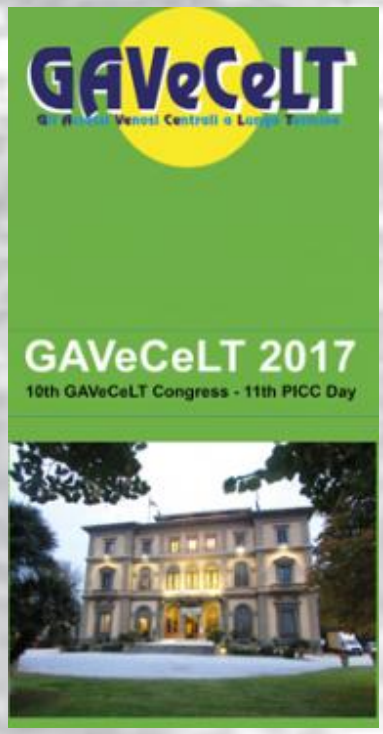
Cateteri Venosi per dialisi e prevenzione delle complicanze: convergenze e divergenze tra le linee guida

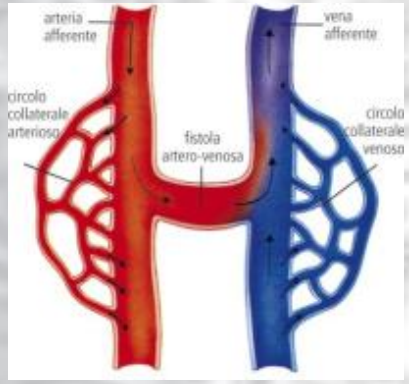


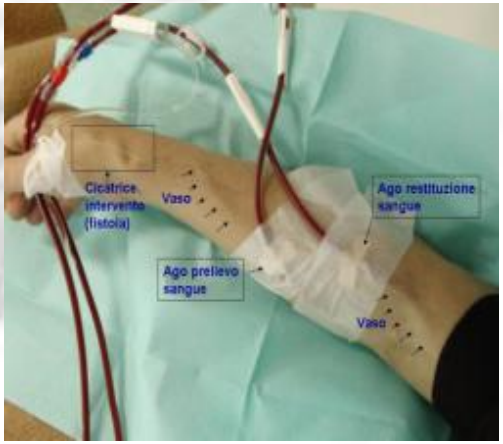
December 4-5-6, 2017
Florence Congress Center
Florence, Italy

Dott. Elisei Daniele
U.O. Anestesia e Rianimazione
AREA VASTA 3, MACERATA

Accessi vascolari per pazienti in emodialisi

- All'inizio della dialisi clinica (W. Kolff, 1943), cateterizzazione intermittente con cannule di vetro o metallo (vasi legati dopo trattamento).
- La dialisi per pazienti cronici inizia con lo shunt arterovenoso in teflon (cfr. figura) di B.H. Scribner (1960).
- Fistola artero-venosa endogena di J.E.Cimino, M.J. Brescia e colleghi (1966).
- Nel 1961 S. Shaldon descrive l'uso dei cateteri femorali.
- Anni '70: uso dei vasi protesici.





Tipi di accesso vascolare in EMODIALISI

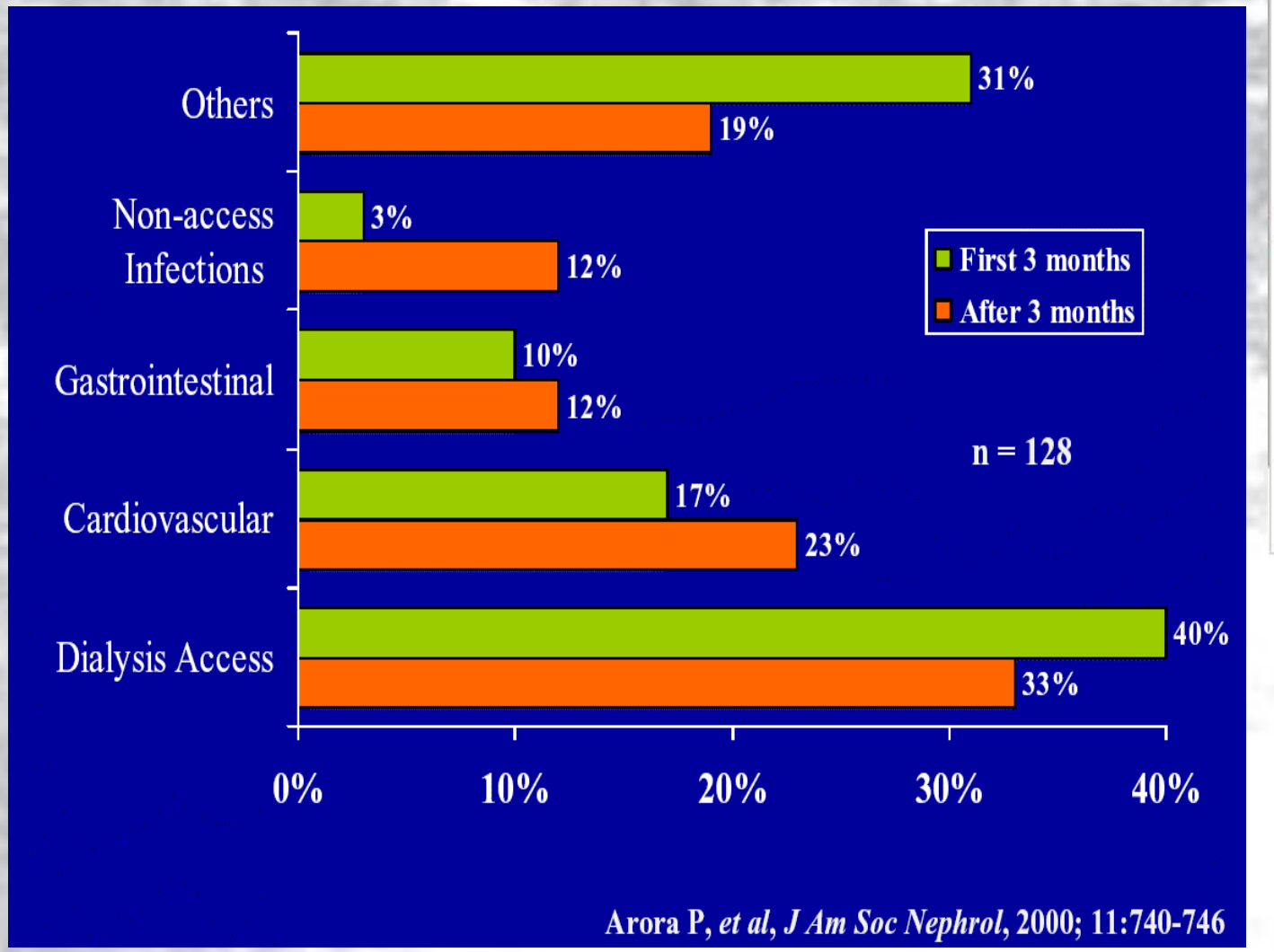
- Fistola artero-venosa (AV) (1966)
- Fistola protesica ("graft") (1970)
- Catetere venoso centrale (1970)
- Porta vascolare sintetica (1980)

Quasi 40 anni dopo la sua introduzione, la fistola AV rimane l'accesso che si avvicina di più a quello ideale (maggior durata e minori interventi).

Il mantenimento dell'accesso vascolare è molto critico e grava significativamente sui costi per un centro dialisi.

Oltre il 25% delle ospedalizzazioni dei pazienti in dialisi sono dovute a problemi con gli accessi vascolari.

JASN JOURNAL OF THE AMERICAN SOCIETY OF NEPHROLOGY



Arora P, *et al*, *J Am Soc Nephrol*, 2000; 11:740-746

OXFORD JOURNALS

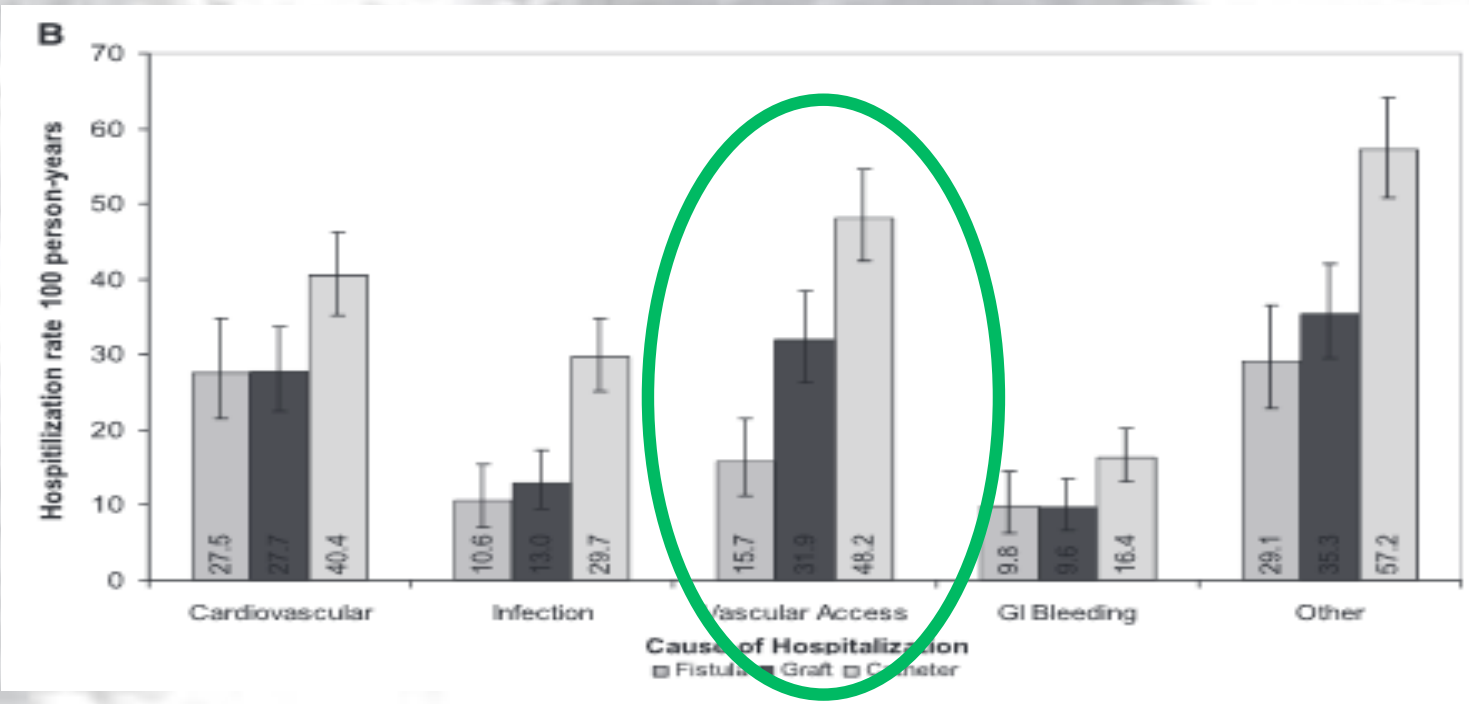
ndt NEPHROLOGY DIALYSIS TRANSPLANTATION

Hospitalization risks related to vascular access type among incident US hemodialysis patients

Leslie J. Ng[1], Fangfei Chen[1], Ronald L. Pisoni[2], Mahesh Krishnan[3], Donna Mapes[2], Marcia Keen[2] and Brian D. Bradbury[1,4]

[1]Department of Biostatistics and Epidemiology, Amgen Inc., Thousand Oaks, CA, USA, [2]Arbor Research Collaborative for Health, Ann Arbor, MI, USA, [3]DaVita Clinical Research, Denver, CO, USA and [4]Department of Epidemiology, University of California, Los Angeles, Los Angeles, CA, USA

Correspondence and offprint requests to: Brian D. Bradbury; E-mail: bradbury@amgen.com



AJKD
AMERICAN JOURNAL OF KIDNEY DISEASES
National Kidney Foundation®

Am J Kidney Dis. 2009 Nov;54(5):912-21. doi: 10.1053/j.ajkd.2009.07.008. Epub 2009 Sep 12.

