Gemelli

Fondazione Policlinico Universitario A. Gemelli
Università Cattolica del Sacro Cuore

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

STATO DELL'ARTE DELLA TROMBOSI CATETERE-RELATA

MAURO PITTIRUTI

FONDAZIONE POLICLINICO UNIVERSITARIO 'A.GEMELLI' - ROMA

Narrative Review

Medicine

OPEN

Published trends and research hotspots of central venous catheter-associated thrombosis from 1973 to 2022

A scientometric analysis

Zuoyan Liu, MM[a,b,c], Xinxin Chen, MM[a,b,d], Shiqi Tao, MM[c,e], Jiuhong You, MM[a,b,d], Hui Ma, MM[a,b,d], Cheng Huang, PhD[a,b,*]

Abstract

This study aims to explore the intellectual landscape and research hotspots in the central venous catheter-related thrombosis (CVC-RT) research field. Studies discussing CVC-RT published from 1973 to 2022 in the Web of Science Core Collection database were retrieved on February 24th, 2022. Citespace was used to perform a scientometric analysis to identify the intellectual landscape and research hotspots in the research fields of CVC-RT. A total of 4358 studies were retrieved, with an ascending trend in publication numbers. The United States of America was the most influential country. The Journal of Vascular Access published the most studies, and McMaster University was the most prolific institution. The results showed that the focus population of CVC-RT research has changed from pediatric patients to cancer patients, the management of CVC-RT has become more formal and standardized, and the focused CVC type has shifted to port and peripherally inserted central catheters. In addition, seventeen active burst keywords were detected, such as patient safety, clinical practice guidelines, and postthrombotic syndrome. This study comprehensively reviewed publications related to CVC-RT. The research topics on patient safety, clinical practice guidelines, and postthrombotic syndrome related to CVC-RT may be future hotspots.

Abbreviations: BSI = bloodstream infection, CVC-RT = central venous catheter-related thrombosis, CVCs = central venous catheters, DVT = deep vein thrombosis, HPN = home parental nutrition, PICCs = peripherally inserted central catheters, PTS = postthrombotic syndrome, USA = United States of America, VTE = venous thromboembolism.

Keywords: central venous catheter, CiteSpace, intellectual mapping, scientometric analysis, thrombosis

Table 1

The top 10 countries, institutions, and authors publishing the most articles on CVC-RT.

Rank	Country	Count	Institution	Count	Author	Count
1	USA	1617	MCMASTER UNIV (Canada)	94	CHOPRA V	40
2	ITALY	328	UNIV TORONTO (Canada)	80	PITTIRUTI M	28
3	CANADA	327	UNIV MICHIGAN (USA)	65	FAUSTINO EVS	22
4	GERMANY	326	HOSP SICK CHILDREN (Canada)	61	BRANDAO LR	21
5	FRANCE	255	MAYO CLIN (USA)	51	CHAN AKC/MONAGLE P	20
6	ENGLAND	244	HARVARD UNIV (USA)	50	FLANDERS SA	19
7	PEOPLES R CHINA	231	JOHNS HOPKINS UNIV (USA)	39	TREROTOLA SO	18
8	THE NETHERLANDS	139	DUKE UNIV/UNIV TEXAS/ UNIV WASHINGTON (USA)	36	ANDREW M/VAN OMMEN CH	16
9	AUSTRALIA	133	UNIV PENN(USA)	35	DEBOURDEAU P/GOLDENBERG NA	15
10	SPAIN	119	OHIO STATE UNIV (USA)	34	GOLDHABER SZ/GUNTHER RW/MASSICOTTE P/MOLINARI AC/RICKARD CM/STREIFF MB	14

Table 2

The top 10 journals publishing the most articles on CVC-RT and the top 10 co-cited journals.

Rank	Journal	Count	IFh 2022	CQ* 2022	H-index	Co-cited journal	IF* 2022	CQ* 2022
1	J VASC ACCESS	175	2.326	Q3	42	NEW ENGL J MED	176.079	Q1
2	J VASC INTERV RADIOL	109	3.682	Q3	142	CHEST	10.262	Q1
3	THROMB RES	81	10.407	Q3	124	J VASC INTERV RADIOL	3.682	Q3
4	COCHRANE DB SYST REV	62	12.008	Q2	309	LANCET	202.731	Q1
5	J VASC SURG	60	4.190	Q2	210	THROMB HAEMOSTASIS	6.681	Q2
6	CARDIOVASC INTER RAD	55	8.271	Q1	92	RADIOLOGY	29.146	Q1
7	JPEN-PARENTER ENTER	55	3.896	Q3	110	J CLIN ONCOL	50.717	Q1
8	ANN VASC SURG	50	1.607	Q4	80	THROMB RES	10.407	Q3
9	J PEDIATR SURG	48	2.549	Q3	137	ANN INTERN MED	51.598	Q1
10	NEPHROL DIA TRANSPL	43	7.186	Q1	187	J VASC SURG	4.860	Q2

CQ = category quartile, IF = Journal Citation Reports Impact Factor.

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CE Test Material

Catheter-Related Central Venous Thrombosis: The Development of a Nationwide Consensus Paper in Italy

Costantino Campisi, MD, Roberto Biffi, MD, and Mauro Pittiruti, MD on behalf of the GAVeCeLT Committee for the Consensus

2007

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

Editorial

JVA The Journal of Vascular Access

Reconsidering the GAVeCeLT Consensus on catheter-related thrombosis, 13 years later

Fulvio Pinelli[1], Paolo Balsorano[1], Benedetta Mura[2] and Mauro Pittiruti[3]

The Journal of Vascular Access
1–8
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DOI: 10.1177/1129729820947594
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2020

ALCUNE CONSIDERAZIONI CLINICHE PRELIMINARI SULLA TROMBOSI CATETERE-CORRELATA

- È un fenomeno ben diverso dalla trombosi non correlata a catetere (CRT clinica = esasperazione di un evento fisiopatologico inevitabile)
- L'unica CRT da prendere in considerazione è quella sintomatica:
  - le CRT asintomatiche spesso non sono trombosi, ma guaine connettivali
  - la storia naturale della CRT asintomatica è diversa dalla CRT sintomatica
- La CRT sintomatica è una complicanza con incidenza moderata (1-10 %), ma con rischio minimo di mortalità (0.05%), costo relativamente basso (<2000 euro per episodio), e quasi sempre senza effetti negativi sull'utilizzo del dispositivo
- Purtroppo però la CRT è fonte di ansietà nel paziente e nei curanti, nonché di problemi logistici a meno che la gestione dell'evento non sia standardizzata

ALCUNE RAPIDE PUNTUALIZZAZIONI BASATE SULLA LETTERATURA CORRENTE

- A proposito della diagnosi
- A proposito del trattamento
- A proposito della prevenzione

A PROPOSITO DELLA DIAGNOSI

- Confusione terminologica
- Confusione diagnostica
- Ruolo oramai preponderante della ecografia
- Raccomandazioni

PRIMO PROBLEMA: CONFUSIONE TERMINOLOGICA

- Nella letteratura anglosassone, si parla di '*thrombotic occlusion*' dei dispositivi di accesso venoso
- In realtà, TROMBO (THROMBUS) e COAGULO (CLOT, or COAGULUM) sono cose ben diverse: quindi, la CRT e la occlusione del catetere da coaguli sono complicanze completamente diverse in termini di prevenzione e trattamento

SECONDO PROBLEMA: CONFUSIONE DIAGNOSTICA

- La guaina fibroblastica o '*fibroblastic sleeve*' (FS) (precedentemente nota con il nome inappropriato di 'guaina di fibrina' o '*fibrin sleeve*') viene oggi SISTEMATICAMENTE scambiata per CRT asintomatica da parte di radiologi, angiologi, ecografisti, chirurghi vascolari, e cosiddetti 'esperti' di accessi venosi
- Ciò comporta una sovraindicazione <u>inaccettabile</u> nella indicazione a trattamenti antitrombotici
- La guaina è un fenomeno fisiopatologico inevitabile (e innocuo) in qualunque dispositivo per accesso venoso, presente nel 100% dei casi e visibile ecograficamente nel 30-40%

Review

JVA The Journal of Vascular Access

The fibroblastic sleeve, the neglected complication of venous access devices: A narrative review

The Journal of Vascular Access
1–13
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DOI: 10.1177/1129729820951035
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Giovanna Passaro, Mauro Pittiruti and Antonio La Greca

