Tip location dei CICC mediante ecoscopia transtoracica: lo stato dell'arte

Dr. Antonio Gidaro
U.O.C. Medicina Generale / Vascular Access Team
H. Sacco Milan

Summary

- Why should we know ECHOTIP?
- The ECHOTIP: tip navigation
- The ECHOTIP: echocardiography
- The ECHOTIP: direct tip location
- The ECHOTIP: indirect tip location
- New perspective on ECHOTIP

Why should we know ECHOTIP?

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Editorial

JVA | The Journal of Vascular Access

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

Antonio La Greca[1], Emanuele Iacobone[2], Daniele Elisei[2], Daniele Guerino Biasucci[3], Vito D'Andrea[4], Giovanni Barone[5], Geremia Zito Marinosci[6] and Mauro Pittiruti[1]

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form, easy to learn, inexpensive, and very accurate.[11] On the other hand, the conventional technique of IC-ECG—as originally described—may be not applicable or not feasible in some clinical conditions when the P wave is not present or not easy to identify (atrial fibrillation, active pacemakers, and several types of arrhythmias); as a result, a significant percentage of patients may not benefit from IC-ECG (up to 10% in selected geriatric or cardiac hospitalized patients). Even though a new modified technique of IC-ECG has been described to be applicable in atrial fibrillation patients,[12] still in a significant percentage of patients IC-ECG may not be applicable (continuously active atrial pacemakers) or not feasible (trembling or uncooperating patients, technical problems due to electric interferences or device failure, emergency). In such conditions, ultrasound-based tip location may be an attractive alternative option.[1,5,7,9]

9-10-11 dicembre | *december 9th-10th-11th*

Why should we know ECHOTIP? Atrial Fibrillation

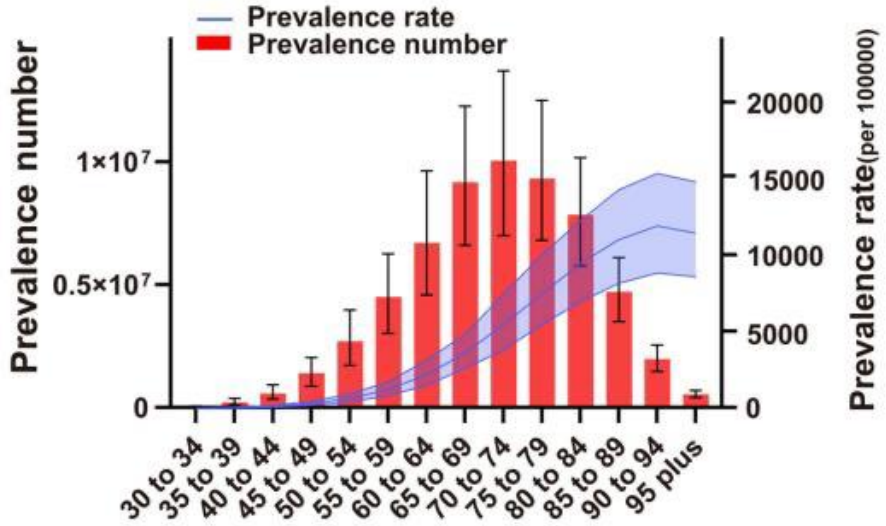
Li et al. BMC Public Health (2022) 22:2015
https://doi.org/10.1186/s12889-022-14403-2

BMC Public Health

RESEARCH Open Access

Global, regional, and national burden of disease study of atrial fibrillation/flutter, 1990–2019: results from a global burden of disease study, 2019

Hong Li[1†], Xuejing Song[1†], Yi Liang[1], Xue Bai[2], Wu-Sha Liu-Huo[2], Chao Tang[2], Wen Chen[1] and Lizhi Zhao[2*]



- The prevalence of AF is very low among young individuals (< 40 years) but increases with age, reaching between 10% and 17% in those aged > 80 years.

Why should we know ECHOTIP? Atrial Fibrillation

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Research

International Journal of Stroke WSO

International Journal of Stroke
2021, Vol. 16(2) 217–221

DOI: 10.1177/1747493019897870
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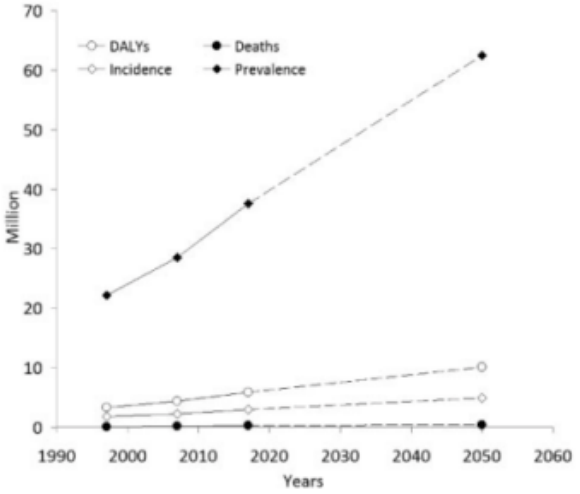
Global epidemiology of atrial fibrillation: An increasing epidemic and public health challenge

Giuseppe Lippi[1], Fabian Sanchis-Gomar[2] and Gianfranco Cervellin[3]

Figure 1. Worldwide burden of AF, reported in terms of frequency, prevalence, cause-specific disability-adjusted life year (DALYs), and mortality. The dotted line represents an approximation based on the linear trend observed during the past 20 years (i.e. between 1997 and 2007).



Future projections suggest that the absolute atrial fibrillation burden may increase by >60% in 2050.

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Why should we know ECHOTIP? Atrial Fibrillation

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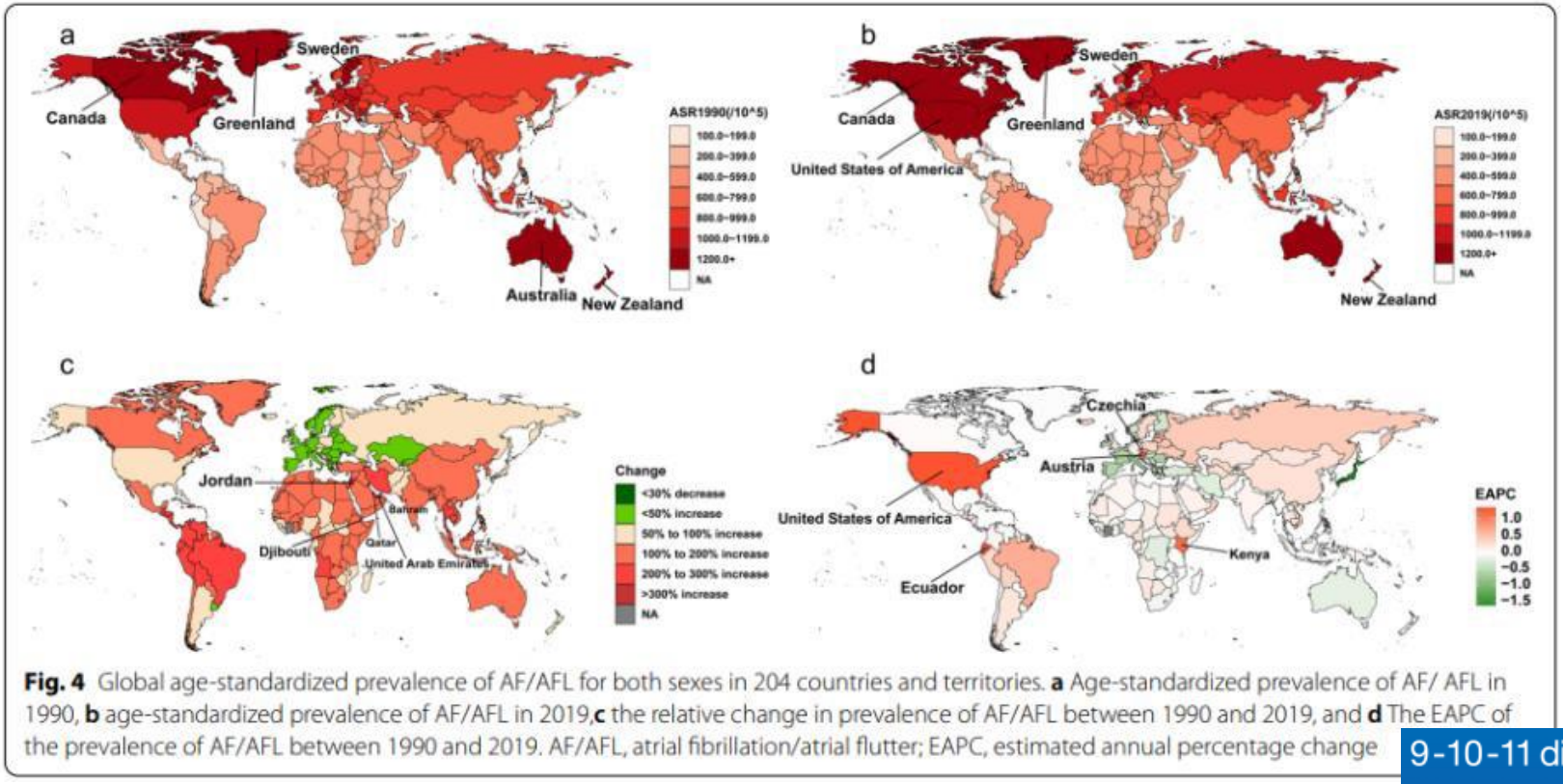

Fig. 4 Global age-standardized prevalence of AF/AFL for both sexes in 204 countries and territories. **a** Age-standardized prevalence of AF/ AFL in 1990, **b** age-standardized prevalence of AF/AFL in 2019,**c** the relative change in prevalence of AF/AFL between 1990 and 2019, and **d** The EAPC of the prevalence of AF/AFL between 1990 and 2019. AF/AFL, atrial fibrillation/atrial flutter; EAPC, estimated annual percentage change

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Why should we know ECHOTIP? Atrial Fibrillation