Change in vascular access and mortality in maintenance hemodialysis patients.

Lacson E Jr[1], Wang W, Lazarus JM, Hakim RM.

- **Catheters have the worst associated mortality risk (HR of 1.76).**
- **Changing from a catheter to a fistula or graft is associated with significantly improved survival (HR of 0.69).**

.....NEL MALATO NEFROPATICO, INDOSSARE PRIMA

.....NEL MALATO NEFROPATICO, INDOSSARE POI

Box 2. Summary of Recommendation Statements

Guideline 1: Timing of Hemodialysis Initiation

1.1 Patients who reach CKD stage 4 (GFR < 30 mL/min/1.73 m^2), including those who have imminent need for maintenance dialysis at the time of initial assessment, should receive education about kidney failure and options for its treatment, including kidney transplantation, PD, HD in the home or in-center, and conservative treatment. Patients' family members and caregivers also should be educated about treatment choices for kidney failure. (*Not Graded*)

1.2 The decision to initiate maintenance dialysis in patients who choose to do so should be based primarily upon an assessment of signs and/or symptoms associated with uremia, evidence of protein-energy wasting, and the ability to safely manage metabolic abnormalities and/or volume overload with medical therapy rather than on a specific level of kidney function in the absence of such signs and symptoms. (*Not Graded*)

Guideline 2: Frequent and Long Duration Hemodialysis

In-center Frequent HD

2.1 We suggest that patients with end-stage kidney disease be offered in-center short frequent hemodialysis as an alternative to conventional in-center thrice weekly hemodialysis after considering individual patient preferences, the potential quality of life and physiological benefits, and the risks of these therapies. (*2C*)

2.2 We recommend that patients considering in-center short frequent hemodialysis be informed about the risks of this therapy, including a possible increase in vascular access procedures (*1B*) and the potential for hypotension during dialysis. (*1C*)

Home Long HD

2.3 Consider home long hemodialysis (6-8 hours, 3 to 6 nights per week) for patients with end-stage kidney disease who prefer this therapy for lifestyle considerations. (*Not Graded*)

2.4 We recommend that patients considering home long frequent hemodialysis be informed about the risks of this therapy, including possible increase in vascular access complications, potential for increased caregiver burden, and accelerated decline in residual kidney function. (*1C*)

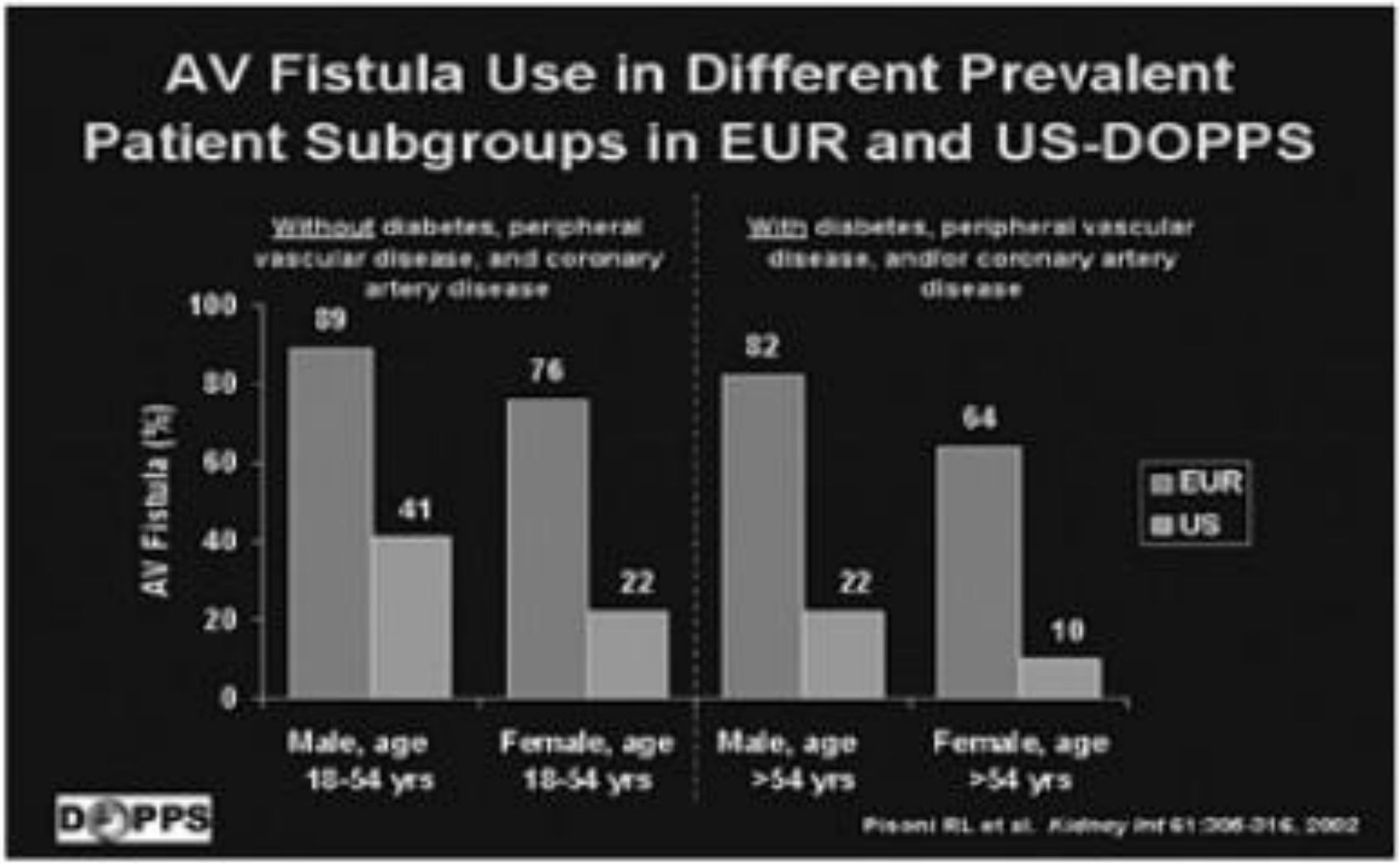
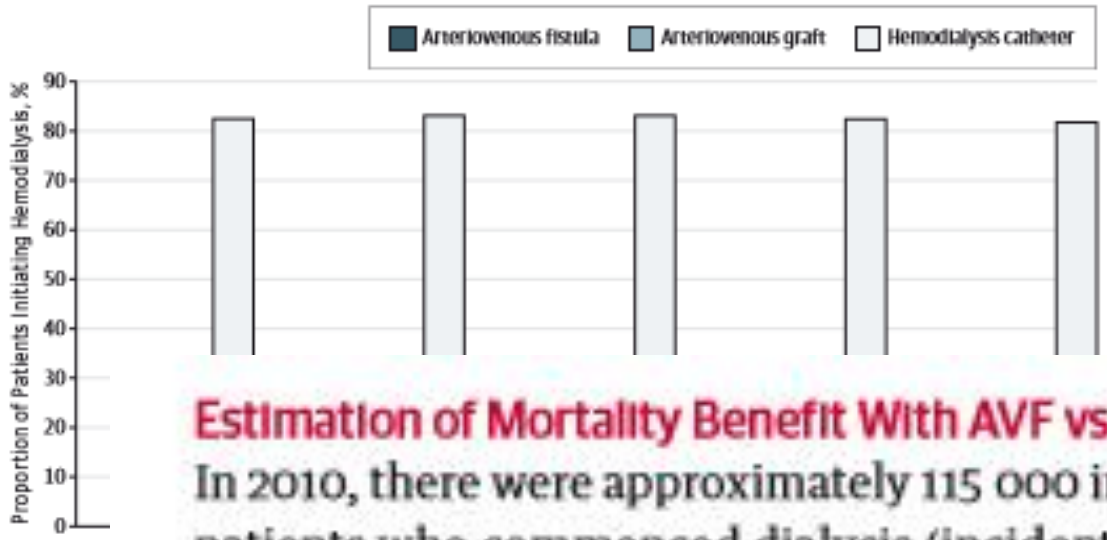


Fig. 3 - Percentuale di confezionamento di FAV in Europa e negli Stati Uniti.

DOPPS II: 2002-2004; DOPPS III: 2005-2007 (7).

Figure 1. Access Method Proportions by Year



Hemodialysis initiation with arteriovenous fistulae increased

0%

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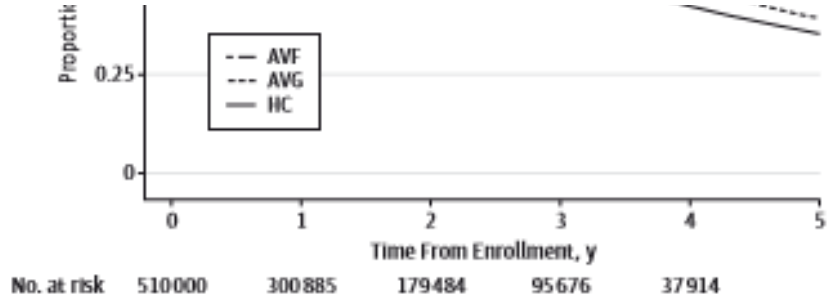
Estimation of Mortality Benefit With AVF vs HC

In 2010, there were approximately 115 000 incidence cases of patients who commenced dialysis (incident cases). Of these, 94 300 (82%) started dialysis with HC, of which 24 716 (26.2%) died within the first year. If all 115 000 patients had started dialysis with an AVF instead, only 10 741 patients (9.3%) would have died within the first year, resulting in a total saving of 13 975 lives in a single year.

Figure 2. Kapl



There was a rapid decline in survival in the hemodialysis catheter (HC) group during the first year after hemodialysis initiation, while there was a steady decline in the arteriovenous fistula (AVF) and arteriovenous graft (AVG) groups. Survival at 1 year was significantly lower at both 1 and 5 years in the HC group compared with the AVF and AVG groups (Wilcoxon $P < .001$).