2020

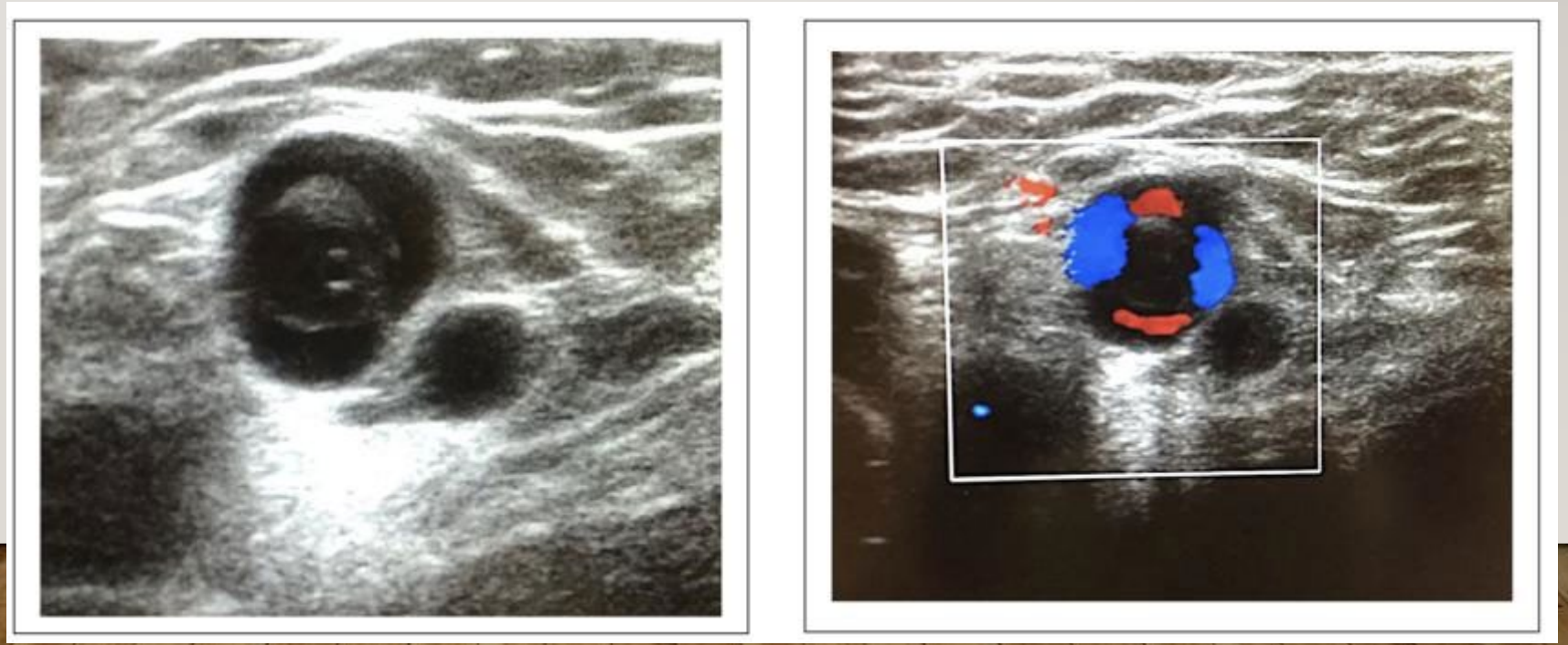
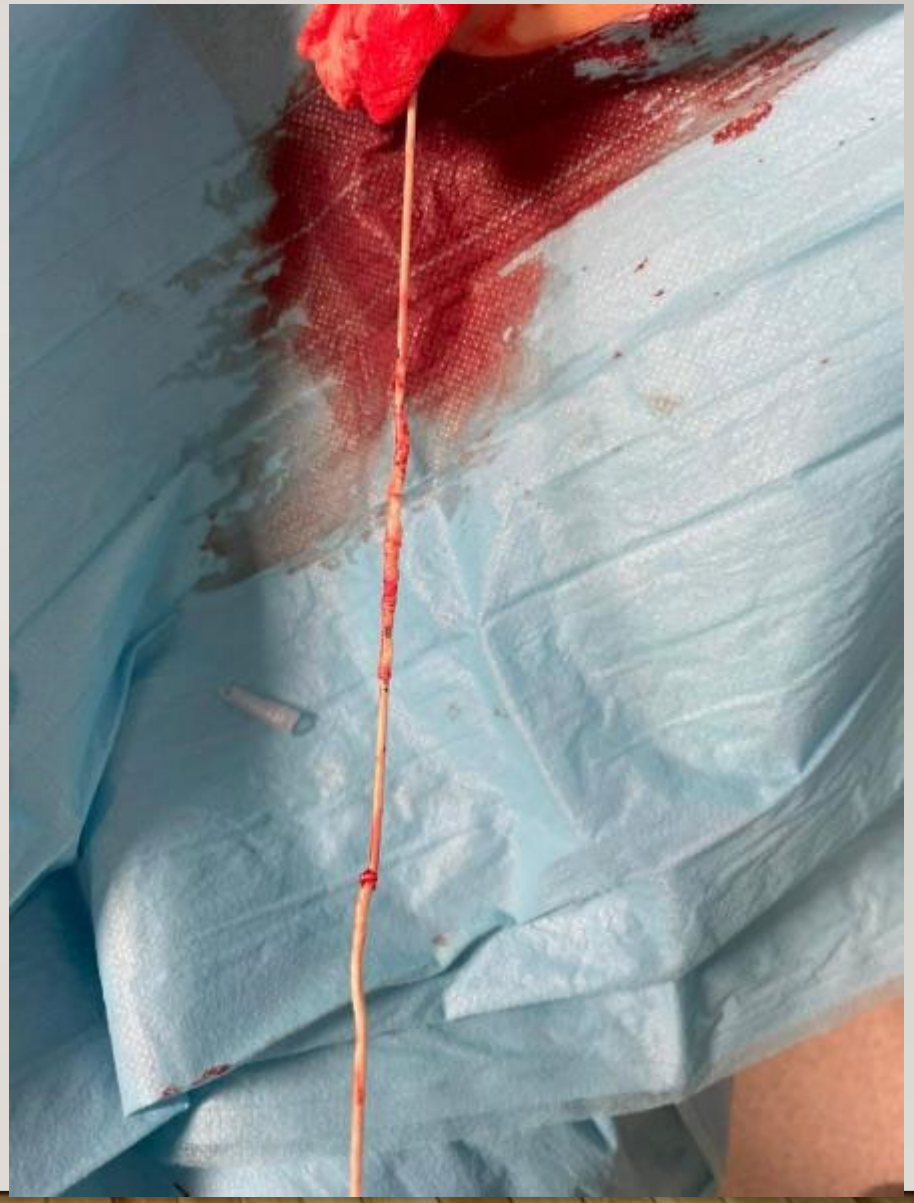


Table 3. Main differences between catheter-related thrombosis (CRT) and fibroblastic sleeve (FS).

	CRT	FS
Etiopathogenesis	Endothelial damage	Foreign body reaction
Molecular trigger	Tissue thromboplastin	Fibronectin
Type of tissue	Thrombus	Connective tissue
Location	At the site of vein wall damage	Around the catheter
Evolution	Fibrosis/reabsorption	Reabsorption (?)
US imaging	Mass obstructing the vein Anechoic, and then hypo-echoic Mainly attached to the vein wall	Sleeve all around the catheter Hypo- or hyper-echoic Mainly attached to the catheter
Clinical manifestation	Signs and symptoms of venous obstruction + risk of catheter malfunction	Catheter malfunction
Risk of pulmonary embolism	Yes	No
Need for VAD removal	Rare (not responsive to therapy)	Rare (irreversible catheter malfunction)
Preventable with anticoagulants	Yes (not consistently)	No
Sensitive to thrombolysis	Yes (in the initial phase)	No
Pharmacological management	LMW heparin	None

2020



Original research article

JVA The Journal of Vascular Access

Incidence of fibroblastic sleeve and of catheter-related venous thrombosis in peripherally inserted central catheters: A prospective study on oncological and hematological patients

The Journal of Vascular Access
1–6
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DOI: 10.1177/1129729820949411
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2020

Carmela Trezza[1], Catello Califano[2], Vincenzo Iovino[3], Carmela D'Ambrosio[1], Giuseppe Grimaldi[4] and Mauro Pittiruti[5]

Results: We enrolled 254 patients with power injectable polyurethane 4Fr peripherally inserted central catheters. Ultrasound scan of the veins of the arm showed fibroblastic sleeve in 76 patients (29.9%); the fibroblastic sleeve was first detected on day 7 in 45 cases (17.7%), on day 14 in 26 cases (10.2%), on day 21 in 3 cases (1.2%), and on day 28 in 2 cases (0.79%). There was no correlation between the type of disease and the development of fibroblastic sleeve. The incidence of asymptomatic catheter-related thrombosis was 5.12%: all catheter-related thromboses were detected before day 14. There was only one case of symptomatic catheter-related thrombosis (0.39%) in a leukemia patient. Fibroblastic sleeve and catheter-related thrombosis were associated only in two cases (0.78%).

RUOLO ORAMAI PREPONDERANTE DELLA ECOGRAFIA: VANTAGGI

- La ecografia consente di visualizzare catetere, parete vasale e immagini intravascolari (CRT o FS) con minimo costo, minima invasività, con semplice manovra '*bedside*'
- Nel neonato e nel bambino è possibile la visualizzazione di qualunque vena percorsa da dispositivo per accesso venoso (anche se nell'adulto vi sono alcune aree 'mute': VCS, tratto della VCI sotto le renali, vene iliache comuni)
- La ecografia consente la differenziazione tra CRT e FS sulla base della ecogenicità e della morfologia; la ecocardiografia consente la differenziazione tra CRT (trombi atriali) e FS (cosiddetta '*fibrin tail*')

DIAGNOSIS OF CRT

Particularly easy with PICCs, since arm veins are easy to explore:

RUOLO ORAMAI PREPONDERANTE DELLA ECOGRAFIA: SVANTAGGI

- La disponibilità immediata di sonde ecografiche '*bedside*' e la non-invasività della manovra inducono ad esami ecografici periodici non giustificati in pazienti asintomatici, con conseguenze negative:
- Diagnosi accidentale di FS, che viene sistematicamente scambiata per CRT asintomatica, il che comporta trattamenti inappropriati
- Diagnosi accidentale di CRT asintomatica 'vera', il che spesso comporta trattamenti di dubbia indicazione, che altrimenti non sarebbero stati presi in considerazione

Abbruzzese et al. Annals of Intensive Care (2023) 13:106
https://doi.org/10.1186/s13613-023-01206-w

Annals of Intensive Care

RESEARCH Open Access

Incidence of asymptomatic catheter-related thrombosis in intensive care unit patients: a prospective cohort study

Chiara Abbruzzese[1†], Amedeo Guzzardella[2*†], Dario Consonni[3], Gloria Turconi[2], Claudia Bonetti[2], Matteo Brioni[1], Mauro Panigada[1] and Giacomo Grasselli[1,2]

2023

52 (14%) out of 375 catheters inserted developed CRT after 5 [3–10] days from insertion.
46 CRTs (88%) were partial thrombosis.
All CRTs remained asymptomatic.

