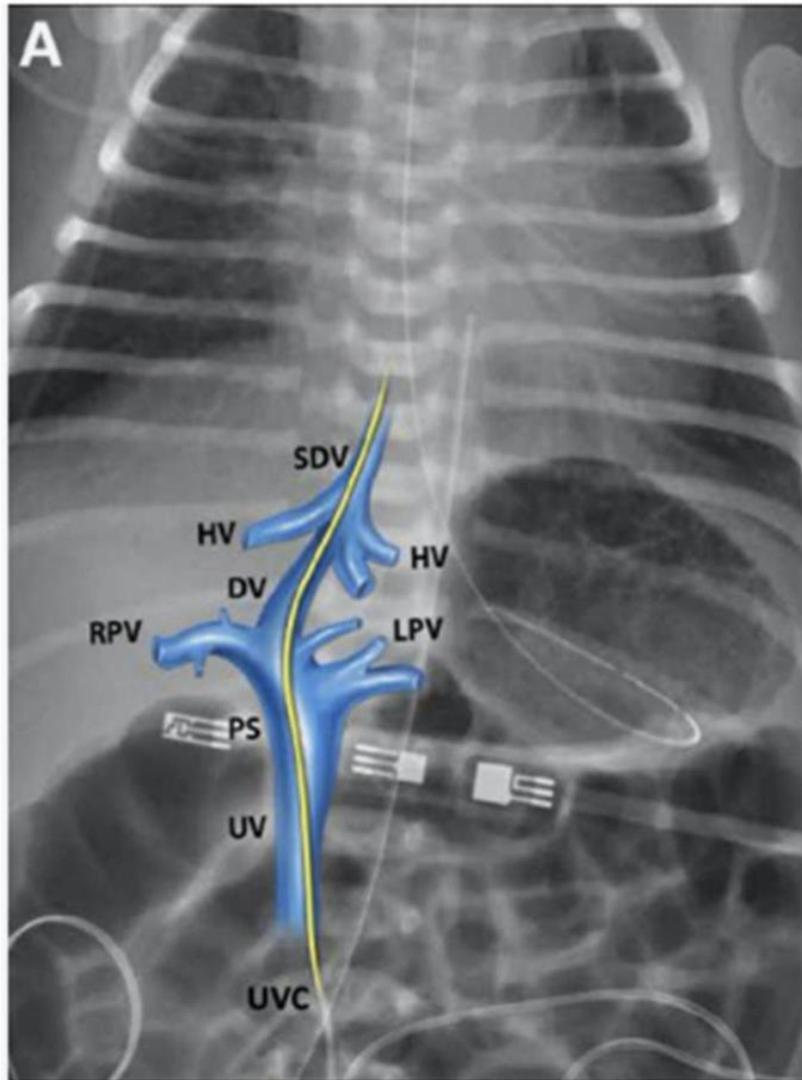
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Gold standard for the correct visualization of the tip of the catheter  
Easy to perform



# Real-Time Ultrasound Guidance for Umbilical Venous Cannulation in Neonates With Congenital Heart Disease

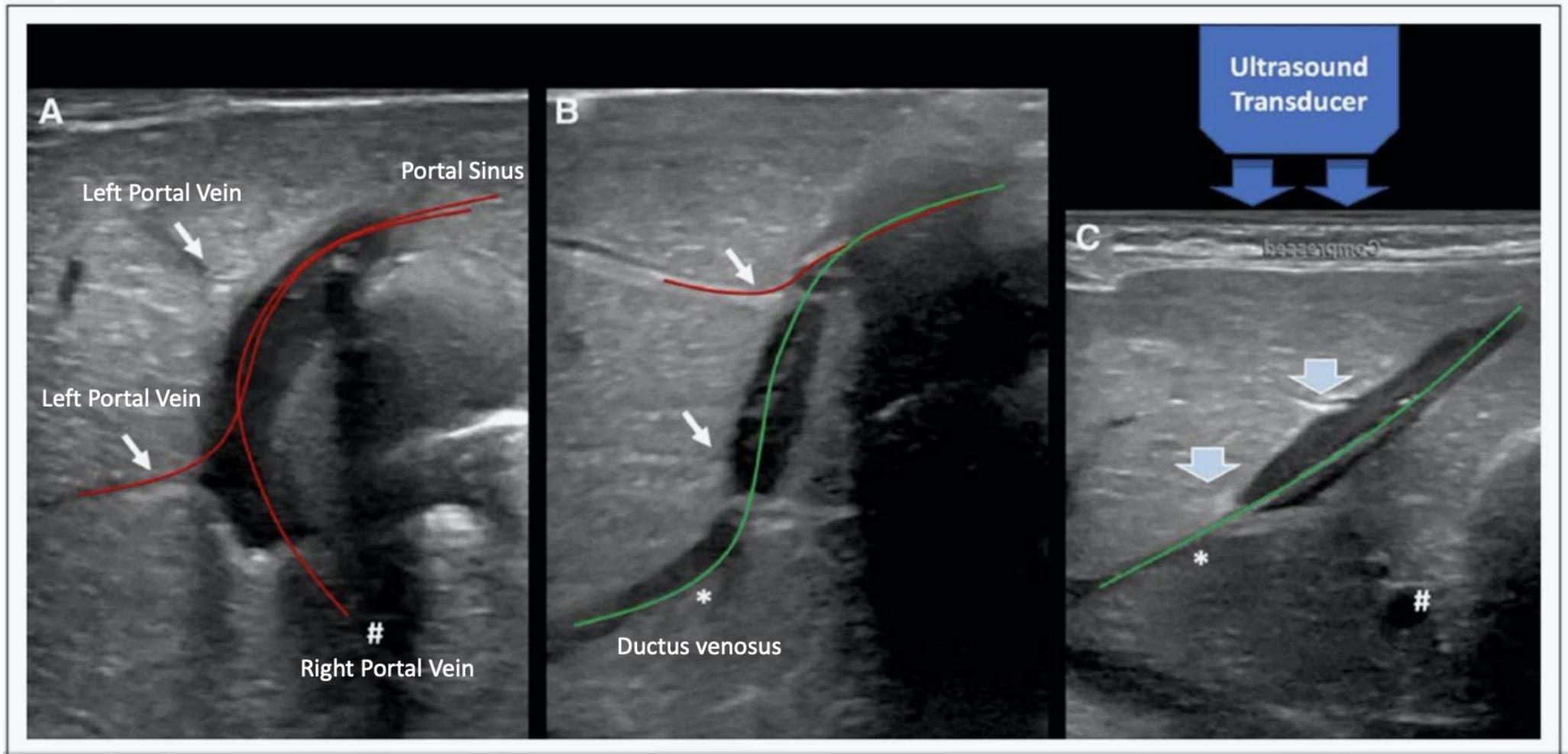
*Ped Critical Care Medicine, May 2022, 23 (5)*



**Figure 2.** Umbilical venous catheter (UVC) malposition. **A** and **B**, Properly positioned, central UVC. **C** and **D**, Malposition in the left portal veins (LPVs). **E** and **F**, Malposition in the right portal veins (RPVs). DV = ductus venosus, HV = hepatic veins, PS = portal sinus, SDV = subdiaphragmatic vestibule, UV = umbilical vein.

# Echocardiography





32 children presented with failed attempts at UVC placement

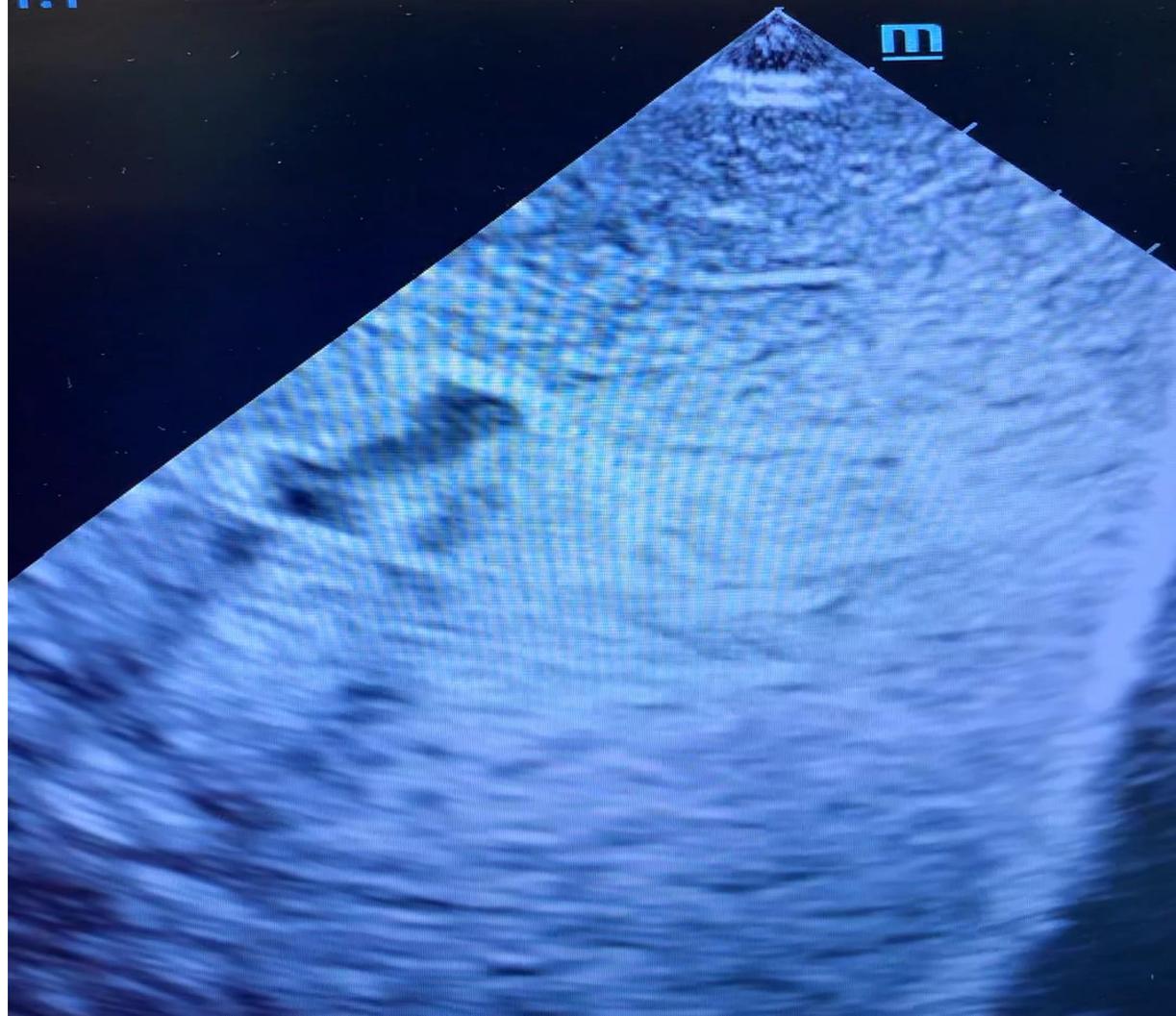
23 (72%) children were able to have their UVC correctly repositioned

SITAIRE SAINT LUC

17

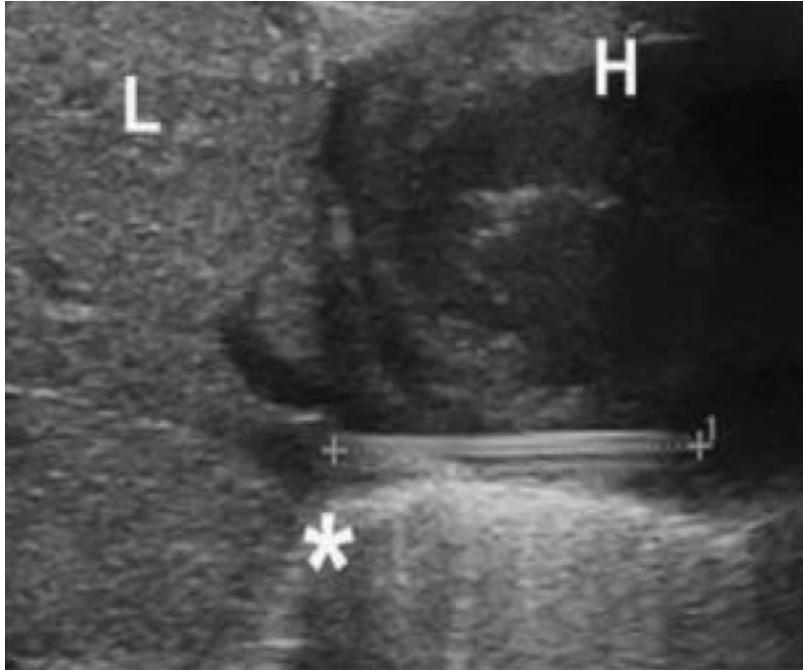
1.1

m



# Check again

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The catheter can move !