Tabella 17. Sede del trattamento dei pazienti acuti (numero e pmp) per Regione

Regione	Trattamenti in nefrologia	Trattamenti in altri reparti	Totale	pmp
Totale	90.400	50.537	140.937	2.318

Ta-

Settembre Ottobre 2017 Anno 34 Vol. 5

Tabella 22. Effettuazione di ecocolordoppler nel Centro

Nel Centro il Nefrologo effettua l'ecocolordoppler	totale	%
SI regolarmente per la valutazione dell'albero vascolare prima di allestire l'accesso dialitico	157	49,4
SI regolarmente per la valutazione delle FAV	138	43,4
SI per la valutazione delle FAV in caso di complicanze	188	59,1
SI per l'inserimento dei cateteri venosi centrali	181	56,9
SI per la valutazione delle arterie renali	119	37,4
SI per la valutazione dei tronchi sovra-aortici	45	14,2
SI per la valutazione dei vasi degli arti inferiori	30	9,4
NO nel centro il nefrologo non effettua questo esame	68	21,4

Ecografia ed accessi vascolari in emodialisi

Authors' conclusions

Use of real-time 2-D Doppler ultrasound guidance has significant benefits with respect to the number of catheters successfully inserted on the first attempt, reduction in the risk of arterial puncture and haematomas and the time taken for successful vein puncture.

PLAIN LANGUAGE SUMMARY

Ultrasound use for the placement of haemodialysis catheters

Insertion of haemodialysis catheters can be achieved either by using the anatomical landmarks for the veins into which they are inserted or using ultrasound guidance. It has been suggested that the use of ultrasound guidance reduces the immediate complications of haemodialysis catheter insertions such as pneumothorax or arterial puncture. We identified seven studies, enrolling 767 patients that compared haemodialysis catheter insertion using the traditional 'blind' landmark method and insertion using ultrasound imaging. The use of ultrasound imaging was found to be associated with significantly less risk of arterial puncture and haematomas and less time to insert the catheter as well as a higher success rate for inserting the catheter on the first attempt.

State of the Art

Hemodialysis Catheter Placement and Management[1]

Scott O. Trerotola, MD

Index terms:
Catheters and catheterization, 907.1269, 946.1269
Catheters and catheterization, central venous access, 907.1269, 946.1269
Catheters and catheterization, complications, 907.29, 907.442, 946.29, 946.442
Catheters and catheterization, technology
Dialysis
State of the Art

Radiology 2000; 215:651–658

Hemodialysis catheters are an integral part of the delivery of hemodialysis. While catheters play an important role in the patient undergoing hemodialysis, catheters should be considered a bridge to more permanent forms of dialysis access in most patients. Recent advances in catheter technology, access techniques, and choice of access sites have improved outcomes associated with hemodialysis catheters. The placement and management of hemodialysis catheters by interventional radiologists have played an important role in these advances, and interventional radiologists are taking an increasingly active role in the research and development of catheters and catheter insertion techniques. The present status of hemodialysis catheters is reviewed.

Ideal Dialysis Catheter

- Easy to insert and remove
- Inexpensive
- **Free of infection**
- Free of fibrin sheath (“invisible to body”)
- Does not cause venous thrombosis or stenosis
- Delivers high flow (>400 ml/min) reliably
- Durable
- **Does not presently exist**

However CVC also have disadvantages:

- **High morbidity due to thrombosis and infection**
- **Risk of permanent central venous stenosis or occlusion**
- **Discomfort and cosmetic disadvantage of external appliance**
- **Lower blood flow rates, requiring longer dialysis times.**

IL CATETERE da EMODIALISI:

- *CVC breve termine, per trattamenti emodialitici acuti*

- *CVC tunnellizzati, per trattamenti cronici*

DOPPIO CATETERE tipo TESIO

MONOCATETERE BILUME

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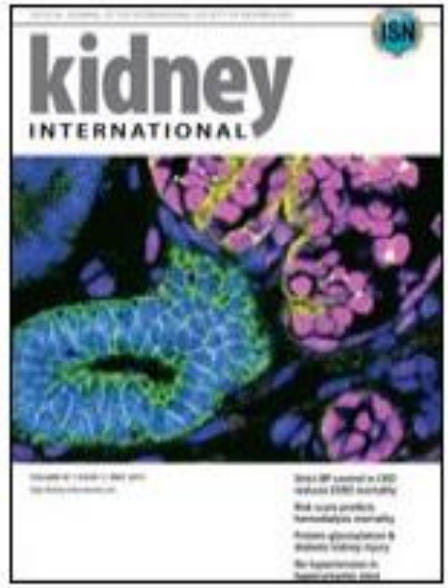


mini review

http://www.kidney-international.org

OPEN

Temporary hemodialysis catheters: recent advances

Edward G. Clark[1,2] and Jeffrey H. Barsuk[3]

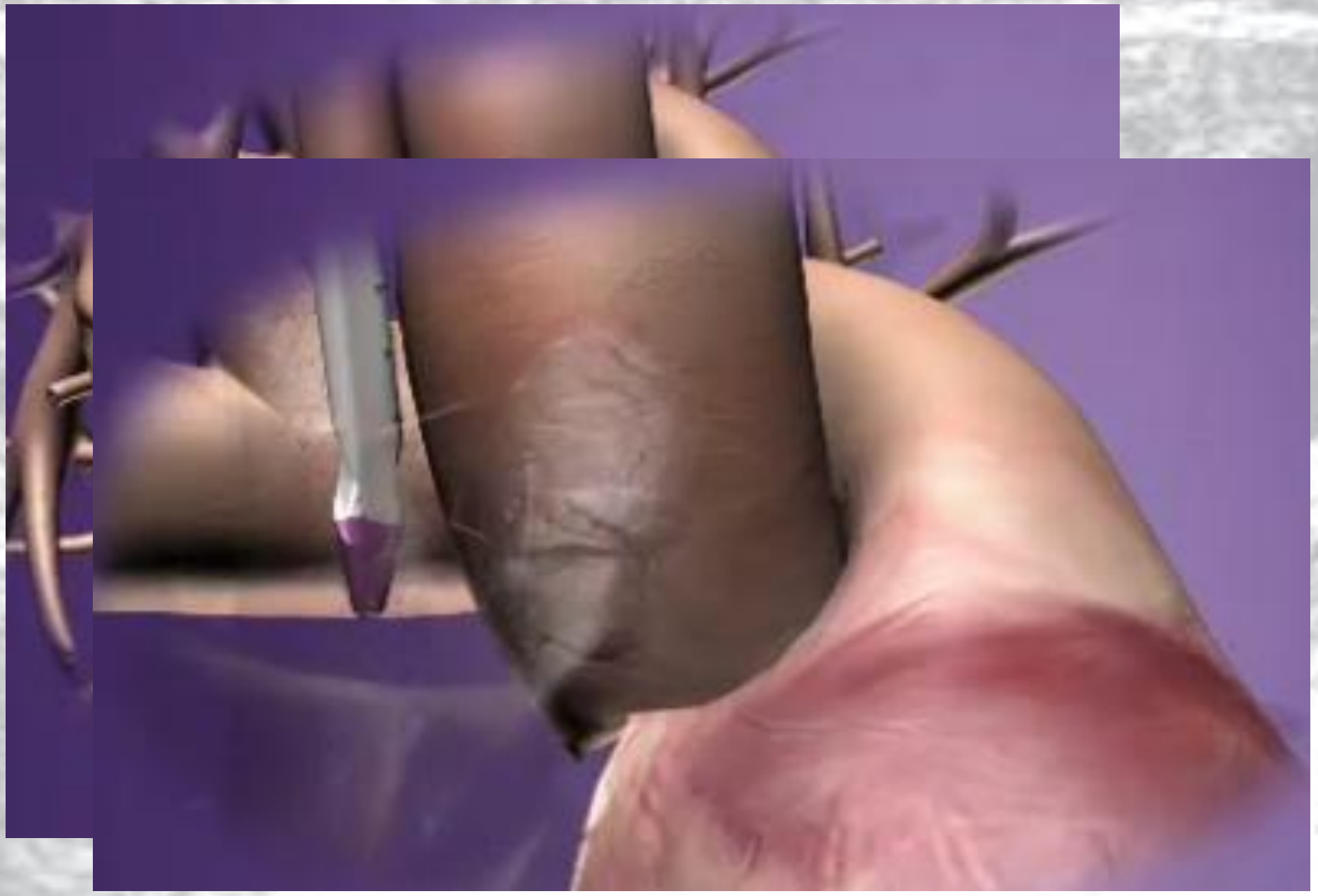
[1]Kidney Research Centre, Ottawa Hospital Research Institute, Ottawa, Ontario, Canada; [2]Division of Nephrology, The Ottawa Hospital, Ottawa, Ontario, Canada and [3]Department of Medicine, Northwestern University Feinberg School of Medicine, Chicago, Illinois, USA

kidney INTERNATIONAL

Table 1 | Selected factors favoring different temporary (non-tunneled) hemodialysis catheter insertion sites