SLEEVE OR THROMBUS?

Intensive Care Med (2023) 49:401–410
https://doi.org/10.1007/s00134-023-07006-x

ORIGINAL

Daily point-of-care ultrasound-assessment of central venous catheter-related thrombosis in critically ill patients: a prospective multicenter study

Chunshuang Wu[1,2,3], Mao Zhang[1,2,3], Wenjie Gu[1,2,3], Caimu Wang[4], Xudong Zheng[5], Junfeng Zhang[6], Xingwen Zhang[7], Shijin Lv[8], Xuwei He[9], Xiaoyuan Shen[10], Wenlong Wei[11], Guotao Wang[12], Yingru Lu[13], Qingli Chen[9], Renfei Shan[14], Lingcong Wang[15], Feng Wu[16], Ting Shen[17], Xuebo Shao[18], Jiming Cai[19], Fuzheng Tao[20], Haiying Cai[21], Qin Lu[1,2,3*] on behalf of and the Study Group of Central Venous Catheter-related Thrombosis

The study included 1262 patients. The incidence of CRT was 16.9%

SLEEVE OR THROMBUS?

2023

Intensive Care Med (2023) 49:878–879
https://doi.org/10.1007/s00134-023-07076-x

CORRESPONDENCE

Catheter-related thrombosis in critically ill patients: a clinical problem or just a matter of definition?

Salvatore L. Cutuli, Antonio M. Dell'Anna*, Simone Carelli, Maria G. Annetta and Massimo Antonelli

SLEEVE OR THROMBUS?

RACCOMANDAZIONI

- Eseguire eco-color-doppler soltanto se il paziente ha segni o sintomi sospetti per CRT
- Conoscere la diagnosi differenziale ecografica tra CRT e FS
- Ricorrere a esame TC con mdc soltanto in casi molto particolari, nel paziente adulto (trombo non visualizzabile interamente, poiché la 'coda' si perde in direzione della vena cava superiore o in direzione della vena iliaca interna/vena cava inferiore)
- Porre indicazione al trattamento
  - Mai – in caso di FS
  - Sempre – in caso di CRT sintomatica
  - In pazienti selezionati – in caso di CRT asintomatica

A PROPOSITO DEL TRATTAMENTO

- Trombolisi locale?
- Quale trattamento antitrombotico?
- Rimuovere il dispositivo per accesso venoso?
- Per quanto tempo continuare il trattamento?
- Raccomandazioni

TROMBOSI VENOSA DA CATETERE
FINALITA' DEL TRATTAMENTO

- **Controllo della sintomatologia clinica**
- **Prevenire la progressione del trombo**
- **Prevenire l'occlusione vascolare cronica**
- **Prevenire le recidive e la EP**
- **Mantenere il catetere in funzione a meno che non sia più necessario, malfunzionante, dislocato o infetto**

SYMPTOMATIC CRT SHOULD ALWAYS BE TREATED

TROMBOLISI LOCALE?

- Soltanto in casi eccezionali.
- Infatti:
  - È efficace soltanto se attuata precocemente (nelle prime 48 ore)
  - Richiede la infusione del trombolitico (rTPA) all'interno del trombo
  - Il dosaggio di rTPA è pari al 50% del dosaggio sistemico, ma pur sempre rischioso

QUALE TRATTAMENTO ANTITROMBOTICO?

- Iniziare il trattamento appena possibile, usando il farmaco antitrombotico a dosaggio terapeutico pieno (salvo situazioni di piastrinopenia o alto rischio emorragico, etc.)
- Vengono utilizzati sia LMWH, sia il fondaparinux, sia i DOAC
  - Per motivi di praticità prescrittiva, vengono attualmente preferiti come prima opzione i preparati sottocute (enoxaparina 100 unità/kg/12 ore, tinzaparina 175 unità/kg/24 ore, fondaparinux 7.5-10 mg secondo il peso corporeo, etc.)
- Salvo controindicazioni, il trattamento a dosaggio pieno va protratto per 2-3 settimane, monitorando la risoluzione del quadro ecografico e la regressione di segni e sintomi

frontiers | Frontiers in Cardiovascular Medicine

BRIEF RESEARCH REPORT
published: 28 June 2022
doi: 10.3389/fcvm.2022.880698

A Single Center Retrospective Cohort Study Comparing Different Anticoagulants for the Treatment of Catheter-Related Thrombosis of the Upper Extremities in Women With Gynecologic and Breast Cancer

Angelo Porfidia[1,2], Giulia Cammà[1,2], Nicola Coletta[1,2], Margherita Bigossi[2,3], Igor Giarretta[1], Andrea Lupascu[1,2], Giuseppe Scaletta[2,4], Enrica Porceddu[2,5], Paolo Tondi[2,5], Giovanni Scambia[2,4], Gabriella Ferrandina[2,4] and Roberto Pola[1,2]*

2022

Conclusion: These results, although retrospective and based on a relatively small sample size, indicate that, in women with gynecologic or breast cancer, CRT of the upper extremities may be treated with similar effectiveness and safety with fondaparinux, enoxaparin, and edoxaban. Further studies are needed to substantiate these findings.

QUALE TRATTAMENTO ANTITROMBOTICO?

- Nella maggior parte dei casi, il trattamento comporta risoluzione dei sintomi soggettivi entro 48-72 ore
  - Può essere indicata la aggiunta di farmaci analgesici (nei casi più sintomatici)
  - Non vi è indicazione ad aggiungere antibiotici
  - Non vi è indicazione ad aggiungere farmaci 'antiedema' o 'venoprotettori' (!)
  - Non vi è indicazione a pomate o unguenti o creme locali (!)
- E' ragionevole rivalutare il paziente – clinicamente ed ecograficamente – dopo 5-7 gg

RIMUOVERE IL DISPOSITIVO PER ACCESSO VENOSO?

No, tranne casi eccezionali.

Infatti:

- la rimozione del DAV non accelera la guarigione della CRT

- la rimozione immediata del DAV prima di aver iniziato il trattamento può associarsi a EP per mobilizzazione del trombo

- la presenza della CRT non si associa quasi mai a malfunzionamento del DAV, che quindi può essere utilizzato per il suo scopo senza interruzioni

- l'eventuale riposizionamento del DAV dopo la rimozione del primo potrebbe comportare difficoltà di accesso + nuovo rischio di CRT

CE Test Material

Catheter-Related Central Venous Thrombosis: The Development of a Nationwide Consensus Paper in Italy

Costantino Campisi, MD, Roberto Biffi, MD, and Mauro Pittiruti, MD
on behalf of the GAVeCeLT Committee for the Consensus

2007

Conclusions of the Consensus

- Catheter removal or maintenance does not influence the outcome.
- Although local thrombolitic treatment may require the presence of the catheter, a poor peripheral vein status could represent a major limiting factor for most therapies, if the catheter has been removed.
- In case of clinically overt or imaging-diagnosed DVT , a risk of embolization during or immediately after catheter removal has been clinically confirmed.
- Catheter should be removed in case of:

  Infected thrombus;

  Malposition of the tip (radiologic reposition of the tip often fails, as a consequence of the inability to reach it inside the thrombus); or

  Irreversible occlusion of the lumen.

review

Annals of Oncology 20: 1459–1471, 2009
doi:10.1093/annonc/mdp052
Published online 12 June 2009

2008 SOR guidelines for the prevention and treatment of thrombosis associated with central venous catheters in patients with cancer: report from the working group

P. Debourdeau[1]*, D. Kassab Chahmi[2], G. Le Gal[3], I. Kriegel[4], E. Desruennes[5], M.-C. Douard[6], I. Elalamy[7], G. Meyer[8], P. Mismetti[9], M. Pavic[1], M.-L. Scrobohaci[10], H. Lévesque[11], J. M. Renaudin[12] & D. Farge[13] on behalf of the working group of the SOR

[1]Department of Oncology and Internal Medicine, Desgenettes Hospital, Lyons; [2]SOR, National Cancer Institute, Boulogne-Billancourt; [3]Department of Internal Medicine, La Cavale-Blanche Hospital, Brest; [4]Department of Anesthesiology, Curie Institute, Paris; [5]Department of Anesthesiology, Gustave Roussy Institute, Villejuif; [6]Department of Anesthesiology, Saint Louis Hospital, Paris; [7]Hemostasis Laboratory, Tenon Hospital, Paris; [8]Department of Pneumology, Georges Pompidou Hospital, Paris; [9]Department of Vascular Pathology, Saint-Etienne Hospital, Saint-Étienne; [10]Hemostasis Laboratory, Saint-Louis Hospital, Paris; [11]Department of Vascular Pathology, Bois Guillaume Hospital, Rouen; [12]Department of Vascular Pathology, Georges Pompidou Hospital, Paris and [13]Department of Vascular Pathology, Saint-Louis Hospital, Paris, France

2008

3 Maintenance of the catheter is justified in the event that the catheter is mandatory, functional, in the right position, and not infected, with a favorable clinical evolution under close monitoring. In this case, an anticoagulant treatment should be maintained as long as the catheter is present.