Ultrasound after 24/48 hours

70 VUC



72% had to be moved  
after 24/48 hours



# Prevent complications

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Scrupulously follow guide lines for insertion and management

Perform US before infusions

→ Replace / remove if tip not central

Check again !!

→ No symptoms does not mean no complications

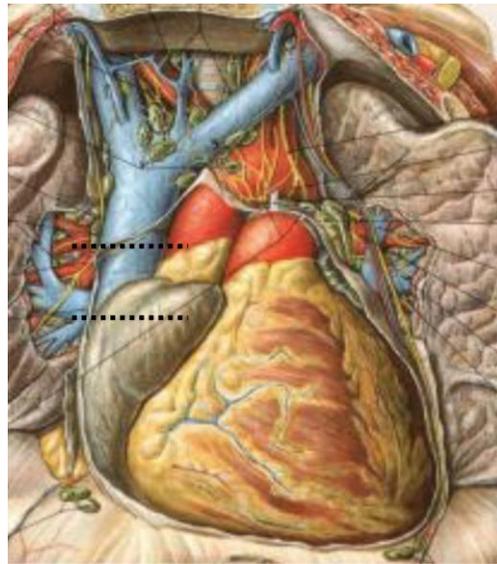
Replace as soon as possible (max 7 days)

# Neonatal PICCs

## Percutaneously Inserted Central Catheters

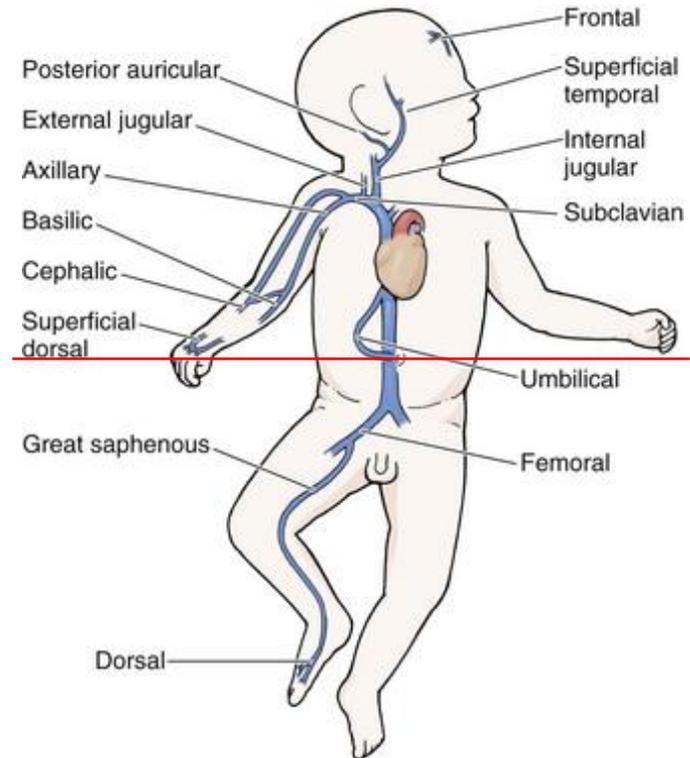
Inserted in a peripheral vein,  
with the tip in a central position

Superior vena cava



vena cava-right  
atrium junction

Inferior vena cava



# Up or down?

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## Peripherally Inserted Central Catheter Complications in Neonates With Upper Versus Lower Extremity Insertion Sites

Wrightson, Della Daugherty MSN, RNC-NIC

Advances in Neonatal Care: June 2013 - Volume 13 - Issue 3 - p 198-204

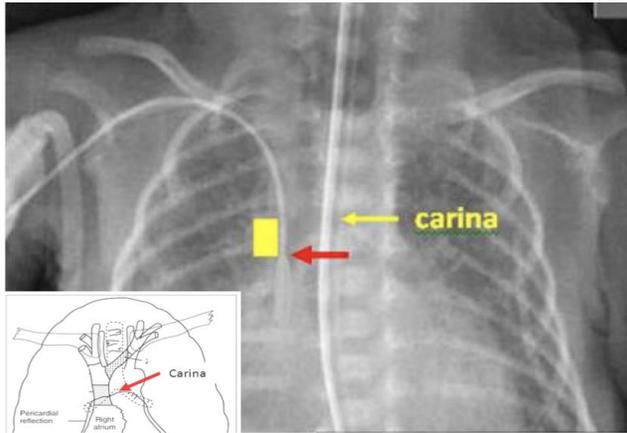
doi: 10.1097/ANC.0b013e31827e1d01

No difference in rate of infections / complications  
between upper versus lower insertion site

Always check all the veins to choose  
the **best** available vein regardless if it is in the upper  
or lower side of the body

# Correct position of the tip

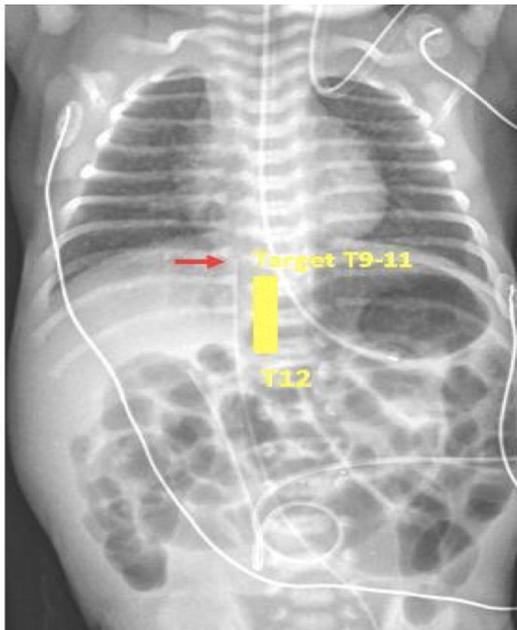
Always check the position of the tip before securing



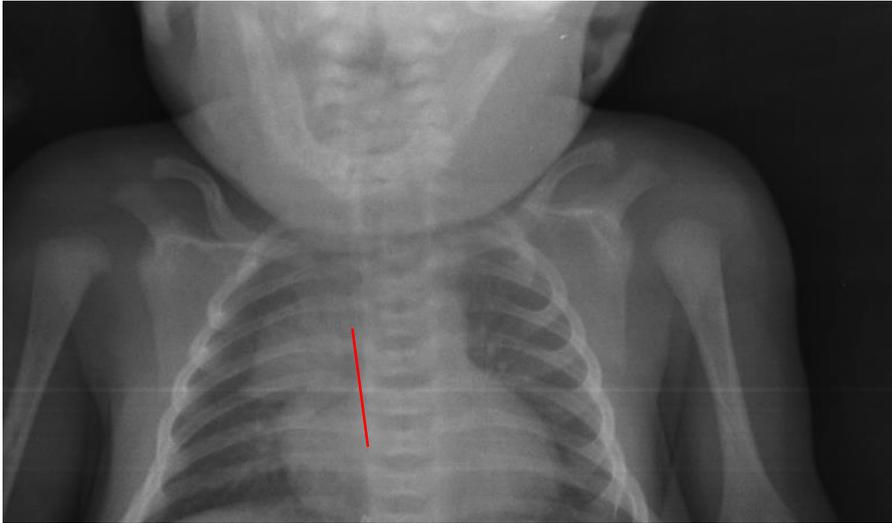
Antero-Post



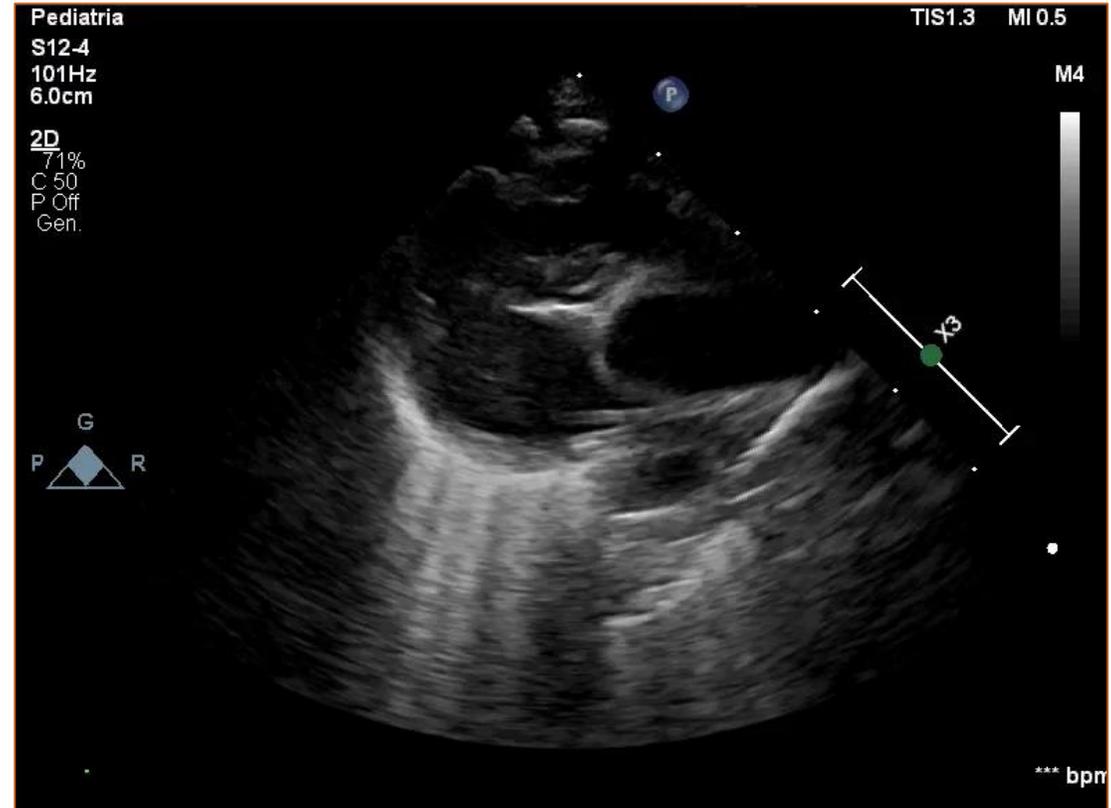
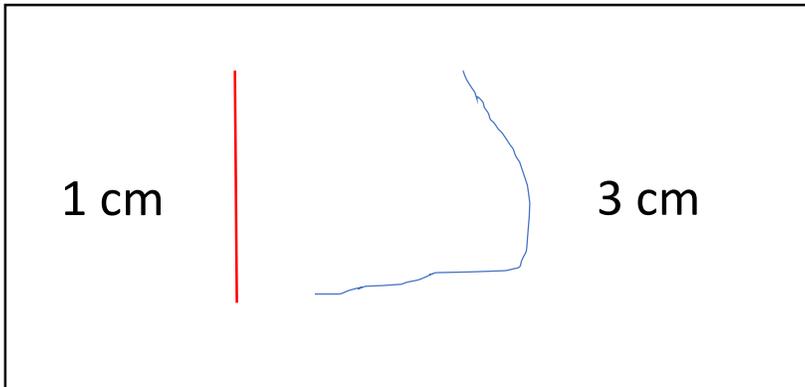
Lateral



# Antero post



# Lateral



# Correct position of the tip

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Always check the position of the tip before securing

## 23. CENTRAL VASCULAR ACCESS DEVICE TIP LOCATION

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### ***Infusion Therapy Standards of Practice***

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5. Avoid fluoroscopy except where CVAD placement is difficult or has failed at the bedside, as it requires exposure to ionizing radiation.<sup>4,53,62,70</sup> (IV)
6. Postprocedure radiograph imaging is not necessary if alternative tip location technology confirms proper tip placement.<sup>46,50,71</sup> (II)

Confirmation of tip location by postprocedure chest radiograph remains acceptable practice and is required in the absence of technology used during the procedure. This method is less accurate because the CAJ cannot be seen on the radiograph, requiring identification of tip location by measurement from the carina, trachea-bronchial angle, or thoracic vertebral bodies. Patient repositioning or movement results in distal or proximal migration of the catheter tip by as much as 2 cm dependent on the movement.<sup>4,12,69,72-75</sup> (II)