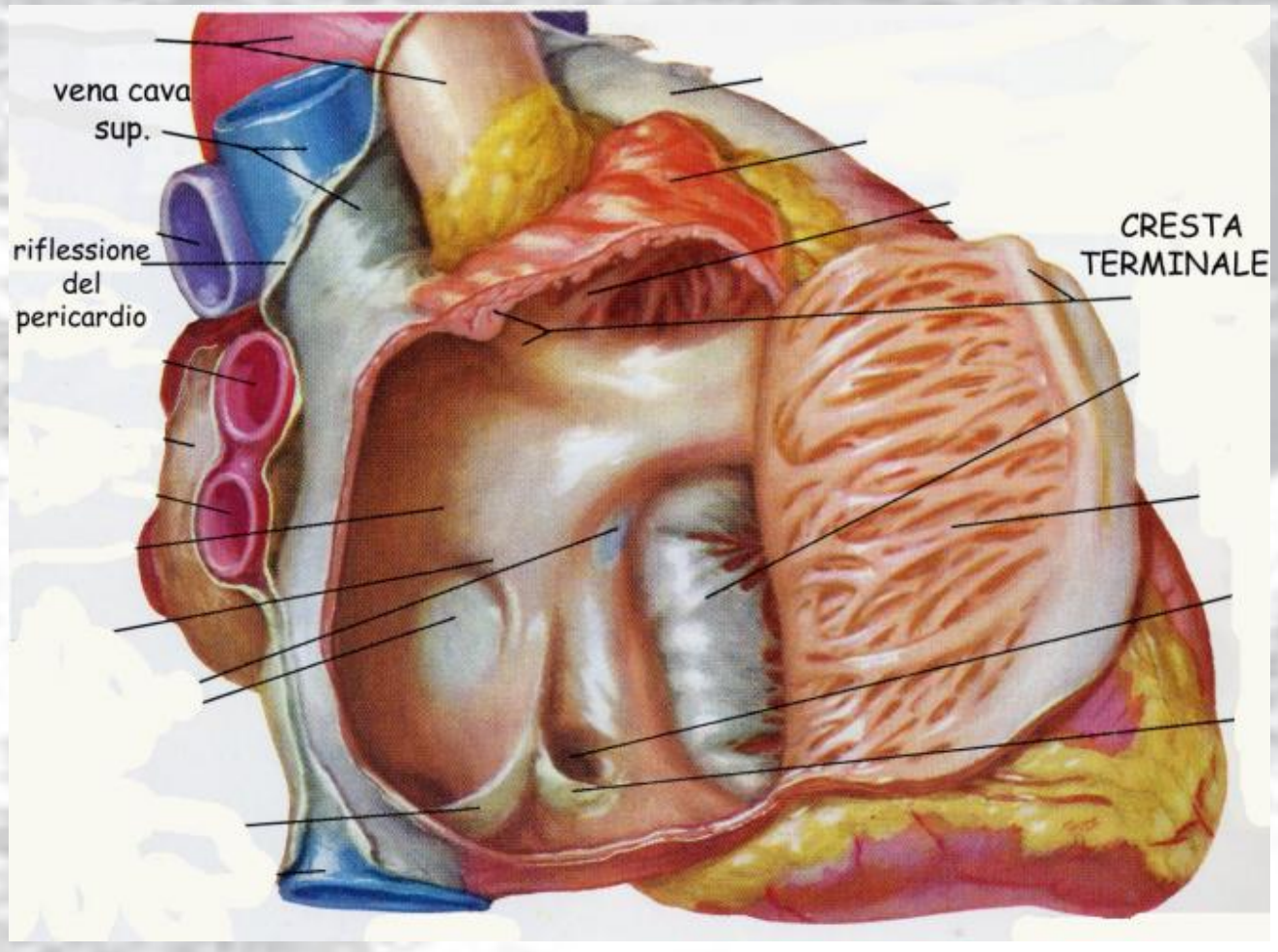
Right internal jugular site
Critically ill and bed-bound with body mass index >28
Postoperative aortic aneurysm repair
Ambulatory patient/mobility required for rehabilitation
Femoral sites
Critically ill and bed-bound with body mass index <24
Tracheostomy present or planned in near-term
Need for long-term hemodialysis access present, highly likely or planned
Emergency dialysis required plus inexperienced operator and/or no access to ultrasound
Left internal jugular site
Contraindications to right internal jugular and femoral sites
Subclavian sites
Contraindications to internal jugular and femoral sites
Right side to be used preferentially

Figu
tunn

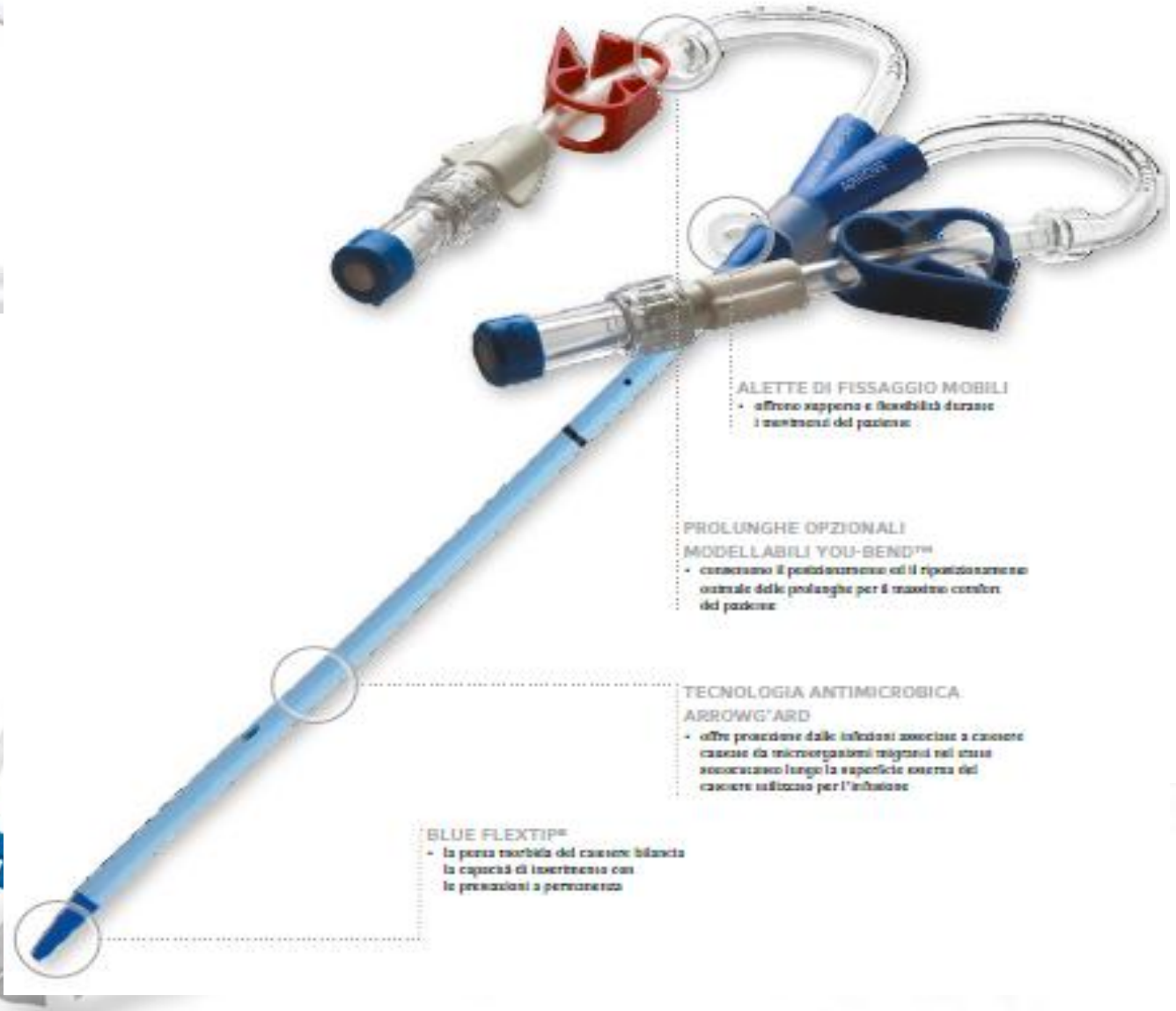


Riflessione del pericardio

- **Rischio di tamponamento**
- **Rischio di perforazione vasale: angolo di impegno tra punta del catetere e parete venosa cavale >40°**



1. Schummer W et al. Optimierte Positionierung zentraler Venenkatheter durch eine modifizierte Anwendung der intravasalen Elektrokardiographie. Der Anaesthesist 54: 983-990 (2005).
2. Schummer W et al. Intra-atrial ECG is not a reliable method for positioning left internal jugular vein catheters. BJA 2003; 91 481-486.



ALETTE DI FISSAGGIO MOBILI
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TECNOLOGIA ANTIMICROBICA ARROWG'ARD
- offre protezione dalle infezioni associate a cateteri causate da microrganismi migranti sul cute associazione lungo la superficie esterna del catetere utilizzato per l'infusione

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- la punta morbida del catetere bilancia la capacità di inserimento con le pressioni a permanenza