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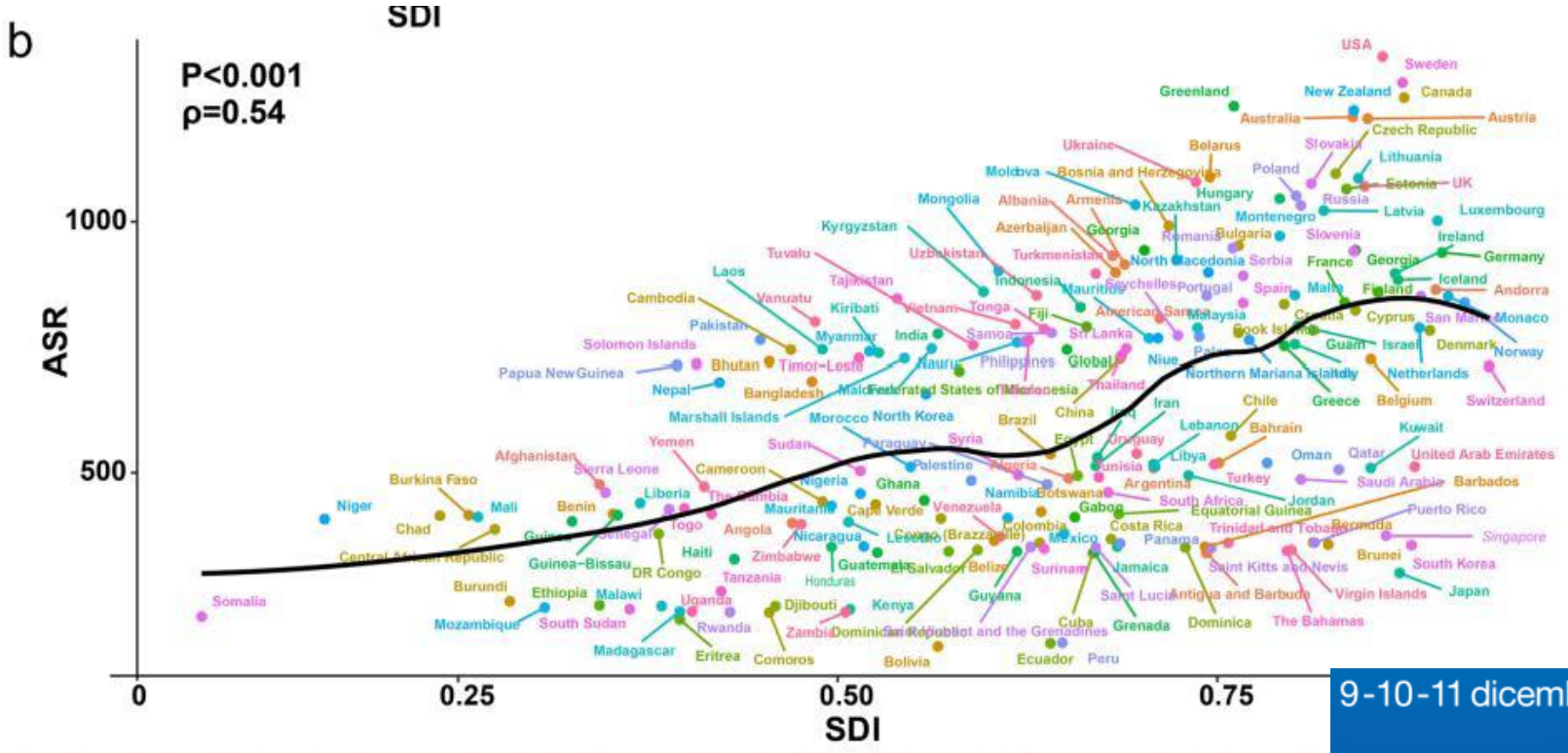

Fig. 5 Age-standardised DALYs rates for AF/AFL for 21 GBD regions (**a**) and 204 countries and territories (**b**) by Socio-demogra
2019 Expected values based on Socio-demographic Index and disease rates in all locations are shown as the black line. DALYs
life-years. GBD = Global Burden of Diseases, Injuries, and Risk Factors Study

9-10-11 dicembre | *december 9th-10th-11th*

Why should we know ECHOTIP? Atrial Fibrillation

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European Heart Journal Acute Cardiovascular Care
ESC European Society of Cardiology

Original scientific paper

Atrial fibrillation detected initially during acute medical illness: A systematic review

European Heart Journal: Acute Cardiovascular Care
2019, Vol. 8(2) 130–141

DOI: 10.1177/2048872618799748
journals.sagepub.com/home/acc
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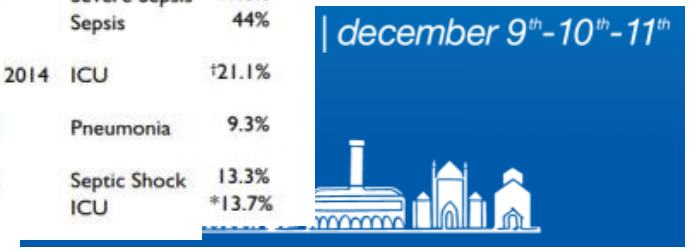
William F McIntyre[1,2], Kevin J Um[1], Christopher C Cheung[3], Emilie P Belley-Côté[1], Orvie Dingwall[4], Philip J Devereaux[1], Jorge A Wong[1], David Conen[1], Richard P Whitlock[1], Stuart J Connolly[1], Colette M Seifer[2] and Jeff S Healey[1]

- In medical patients, the incidence ranges from 1% to 46% across different patient cohorts.
- The incidence of acute AF varies with the severity of sepsis, with an incidence of 8% to 10% in sepsis, 6% to 22% in severe sepsis, and 23% to 44% in septic shock

		Incidence
Ambrus, 2015	ARDS	†7.6%
Arora, 2007	ICU	†38.7%
Asfar, 2014	Septic Shock	4.8%
Baumfeld, 2014	ICU	†5.8%
Calvo, 2005	PE	6.5%
Chen, 2015	ICU	7.2%
Cheng, QJM 2017	Sepsis	†1.9%
Cheng, JSCD 2017	Sepsis	†1.1
Cuculi, 2006	Alcohol	2.0%
Duarte, 2017	ICU	12.2%
Dunser, 2003	Septic Shock	†34.5%
Hayase, 2016	Septic Shock	†5.3%
Guenancia, 2015	Septic Shock	44%
Jaffer, 2016	Septic Shock	21.8%
Klein, 2014	Sepsis	†24.3%
Koyfman, 2015	Sepsis	†23.7%
Launey, 2017	Septic Shock	21.8%
Lewis, 2016	Severe Sepsis	19.8%
Liu, 2016	Sepsis	44%
Makyrgiannis, 2014	ICU	†21.1%
Mandal, 2011	Pneumonia	9.3%
Morelli, 2009	Septic Shock	13.3%
Moss, 2017	ICU	*13.7%



Why should we know ECHOTIP? Atrial Fibrillation

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Circulation

AHA SCIENTIFIC STATEMENT

Atrial Fibrillation Occurring During Acute Hospitalization: A Scientific Statement From the American Heart Association

Janice Y. Chyou, MD, FAHA, Chair; Ebrahim Barkoudah, MD, MPH; Jonathan W. Dukes, MD; Larry B. Goldstein, MD, FAHA; Jose A. Joglar, MD, FAHA; Anson M. Lee, MD; Steven A. Lubitz, MD, MPH, FAHA; Keith A. Marill, MD, MS; Kevin B. Sneed, PharmD; Megan M. Streur, PhD, ARNP; Graham C. Wong, MD, MPH, FAHA; Rakesh Gopinathannair, MD, MA, FAHA, Vice Chair; on behalf of the American Heart Association Acute Cardiac Care and General Cardiology Committee, Electrocardiography and Arrhythmias Committee, and Clinical Pharmacology Committee of the Council on Clinical Cardiology; Council on Cardiovascular Surgery and Anesthesia; Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation; Council on Cardiovascular and Stroke Nursing; and Stroke Council

- Noncardiac surgery, 3% to 16% of patients develop acute AF
- Postoperative AF in the setting of cardiac surgery is common, affecting ≈32% of patients after coronary artery bypass grafting, 49% of patients after concomitant coronary artery bypass grafting and aortic valve replacement, and 64% of patients after coronary artery bypass grafting and mitral valve replacement

Why should we know ECHOTIP? Pacemaker

Health care delivery, economics and global health care

openheart

Trends in the incidence and prevalence of cardiac pacemaker insertions in an ageing population

Pamela J Bradshaw,[1] Paul Stobie,[2] Matthew W Knuiman,[1] Thomas G Briffa,[1] Michael S T Hobbs[1]

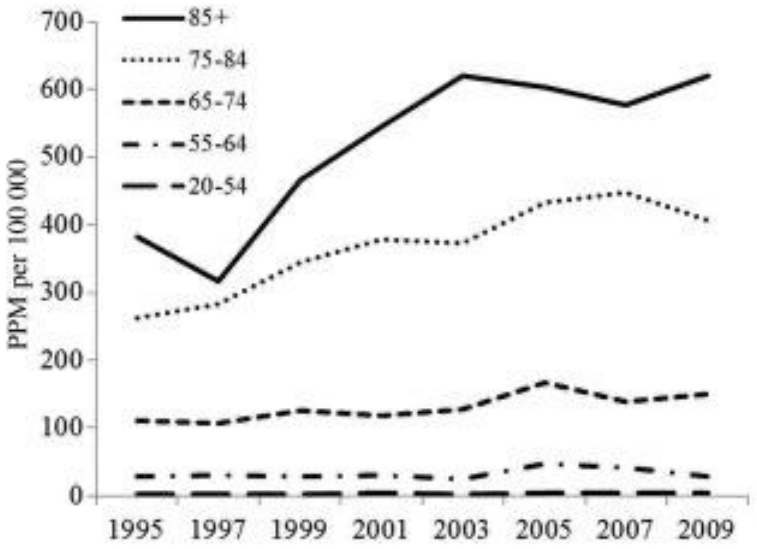

Figure 1 Trends in prevalence-adjusted incidence of permanent pacemaker insertion (per 100 000) by age group, 1995–2009.

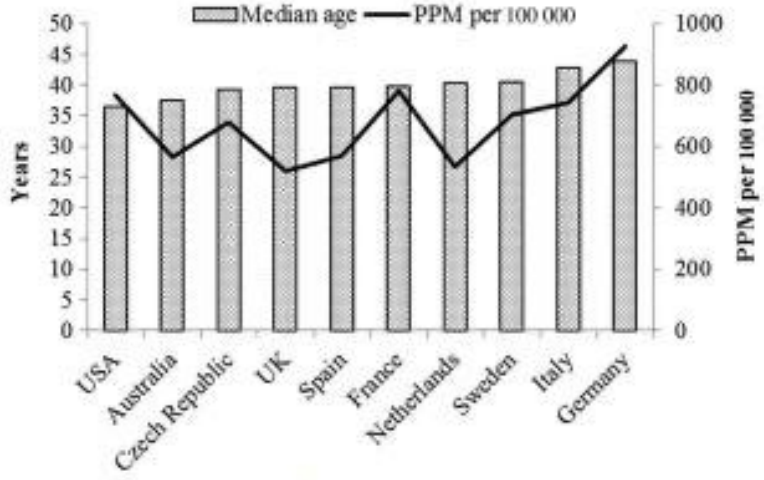

Figure 4 Median age[32] and new cardiac pacemaker implants per million[7] for 10 developed countries in 2009 (PPM, permanent pacemaker).

Editorial

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

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1. Tip navigation: ultrasound-based visualization of the guidewire and/or of the catheter to verify the correct direction into the superior vena cava (SVC) or inferior vena cava (IVC).
2. Tip location by direct visualization of the final position of the tip of the catheter, usually at the junction between right atrium and SVC or between right atrium (RA) and IVC.
3. Tip location by indirect visualization of the final position of the tip of the catheter, using the so-called "bubble test" (visualization of micro-bubbles inside the vasculature after injection of saline or saline/air mixture into the catheter)

Tip Navigation

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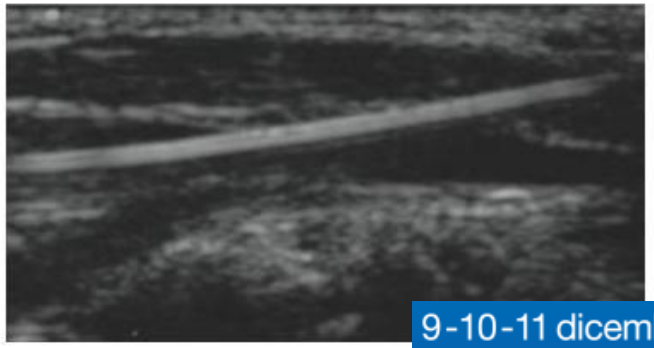
Tip navigation: ultrasound-based visualization of the guidewire and/or of the catheter to verify the correct direction into the superior vena cava (SVC) or inferior vena cava (IVC).