# Echocardiography

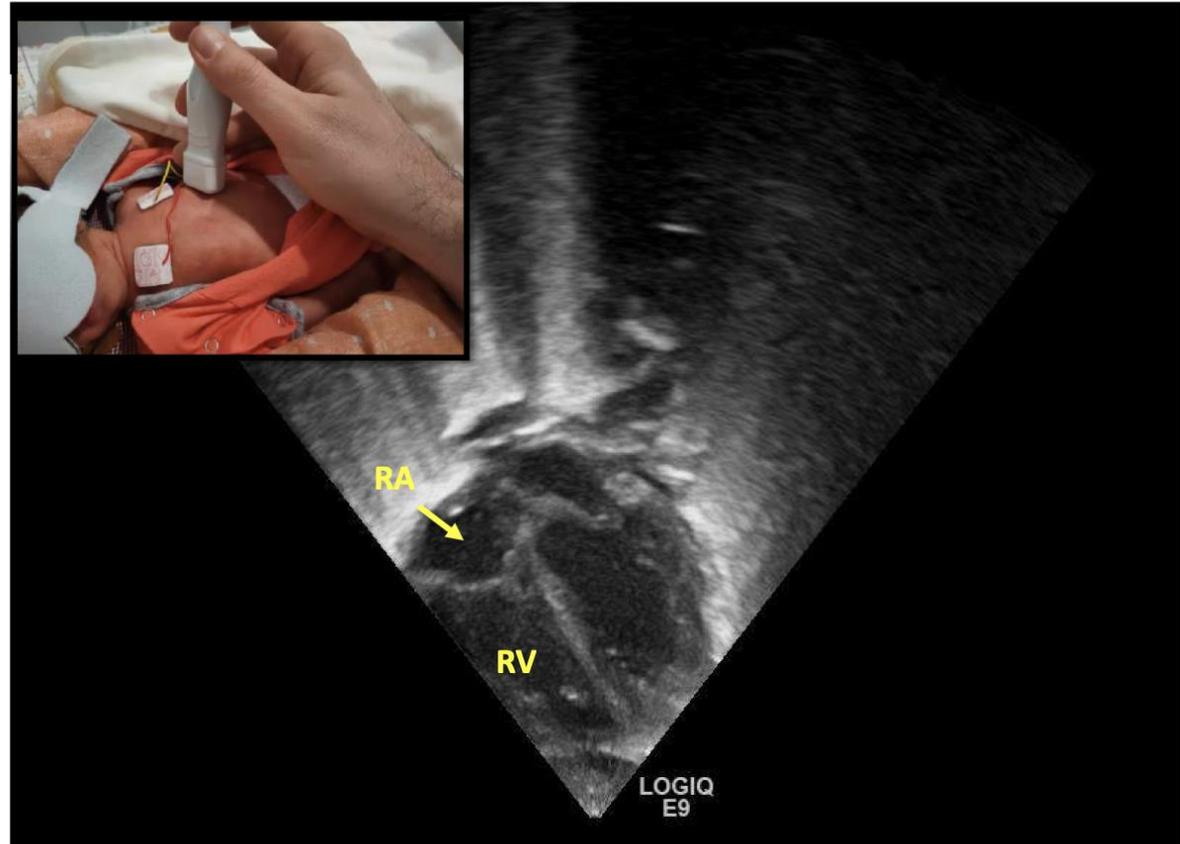
Editorial

## Neo-ECHOTIP: A structured protocol for ultrasound-based tip navigation and tip location during placement of central venous access devices in neonates

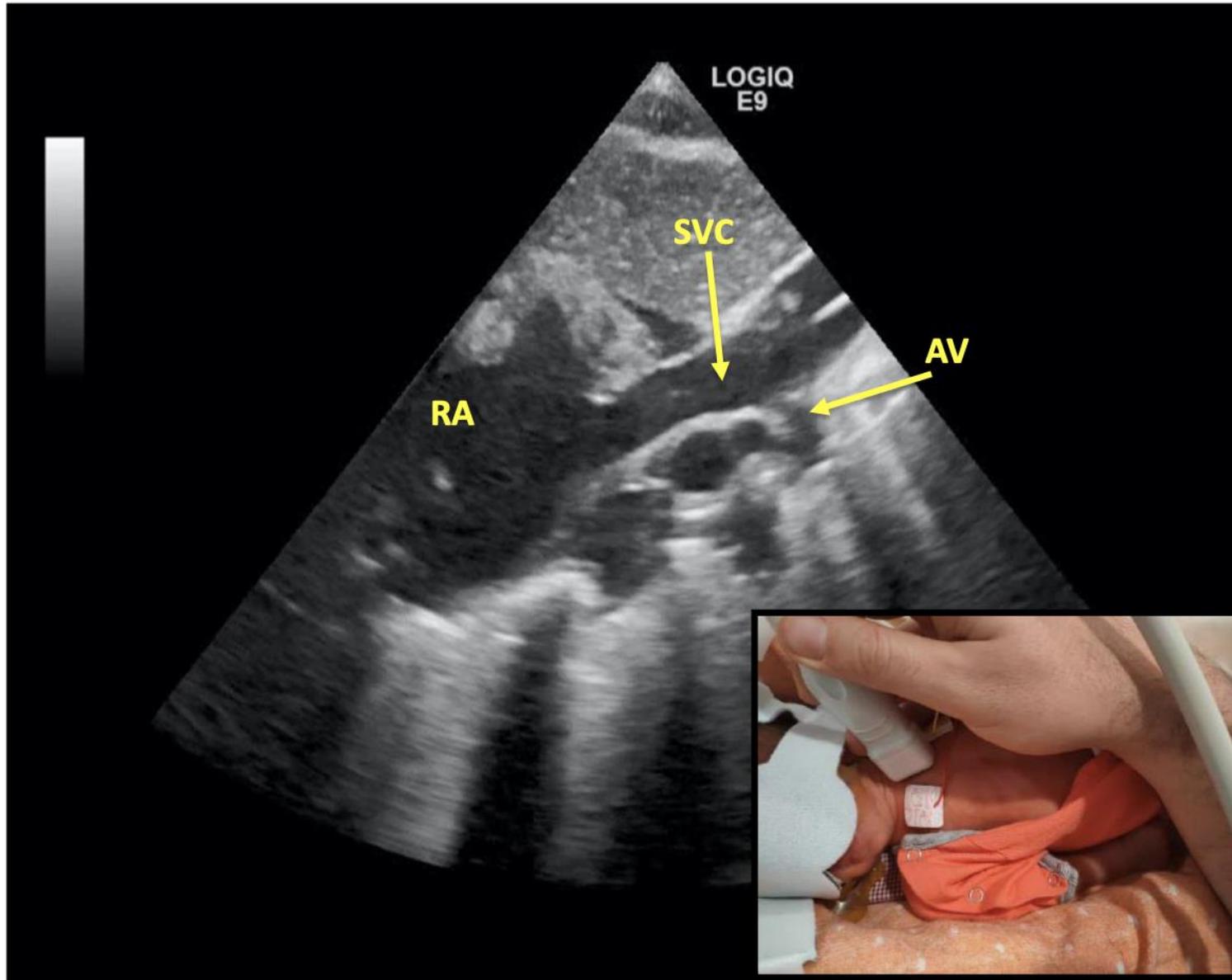
Giovanni Barone<sup>1</sup> , Mauro Pittiruti<sup>2</sup> , Daniele G Biasucci<sup>3</sup>,  
Daniele Elisei<sup>4</sup>, Emanuele Iacobone<sup>4</sup> , Antonio La Greca<sup>2</sup>,  
Geremia Zito Marinosci<sup>5</sup> and Vito D'Andrea<sup>6</sup> 

JVA The Journal of  
Vascular Access

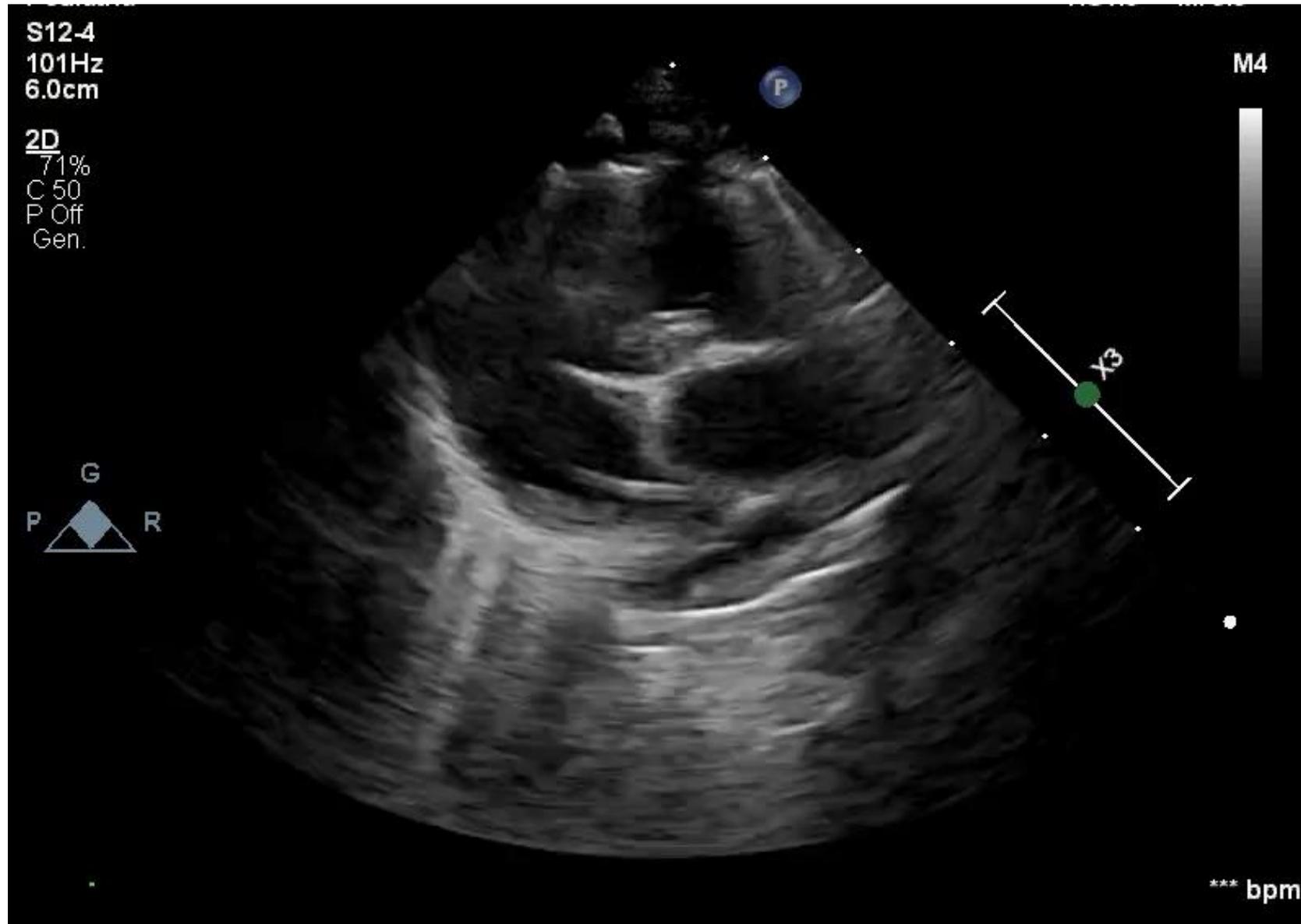
The Journal of Vascular Access  
1–10  
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DOI: 10.1177/11297298211007703  
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# PICC in the superior vena cava