4 In the event of catheter removal, there is no standard approach in terms of the interval between removal and initiation of anticoagulant treatment.

Clinical Nutrition 28 (2009) 365–377

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

ESPEN Guidelines on Parenteral Nutrition: Central Venous Catheters (access, care, diagnosis and therapy of complications)

Mauro Pittiruti [a], Helen Hamilton [b], Roberto Biffi [c], John MacFie [d], Marek Pertkiewicz [e]

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[c] *Division of Abdomino-Pelvic Surgery, European Institute of Oncology, Milano, Italy*
[d] *Scarborough Hospital, Scarborough, United Kingdom*
[e] *Medical University of Warsaw, Poland*

2009

Catheter removal or maintenance does not appear to influence the outcome of the thrombosis; indeed, the presence of the catheter might be useful for local thrombolytic treatment, when indicated. Moreover there is a risk of embolization of clot partially attached to the catheter which may easily become dislodged during catheter removal. The catheter should be removed in the case of infected thrombus, when the tip is malpositioned, and if occlusion proves irreversible (Grade C).

Journal of Thrombosis and Haemostasis, **11**: 71–80 DOI: 10.1111/jth.12071

ORIGINAL ARTICLE

International clinical practice guidelines for the treatment and prophylaxis of thrombosis associated with central venous catheters in patients with cancer

P. DEBOURDEAU,*[1] D. FARGE,†‡[1] M. BECKERS,§¶ C. BAGLIN,§¶ R. M. BAUERSACHS,**
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M. H. PRINS,‡‡‡‡‡ M. H. QARI,§§§§§ M. B. STREIFF,¶¶¶¶¶ K. SYRIGOS,****** H. R. BÜLLER†††††††[1]
and H. BOUNAMEAUX‡‡‡‡‡‡[1]

2012

The experts do not recommend catheter removal if all the following conditions are met: (i) the distal catheter tip is in the right position (at the junction between the superior vena cava and the right atrium), (ii) the catheter is functional (good blood reflux), (iii) the catheter is mandatory or vital for the patient, and (iv) there is no fever or any sign or symptom of infected thrombophlebitis. In contrast, catheter removal is warranted if there is a prime risk factor for thrombosis (catheter too short, misplaced, etc.).

clinical practice guidelines

Annals of Oncology 26 (Supplement 5): v152–v168, 2015
doi:10.1093/annonc/mdv296

Central venous access in oncology: ESMO Clinical Practice Guidelines†

B. Sousa[1], J. Furlanetto[2], M. Hutka[3], P. Gouveia[1], R. Wuerstlein[4], J. M. Mariz[5], D. Pinto[1] & F. Cardoso[1], on behalf of the ESMO Guidelines Committee*

[1]*Breast Unit, Champalimaud Clinical Center, Lisbon, Portugal;* [2]*German Breast Group, Neu Isenburg, Germany;* [3]*St George's University Hospitals, NHS Foundation Trust, London, UK;* [4]*CCC of LMU, Breast Center, University Hospital Munich, Munich, Germany;* [5]*Department of Haematology, Instituto Português de Oncologia do Porto- Francisco Gentil, Oporto, Portugal*

2015

Catheter-related thrombosis —treatment

- Anticoagulation therapy with LMWH is the preferred treatment, as it is more effective in preventing thrombosis and has less risk for bleeding compared with VKA [II, A]
- If the catheter is functional and there are no risks for complications, or severe/rapid progressive symptoms, anticoagulation treatment should be continued for the time length of time the catheter is in use [III, C]
- If the CVC is not necessary or non-functioning, or there is concomitant deep vein thrombosis, sepsis, or if long-term anticoagulation is contraindicated, a short course (3–5 days) of anticoagulation therapy is recommended and then the catheter should be removed [I, A]
- LMWH alone or LMWH followed by warfarin should be used for a minimum of 3–6 months [I, C]
- It is recommended to continue anticoagulation therapy at a prophylactic dose, until the catheter is in place [I, C]
- Thrombolytic (urokinase, streptokinase and alteplase) treatment is not recommended as a first-line therapy, due to a greater risk of thrombosis [I, B]

Ann Hematol (2015) 94:1765–1776
DOI 10.1007/s00277-015-2481-1

REVIEW ARTICLE

Recommendations for the use of long-term central venous catheter (CVC) in children with hemato-oncological disorders: management of CVC-related occlusion and CVC-related thrombosis. On behalf of the coagulation defects working group and the supportive therapy working group of the Italian Association of Pediatric Hematology and Oncology (AIEOP)

Paola Giordano[1] · Paola Saracco[2] · Massimo Grassi[1] · Matteo Luciani[3] · Laura Banov[4] · Francesca Carraro[5] · Alessandro Crocoli[6] · Simone Cesaro[7] · Giulio Andrea Zanazzo[8] · Angelo Claudio Molinari[4]

2015

The removal of the CVC is not recommended if all the following conditions are present: (a) the distal tip of the catheter is in the right position (at the junction of the superior vena cava and the right atrium), (b) the catheter is working both on entry and extraction, (c) the catheter is mandatory or of vital importance to the patient, and (d) there is no fever or any signs or symptoms of infectious thrombophlebitis (IIIC).

The removal of the catheter is indicated in the presence of a primary risk factor for thrombosis (catheter too short, dislocation, etc.) (IIIC).


Supplement to
January/February 2016
Volume 39, Number 1S
ISSN 1533-1458
www.journalofinfusionnursing.com
Journal of
Infusion Nursing
The Official Publication of the Infusion Nurses Society
Infusion Therapy
Standards of Practice

2016

J. Do not remove a CVAD in the presence of DVT when the catheter is correctly positioned at the cavoatrial junction, the catheter is functioning correctly with a blood return, and there is no evidence of any infection (refer to Standard 44, *Vascular Access Device [VAD] Removal*).

Special article

Catheter-related thrombosis: A practical approach

Caroline Wall[1], John Moore[2] and Jecko Thachil[1]

jics

Journal of the Intensive Care Society
2016, Vol. 17(2) 160–167
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DOI: 10.1177/1751143715618683
jics.sagepub.com

SAGE

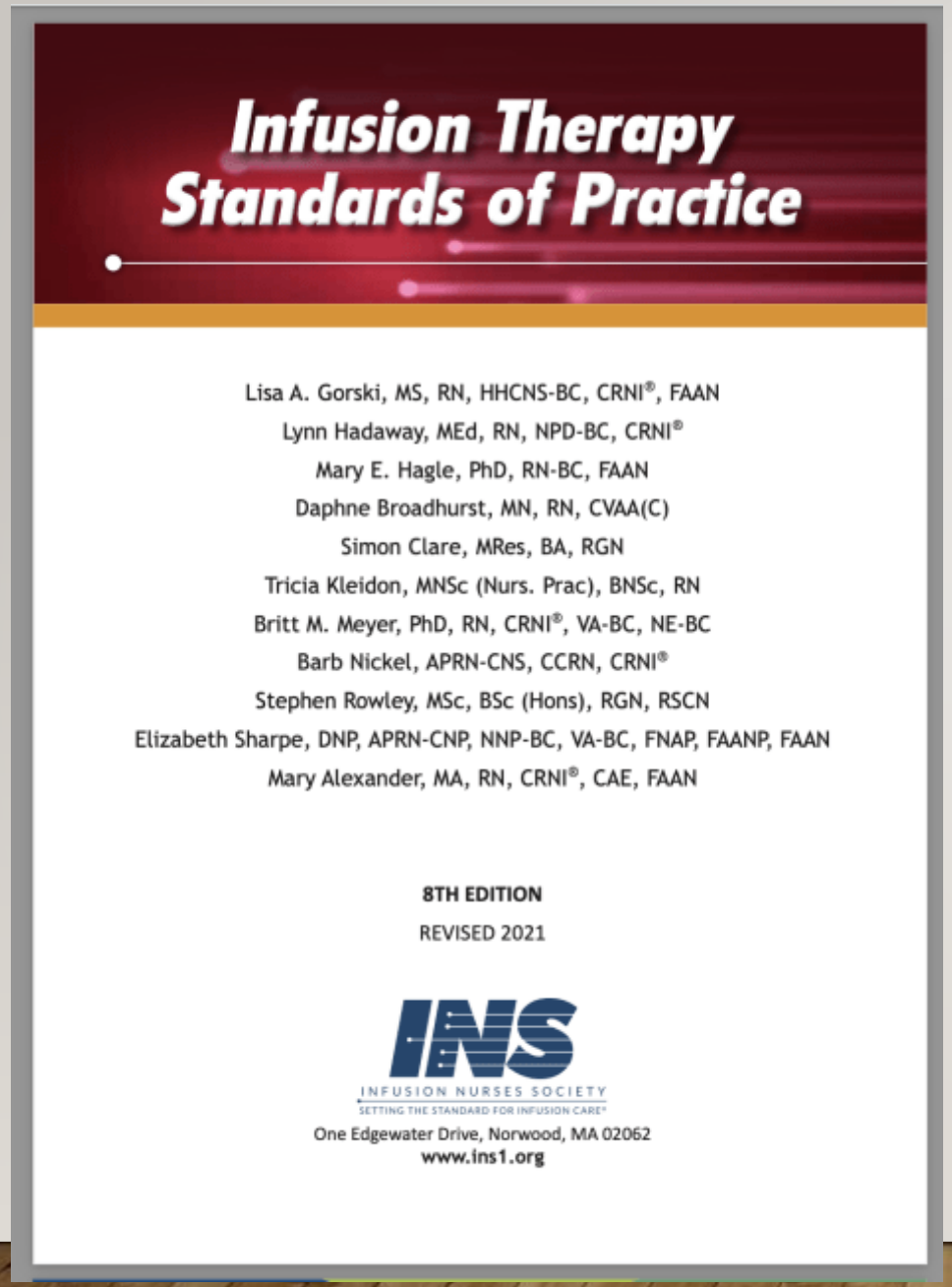
2016

Line removal

The current recommendations[3,23] state that if the CVC is still required and functioning well, it does not have to be removed provided it

- is well positioned
- is non-infected
- demonstrates good resolution of symptoms on surveillance.