9-10-11 dicembre | *december 9th-10th-11th*

Visualization of the guidewire Why?

- Deadline before insertion of introducer
- The catheter will follow the guire; if the guire takes a collateral vein the catheter will make the same wrong direction

Visualization of the catheter Why?

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EXPERIMENTAL AND THERAPEUTIC MEDICINE 6: 891-893, 2013

Malposition of peripherally inserted central catheter: Experience from 3,012 patients with cancer

LINPING SONG and HUI LI

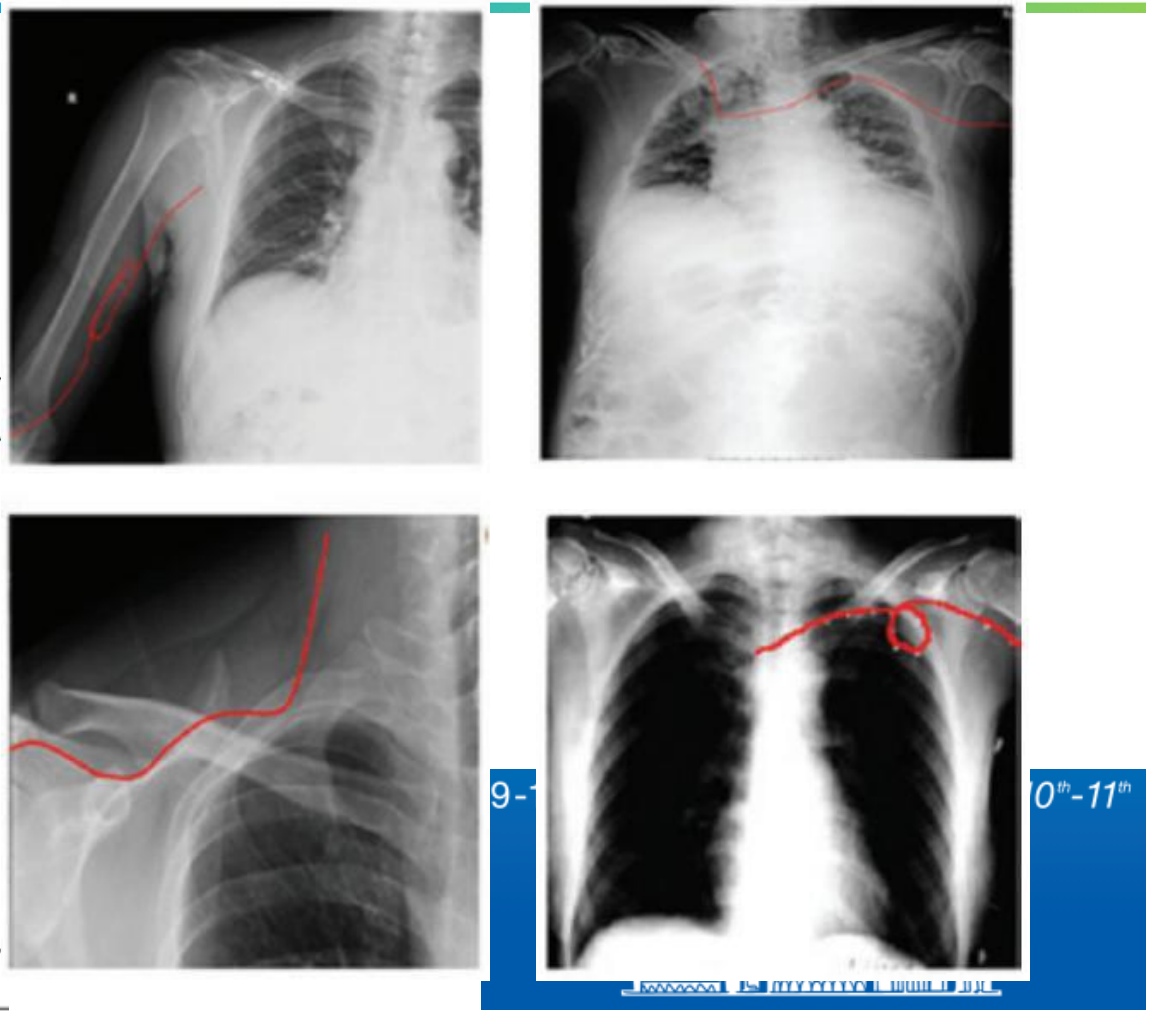
Department of Oncology, The First Affiliated Hospital of Chinese PLA General Hospital, Beijing 100048, P.R. China

Received March 5, 2013; Accepted June 5, 2013

Table I. Two hundred and thirty-seven cases of malpositioned PICC.

Location	During PICC insertion
Right atrium	2
Right ventricle	1
Radial vein	1
Jugular vein	77
Brachial vein	19
Fold in basilic vein	3
Fold from basilic vein back into cephalic vein	2
Fold from cephalic vein back into basilic vein	1
Fold in cephalic vein	1
Catheter prolapse	0
Axillary vein	45
Contralateral subclavian vein	7
Azygos vein	5
Total	164

PICC, peripherally inserted central catheter.



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

Table 1. (a) ECHOTIP protocol for CICCs.

	Probe	Technique
Tip navigation	7–12 MHz linear probe	Visualization of the cannulated vessel (wire/catheter inside the vein)
		Visualization of the deep vessels of neck and chest according to RaCeVA
Tip location	2–6 MHz sectorial probe	Immediate visualization (<1 s) of bubbles in RA after flushing
	As alternative option:	First option: subcostal views (four-chamber or bi-caval)
	3–8 MHz convex probe	Second option: four-chamber apical view

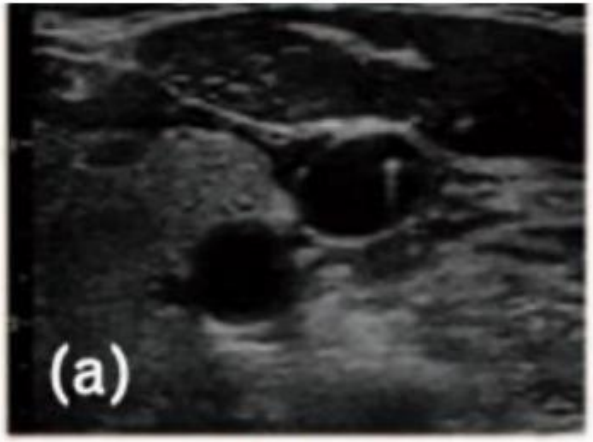
(b) ECHOTIP protocol for PICCs.

	Probe	Technique
Tip navigation	7–12 MHz linear probe	Visualization of the deep veins of the arm and of the infra/supraclavicular area according to RaPeVA and RaCeVA
Tip location	2–6 MHz sectorial probe	Immediate visualization (<2 s) of bubbles in RA after flushing
	As alternative option:	First option: subcostal views (four-chamber or bi-caval)
	3–8 MHz convex probe	Second option: four-chamber apical view

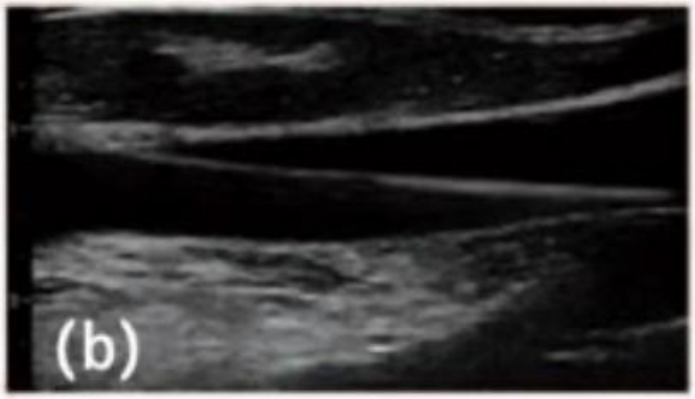
(c) ECHOTIP protocol for FICCs.

	Probe	Technique
Tip navigation	7–12 MHz linear probe (femoral vein and external iliac vein)	Visualization of the deep vessels of the lower limb according to RaFeVA
	3–8 MHz convex probe (common iliac vein and IVC)	Visualization of IVC in short and long axis views
Tip location	2–6 MHz sectorial probe	Visualization of bubbles after flushing
	As alternative option: 3–8 MHz convex probe	Tip in IVC: immediate visualization of bubbles in IVC
		Tip in RA or at the junction RA/IVC: immediate visualization of bubbles in RA

Tip navigation
Guidewire visualization



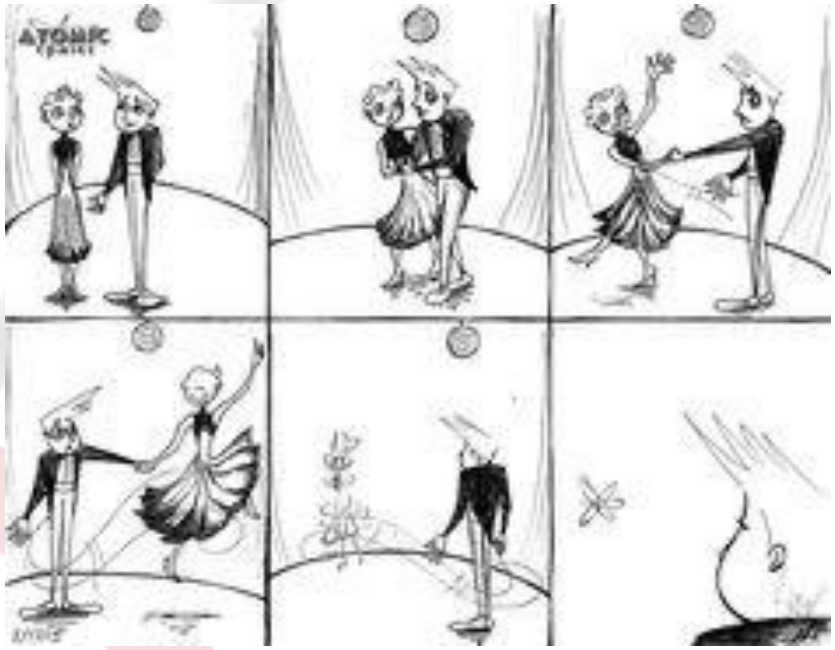
Short axis



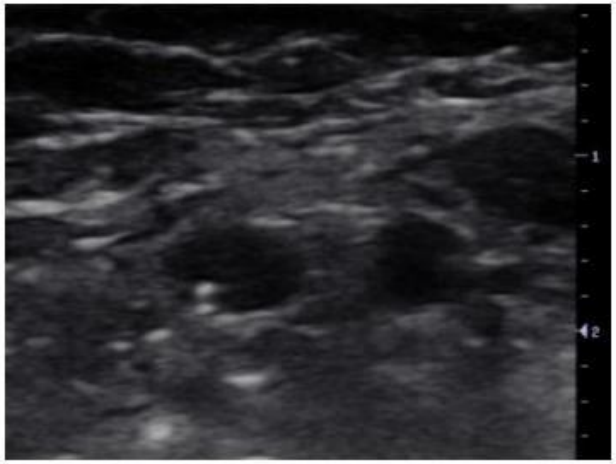
Long axis

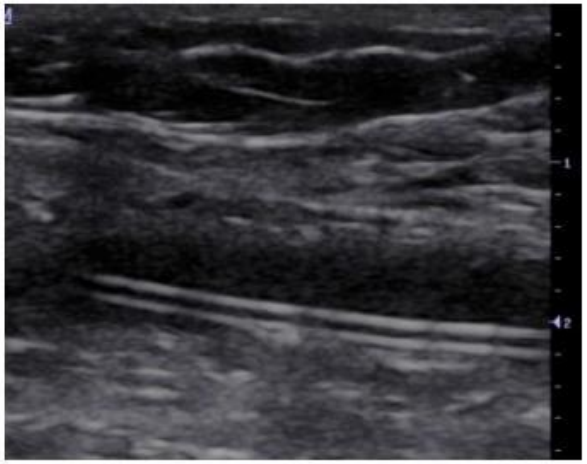
Visualization of the guidewire toward brachio-cephalic vein and SVC

A little trick: Let’s dance the guire!