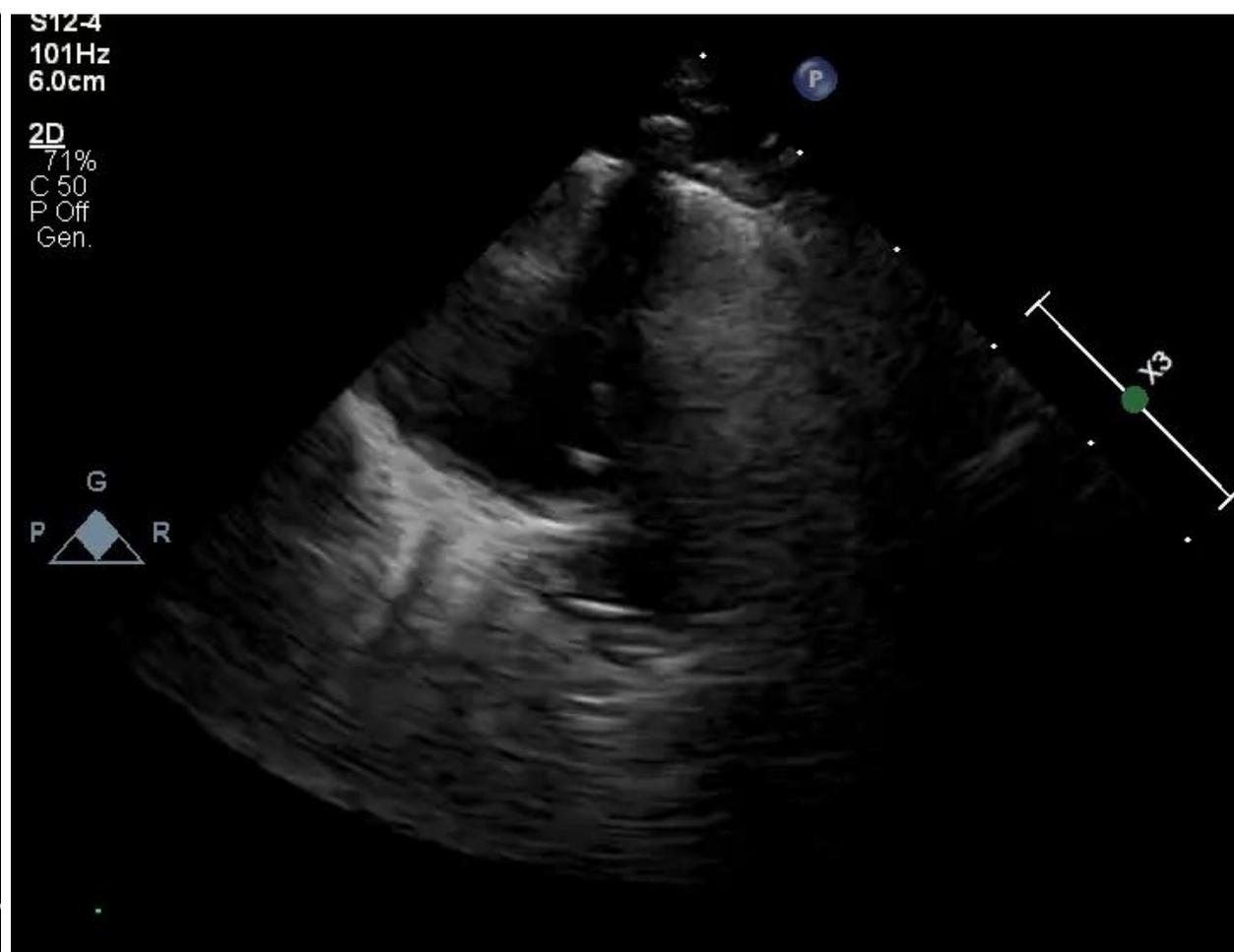
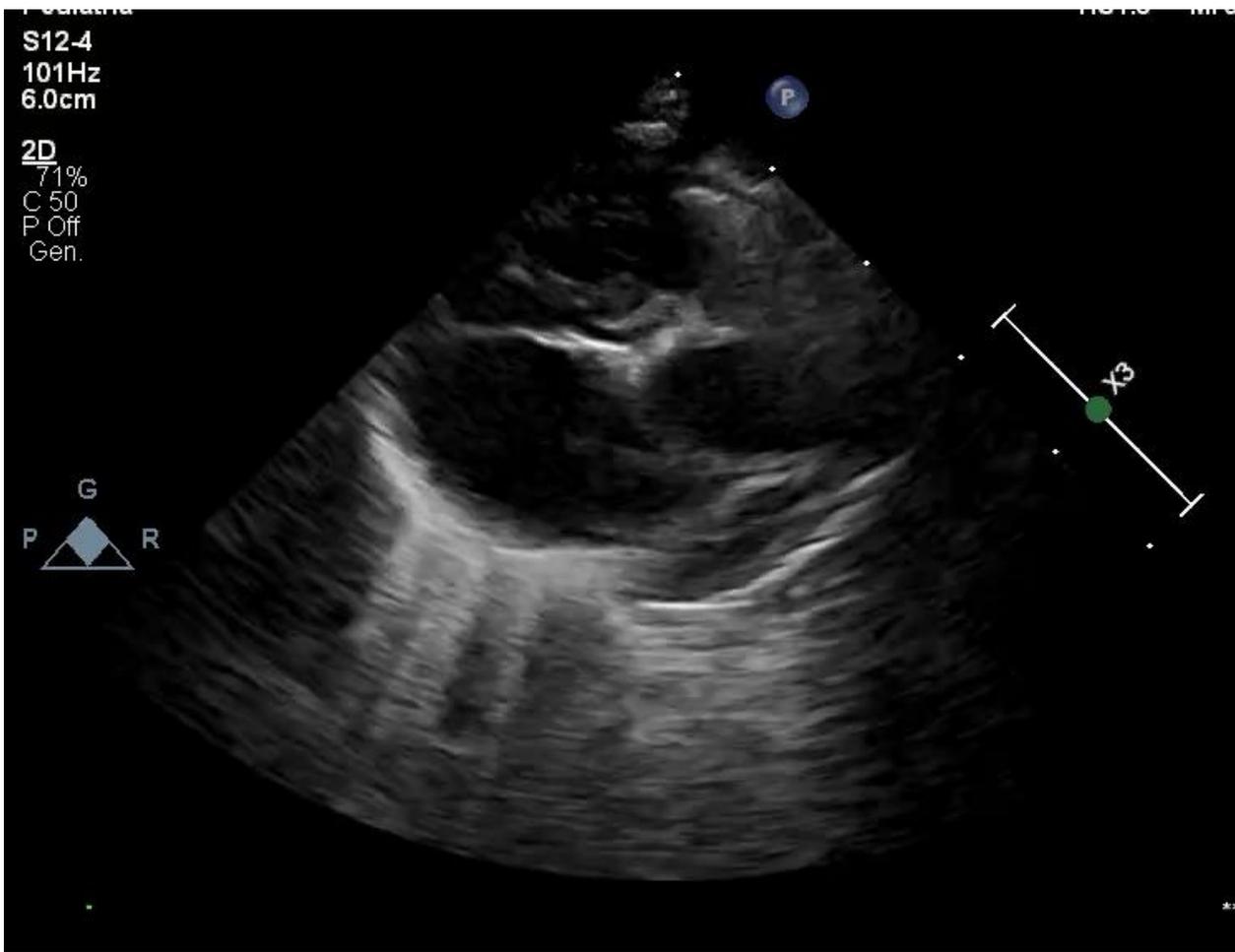


# PICC in the superior vena cava



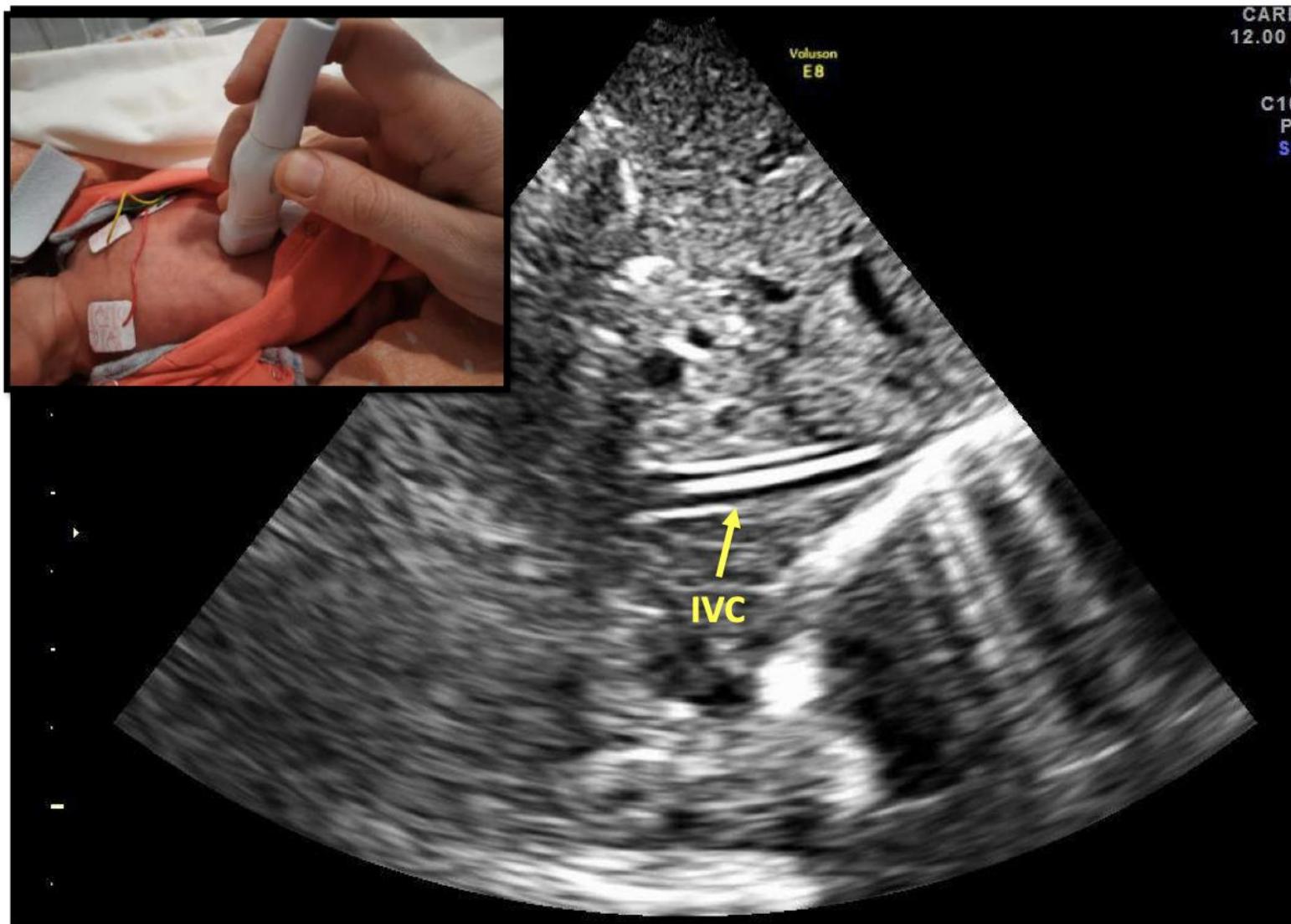
# PICC in the superior vena cava

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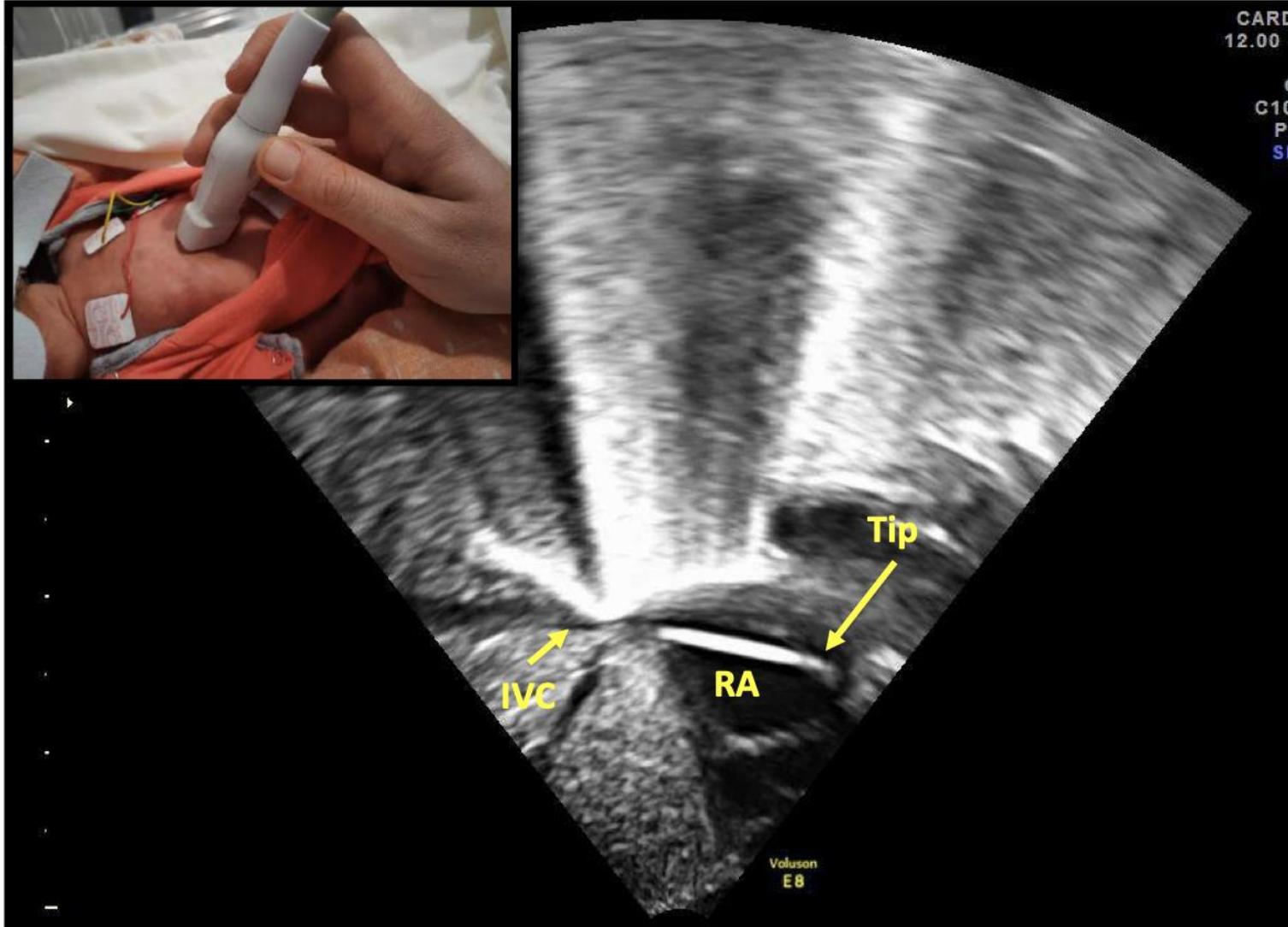
# PICC in the inferior vena cava