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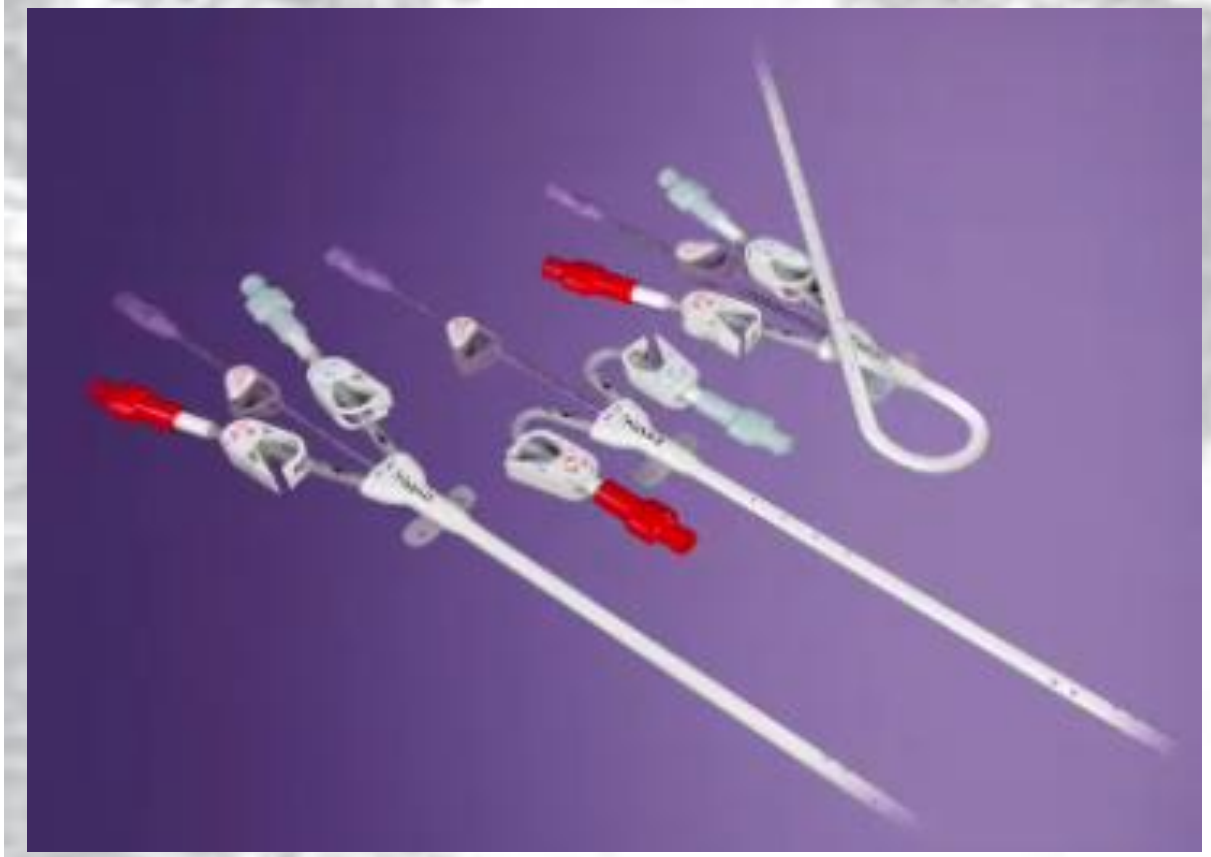
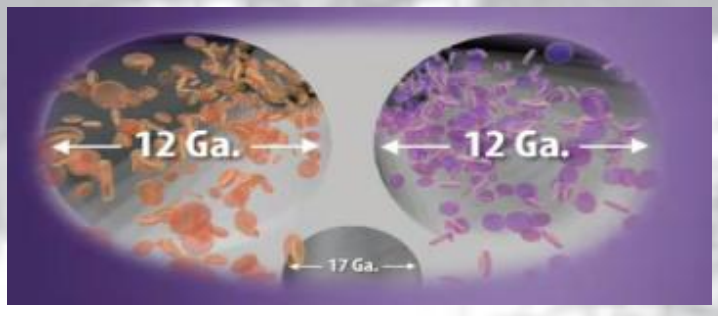
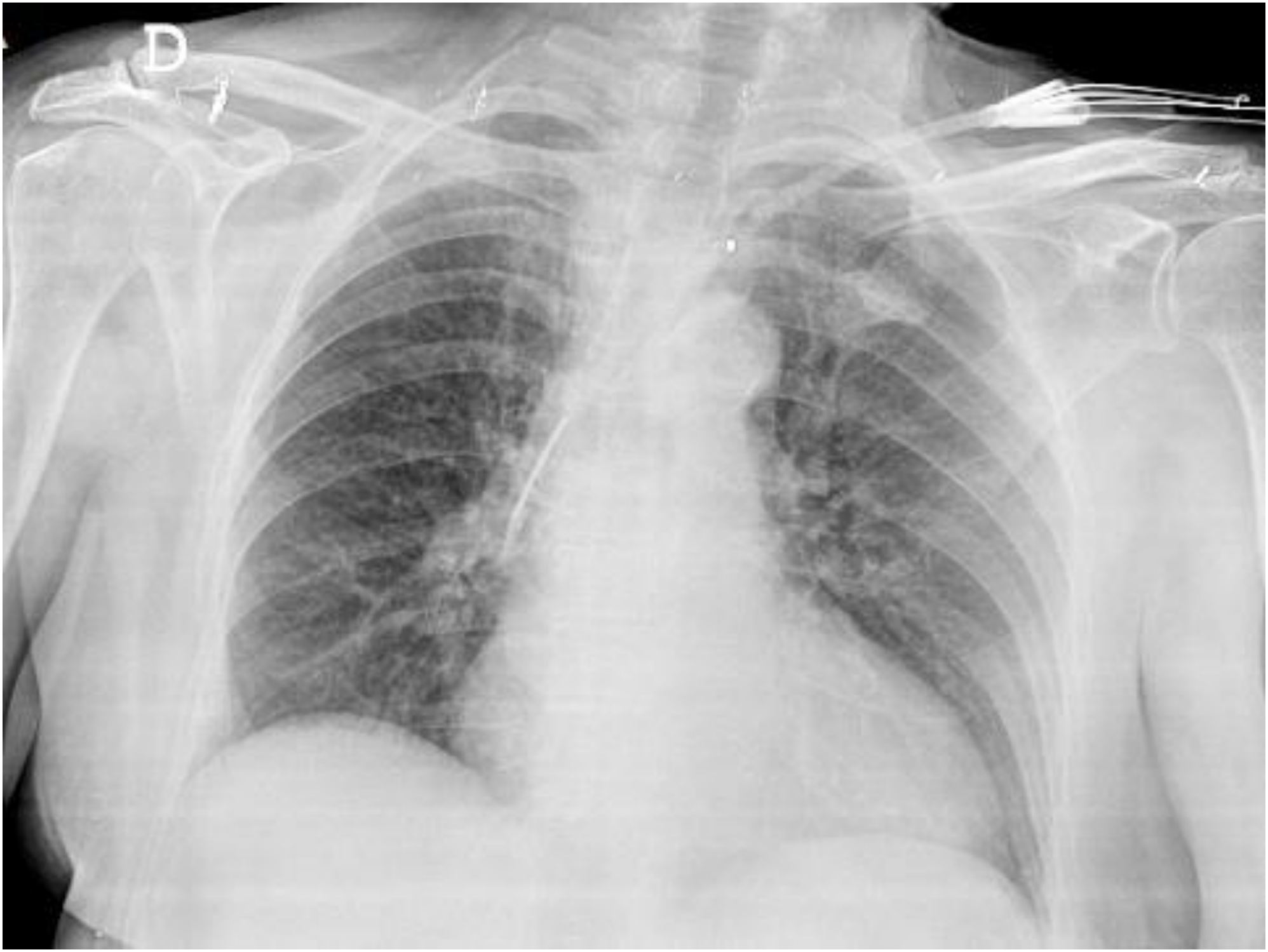
SHORT-TERM DIALYSIS CATHETER



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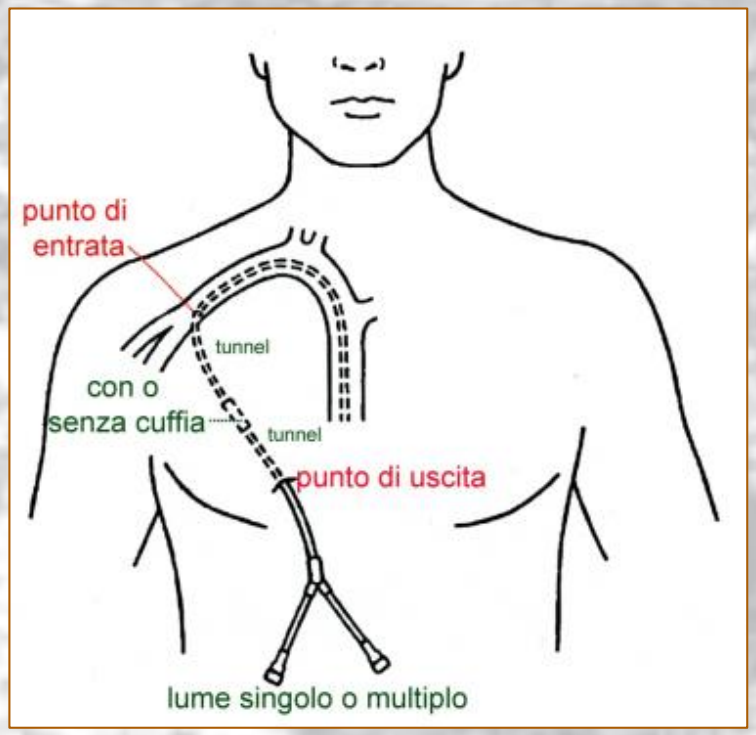
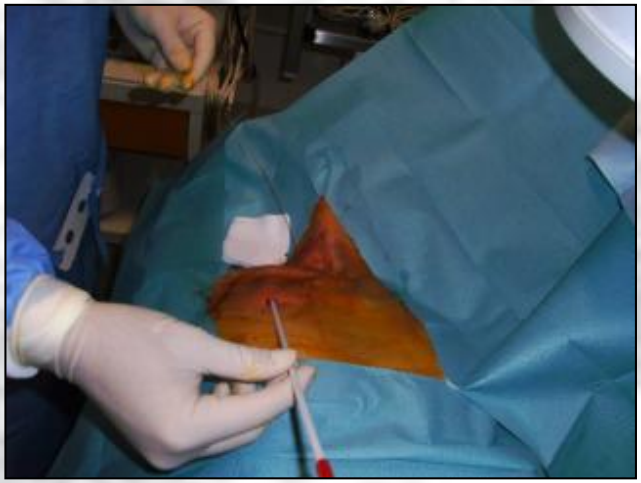
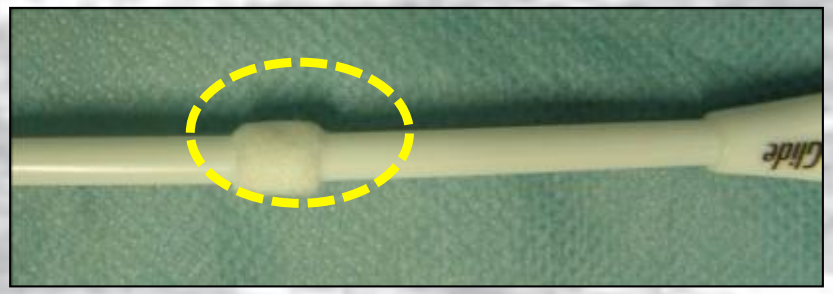
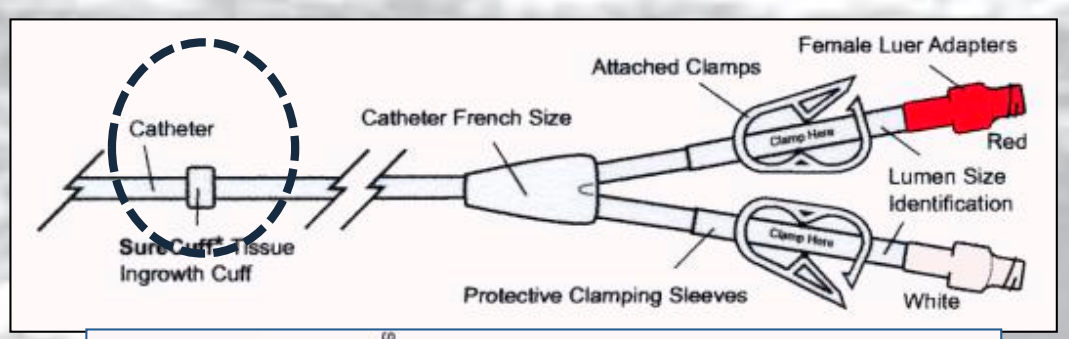
Cateteri tunnellizzati: definizioni