Visualization of the catheter in the vein

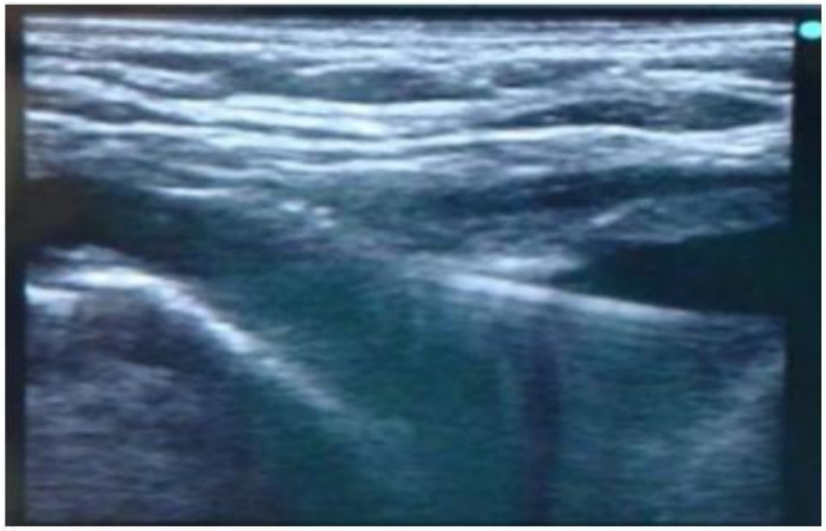




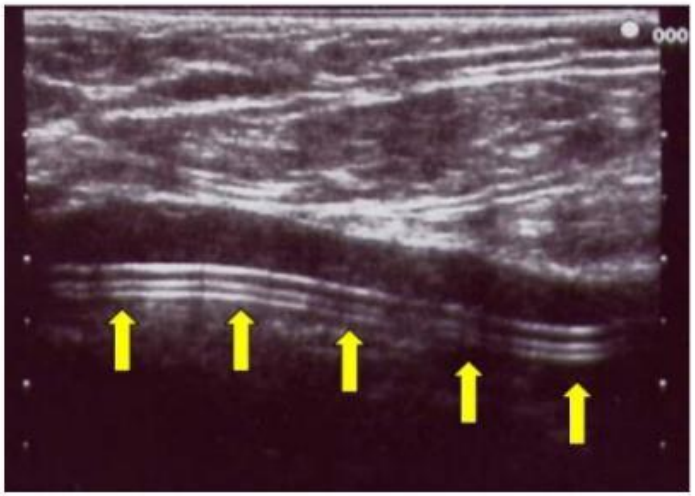
short axis view

long axis view

Tip navigation



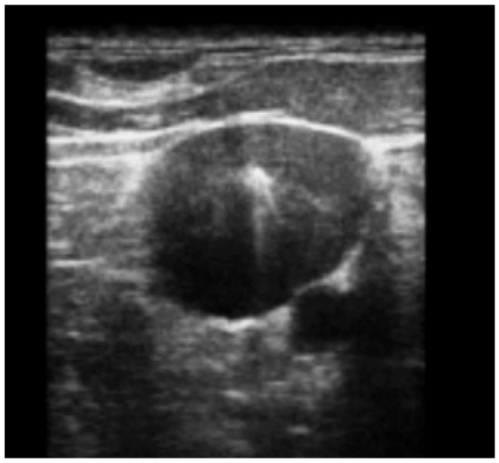
Guidewire



Catheter

… but the final position of the tip can not be properly assessed

Tip navigation

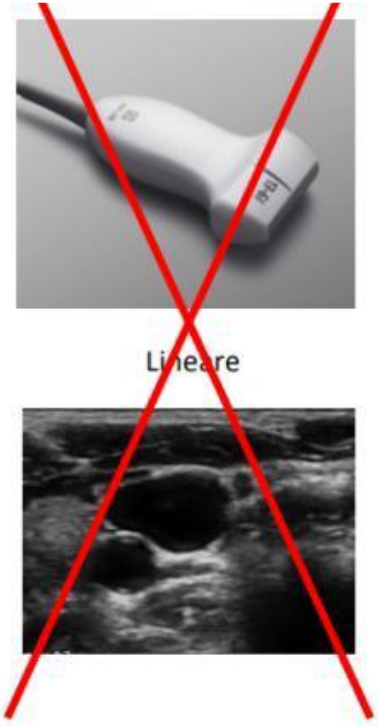


- Overall feasibility 96%
- Specificity 100%
  (no false positives)

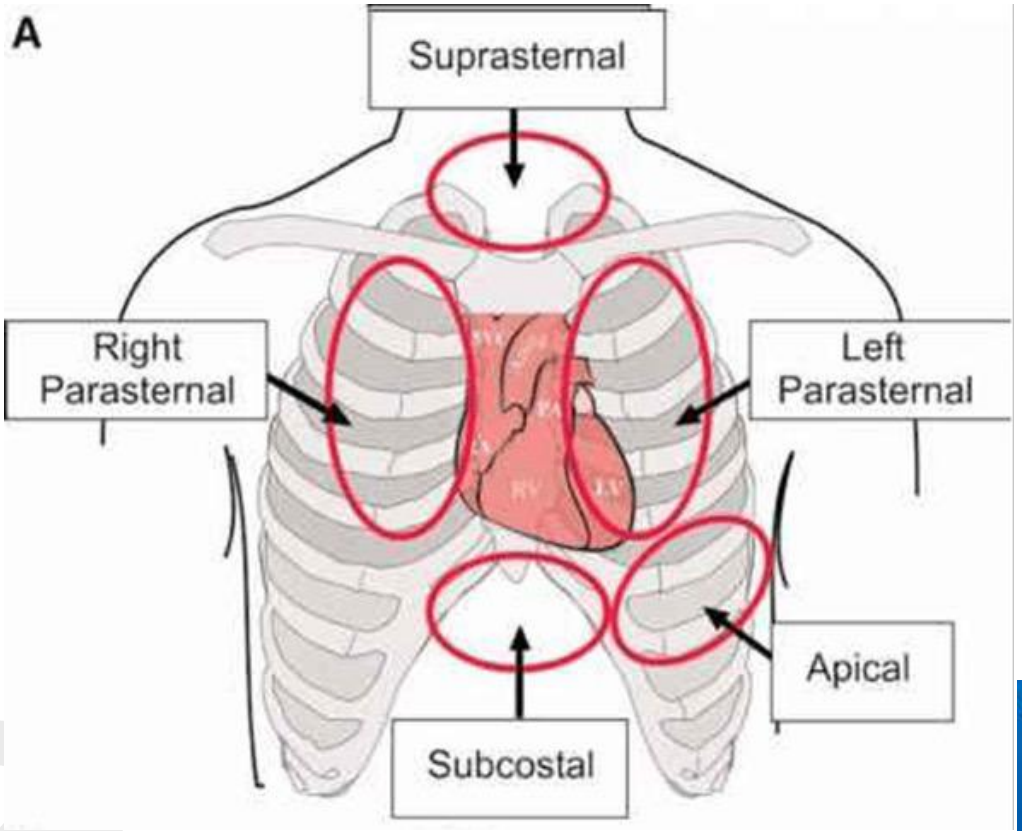
LIMITS

- While the guidewire can be easily visualized in SVC, the catheter is not easily identified, unless it still has the guidewire inside.
- Some case of false negative has been described