The line should be removed if not all the criteria are met, if anticoagulation is contraindicated, if the thrombosis is life or limb threatening or if symptoms are not resolving.



2021

Do not remove a CVAD in the presence of CA-DVT when the catheter is correctly positioned, functional, and necessary for infusion therapy.[3,10,27,45] (II)

1. Catheter removal and replacement in a new site are associated with a high rate of new-site CA-DVT.[46] (IV)

RIMUOVERE IL DISPOSITIVO PER ACCESSO VENOSO?

Casi speciali in cui il dispositivo va rimosso:

- Infezione catetere-correlata concomitante (evenienza assai rara)
- Malfunzione del catetere da ostruzione causata dalla CRT (quando la CRT si è verificata in corrispondenza della punta del DAV): tipicamente, a causa di malposizione secondaria o primaria
- Dispositivo non più utilizzato per fine uso
- Ostruzione venosa persistente e/o sintomi persistenti dopo una settimana di trattamento

Rimuovere il DAV soltanto dopo aver iniziato il trattamento da 3-7 gg (e controllando la evoluzione/morfologia ecografica)

USE ULTRASOUND BEFORE/DURING CATHETER REMOVAL !

- Is the thrombus still 'young' (anechogenic)?
- Is fixed to the vein wall or floating?
- Is it going to move during catheter removal?

US GUIDED CATHETER REMOVAL

PER QUANTO TEMPO CONTINUARE IL TRATTAMENTO?

- Dopo le prime 2-3 settimane a dosaggio terapeutico, se i sintomi sono regrediti completamente e se il quadro morfologico si è quasi normalizzato, si passa a trattamento antitrombotico a dosaggio profilattico (utilizzando LMWH, fondaparinux opp. DOAC)
  - Il dosaggio profilattico va proseguito per almeno tre mesi (anche se nel frattempo si è tolto il DAV)
  - Se il DAV rimane in sede oltre tre mesi, la profilassi va continuata fino alla rimozione del DAV per fine uso
- Se la profilassi continua per molti mesi, preferire i DOAC

ESMO GOOD SCIENCE BETTER MEDICINE BEST PRACTICE

ANNALS OF ONCOLOGY driving innovation in oncology

SPECIAL ARTICLE

Venous thromboembolism in cancer patients: ESMO Clinical Practice Guideline☆

A. Falanga[1,2], C. Ay[3], M. Di Nisio[4], G. Gerotziafas[5], L. Jara-Palomares[6,7], F. Langer[8], R. Lecumberri[9,10], M. Mandala[11], A. Maraveyas[12], I. Pabinger[3], M. Sinn[8], K. Syrigos[13], A. Young[14] & K. Jordan[15,16], on behalf of the ESMO Guidelines Committee*

2023

- For the treatment of symptomatic CRT in cancer patients, anticoagulant treatment is recommended for a minimum of 3 months [III, A]. LMWH is suggested, although, in the absence of direct comparisons between anticoagulants in this setting, VKAs or DOACs may be considered alternative options [IV, C].
- It is recommended to remove the catheter if it is not needed or is infected, anticoagulant treatment is contraindicated or there is clinical deterioration due to thrombus extension despite treatment [III, B].
- In patients with CRT, who have completed 3 months of anticoagulant treatment, extended anticoagulation until catheter removal is suggested, if the patient's bleeding risk is low [IV, C].

RACCOMANDAZIONI

- Iniziare il trattamento non appena fatta la diagnosi ecografica di CRT sintomatica: dosaggio terapeutico di LMWH opp. Fondaparinux per 2-3 settimane
- Rimuovere il DAV soltanto se infetto, o inutile, o malfunzionante
- Ricontrollare il paziente (es. ogni settimana) e passare a dosaggio profilattico dopo 2-3 settimane, se vi è regressione dei sintomi e riduzione del quadro morfologico
- Continuare la profilassi per tre mesi o – se a tre mesi il DAV è ancora in sede – fino alla rimozione del DAV

A PROPOSITO DELLA PREVENZIONE

- Quando è indicata la prevenzione farmacologica?
- Come può influire sul rischio di CRT la scelta del DAV?
- Come può influire sul rischio di CRT la tecnica di inserzione del DAV?
- Raccomandazioni

QUANDO È INDICATA LA PREVENZIONE FARMACOLOGICA?

- La prevenzione farmacologica di tutti i pazienti candidati a DAV non è giustificata
- La prevenzione farmacologica (dosaggio profilattico di LMWH, fondaparinux, opp. DOAC da iniziare il giorno dopo l'impianto) è consigliata nei seguenti casi:
  1. Pazienti con nota diatesi trombofilica legata ad alterazioni congenite
  2. Pazienti con anamnesi di CRT in occasione di pregressi DAV
  3. Pazienti oncologici con anamnesi di trombosi venosa non catetere correlata diagnosticata contestualmente alla diagnosi di malattia oncologica o poco prima o dopo tale diagnosi

ESMO GOOD SCIENCE BETTER MEDICINE BEST PRACTICE

ANNALS OF ONCOLOGY driving innovation in oncology

2023

SPECIAL ARTICLE

Venous thromboembolism in cancer patients: ESMO Clinical Practice Guideline☆

A. Falanga[1,2], C. Ay[3], M. Di Nisio[4], G. Gerotziafas[5], L. Jara-Palomares[6,7], F. Langer[8], R. Lecumberri[9,10], M. Mandala[11], A. Maraveyas[12], I. Pabinger[3], M. Sinn[8], K. Syrigos[13], A. Young[14] & K. Jordan[15,16], on behalf of the ESMO Guidelines Committee*

- Routine pharmacological prophylaxis of CRT is not recommended [II, D].

ESISTE UNA EFFICACE PREVENZIONE FARMACOLOGICA DELLA CRT ?

PREVENZIONE FARMACOLOGICA DELLA CRT

PAZIENTI SENZA FATTORI DI RISCHIO

NESSUNA EVIDENZA CLINICA DI EFFICACIA

PAZIENTI CON FATTORI DI RISCHIO ACQUISITI O CONGENITI

SUGGERITA SEBBENE SCARSA LETTERATURA PER LA CRT

COME PUÒ INFLUIRE SUL RISCHIO DI CRT LA SCELTA DEL DAV?

- Cateteri il cui calibro esterno è > 1/3 del diametro interno della vena si associano a maggior rischio di CRT
- Alcuni materiali si associano a maggior rischio di CRT (PE, PTFE, PVC)
- Non è ancora chiaro se il PUR trattato con Endexo possa realmente ridurre il rischio di CRT
- I DAV con sito di emergenza instabile o collocato in zone di flessione (zona antecubitale, collo, inguine) si associano a maggior rischio di CRT

COME PUÒ INFLUIRE SUL RISCHIO DI CRT LA TECNICA DI INSERZIONE DEL DAV?

La tecnica di impianto ha un ruolo fondamentale nel ridurre il rischio di CRT. Strategie provatamente efficaci sono le seguenti:

- Scelta della vena di calibro appropriato
- Venipuntura ecoguidata
- Uso di kit di microintroduzione
- Accurato posizionamento intraprocedurale della punta (per i DAV centrali)
- Adeguata stabilizzazione del DAV al sito di emergenza

frontiers | Frontiers in Nutrition

TYPE Review
PUBLISHED 06 February 2023
DOI 10.3389/fnut.2023.1106327

Check for updates

OPEN ACCESS

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SPECIALTY SECTION

Prevention and treatment of catheter-related venous thrombosis in long-term parenteral nutrition: A SINuC position statement

Vincenzo Zaccone[1], Luca Santoro[2]*, Emanuele Guerrieri[3], Ilaria Diblasi[3], Ilaria Roncarati[3], Giovanna Viticchi[4], Pietro Vecchiarelli[5], Angelo Santoliquido[2,6], Francesca Fiore[7], Alessio Molfino[8], Francesco Landi[6,7], Gianluca Moroncini[9], Antonio Gasbarrini[6,10], Maurizio Muscaritoli[8] and Lorenzo Falsetti[1] on behalf of SINuC†

2023

Which are the risk factors to develop CRT?