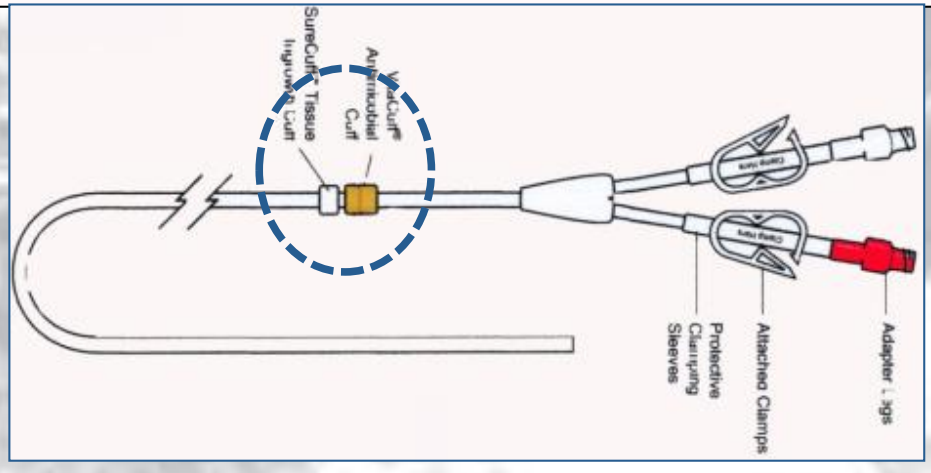




La cuffia del catetere

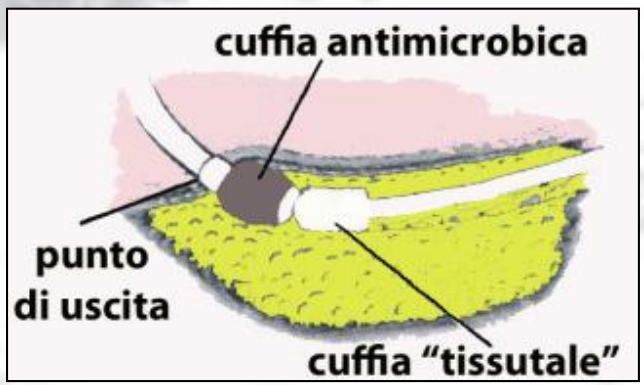




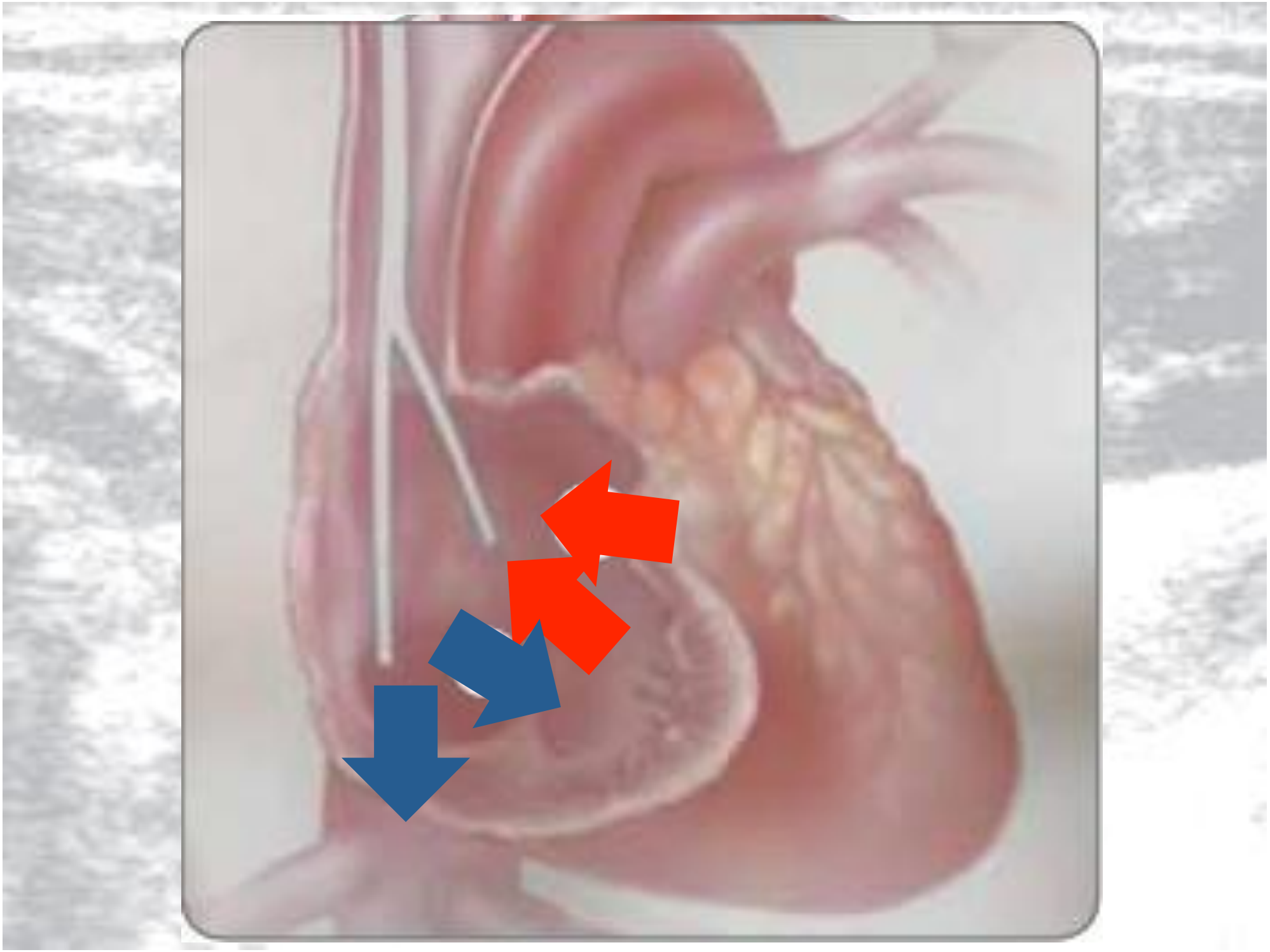


- La cuffia inibisce la migrazione dei micro-organismi nel tragitto del catetere (minore incidenza di infezioni rispetto ai CVC non tunnellizzati)

- Cuffie antimicrobiche riducono l'incidenza di infezioni incorporando un agente antimicrobico nelle porosità di una matrice di collagene



- Bishop L. et al, Guidelines on the insertion and management of central venous access devices in adults. Int. Jnl. Lab. Hem. 29: 261-278 (2007).
- Kohli MD, Outcome of polyester cuff retention following traction removal of tunneled central venous catheters. Radiology 219: 651-654 (2001).



Clinical Practice Guidelines and Clinical Practice Recommendations 2006 Updates Hemodialysis Adequacy Peritoneal Dialysis Adequacy Vascular Access

National Kidney Foundation®
KDOQI

The position of the tip of any central catheter should be verified radiologically.

Long-term catheter systems—tunneled cuffed catheters (TCCs) and tunneled port catheter systems— should have their tips within the right atrium confirmed by fluoroscopy for optimal flow

Short-term catheter tips should be in the superior vena cava (SVC) and confirmed by using chest radiograph or fluoroscopically at the time of placement before initiating dialysis therapy.

Fluoroscopy allows ideal catheter tip placement to maximize blood flow. At the time of placement the tip(s) of the catheter should be in the midatrium, with the arterial lumen facing the mediastinum.

http://www.kidney.org/professionals/KDOQI/guideline_upHD_PD_VA/va_guide2.htm

Tip Location: Tecnica ECG intracavitario ed Ecocardiogramma

http://www.kidney.org/professionals/KDOQI/guideline_upHD_PD_VA/va_guide2.htm

Clinical Practice Guidelines and Clinical Practice Recommendations 2006 Updates Hemodialysis Adequacy Peritoneal Dialysis Adequacy Vascular Access

National Kidney Foundation® KDOQI

- 2.1.3 Avoid if possible: Long-term catheters. (B)

- 2.1.3.3 Long-term catheters should not be placed on the same side as a maturing AV access, if possible. (B)

- Special attention should be paid to consideration of avoiding femoral catheter access in HD patients who are current or future kidney transplant candidates. MRA imaging of both arteries and veins is the diagnostic procedure of choice for evaluating central vessels for possible chest wall construction.

Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011

- **If temporary access is needed for dialysis, a tunneled cuffed catheter is preferable to a non-cuffed catheter, even in the ICU setting, if the catheter is expected to stay in place for >3weeks [59].**

http://www.kidney.org/professionals/KDOQI/guideline_upHD_PD_VA/va_guide2.htm

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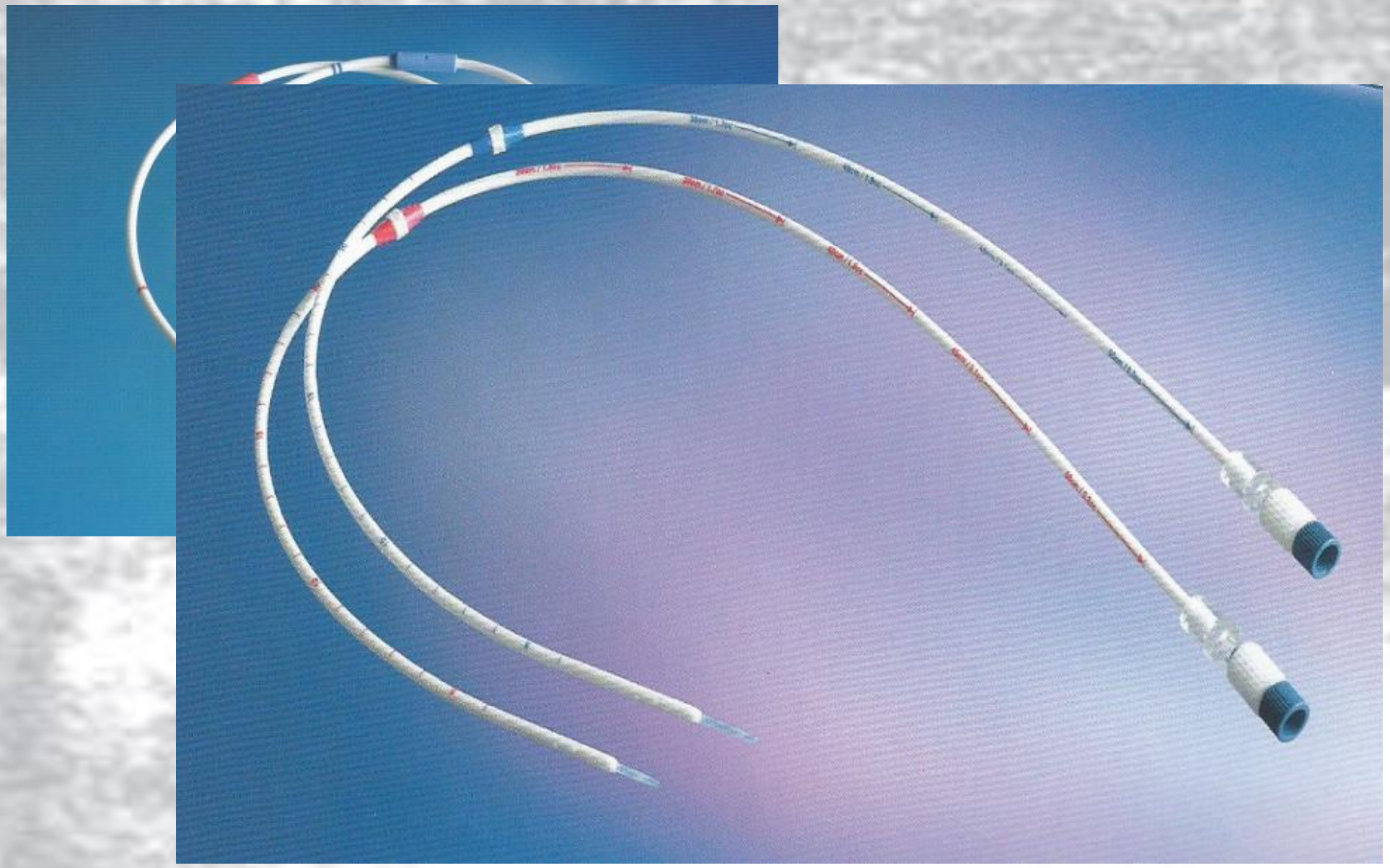


CATETERE di TESIO

Nephrol Dial Transplant (2004) 19: 2816–2822
doi:10.1093/ndt/gfh467
Advance Access publication 31 August 2004