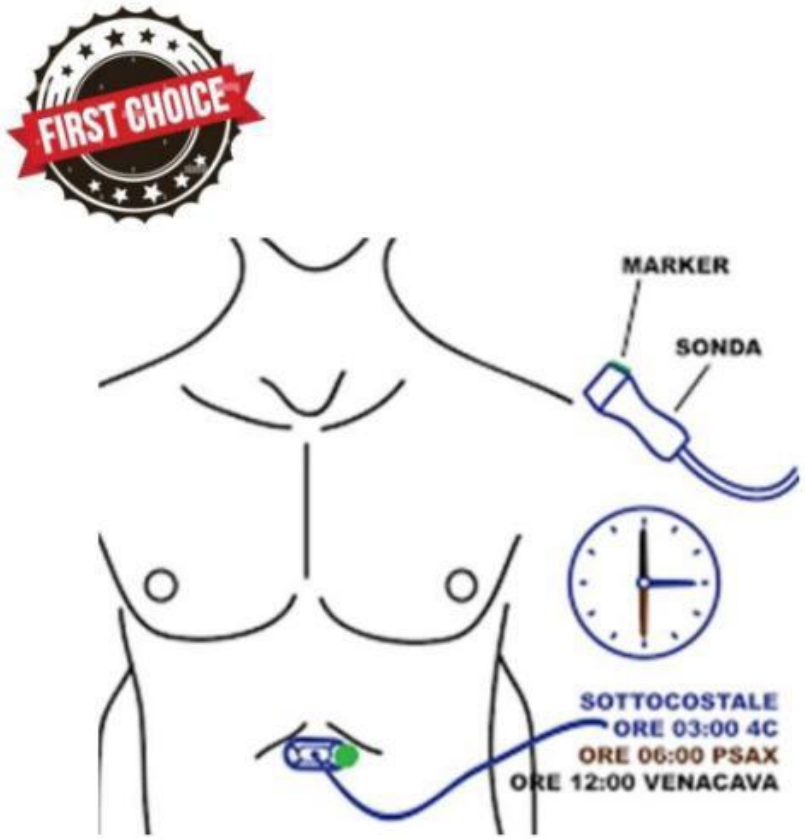
The ECHOTIP: echocardiography Probe

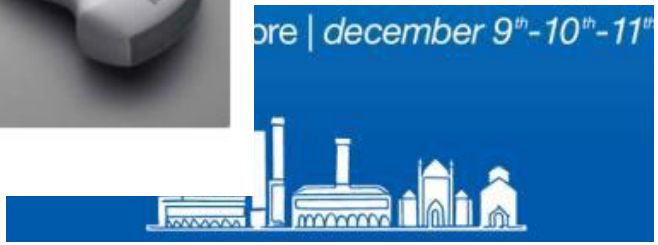


The ECHOTIP: echocardiography view

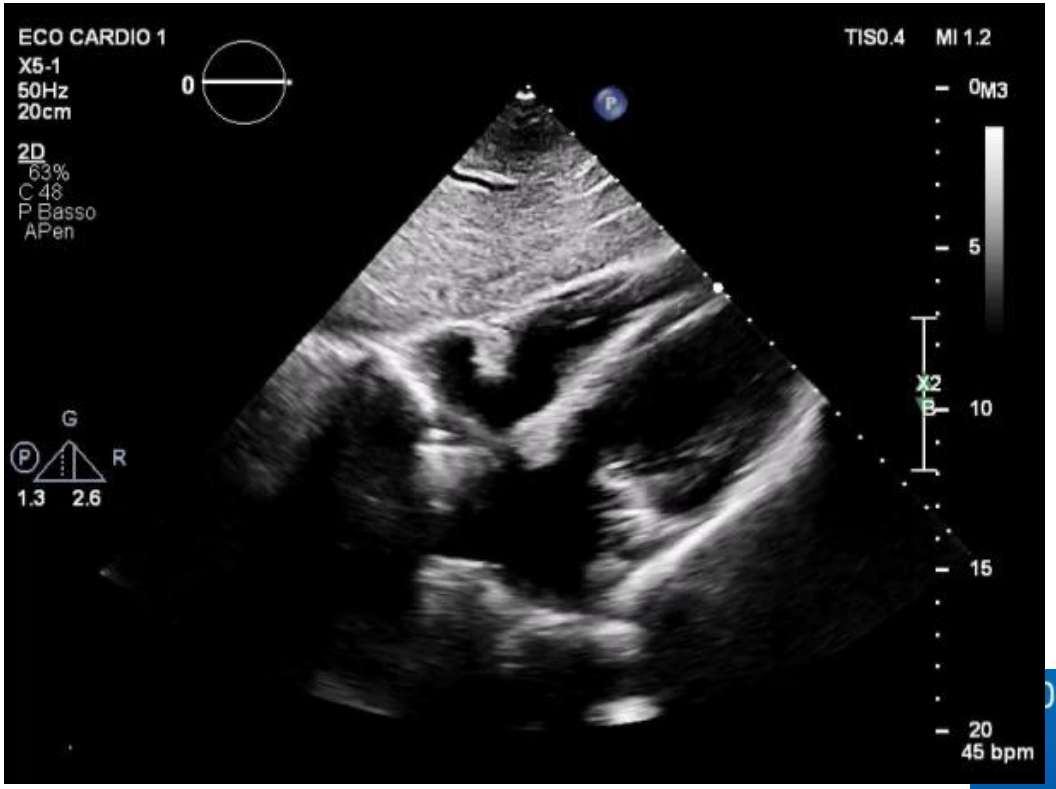


The ECHOTIP: echocardiography subcostal view

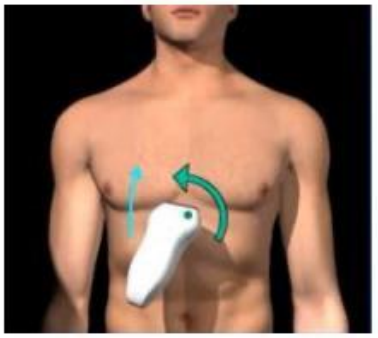




Subcostal longitudinal 4 chambers

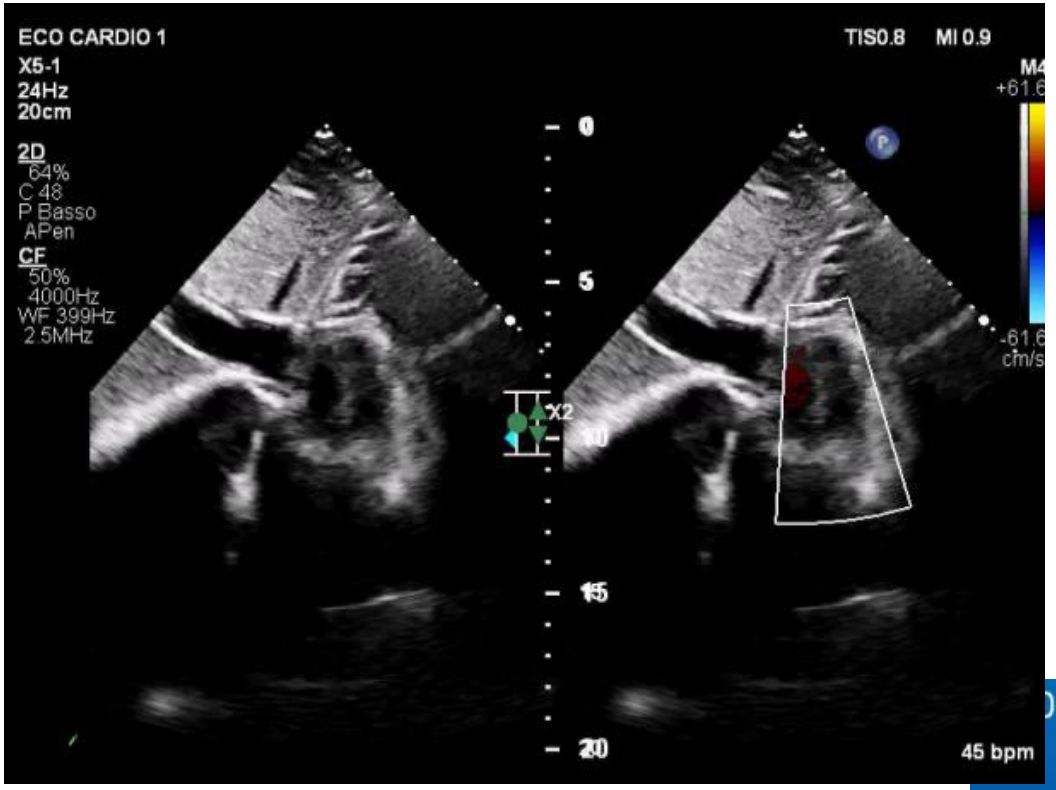


Subcostal oblique (Bicaval vein)



Marker at 12 o'clock

Subcostal oblique (Bicaval vein)



A little trick: take a breath!

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9-10-11 dicembre | *december 9th-10th-11th*

A little trick: hands over the probe!

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9-10-11 dicembre | *december 9th-10th-11th*

Apical four chambers

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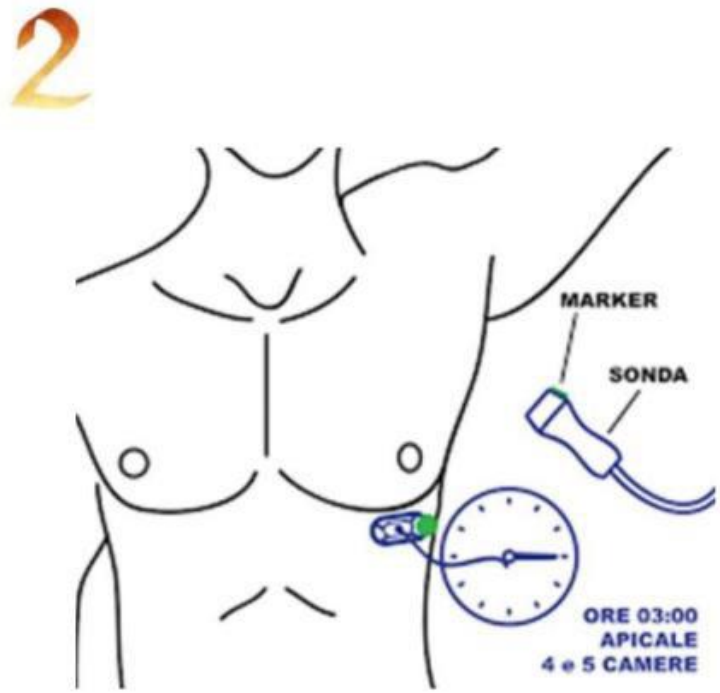
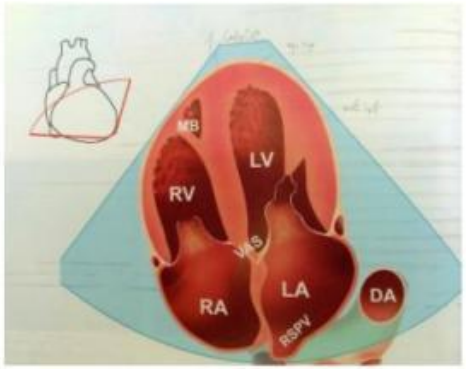
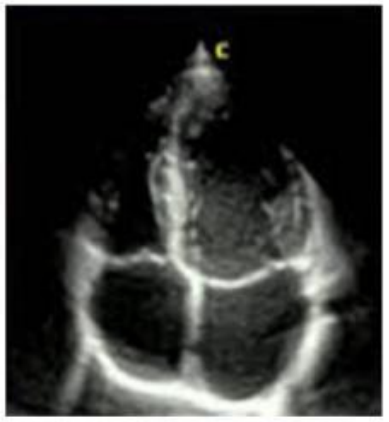
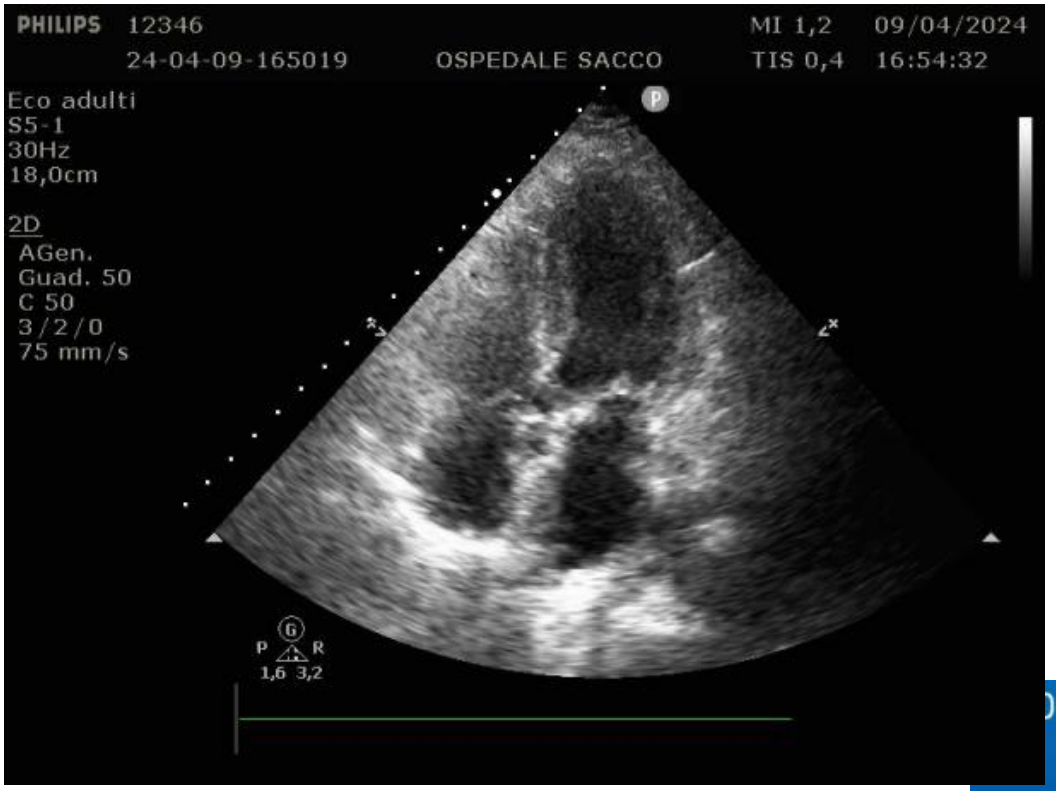






Apical four chambers



A little trick: left side lying!