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# PICC in the inferior vena cava

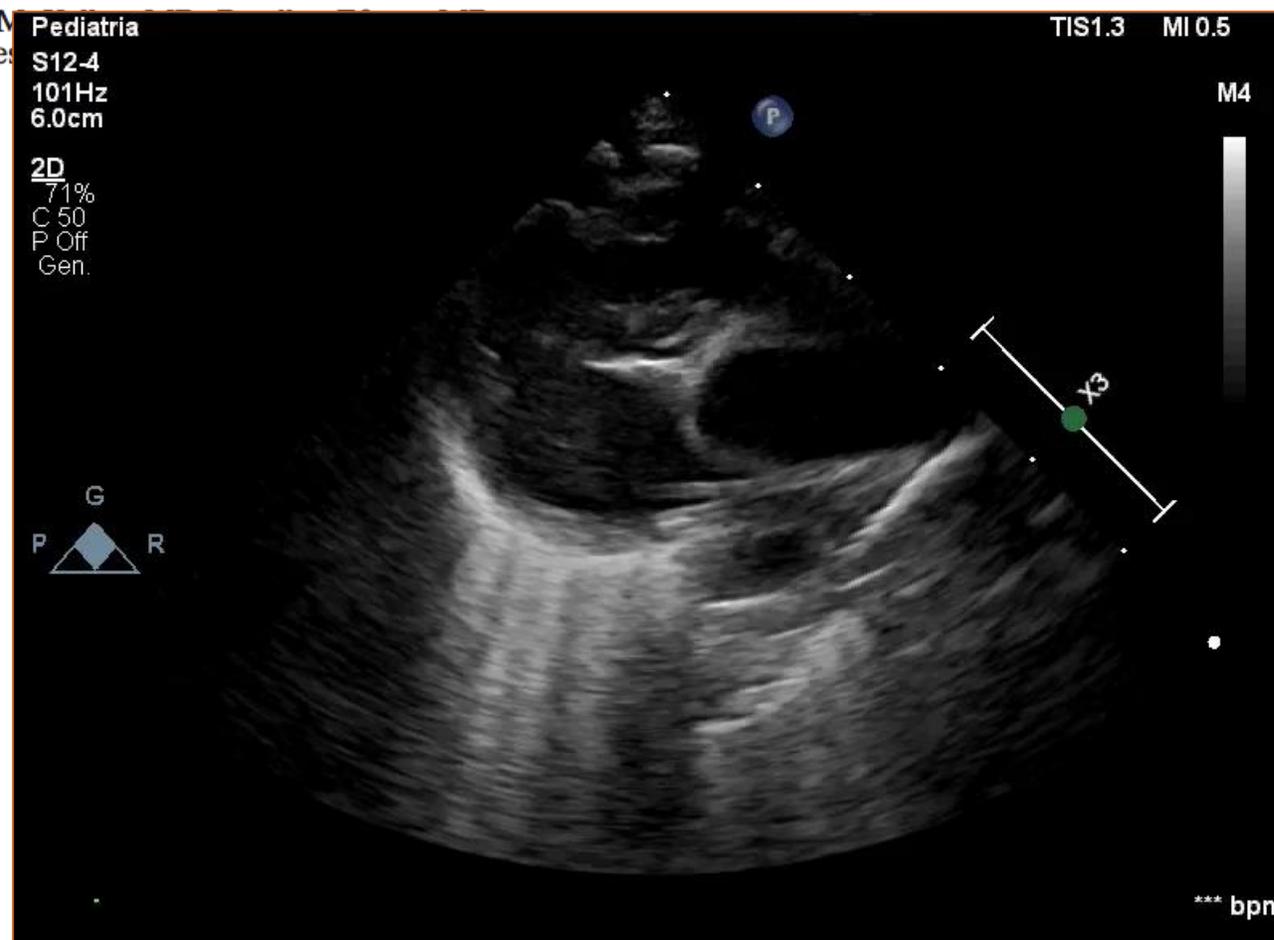
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ORIGINAL RESEARCH CONTRIBUTION

# Central Vascular Catheter Placement Evaluation Using Saline Flush and Bedside Echocardiography

Anthony J. Weekes, MD, David A. Johnson, MD, Stephen M. Christopher Carey, MD, Nigel L. Rozario, MS, and H. James



# Intracavitary ECG guidance

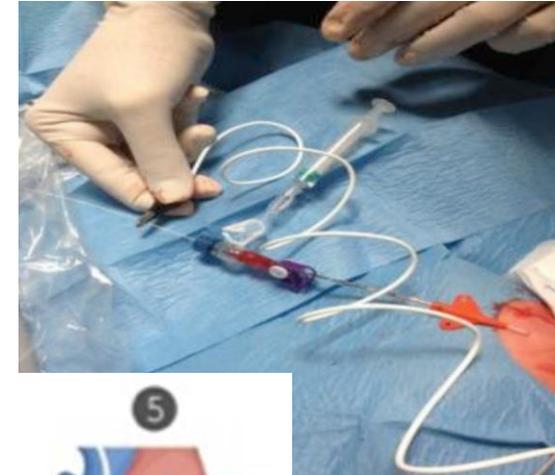
**JVA**  
ISSN 1129-7298

J Vasc Access 2014; 00 (00): 000-000  
DOI: 10.5301/jva.5000281

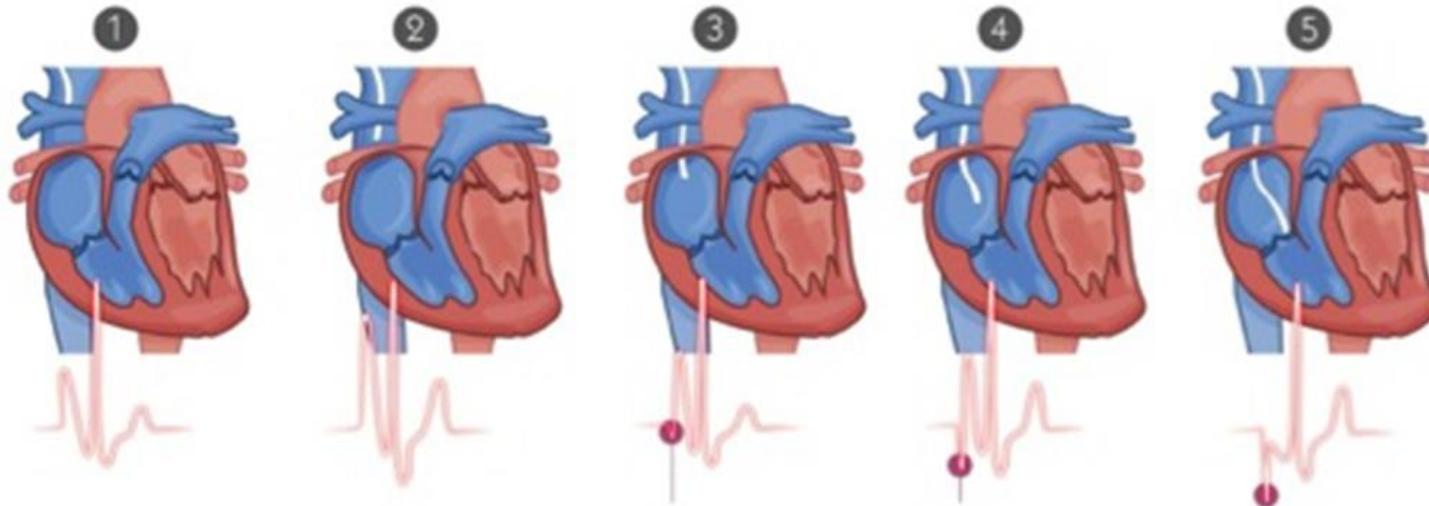
ORIGINAL ARTICLE

## The intracavitary ECG method for positioning the tip of central venous access devices in pediatric patients: results of an Italian multicenter study

Francesca Rossetti<sup>1</sup>, Mauro Pittiruti<sup>2</sup>, Massimo Lamperti<sup>3</sup>, Ugo Graziano<sup>4</sup>, Davide Celentano<sup>5</sup>, Giuseppe Capozzoli<sup>6</sup>



Intra



visualization of P-wave at baseline



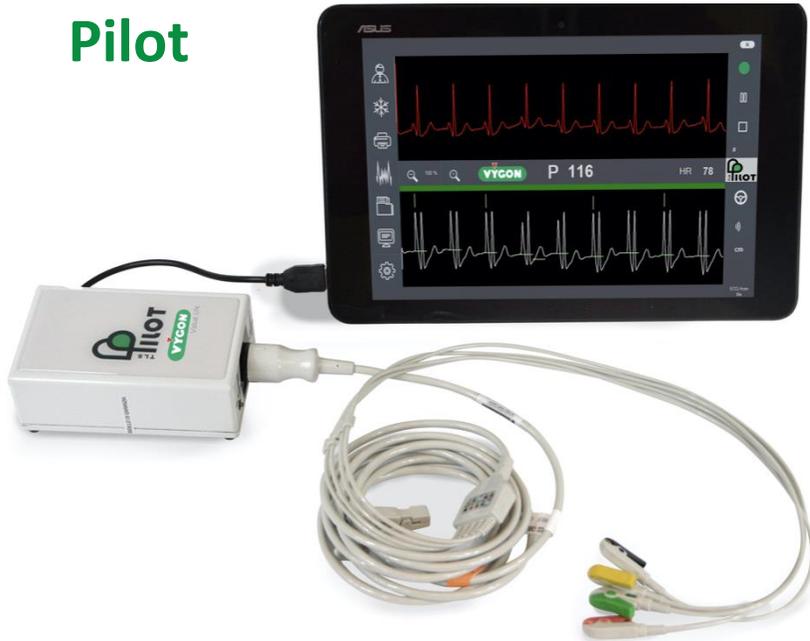
acquisition of the maximal P-wave

negative deflection

# Intracavitary ECG guidance

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Pilot



Baseline

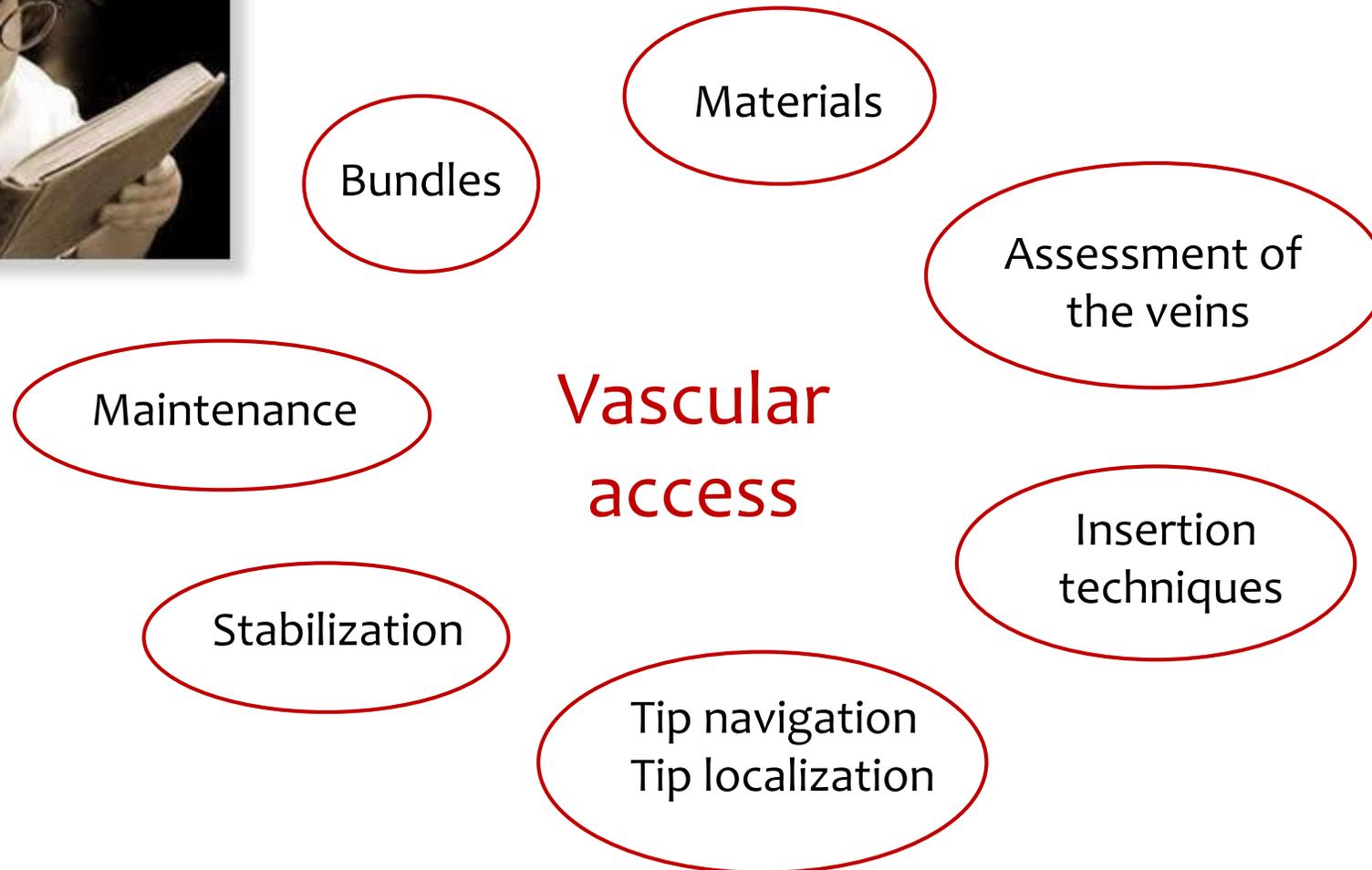
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Intracavitary ECG