Recommendation
A catheter larger than 33% of the diameter should be considered a risk factor for CRT
Active cancer, inflammatory states and thrombophilia should be considered as factors that further promote CRT
Chemical and mechanical endothelial damage should be considered as a risk factor for CRT
Local inflammation should be considered as a risk factor for CRT
There is no convincing evidence to suggest antithrombotic material over classical materials to prevent CRT
Micro-introduction kits should be considered to reduce CRT risk
Intraprocedural methods of tip placement (such as intracavitary ECG, cardiac ultrasound assessment, or, in special cases, fluoroscopy) should be considered to improve the accuracy of the central position and reduce CRT risk
A correct catheter fixation should be considered as useful to reduce CRT risk

THE GAVECELT INSERTION BUNDLE FOR PREVENTING CRT

1. Appropriate choice of the vein
2. Appropriate technique of venipuncture
3. Adequate position of the tip
4. Proper securement

THE MOST IMPORTANT FACTOR

Match the VAD caliber with the vein caliber:

- Inner vein diameter should be at least three times the catheter diameter
  - 3Fr PICC = vein of 3 mm or larger
    - 4Fr PICC = vein of 4 mm or larger
    - 5Fr PICC = vein of 5 mm or larger
    - 6Fr PICC = vein of 6 mm or larger

Review

Symptomatic Deep Vein Thrombosis Associated With Peripherally Inserted Central Catheters of Different Diameters: A Systematic Review and Meta-Analysis

Clinical and Applied Thrombosis/Hemostasis
Volume 28: 1-11
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DOI: 10.1177/10760296221144041
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Sage

Amit Bahl, MD[1], Kimberly Alsbrooks, BSN, RN, RT(R), VA-BC[2], Smeet Gala, MS, BTech[2], and Klaus Hoerauf, MD, PhD, DBA[2,3]

2022

Thrombosis Research 228 (2023) 172–180

Contents lists available at ScienceDirect

Thrombosis Research

journal homepage: www.elsevier.com/locate/thromres

Full length article

Risk of midline catheter-related thrombosis due to catheter diameter: An observational cohort study

Amit Bahl[a,*], Nicholas Mielke[b], Yuying Xing[c]

2023

Intensive Care Med
DOI 10.1007/s00134-012-2597-x

CONFERENCE REPORTS AND EXPERT PANEL

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Michael Blaivas
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Mahmoud Elbarbary
Thierry Pirotte
Dimitrios Karakitsos

International evidence-based recommendations on ultrasound-guided vascular access

Use ultrasound !

2012

Table 6 Recommendations regarding sterility using ultrasound guidance and prevention of infectious and mechanical complications using ultrasound-guided cannulation

Domain code	Suggested definition	Level of evidence	Degree of consensus	Strength of recommendation
Sterility during ultrasound vascular procedures				
D8.S1	Sterile techniques should always be used during the placement of a vascular access device, including hand washing; sterile full body drapes; wearing of sterile gowns, gloves, caps and masks covering both the mouth and nose. Probe and cable sterility have to be maintained using sterile gel and appropriate probe and cable shields	A	Very good	Strong
Prevention of infectious and mechanical complications with ultrasound-guided cannulation				
D8.S2	Ultrasound guidance should be used in order to decrease the rate of CRBSI in adults and children	C	Very good	Strong
D8.S3–4	A multi-faceted strategy, including the use of ultrasound guidance with specific preventive and educational measures and the promotion of good practices applied by both medical and nursing staff, is suggested in order to reduce the incidence of CRBSI	B	Good	Strong
D8.S5	Ultrasound guidance should be used to avoid cannulation of thrombotic sites	A	Very good	Strong
D8.S6	Ultrasound guidance, by reducing puncture attempts, technical failure rates and mechanical complications, has to be preferred because of a reduced incidence of catheter-related thrombosis	A	Very good	Strong

USE MICROINTRODUCER KITS !

CE Test Material

Catheter-Related Central Venous Thrombosis: The Development of a Nationwide Consensus Paper in Italy

Costantino Campisi, MD, Roberto Biffi, MD, and Mauro Pittiruti, MD on behalf of the GAVeCeLT Committee for the Consensus

38 | JAVA | Vol 12 No 1 | 2007

Q 5
Which is the role of the position of the catheter tip?

In many prospective studies, tip position emerged as the main independent prognostic factor for malfunction, thrombosis and reduced duration of the device.

In oncology patients, the atrial-caval junction is apparently the optimal position of the catheter tip, as it minimizes the risk of central venous thrombotic events.

Strength B Recommendation

review

Annals of Oncology 20: 1459–1471, 2009
doi:10.1093/annonc/mdp052
Published online 12 June 2009

2008 SOR guidelines for the prevention and treatment of thrombosis associated with central venous catheters in patients with cancer: report from the working group

P. Debourdeau[1]*, D. Kassab Chahmi[2], G. Le Gal[3], I. Kriegel[4], E. Desruennes[5], M.-C. Douard[6], I. Elalamy[7], G. Meyer[8], P. Mismetti[9], M. Pavic[1], M.-L. Scrobohaci[10], H. Lévesque[11], J. M. Renaudin[12] & D. Farge[13] on behalf of the working group of the SOR

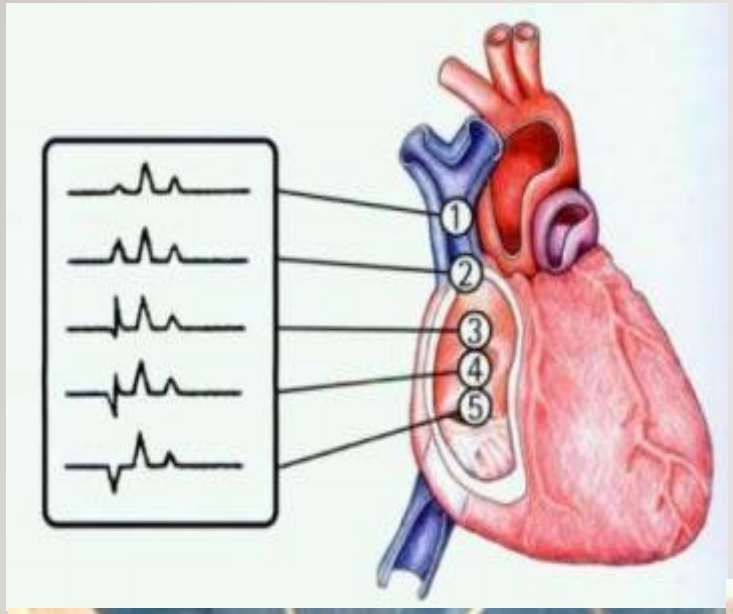
2009

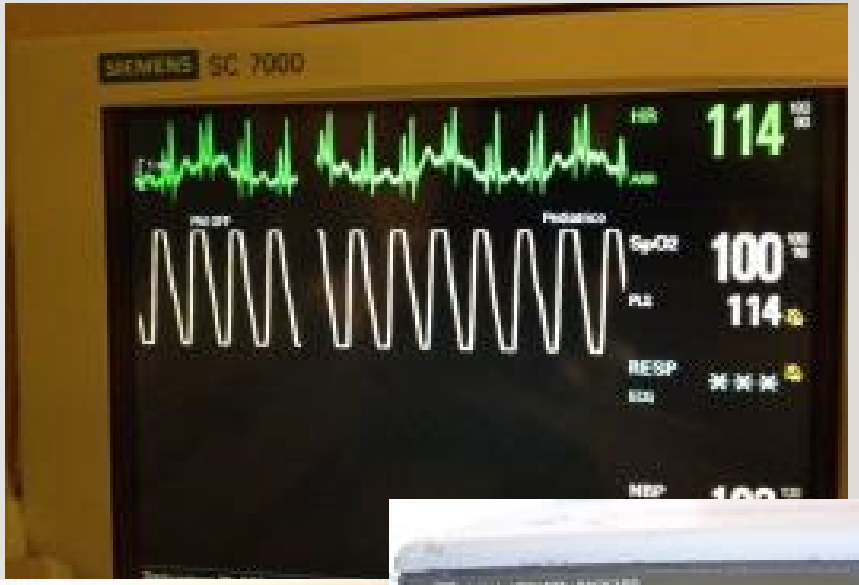
primary prevention of CVC-associated thrombosis in patients with cancer

standards.

1 The distal tip of CVC should be placed at the junction between the superior vena cava and the right atrium.

USE INTRACAVITARY EKG !





GLUE

SUTURELESS DEVICES

- Skin adhesion

SUTURELESS DEVICES

- Included in the dressing

SUTURELESS DEVICES

- Anchored subcutaneously

TRANSPARENT DRESSING

- Transparent dressings are to be preferred not only because protective against bacterial contamination, but also because of the catheter securement they offer

(see EPIC guidelines 2014)

INSERTION-BUNDLE TO PREVENT CRT

PICC insertion

1) PROPER CHOICE OF THE VEIN

2) US-GUIDED VENIPUNCTURE + MICROINTRODUCER KIT

3) INTRACAVITARY EKG FOR INTRAPROCEDURAL TIP LOCATION

4) GLUE + SUTURELESS DEVICE + TRANSPARENT DRESSING

DOES THIS BUNDLE WORK ?

Pittiruti et al. Critical Care 2012, 16:R21
http://ccforum.com/content/16/1/R21

CRITICAL CARE

RESEARCH Open Access

Clinical experience with power-injectable PICCs in intensive care patients

Mauro Pittiruti[1*], Alberto Brutti[2], Davide Celentano[2], Massimiliano Pomponi[2], Daniele G Biasucci[2], Maria Giuseppina Annetta[2] and Giancarlo Scoppettuolo[3]

See related Letter by Zampieri,

http://ccforum.com/content/16/2/425

89 PICCs in ICU patients – CRT 3%

DOES THIS BUNDLE WORK ?