Editorial

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Tip location by direct visualization of the tip

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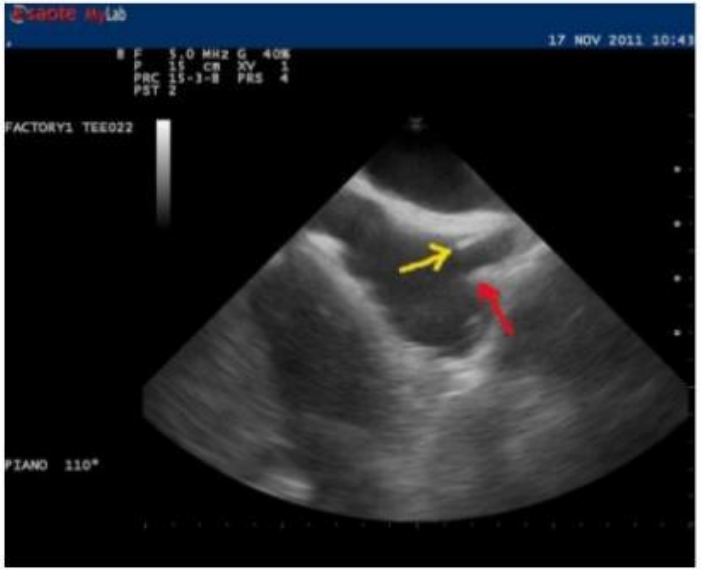
CRITICAL CARE

Transoesophageal echocardiographic evaluation of central venous catheter positioning using Peres' formula or a radiological landmark-based approach: a prospective randomized single-centre study†



- The most accurate method for tip location
- Invasive
- Logistically impossible in the vast majority of patients
- Feasible for CICCs before/during cardiac surgery
- Not feasible for PICCs
- It requires a hard training for operators.

British Journal of Anaesthesia, 118 (2): 215–22 (2017)

Tip location by direct visualization of the tip

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of the final position of the tip.[22] The method of direct visualization of the tip by ultrasound had high feasibility (94.1%) and high specificity (98.9%)[15–19,22,27]; its sensitivity was evaluated only in six studies[15–19,22] and estimated to be 78.4%, though quite variable from study to study.

One critical issue is the training of the operators. In

9-10-11 dicembre | *december 9th-10th-11th*

Editorial

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

Antonio La Greca[1], Emanuele Iacobone[2], Daniele Elisei[2], Daniele Guerino Biasucci[3], Vito D'Andrea[4], Giovanni Barone[5], Geremia Zito Marinosci[6] and Mauro Pittiruti[1]

JVA | The Journal of Vascular Access

The Journal of Vascular Access
2023, Vol. 24(4) 535–544

DOI: 10.1177/1129729821044325
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1. Tip navigation: ultrasound-based visualization of the guidewire and/or of the catheter to verify the correct direction into the superior vena cava (SVC) or inferior vena cava (IVC).
2. Tip location by direct visualization of the final position of the tip of the catheter, usually at the junction between right atrium and SVC or between right atrium (RA) and IVC.
3. Tip location by indirect visualization of the final position of the tip of the catheter, using the so-called "bubble test" (visualization of micro-bubbles inside the vasculature after injection of saline or saline/air mixture into the catheter).

Infusion Therapy Standards of Practice

2. Consider the use of ultrasound for CVAD tip location. The clinical applicability of this is currently limited by the small sample sizes used to demonstrate its efficacy as a reliable and safe method to replace chest radiographs in all ages, and its usefulness is limited by the knowledge, skill, and experience of the operator.[6,33-38] (III)
   a. The addition of agitated saline to enhance transthoracic echocardiography has been shown to be effective in detecting catheter tip position in the lower third of the SVC, as well as detecting catheter malposition through delayed opacification and reduced echogenicity.[6,39] (IV)
3. Consider using ultrasound to confirm catheter tip position in neonates and in the emergency department or other critical care environments where immediate confirmation of tip location is time critical.[6,33,40] (IV)

Table 1. (a) ECHOTIP protocol for CICCs.

	Probe	Technique
Tip navigation	7–12 MHz linear probe	Visualization of the cannulated vessel (wire/catheter inside the vein) Visualization of the deep vessels of neck and chest according to RaCeVA
Tip location	2–6 MHz sectorial probe As alternative option: 3–8 MHz convex probe	Immediate visualization (<1 s) of bubbles in RA after flushing First option: subcostal views (four-chamber or bi-caval) Second option: four-chamber apical view

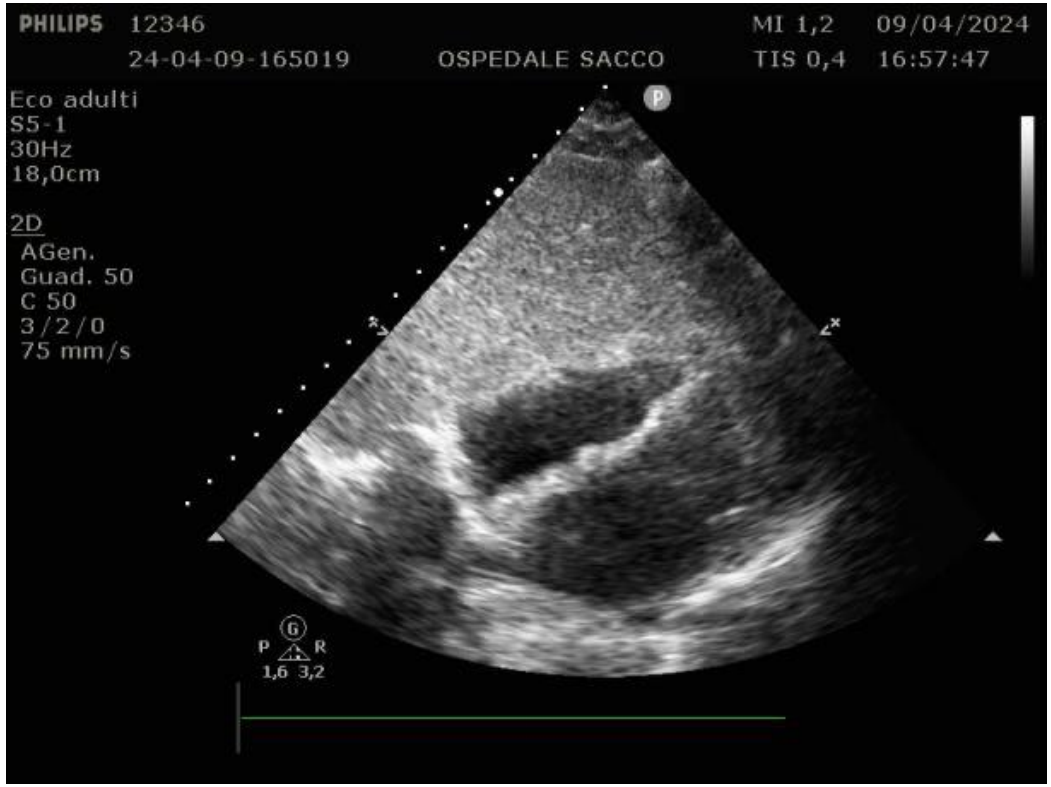
(b) ECHOTIP protocol for PICCs.

	Probe	Technique
Tip navigation	7–12 MHz linear probe	Visualization of the deep veins of the arm and of the infra/supraclavicular area according to RaPeVA and RaCeVA
Tip location	2–6 MHz sectorial probe As alternative option: 3–8 MHz convex probe	Immediate visualization (<2 s) of bubbles in RA after flushing First option: subcostal views (four-chamber or bi-caval) Second option: four-chamber apical view

(c) ECHOTIP protocol for FICCs.

	Probe	Technique
Tip navigation	7–12 MHz linear probe (femoral vein and external iliac vein) 3–8 MHz convex probe (common iliac vein and IVC)	Visualization of the deep vessels of the lower limb according to RaFeVA Visualization of IVC in short and long axis views
Tip location	2–6 MHz sectorial probe As alternative option: 3–8 MHz convex probe	Visualization of bubbles after flushing Tip in IVC: immediate visualization of bubbles in IVC Tip in RA or at the junction RA/IVC: immediate visualization of bubbles in RA

Bubble test: Subcostal longitudinal 4 chambers



Bubble test: Subcostal oblique (Bicaval vein)

Bubble test: Apical four chambers

J Ultrasound (2013) 16:161–170
DOI 10.1007/s40477-013-0046-5

REVIEW

Ultrasonography as a guide during vascular access procedures and in the diagnosis of complications

A. Vezzani · T. Manca · A. Vercelli ·
A. Braghieri · A. Magnacavallo

the other filled with 1 ml air [65]. TTE with the microbubble test identifies CVC misplacement with a sensitivity of 96 % and specificity of 93 %; findings are concordant with those of chest X-ray in 95 % of cases [66]. This makes it a valid alternative to chest X-ray for verifying the position of a CVC.

Cut-off < 2 seconds

ORIGINAL ARTICLE

2015

Confirmation of correct central venous catheter position in the preoperative setting by echocardiographic "bubble-test"

M. MEGGIOLARO [1], A. SCATTO [1], A. ZORZI [2], E. ROMAN-POGNUZ [1]
A. LAURO [3], C. PASSARELLA [1], G. BONACCORSO [1]

Results. CXR identified 14 (13%) CVC malpositions. Vascular US showed a sensitivity of 64% and a specificity of 100% while visualization of "no or few bubbles" at bubble test yielded a sensitivity of 50% and a specificity of 100%. "Push-to-bubbles" times were ≈9 times longer in patients with compared to those without CVC malposition (1400 [702-2160] ms *versus* 167 [123-228] ms, P<0.001). A cut off value of 500 ms had a sensitivity of 100% and a specificity of 99% for CVC malposition with an inter-observer agreement of 99% (kappa 0.96, P<0.001).