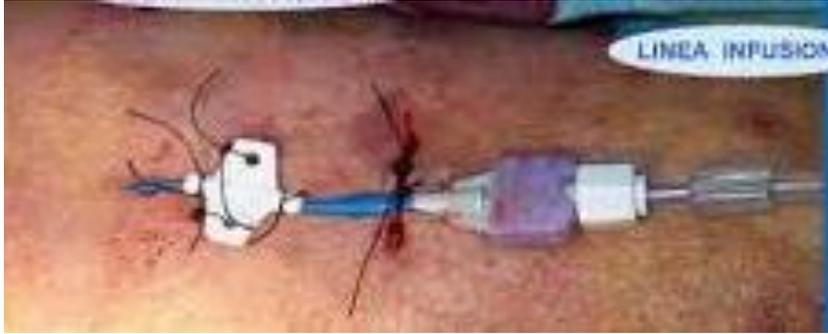
# What's new???

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# Securement of the catheter

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Sutureless device



Improved stabilization

Avoids CVC in and out  
movement

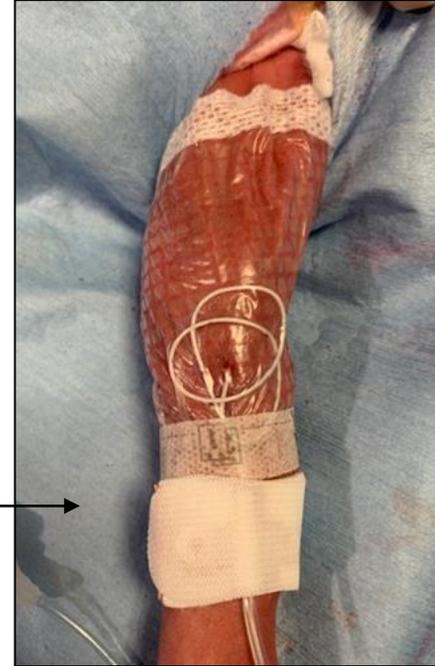
Easier to clean the insertion  
point



# Securement of the device

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Grip lock



Reduction of infections

Reduction of thrombosis



Reduction of accidental dislocations

# Securement of the device

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Transparent dressing

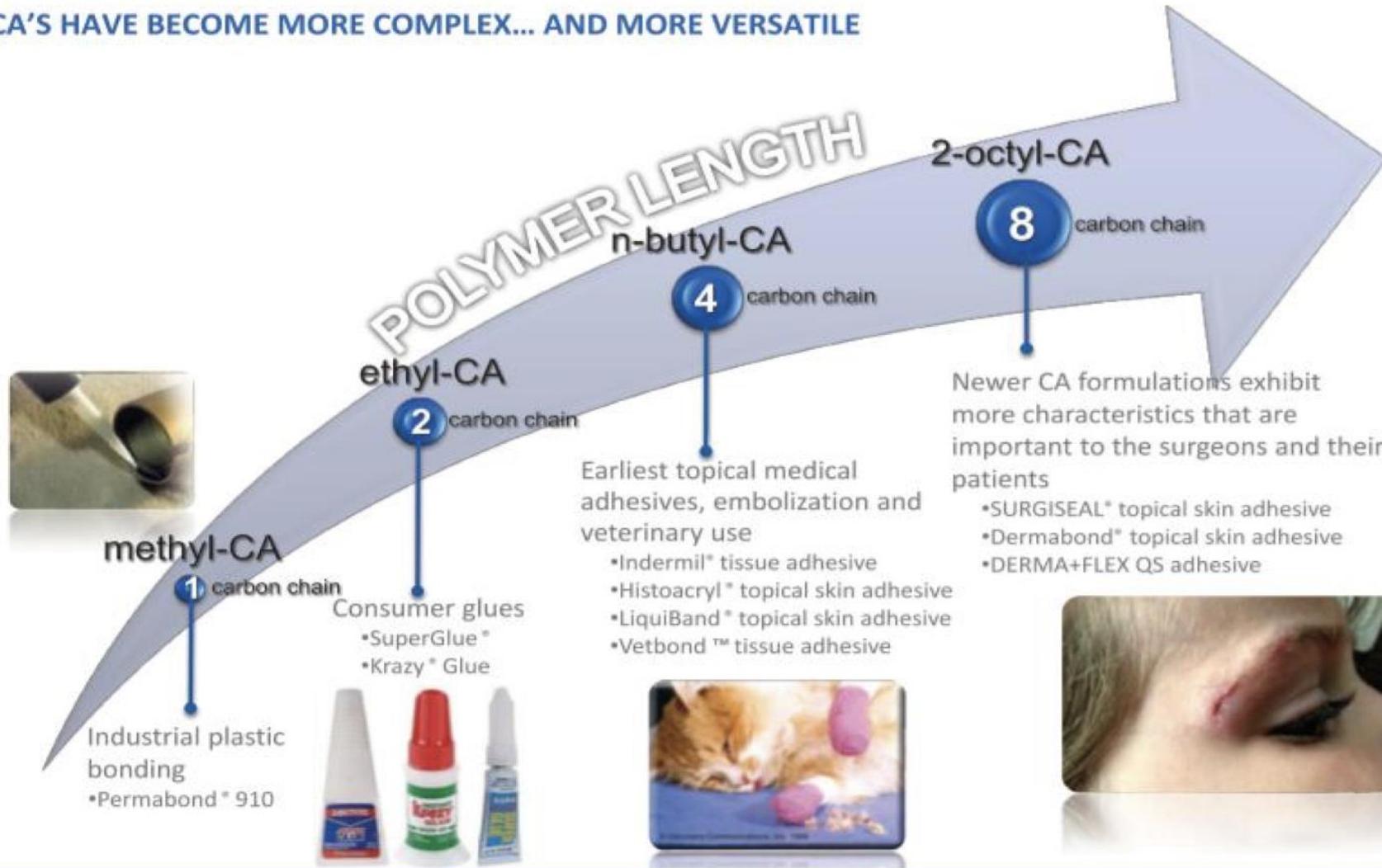
The point of insertion has to be always visible

Every day check for  
infection  
redness  
extravasation



# Hystoacryl glue

CA'S HAVE BECOME MORE COMPLEX... AND MORE VERSATILE



# Hystoacryl glue

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Stabilization

Hemostasis

Anti infective  
properties

# Cyanoacrylate glue

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Medical grade products currently available contain either butyl, isobutyl or octyl esters

Butyl products



rigid when dry  
provide a strong bond

Octyl products



more flexible when dry  
produce a weaker bond

# Secureport IV

Approved and licensed to secure catheters

DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Food and Drug Administration

## Indications for Use

Form Approved: OMB No. 0910-0120  
Expiration Date: January 31, 2017  
*See PRA Statement below.*

510(k) Number *(if known)*  
K170505

Device Name  
SecurePortIV Catheter Securement Adhesive

Thin and precise applicator  
with **patented design**,  
created for vascular access



Unique formulation combining  
**flexibility and fast drying**  
(80% 2-octyl CA and 20% n-butyl CA)

**Right volume:**  
0.15 ml

# Cyanoacrylate glue

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Safety

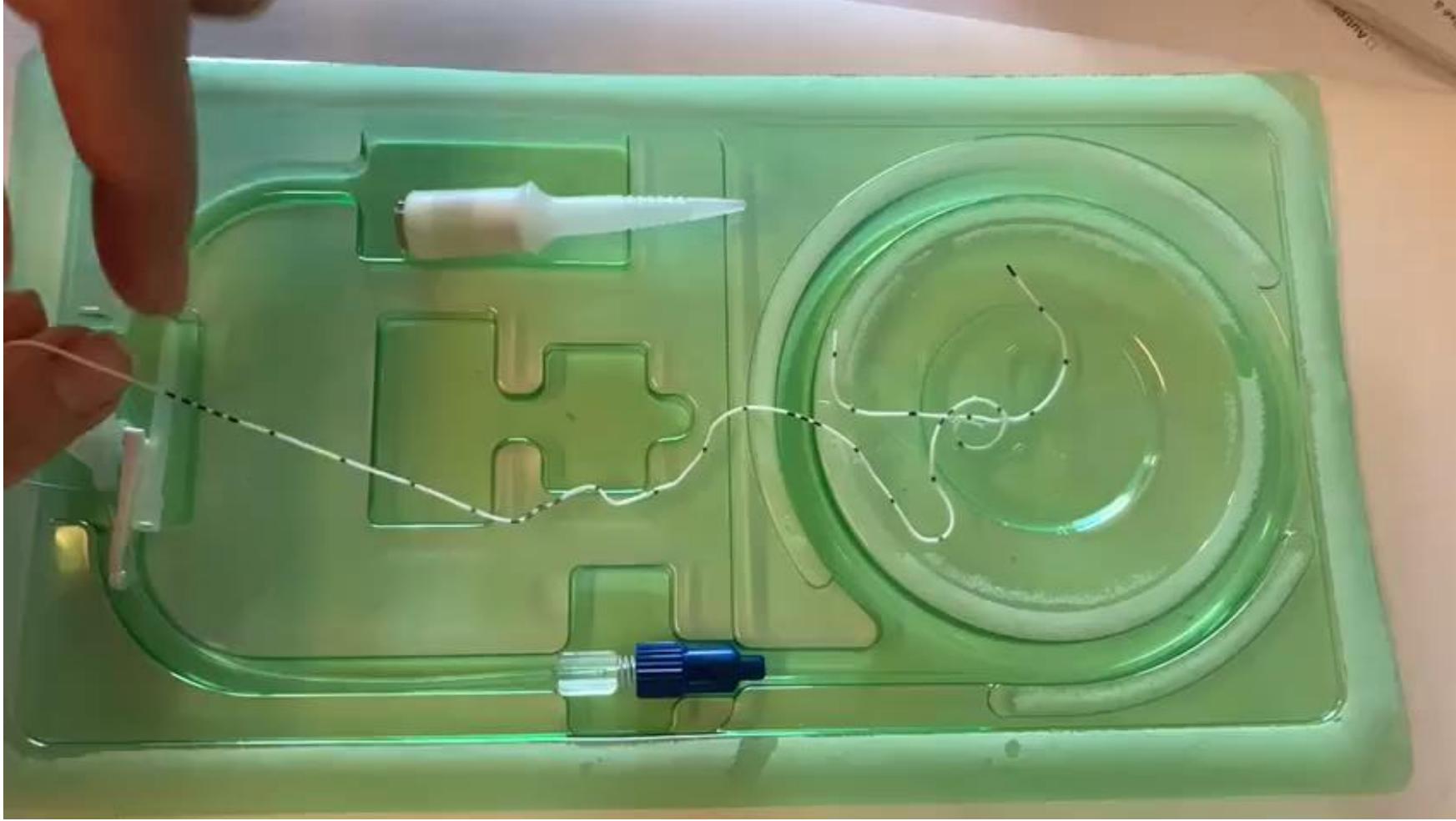
2018 Di Puccio et al. – The Journal of Vascular Access

***“Experimental study on the chemico-physical interaction between a two-component cyanoacrylate glue and the material of PICCs”***



Cyanoacrylate does not cause structural damage to polyurethane catheters even long term after exposure