Journal of Parenteral and Enteral Nutrition
http://pen.sagepub.com/

Catheter-Related Complications in Cancer Patients on Home Parenteral Nutrition : A Prospective Study of Over 51,000 Catheter Days

Paolo Cotogni, Mauro Pittiruti, Cristina Barbero, Taira Monge, Augusta Palmo and Daniela Boggio Bertinet

JPEN J Parenter Enteral Nutr published online 20 September 2012
DOI: 10.1177/0148607112460552

The online version of this article can be found at:
http://pen.sagepub.com/content/early/2012/09/18/0148607112460552

165 PICCs in cancer patients – CRT 0 %

DOES THIS BUNDLE WORK ?

Support Care Cancer
DOI 10.1007/s00520-014-2387-9

ORIGINAL ARTICLE

Peripherally inserted central catheters in non-hospitalized cancer patients: 5-year results of a prospective study

Paolo Cotogni · Cristina Barbero · Cristina Garrino · Claudia Degiorgis · Baudolino Mussa · Antonella De Francesco · Mauro Pittiruti

269 PICCs in cancer patients – CRT 1.1 %

DOES THIS BUNDLE WORK ?

J Vasc Access 2014; 00 (00): 000-000
DOI: 10.5301/jva.5000280

ORIGINAL ARTICLE

A prospective, randomized comparison of three different types of valved and non-valved peripherally inserted central catheters

Mauro Pittiruti[1], Alessandro Emoli[2], Patrizia Porta[2], Bruno Marche[2], Rosa DeAngelis[2], Giancarlo Scoppettuolo[3]

[1] Department of Surgery, Catholic University Hospital, Rome - Italy
[2] Day Hospital of Oncology, Catholic University Hospital, Rome - Italy
[3] Department of Infectious Diseases, Catholic University Hospital, Rome - Italy

180 PICCs in cancer patients – CRT 0.5 %

DOES THIS BUNDLE WORK ?

Support Care Cancer
DOI 10.1007/s00520-015-2740-7

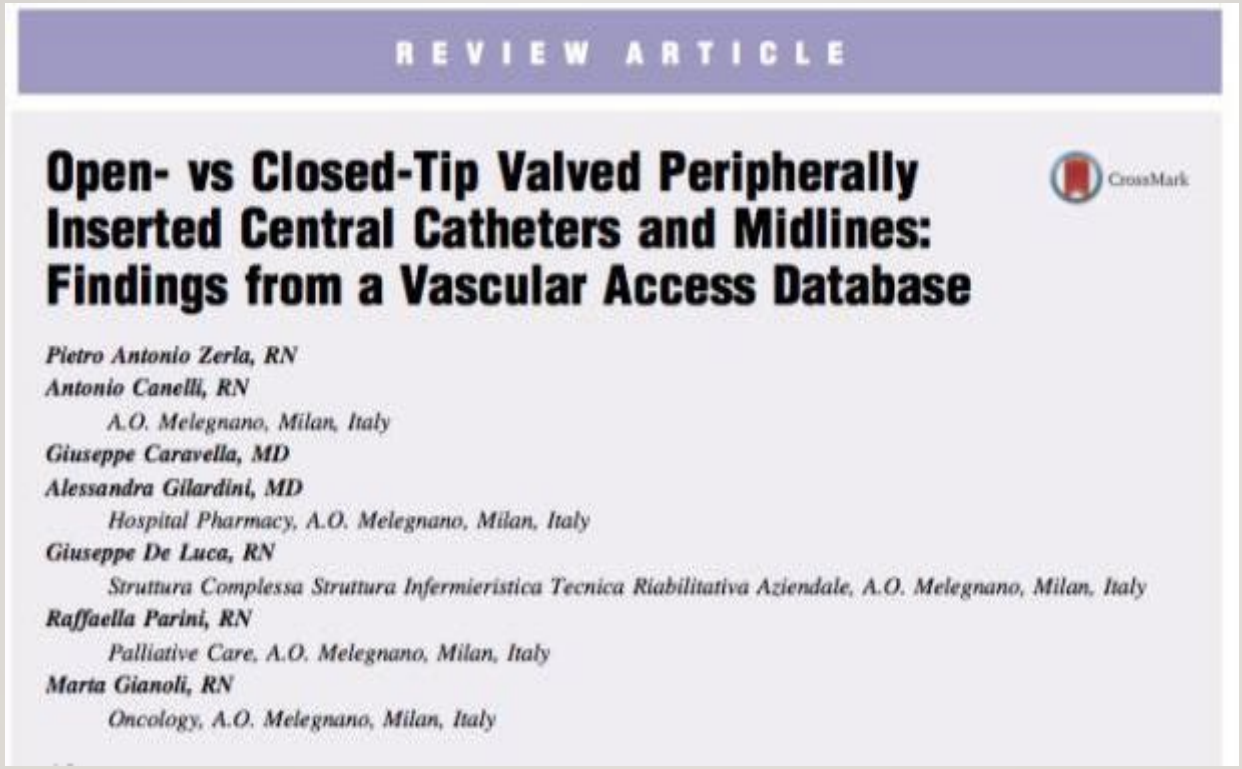
ORIGINAL ARTICLE

Catheter-associated bloodstream infections and thrombotic risk in hematologic patients with peripherally inserted central catheters (PICC)

Salvatore Giacomo Morano[1] · Roberto Latagliata[1] · Corrado Girmenia[1] · Fulvio Massaro[1] · Paola Berneschi[1] · Alfonso Guerriero[1] · Massimo Giampaoletti[1] · Arianna Sammarco[1] · Giorgia Annechini[1] · Angelo Fama[1] · Alice Di Rocco[1] · Antonio Chistolini[1] · Alessandra Micozzi[1] · Matteo Molica[1] · Walter Barberi[1] · Clara Minotti[1] · Gregorio Antonio Brunetti[1] · Massimo Breccia[1] · Claudio Cartoni[1] · Saveria Capria[1] · Giovanni Rosa[2] · Giuliana Alimena[1] · Robin Foà[1]

612 PICCs in hematology patients – CRT 2.6 %

DOES THIS BUNDLE WORK ?



REVIEW ARTICLE

Open- vs Closed-Tip Valved Peripherally Inserted Central Catheters and Midlines: Findings from a Vascular Access Database

Pietro Antonio Zerla, RN
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Alessandra Gilardini, MD
Hospital Pharmacy, A.O. Melegnano, Milan, Italy
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Struttura Complessa Struttura Infermieristica Tecnica Riabilitativa Aziendale, A.O. Melegnano, Milan, Italy
Raffaella Parini, RN
Palliative Care, A.O. Melegnano, Milan, Italy
Marta Gianoli, RN
Oncology, A.O. Melegnano, Milan, Italy

793 PICCs – CRT 2.6 %

RACCOMANDAZIONI

- Utilizzare la prevenzione farmacologica soltanto se indicata
- Ricordare che l'impiantatore del DAV ha la responsabilità di adottare in modo consistente le strategie di prevenzione (vedi protocollo GAVeCeLT per la prevenzione delle CRT): la CRT è una complicanza in parte prevenibile proprio nella fase di impianto
- Tranne poche eccezioni (cateteri per ECMO), le raccomandazioni GAVeCeLT possono e devono essere applicate a tutti i DAV centrali (PICC, CICC, FICC, sistemi totalmente impiantabili)

CONCLUSIONI

CONCLUSIONI

- La CRT è una complicanza frequente, ma che nella maggior parte dei casi (a) ha evoluzione benigna, (b) risponde rapidamente al trattamento, (c) non si associa ad elevati costi assistenziali, (d) non si associa a rischi gravi per il paziente, (e) non comporta la interruzione dell'utilizzo del DAV
- Il rischio di CRT ha una componente non prevenibile (trombofilia del paziente - malattia neoplastica) e una componente prevenibile (scelta del DAV e della tecnica di impianto)

PROBLEMI APERTI

- Necessità di educazione/formazione per tutti gli operatori sanitari interessati, per renderli consapevoli della esistenza della guaina fibroblastica
- Acquisire evidenze in proposito alla opportunità di trattare o meno la CRT asintomatica
- Acquisire evidenze sulla eventuale efficacia antitrombotica di cateteri di determinati materiali (Endexo)
- Acquisire evidenze sulla effettiva necessità di eseguire esami ecografici prima della rimozione di DAV scevri da segni o sintomi di CRT
- ……..