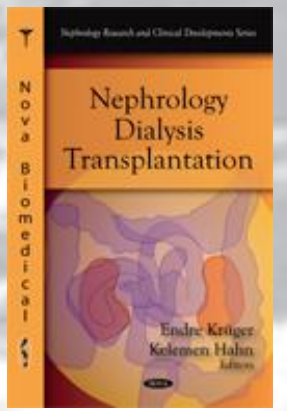
Original Article

Nephrology Dialysis Transplantation

Tesio-Caths provide effective and safe long-term vascular access

Neill D. C. Duncan[1], Seema Singh[1], Thomas D. H. Cairns[1], Martin Clark[2], Adil El-Tayar[1], Megan Griffith[1], Nadey Hakim[1], Mohamad Hamady[2], Adam G. McLean[1], Vassilios Papalois[1], Andrew Palmer[1] and David Taube[1]

[1]Renal and Transplant Unit and [2]Radiology Department, St Mary's Hospital, London, UK

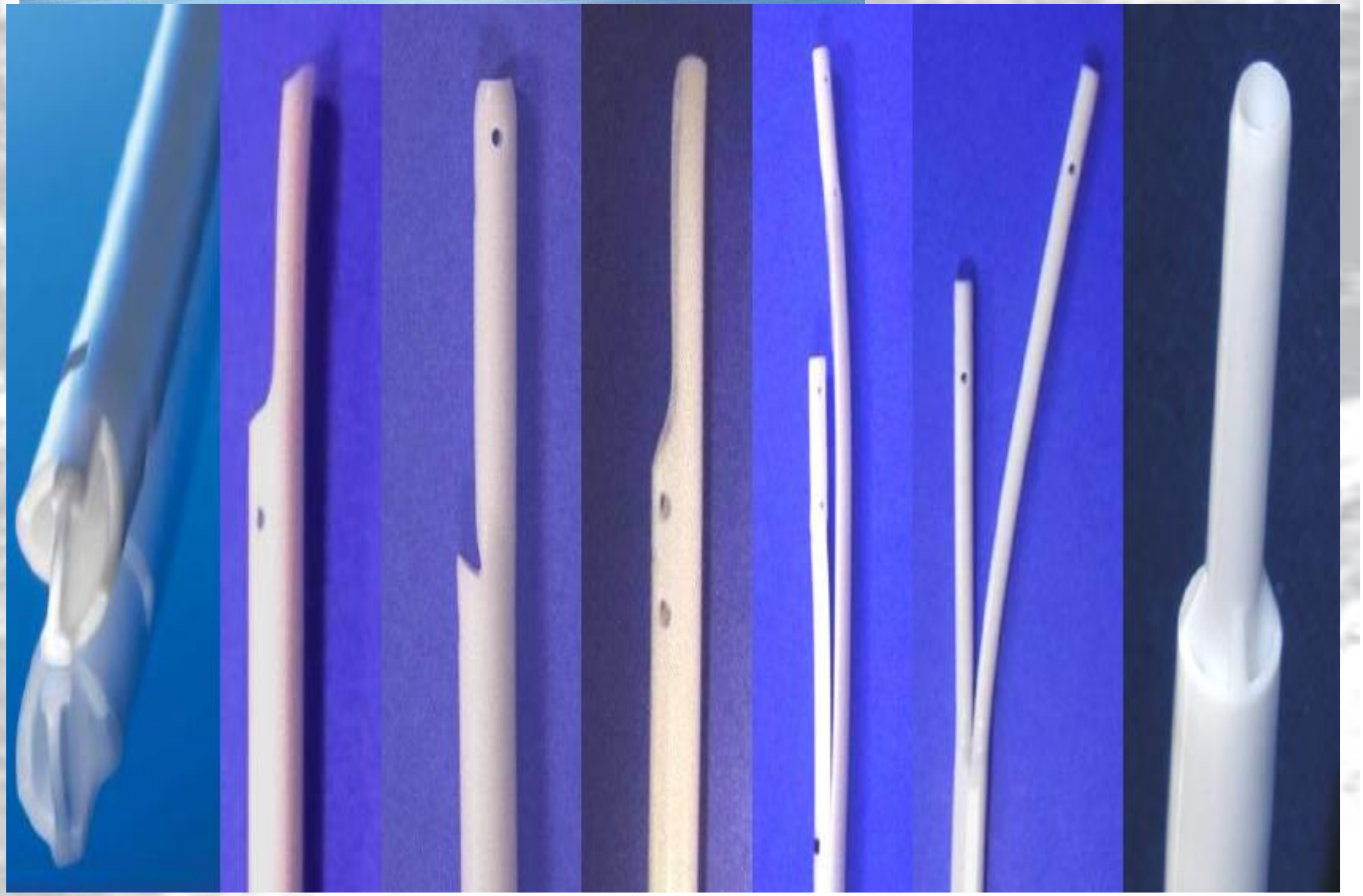


Tesio Catheter Access for Long-term Maintenance Hemodialysis[1]

Radiology


DO NOT USE ICONE
DO NOT USE ICONE

CATETERE TUNNELLIZZATO

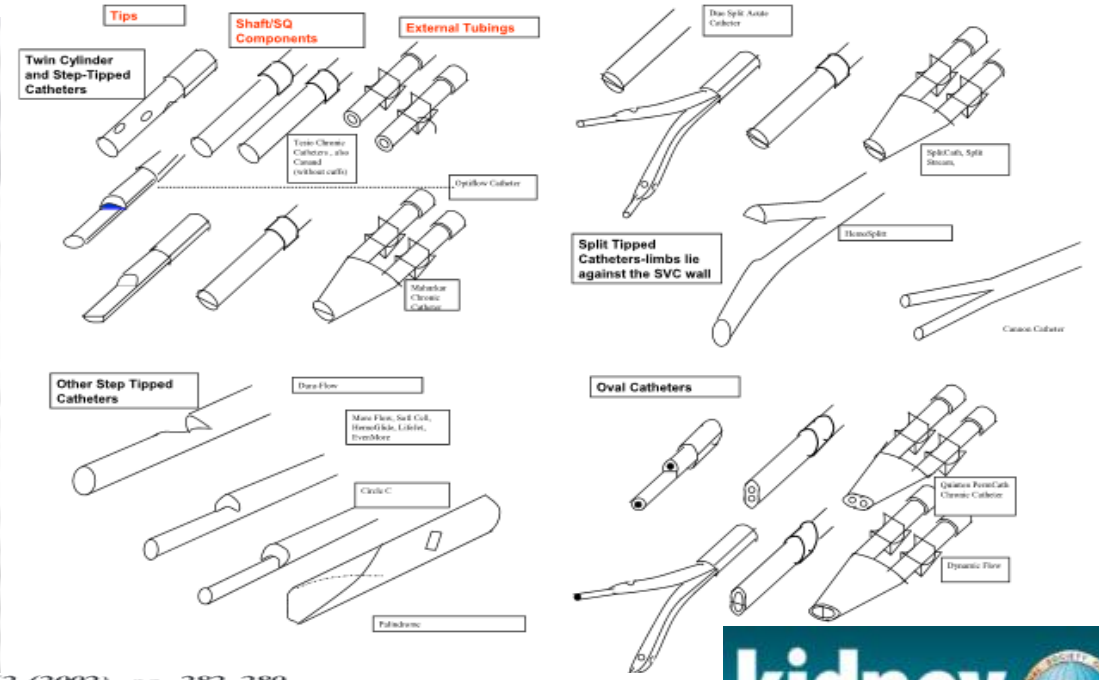


Seminars in Dialysis

REDUCING TUNNELED HEMODIALYSIS CATHETER MORBIDITY

Advances in Tunneled Central Venous Catheters for Dialysis: Design and Performance

Stephen R. Ash
Clarian Arnett Health and Wellbound, Inc., Ash Access Technology and HemoCleanse, Inc., Lafayette, and Purdue University, West Lafayette, Indiana



Kidney International, Vol. 62 (2002), pp. 282–289

kidney INTERNATIONAL ISN Official journal of the International Society of Nephrology

Randomized comparison of split tip versus step tip high-flow hemodialysis catheters

SCOTT O. TREROTOLA, MICHAEL KRAUS, HIMANSHU SHAH, JAN NAMYSLOWSKI, MATTHEW S. JOHNSON, MICHAEL S. STECKER, IFTIKHAR AHMAD, GORDON MCLENNAN, NILESH H. PATEL, ELAINE O'BRIEN, KATHLEEN A. LANE, and WALTER T. AMBROSIUS

Departments of Radiology, Medicine-Nephrology, and Medicine-Biostatistics, Indiana University School of Medicine, Indianapolis, Indiana, USA


SEMISEDUTO
Cannon II plus

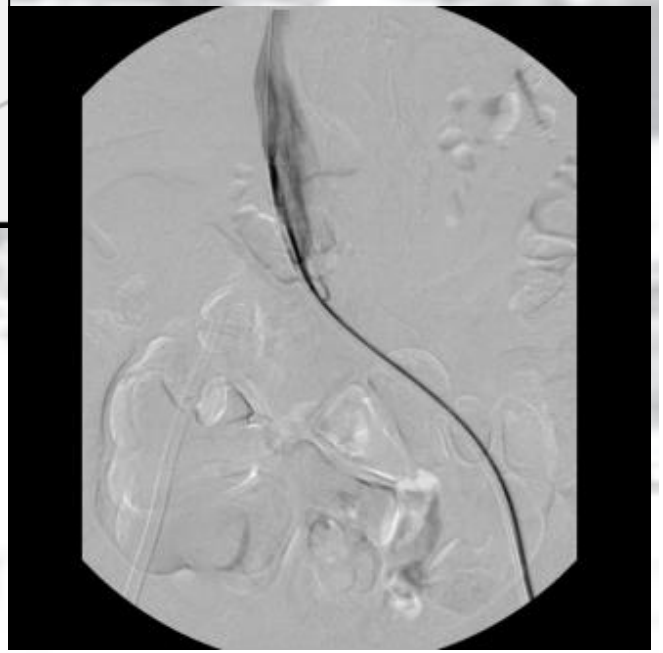
Tunnellizzazione di un catetere femorale

- **Place catheters used for hemodialysis in a jugular or femoral vein rather than subclavian vein to avoid venous stenosis if catheter access is needed[1].**

- **La maggior parte dei pazienti che richiedono questo accesso ha una limitata mobilità**