Lesion to one silicone PICC



# Cyanoacrylate glue

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Hemostasis

Central venous catheters

2013 Scoppettuolo et al. – Critical Care

***“Cyanoacrylate glue prevents early bleeding of the exit site after CVC or PICC placement”***

65 patients



Cyanoacrylate was effective in reducing bleeding after 1 and 24 hours

# Cyanoacrylate glue

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Hemostasis

Central venous catheters

2017 Kleidon et al. – Journal of Vascular and Interventional Radiology

***“A pilot randomized controlled trial of novel dressing and securement techniques in 101 pediatric patients”***

101 pediatric patients



Cyanoacrylate was effective in reducing bleeding

Reduced need to change dressing

# Cyanoacrylate glue

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Anti infective

Central venous catheters

2008 Wilkinson et al. - Anaesthesia

***“The antimicrobial effect of Histoacryl skin adhesive”***

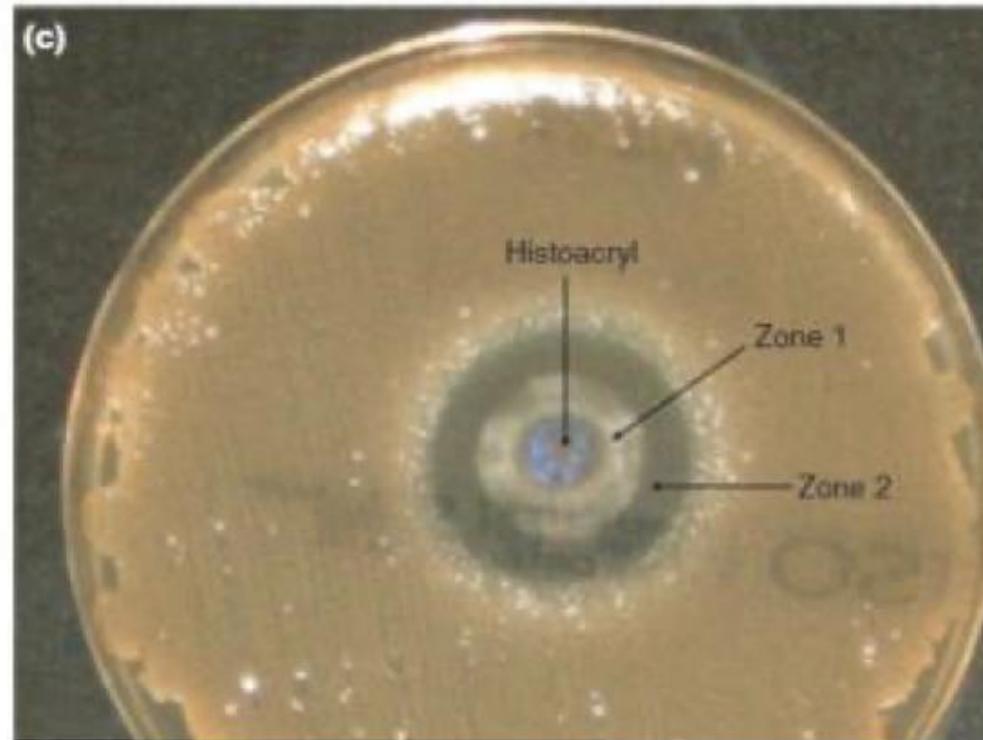
In vitro study



Antimicrobial action

Not on candida

Wilkinson JN, Chikhani M, Mortimer K, Gill SJ.  
 The antimicrobial effect of Histoacryl® skin  
 adhesive. *Anaesthesia*. 2008;63(12):1382–1384.



**Table 1** Diameters of bacterial growth around the Histoacryl® adhesive.

Organism	Mean drop diameter: mm	Mean zone 1 diameter: mm	Mean zone 2 diameter: mm
<i>Candida albicans</i>	5	13	0
<i>Enterococcus faecalis</i>	5	14	23
<i>Escherichia coli</i>	5	12	0
MRSA	5	13	21
MSSA	6	14	27
<i>Pseudomonas aeruginosa</i>	5	11	0
<i>Streptococcus pneumoniae</i>	6	11	23
Coagulase negative staphylococcus	5	13	21

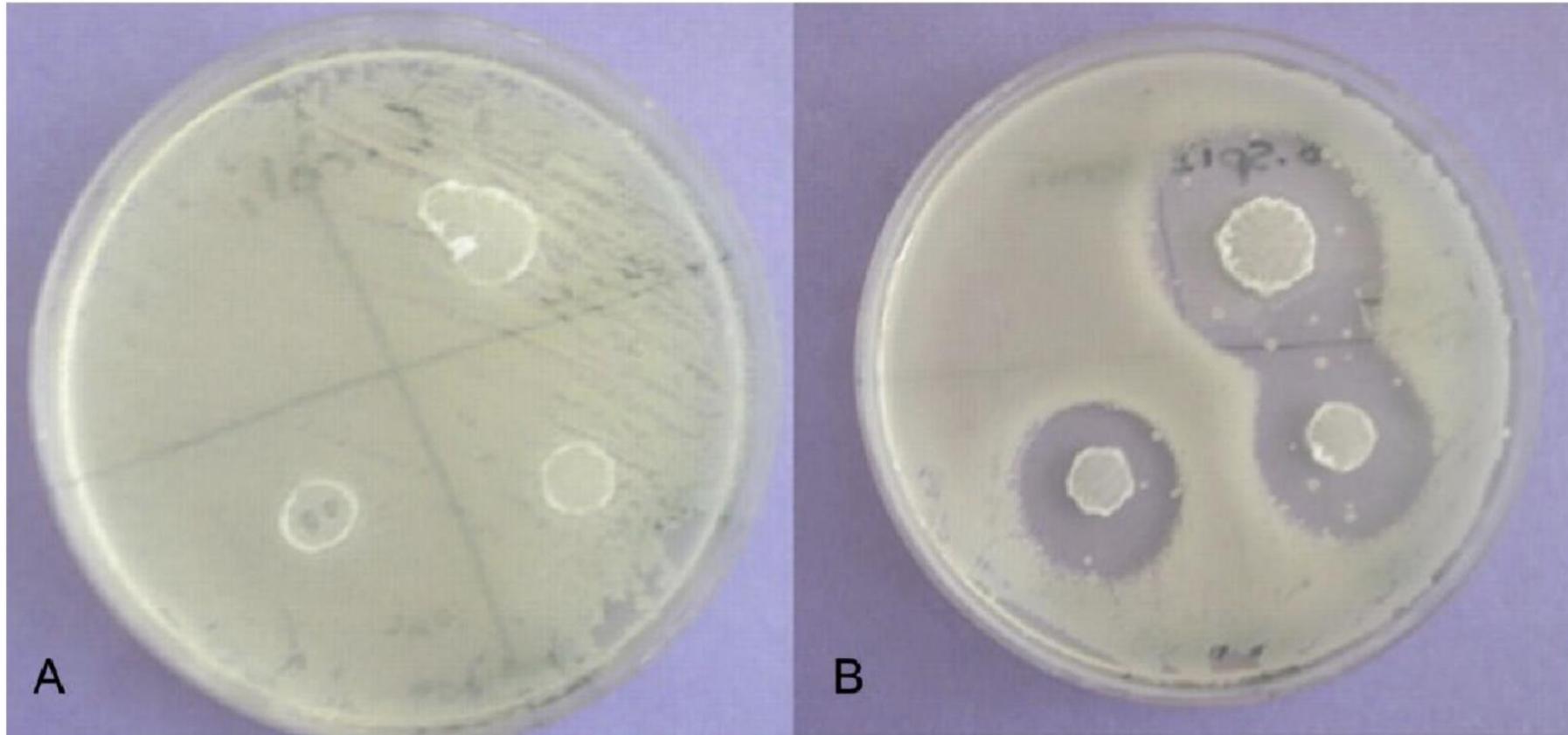


Figure 2. Photograph showing no inhibition of growth of a Gram-negative bacteria (A) and inhibition of growth of a Gram-positive bacteria (B) around the pellets of Dermabond®

Figure 2. Photograph showing no inhibition of growth of a Gram-negative bacteria (A) and inhibition of growth of a Gram-positive bacteria (B) around the pellets of Dermabond®

Published in Journal of infection prevention 2014

### **The antibacterial effect of 2-octyl cyanoacrylate (Dermabond®) skin adhesive**

J. Rushbrook, Grace White, Lizi Kidger, P. Marsh, T. Taggart



# Cyanoacrylate glue

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Anti infective

Central venous catheters

2020 Gilardi et al. – The Journal of Vascular Access

***“Reduction of bacterial colonization at the exit site of peripherally inserted central catheters: a comparison between chlorhexidine-releasing sponge dressings and cyano-acrylate”***

51 patients



As effective as chlohexidine as antimicrobial barreer, but less bleedings

# Cyanoacrylate glue

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Stabilization

Peripheral venous catheters

2015 Marsh et al. – The Journal of Vascular Access

***“Securement methods for peripheral venous catheters to prevent failure: a randomised controlled pilot trial”***



Cyanoacrilate was effective in stabilising peripheral venous catheters

# Cyanoacrylate glue

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Stabilization

Peripheral venous catheters

2021 Bahl et al. – The Journal of Vascular Access

***“Short peripheral intravenous catheter securement with cyanoacrylate glue compared to conventional dressing: a randomized controlled trial”***

350 patients



Cyanoacrylate was effective in stabilising peripheral venous catheters

# Cyanoacrylate glue

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Stabilization

Peripheral arterial catheters

2014 Edwards et al. – Critical Care and Resuscitation

***“A pilot trial of bordered polyurethane dressings, tissue adhesive and sutureless devices compared with standard polyurethane dressings for securing short-term arterial catheters”***

195 patients



Cyanoacrylate was effective in stabilising peripheral arterial catheters

# Cyanoacrylate glue

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Stabilization

Peripheral arterial catheters

2015 Reynolds et al. – Australian Critical Care

***"Novel technologies can provide effective dressing and securement for peripheral arterial catheters: a pilot randomized controlled trial in the operating theatre and the intensive care unit"***

123 patients



Cyanoacrylate was cost-effective in stabilising peripheral arterial catheters



# Our experience

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Neonatal PICCs

413

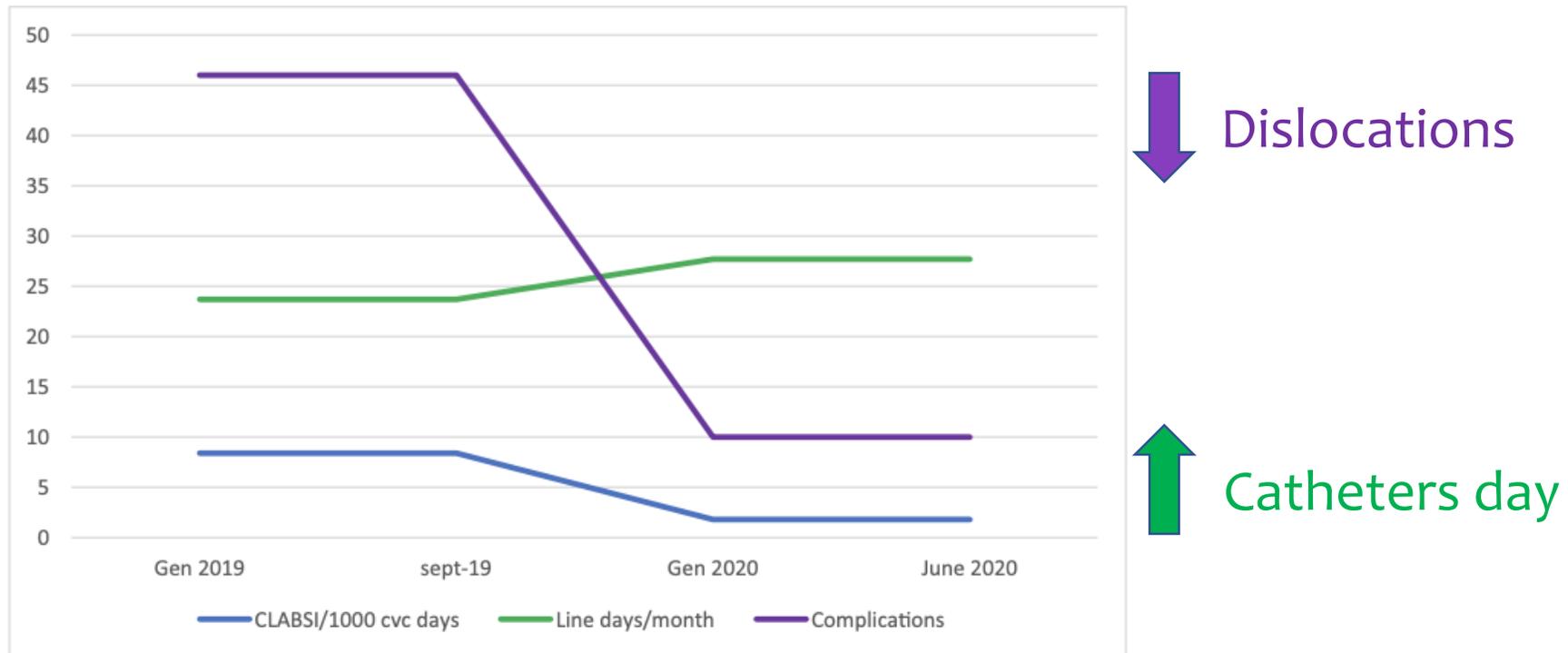
CICCs

391

No ruptures  
No complications  
No irritation of the skin

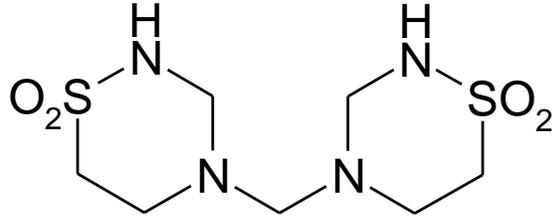
## How to minimize central line-associated bloodstream infections in a neonatal intensive care unit: a quality improvement intervention based on a retrospective analysis and the adoption of an evidence-based bundle