Conclusion. CVC malposition was observed in a sizeable proportion of patients undergoing preoperative central venous cannulation. Measurement of "push-to-bubbles" time is a fast, accurate and highly reproducible tool for verifying the correct CVC position. *(Minerva Anestesiol 2015;81:989-1000)*

9-10-11 dicembre | *december 9th-10th-11th*

Original research article

JVA | The Journal of Vascular Access

Transthoracic echocardiography as bedside technique to verify tip location of central venous catheters in patients with atrial arrhythmia

The Journal of Vascular Access
1–7

DOI: 10.1177/1129729820905200
journals.sagepub.com/home/jva
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Emanuele Iacobone[1], Daniele Elisei[1], Diego Gattari[1], Luigi Carbone[1] and Giuseppe Capozzoli[2]

When the tip was well positioned, the mean (±SD) time for onset of the bubble effect was 0.89 ± 0.33 s in patients with CICC and 1.1 ± 0.20 s in those with PICC; this time difference was not statistically significant ($p > 0.05$).

Original research article

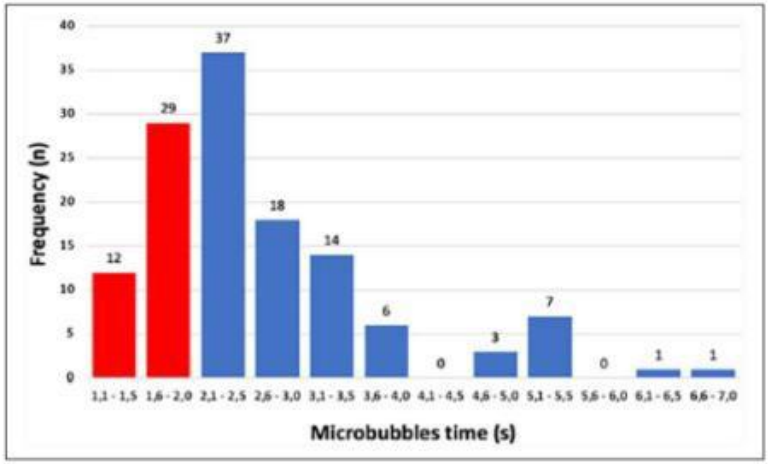
JVA | The Journal of Vascular Access

Contrast enhanced ultrasound as a new tool to estimate the performance of midline catheters in the single patient

The Journal of Vascular Access
1–5

DOI: 10.1177/11297298211034629
journals.sagepub.com/home/jva
SAGE

Antonio Gidaro, Francesco Casella, Francesca Lugli, Chiara Cogliati, Maria Calloni, Federica Samartin, Nicola Brena and Guido Pace



Two seconds, originally proposed by Vezzani, is too long

Original research article

JVA The Journal of Vascular Access

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2024, Vol. 25(4) 1187–1193
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DOI: 10.1
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SAG

Impact of distance of the catheter tip from cavo-atrial junction on bubble test (delay) time: A prospective study

Elli Stefano[1], D'amata Dario[2], Cavalli Silvia[2], Cambiaghi Gloria[2], Giorgianni Mariavittoria[3], Marino Francesco[4], Pozzoli Jessica[5], Russo Ma
Lucchini Alberto[1], Foti Giuseppe[1], Pozzi Matteo[1] and Giani Marco[1]

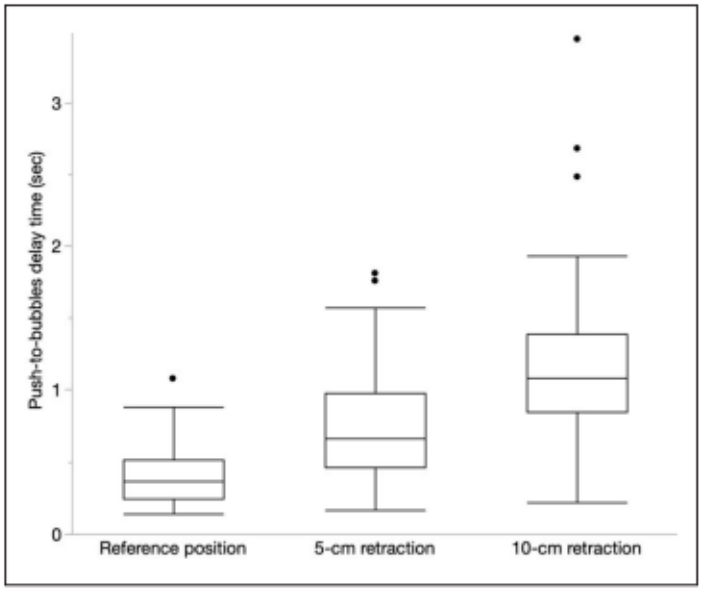

Figure 3. Push-to-bubbles delay times at the different locations. P0, cavo-atrial junction (CAJ); P1, 5-cm retraction from CAJ; P2, 10-cm retraction from CAJ.

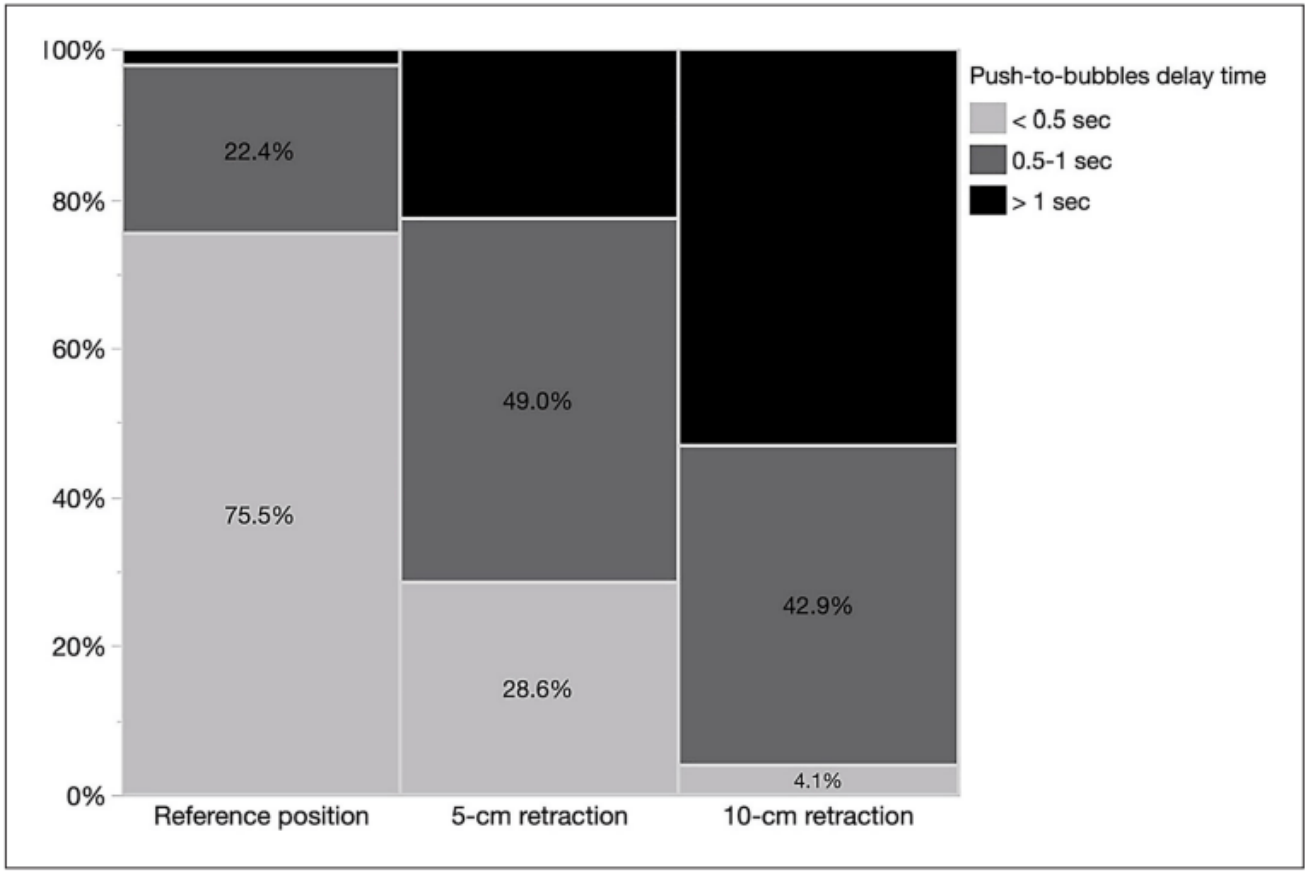

Figure 4. Distribution of push-to-bubbles times for each catheter tip position. Cavo-atrial junction, as identified by intracavitary electrocardiography, was considered as the reference position.

Original research article

JVA | The Journal of Vascular Access

Can the length of a catheter change the time to bubble at the tip performing the "Bubble Test"? A bench study

The Journal of Vascular Access
1–7

DOI: 10.1177/11297298231199505
journals.sagepub.com/home/jva
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Davide Giustivi[1], Stefano Elli[2], Chiara Airoldi[3], Federica Lo Izzo[4], Michela Rossini[5], Antonio Gidaro[6], Alberto Lucchini[7,8] and Daniele Privitera[5]

Figure 1. Experimental model.

9-10-11 dicembre | *december 9th-10th-11th*

Original research article

JVA | The Journal of Vascular Access

The Journal of Vascular Access
1–7

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Can the length of a catheter change the time to bubble at the tip performing the "Bubble Test"? A bench study

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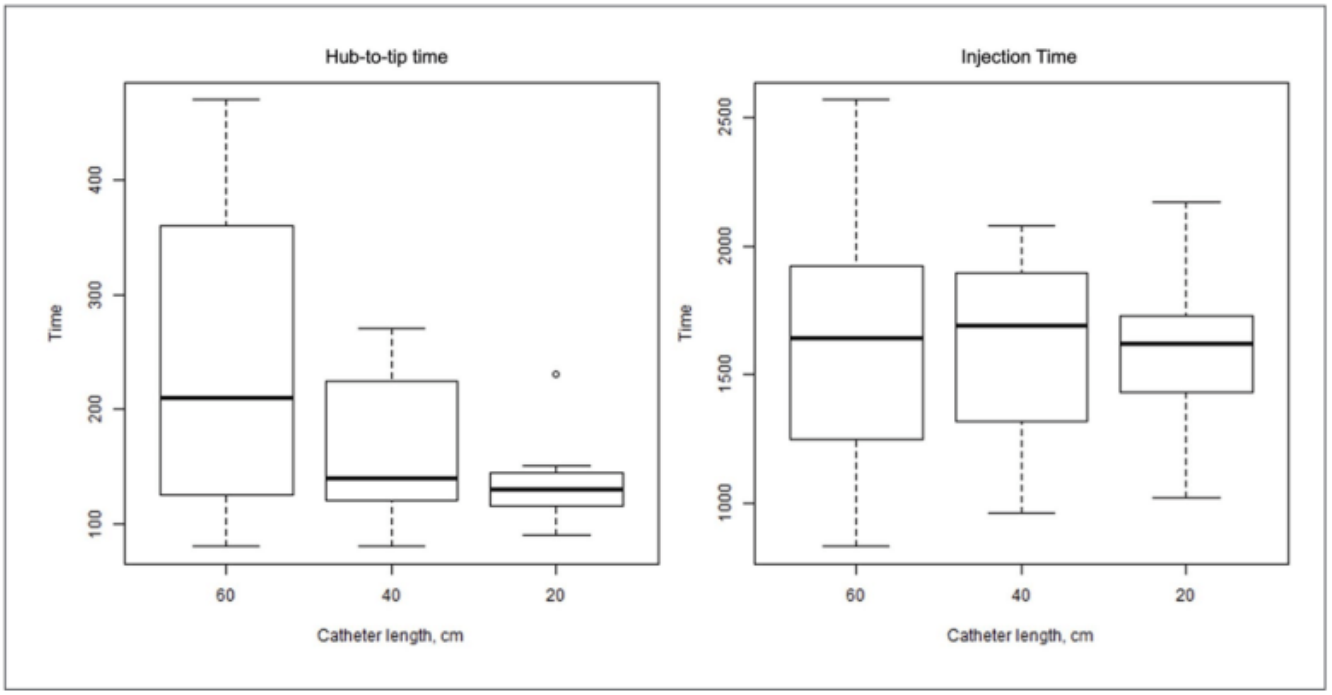


Figure 3. Graphical representation of HTT and IT for different catheter lengths (60, 40, and 20 cm).