- **Tunnel inferiore**

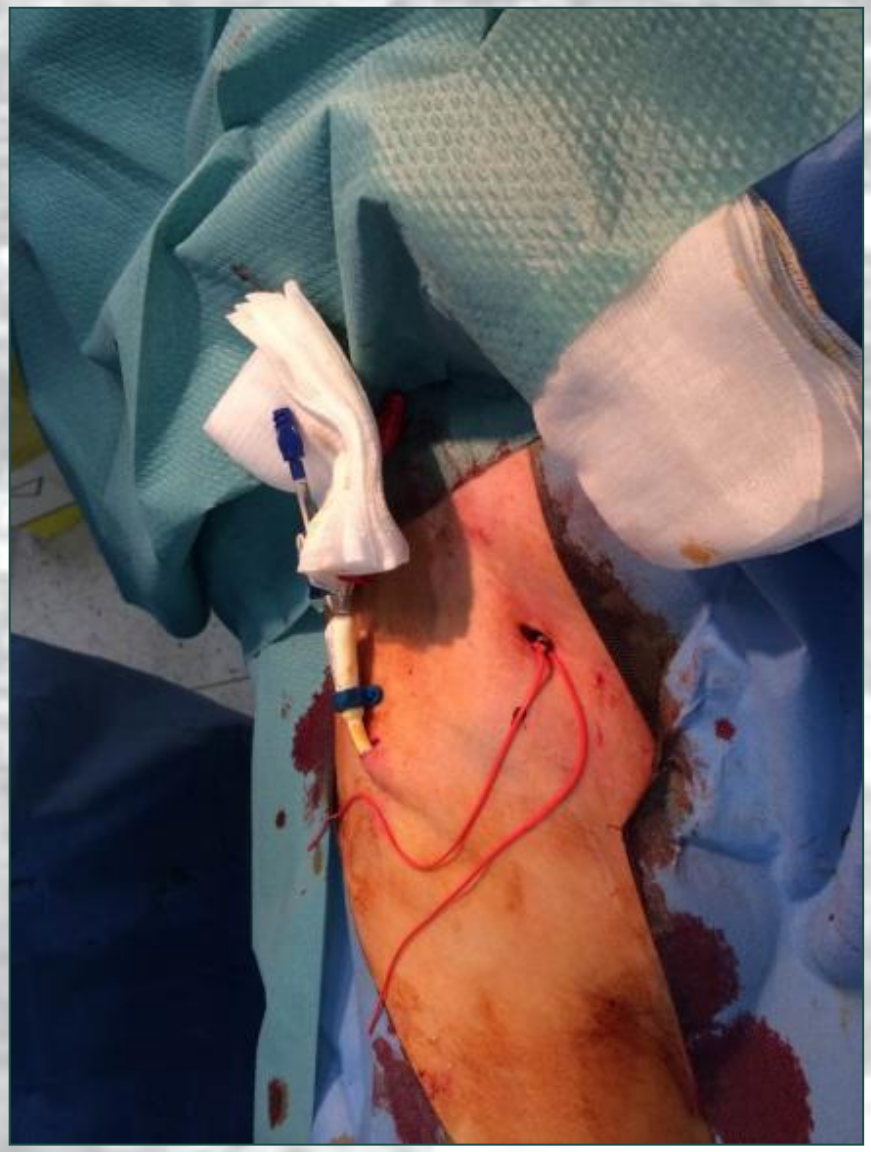
- **Tunnel superiore**



1. Parienti JJ, Femoral vs Jugular venous cathterization and risk of nosocomial events in adults requiring acute renal replacement therapy; JAMA vol. 299 (20), 2008
2. Zaleski G.X., Experience with tunneled femoral hemodialysis catheters; AJR:172, 493-496, (1999)
3. Timsit JF, Use of tunneled femoral cathters to prevent cathter-related infection; Ann Intern Med, 130: 729-735 (1999).

Tunnellizzazione femorale retrograda

con tunnellizzazione superiore



Controllo rx

Clin Nephrol. 2017 Oct 11. doi: 10.5414/CN108943. [Epub ahead of print]

Switching temporary hemodialysis catheters to long-term catheters: exchange versus de-novo placement, any difference in line infection?.

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Abstract

BACKGROUND: Shifting from a short-term catheter to a long-term one is done either by removing the old catheter and placing a new long-term one via fresh new puncture site, or by replacing the old catheter with a long-term one over a guidewire.

AIM: We aimed to describe our technique in changing a temporary line to a long-term catheter (LTC) over a guidewire and to determine the incidence of line-related infections following this procedure.

MATERIALS AND METHODS: A retrospective pilot study was conducted between 2005 and 2010 at the American University of Beirut Hospital. We compared the first group (A), which consisted of 20 patients who underwent exchange of a short-term dialysis catheter with a tunneled one over a guidewire using our technique, to a second group (B) of 60 patients who underwent de-novo LTC placement. The two groups were matched by age, with a follow-up of at least 1 month.

RESULTS: The technical success rate of the catheter-conversion procedure was 100%. Our results revealed no significant difference of catheter duration between the two groups, with median duration of 6.5 vs. 4.0 days for group A and group B, respectively ($p = 0.21$). Moreover, there was also no significant mean time difference between any infection and long term catheter (LTC) insertion among the two groups ($p = 0.31$). Furthermore, there was no difference of catheter infection between the two groups ($p = 0.1$).

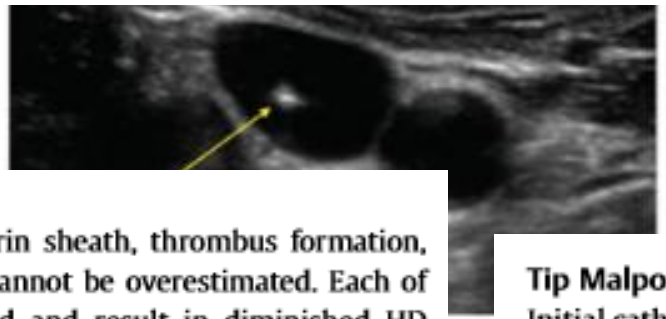
CONCLUSION: We concluded that there was no difference in terms of side effects or risk of infection in the guidewire group when compared to standard technique..

Complications

Short Term

Table 2 Thresholds for early complication from image-guided catheter placement

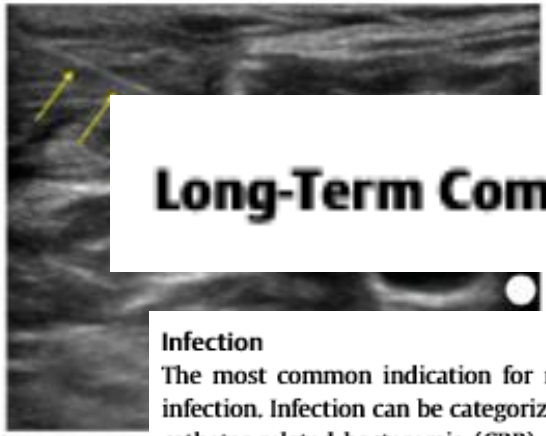
Event	Frequency (%)
Hemorrhage/hematoma	<2
Catheter malposition/kinking	<1
Venous perforation	<1
Infection	<1
Arterial puncture	<1
Pneumothorax	0–1
Air embolism	0–1



Central Venous Stenosis

The interplay between fibrin sheath, thrombus formation, and central vein stenosis cannot be overestimated. Each of these factors is interrelated and result in diminished HD access over time for patients with long-term CVC. There

carotid (white circle) are seen. The needle appears as a bright
in-plane ultrasound-guided needle placement into the right int
from the skin to the IJ (white star). The carotid (white circle)



Long-Term Complications

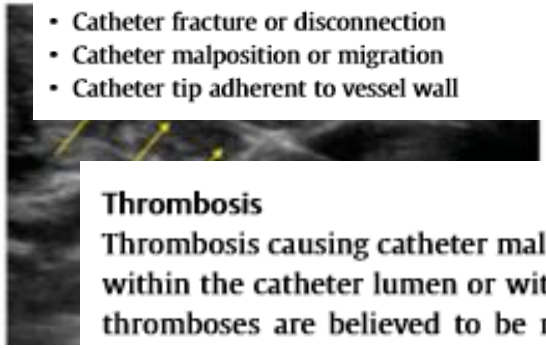
Infection

The most common indication for removal of a HD CVC is infection. Infection can be categorized as exit site, tunnel, or catheter-related bacteremia (CRB). Overall, the rate of CRB with cuffed, tunneled HD CVC is 1.6 to 5.5 episodes/1,000 catheter days.[19,20] An in-depth review of this subject is beyond the scope of this article.

Catheter Malfunction

Catheter malfunction can be categorized according to etiology, many of which can be reduced with careful attention to placement technique, especially tip position within the RA. The most common etiologies include the following:

- Fibrin sheath formation
- Thrombus within catheter
- Catheter kinks
- Catheter fracture or disconnection
- Catheter malposition or migration
- Catheter tip adherent to vessel wall



Thrombosis

Thrombosis causing catheter malfunction can occur either within the catheter lumen or within the vessel lumen. All thromboses are believed to be related to fibrin sheaths.

Tip Malposition

Initial catheter tip malposition should not occur with experienced operators using image guidance. One of the goals of placement of a HD CVC is to provide a catheter with the tip in the RA capable of adequate HD. Tip positions outside of the RA

29. HEMODIALYSIS VASCULAR ACCESS DEVICES (VADs)

F. Use povidone-iodine ointment or bacitracin/gramicidin/polymixin ointment at the dialysis catheter exit site when there is no interaction with the catheter

J. Lock hemodialysis CVADs with heparin lock solution 1000 units/mL, 4% citrate, or antimicrobial lock solutions. Use recombinant tissue plasminogen activator to lock hemodialysis catheters once per week as a strategy to reduce CR-BSI.[40-43] (I)

placed for short-term vascular access for infusion therapy needs. Administer medications through the medial infusion port and not the dialysis lumens. Because multiple lumens increase the risk of infection, limit the duration that a dialysis catheter with a medial infusion port is used.[8] (V)

- *Q. 4 - Is there evidence about the most appropriate flushing method with saline before any kind of lock?*

RACCOMANDAZIONI DEL PANEL

1-La tecnica di flushing a pressione positiva "push and pause" ("start and stop") è da considerarsi la più appropiata.

2-Adottare sempre strategie di flushing che prevengano il reflusso di sangue nel catetere

Plausible biological mechanisms exist by which citrate alone might reduce systemic infections when instilled in catheter ports. In vitro studies have demonstrated bactericidal and sporocidal activity with both high (23%) and lower (4%) citrate concentrations, and prevention of biofilm formation, with no evidence of citrate resistance [29,30]. This is in contrast to heparin, which may in fact promote biofilm formation and increase infection risk [31,32]. Citrate's antibacterial activity appears to be related to the chelation of calcium and magnesium ions, leading to the degradation of bacterial cell membranes, thus reducing bacterial cellular integrity [33]. Given its avidity for divalent cations, inadvertent systemic administration of large volumes of citrate locking solutions can result in calcium complexation and hypocalcemia.

Blood Purification

Conclusions

Our analysis indicated that catheter locking with taurolidine-citrate reduced the incidence of CRB and Gram-negative bacterial infection, whereas it was associated with an increased need for thrombolysis. We believe TCLS would be preferable to heparin or antibiotic locks if the need for thrombolysis can be decreased.

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Associazione Europea Infermieri Dialisi e Trapianto
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Gestione del catetere venoso centrale per emodialisi

Raccomandazioni di buona pratica clinica EDTNA/ERCA filiale italiana 2014

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«Grazie per aver ascoltato il nostro babbo!!!!»


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