Stéphanie Bierlaire<sup>1</sup> · Olivier Danhaive<sup>1,2</sup> · Katherine Carkeek<sup>1</sup> · Fiammetta Piersigilli<sup>1,3</sup> 



# Taurolidine

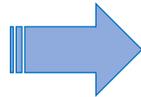
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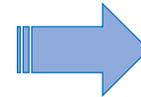
Derived from the aa Taurine

Large spectrum antimicrobial activity

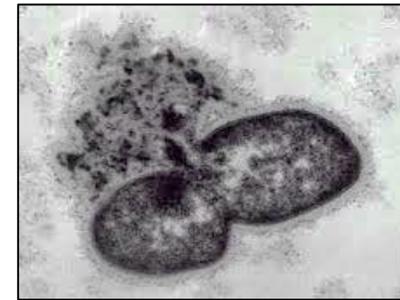
Reacts with bacterial surface



Bacteriostatic effect



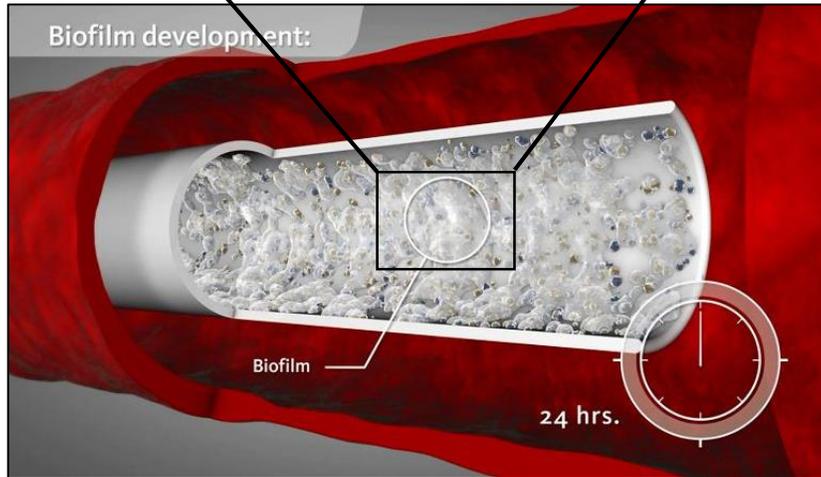
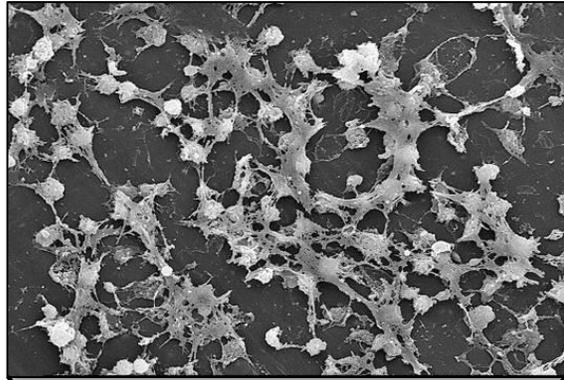
Bactericidal effect



Death

# Taurolidine

## The biofilm



## In vitro activity

### Antimicrobial spectrum

In vitro activity of taurolidine (MIC<sub>50</sub> mg/ml)

Staph. aureus	0,25 – 0,5	Acinetobacter spec.	0,5
Staph. epidermidis	0,25 – 0,5	Moraxella catarrhalis	0,5
Enterococcus faecalis	0,25	Pseud. aeruginosa	0,5 – 1,0
Strept. haemolyticus	0,125 – 0,25	Bacteroides fragilis	0,25
Strept. pneumoniae	0,125 – 0,25	Bact. thetaiotaomicron	0,25
Strept. viridans	0,25	Burkholderia cepacia	0,5
Klebs. pneumoniae	0,25 – 0,5	Clostridium difficile	0,125
Klebs. oxytoca	0,125 – 0,5	Clostridium perfringens	0,125
Enterobacter cloacae	0,5	Corynebacterium spec.	0,25
Enterobacter aerogenes	0,5	Peptostreptococcus spec.	0,125 – 0,25
Citrobacter freundii	0,5	Peptococcus spec.	0,125
Proteus mirabilis	0,25 – 0,5	Fusobacterium	0,125 – 0,25
Proteus vulgaris	0,25 – 0,5	Salmonella thypimurium	0,8
Morganella morganii	0,25 – 0,5	Shigella flexneri/sonnei	0,8
Serratia marcescens	0,125 – 0,5	Candida albicans	0,5 – 1,0
Listeria monocytogenes	0,5	Rhodotorula spec.	0,125 – 0,5

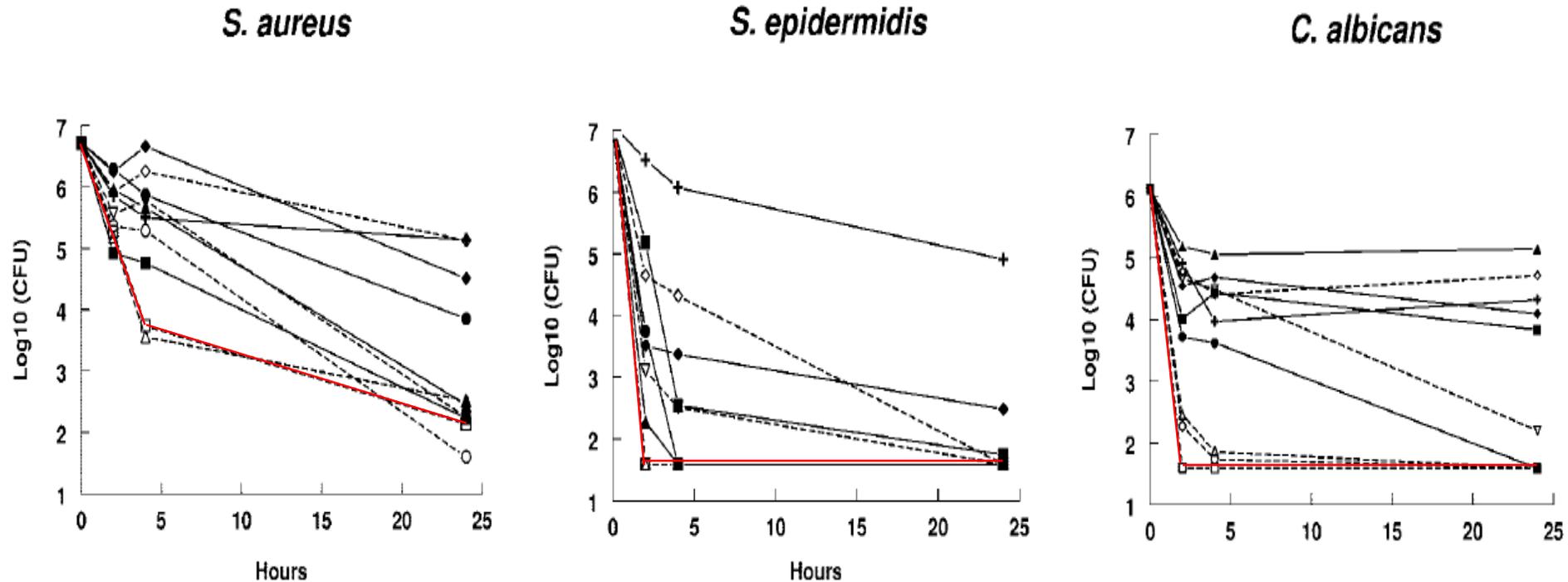
Torres-Viera et al. 2000, Nösner & Focht 1994

Acts also on resistant microorganisms

Does not develop resistance

# Taurolidine

Efficacy of taurolidine lock vs antibiotic lock



— Taurolidine

Sherertz et al. Antimicrobial Agents and Chemotherapy. 2006

# Taurolidine

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Taurolidine 2%  
without citrate

New formulation, can be used also in  
children and **neonates**

# Taurolidine - Therapy

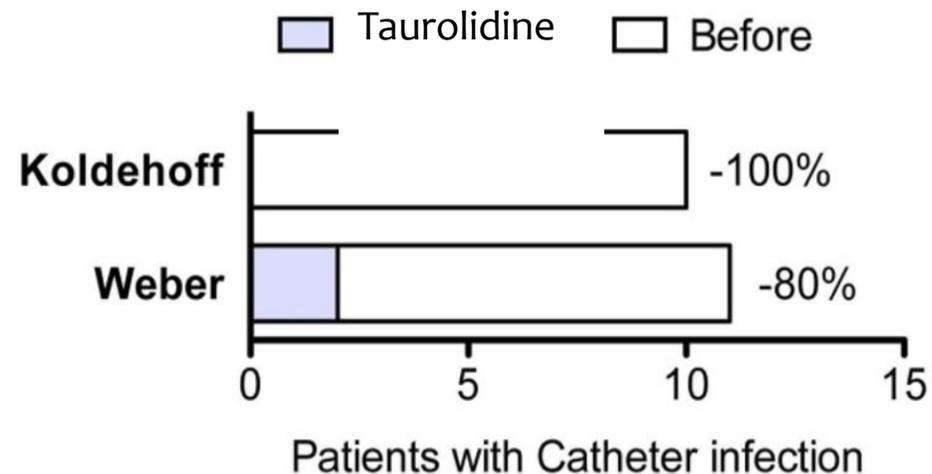
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Lock of at least 2 hours

Volume = priming volume of CVCx 2

In neonates, if possible, aspirate the lock

## CLABSI reduction



# Taurolidine – Our experience

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## Preventive Lock

15 term neonates  
8 preterm

Catheters 2Fr – 3 Fr

From the first day  
till removal

Every 48 hours

## Therapeutic Lock

10 term neonates  
3 preterm

Catheters 2Fr – 3 Fr

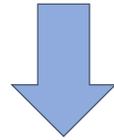
7 days

Every 24 hours

# Taurolidine – Our experience

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Lock: 0.3 - 0.5 ml



After the lock try to reaspirate the lock,  
otherwise just flush it with saline

## Side effects

In one neonate nausea and vomit after the flush

Not always possible to close the catheter  
(vasoactive drugs, hypoglycemia)



# Take home messages

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Use the right catheter for the right patient with the right technique

Use always the Bundles

Replace silicone with polyurethane

Replace sutures with sutureless devices

Use cyanoacilate glue and transparent dressings

Consider taurolidine lock to reduce CLABSI



# NEVAT - Neonatal European Vascular Access Team



Are you interested in  
joining the group?  
Go to the website by scanning



*The Neonatal European  
Vascular Access Team*

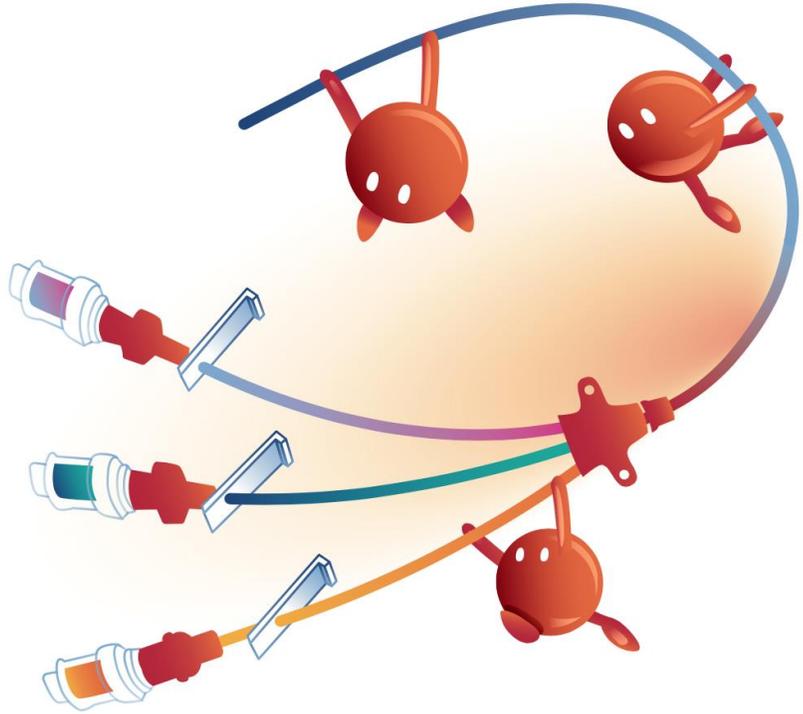
<https://neonat.org/>

**NEVAT** – Neonatal European Vascular Access Team



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Thank You