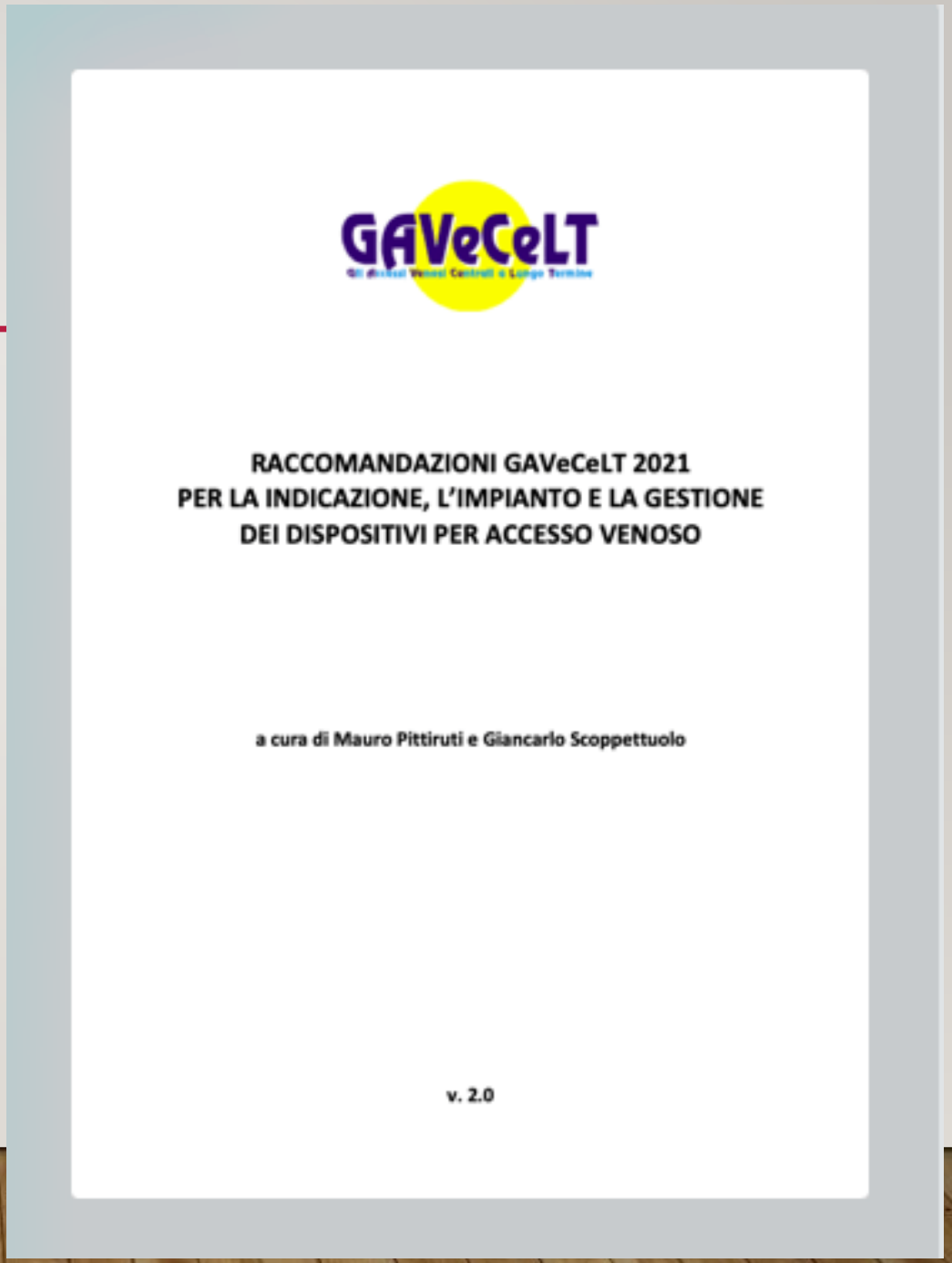
PER SAPERNE DI PIÙ…..

Raccomandazioni pratiche

SIAARTI
GAVECELT

SIAARTI
PRO VITA CONTRA DOLOREM SEMPER

Buone pratiche cliniche SIAARTI



JOURNAL OF VASCULAR ACCESS

https://journals.sagepub.com/home/jva

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

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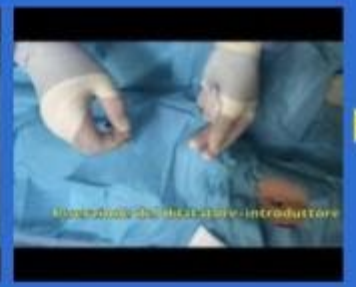
GAVeCeLT - Posizionamento di CICC mediante ECG intracavitario wireless

GAVeCeLT - Posizionamento di Bioflo FICC

GAVeCeLT - Posizionamento di Bioflo PICC tunnellizzato

GAVeCeLT - Tip location di FICC mediante finestra transepatica



GAVeCeLT - Posizionamento FICC in vena femorale superficiale

Gli Accessi Venosi Centrali a Lungo Termine

GAVeCeLT

è il sito web del Gruppo Aperto di Studio 'Gli Accessi Venosi Centrali a Lungo Termine', un sito dedicato a tutti gli operatori sanitari interessati alle problematiche connesse con le indicazioni, l'impianto e la gestione degli accessi venosi a breve, medio e lungo termine.

E' un sito multidisciplinare e multiprofessionale, coordinato da un gruppo di esperti, ma aperto ai contributi di ognuno.

RegistrandoVi potrete avere accesso a tutte le sezioni del sito, essere informati sui prossimi eventi formativi nel campo degli accessi vascolari, e scaricare gratuitamente linee guida, protocolli, documenti, tecniche e 'link' utili.

Cerca

RACCOMANDAZIONI GAVeCeLT 2021 PER LA INDICAZIONE, L'IMPIANTO E LA GESTIONE DEI DISPOSITIVI PER ACCESSO VENOSO

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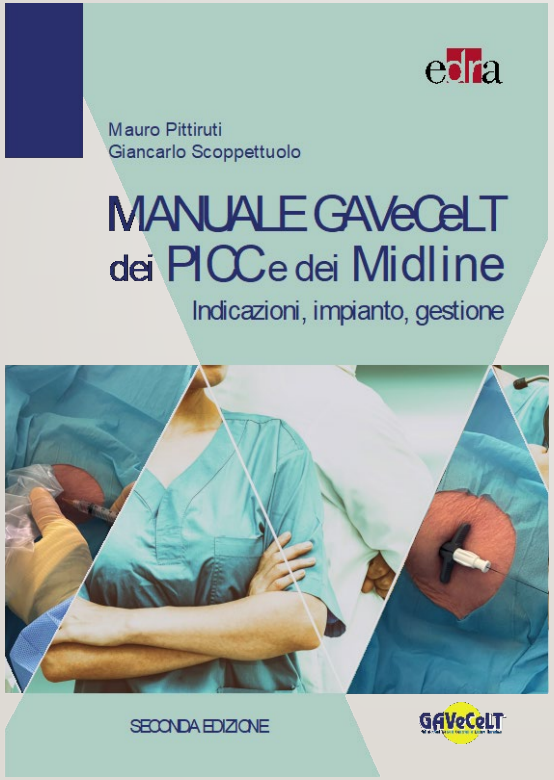
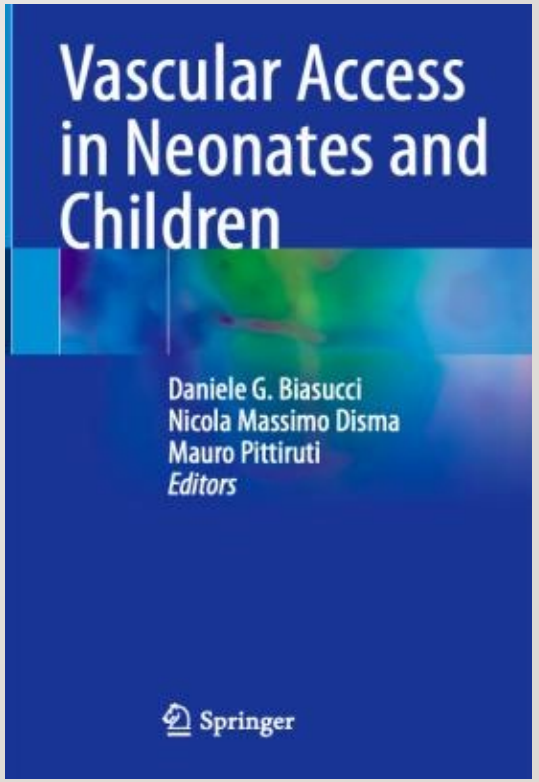
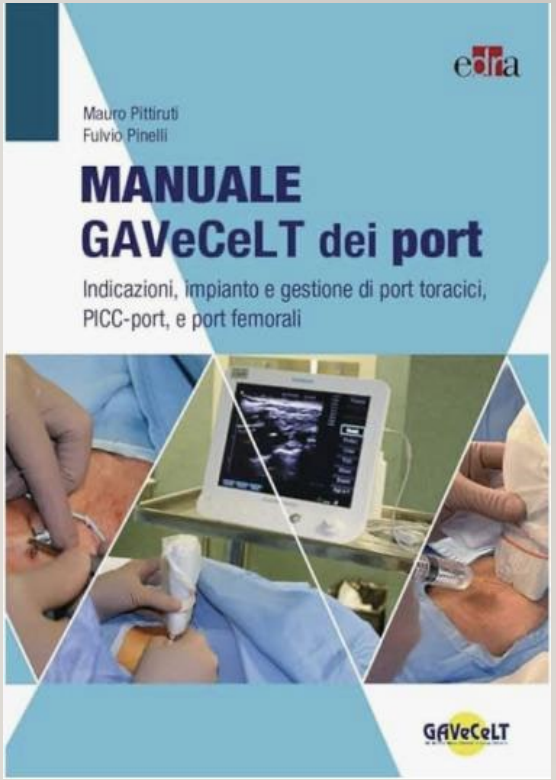
2022



2022



2022



2024

GAVeCeLT
Gli Accessi Venosi Centrali a Lungo Termine

GAVeCeLT 2024
Bologna, 9-10-11 dicembre

XIII Congresso Nazionale GAVeCeLT - 9 dicembre

XVII PICC Day - 10 dicembre

IV Convegno Nazionale PICC-port - 11 dicembre

GRAZIE DELL'ATTENZIONE

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