Techniques in vascular access

JVA The Journal of Vascular Access

An ultrasound-based technique in the management of totally implantable venous access devices with persistent withdrawal occlusion

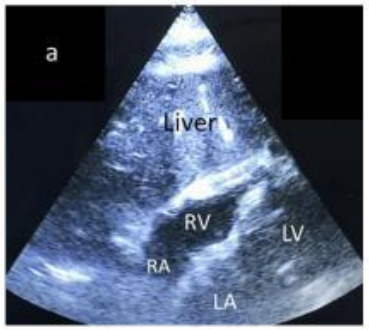
The Journal of Vascular Access
1–5

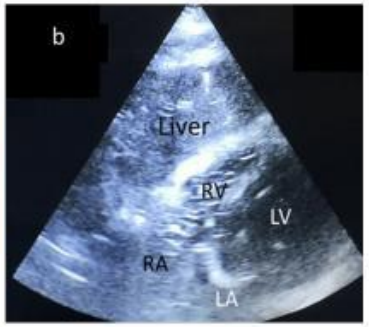
DOI: 10.1177/11297298211023275
journals.sagepub.com/home/jva
SAGE

Sonia D'Arrigo[1], Maria Giuseppina Annetta[1] and Mauro Pittiruti[2]

Table 1. Patients characteristics

Patients (n°)	Age (years)	Gender	Site of TIVAD	Oncological disease	Problem	Mean time for BT (sec)	X-ray confirmation
1	49	F	Right basilic vein	Ovaric cancer in neoadjuvant chemotherapy	PWO	45	Yes
2	51	F	Right axillary vein	Ovaric cancer post surgery, in chemotherapy	PWO	50	Yes
3	65	M	Left basilic vein	Intestinal cancer post surgery, in chemotherapy	PWO	60	Yes
4	34	F	Left basilic vein	Breast cancer post surgery, in chemotherapy	PWO	40	Yes
5	37	F	Right basilic vein	Breast cancer in neoadjuvant chemotherapy	PWO	30	Yes
6	25	F	Right basilic vein	Ovaric cancer post surgery, in chemotherapy	PWO	45	Yes
7	68	F	Right axillary vein	Uterus cancer post surgery, in chemotherapy	PWO	40	Yes
8	69	M	Right axillary vein	Liver cancer in neoadjuvant chemotherapy	PWO	50	Yes
9	56	F	Right brachial vein	Ovaric cancer post surgery, in chemotherapy	PWO	55	Yes





New prospective on ECHOTIP

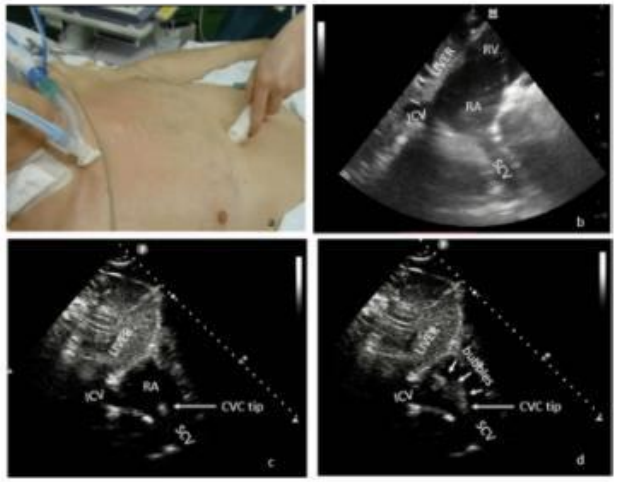
Corradi et al. Critical Care (2022) 26:113
https://doi.org/10.1186/s13054-022-03985-3

Critical Care

RESEARCH Open Access

Ultrasound localization of central vein catheter tip by contrast-enhanced transthoracic ultrasonography: a comparison study with trans-esophageal echocardiography

Francesco Corradi[1,10*], Fabio Guarracino[2], Gregorio Santori[3], Claudia Brusasco[4], Guido Tavazzi[5,6], Gabriele Via[7], Silvia Mongodi[8], Francesco Mojoli[5,6], Raffaello Umberto Dario Biagini[1], Alessandro Isirdi[1], Federico Dazzi[1], Chiara Robba[3,8], Luigi Vetrugno[9] and Francesco Forfori[1] on behalf of UCARE research group



Feasibility:

CE-TTE 4 chambers: 95%
CE-TTE subcostal view: 97.3%

Accuracy:

CE-TTE 4 chambers: 70%
CE-TTE subcostal view: 92%
CXR: 73%

TEE vs. TTE vs. CXR

Original research article

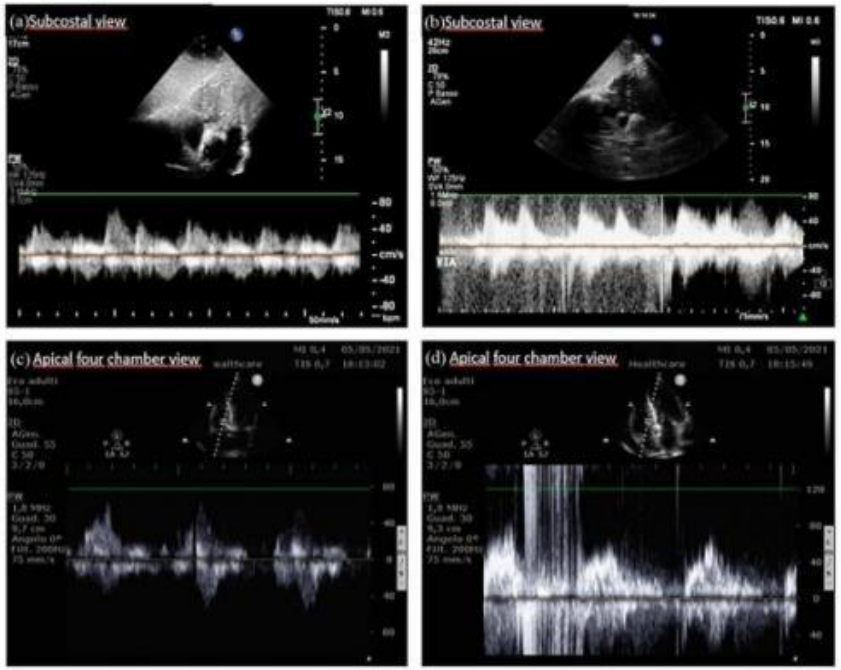
JVA | The Journal of Vascular Access

The Journal of Vascular Access
1–7

DOI: 10.1177/11297298221109662
journals.sagepub.com/home/jva
SAGE

Pulsed-wave Doppler for ultrasound-based tip location using bubble test: A pilot study

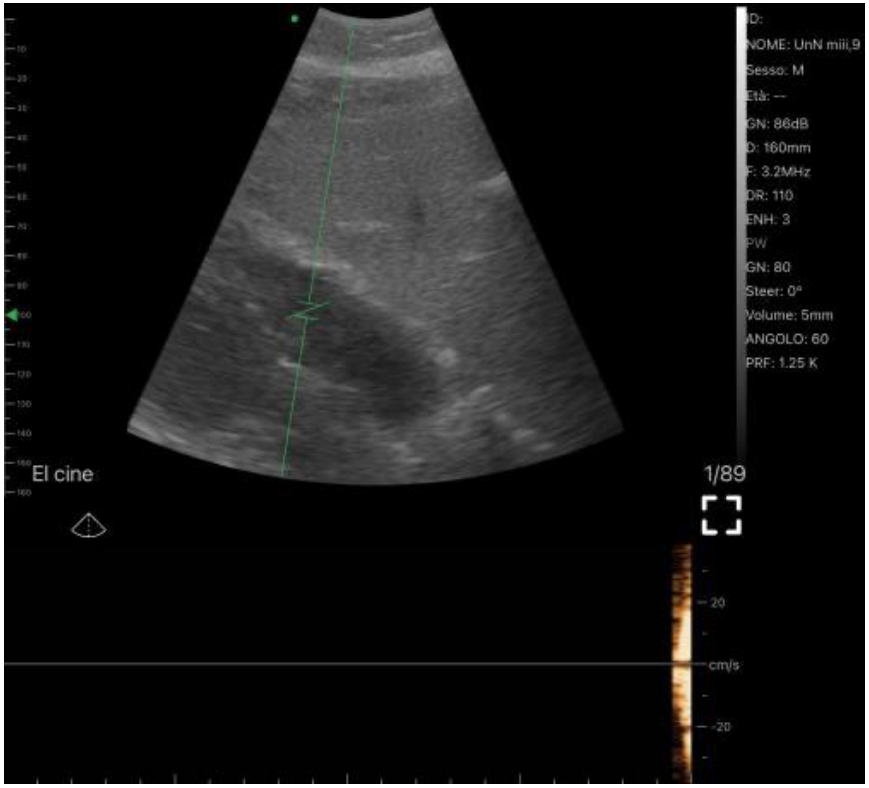
Antonio Gidaro[1], Francesco Casella[1], Chiara Cogliati[1], Antonio La Greca[2], Francesca Lugli[1], Chiara Trione[1], Maria Calloni[1], Chiara Melchionda[1], Federica Samartin[1], Emanuele Salvi[1] and Elisa Ceriani[1]



Advantages:
Visual signal of MES (microembolic signals)
Production of a typical sound due to the alternation of PW wave
It is synchronous with cardiac flow and heart rate

Limitations:
Single center
Small sample size (n=9)

Power doppler: Subcostal longitudinal 4 chambers



Time sparing

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- The time required to perform the bubble test ranged from 30 to 60seconds (average 45 seconds).
- The real-time and fast confirmation of the correct position of the tip of the device allowed us to immediately start the administration of the therapy.

Microbubble test LIMITATIONS

GAVeCeLT 2024 BOLOGNA

- A better synchronization method between flush start and turbulence detection is needed.
- More studies are needed to understand the role of MBT as a primary method vs rescue.

Thank you!

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