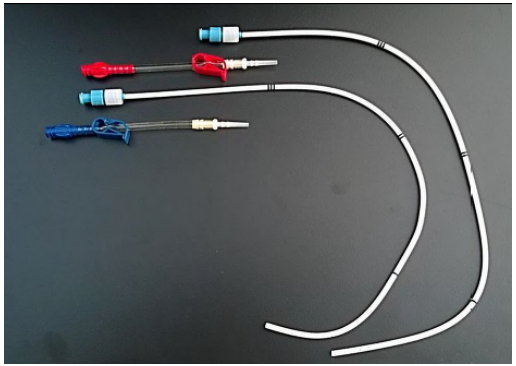
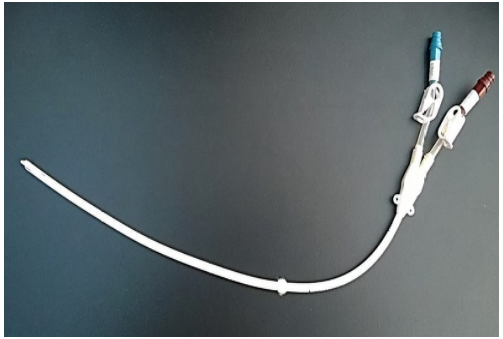
Comment gérer les complications des cathéters permanents

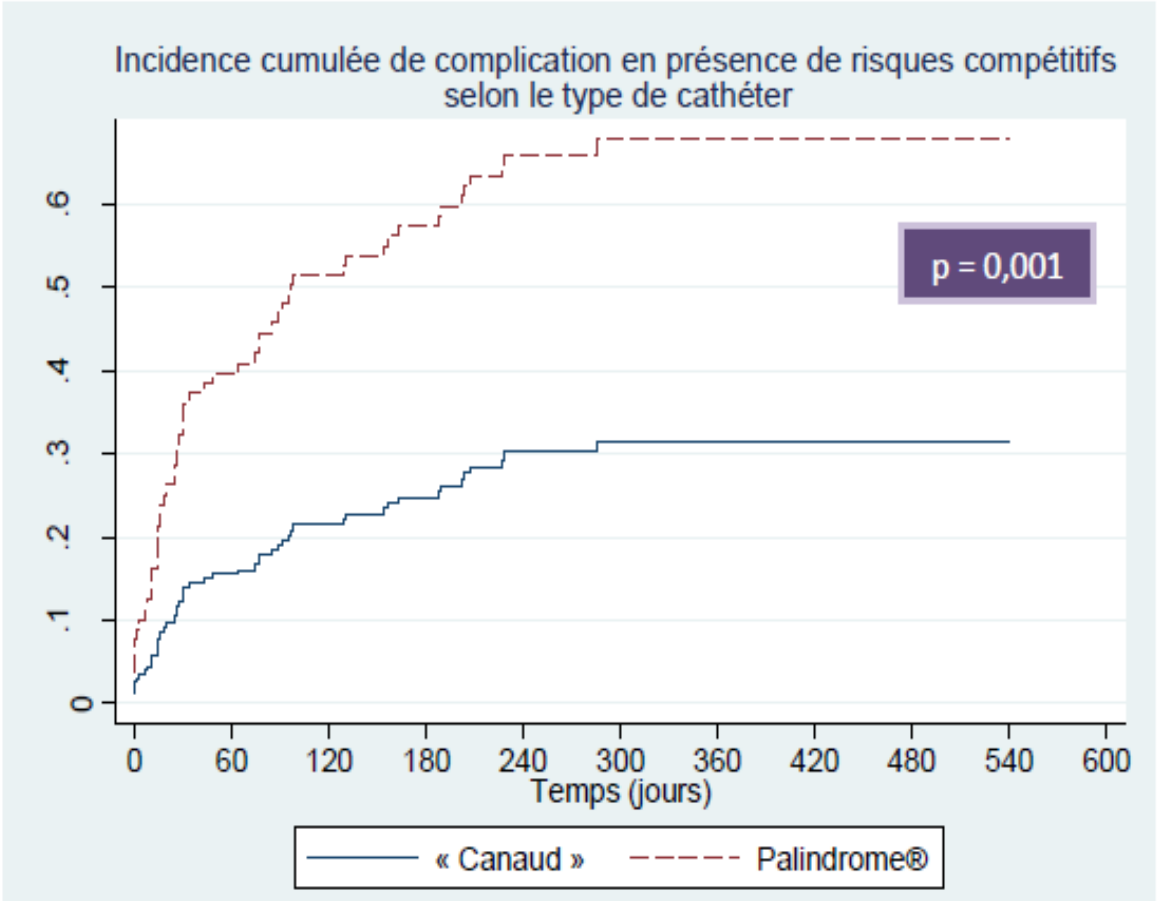
Pr Ag Dorsaf Zellama & Dr Asma Fradi
Service de Néphrologie, Hôpital Sahloul
Faculté de Médecine de Sousse

Bi-cathéters Indépendants



Cathéter monobloc Bi-Lumières





Mélodie CUNY

Dysfonction
Thrombose
Infection

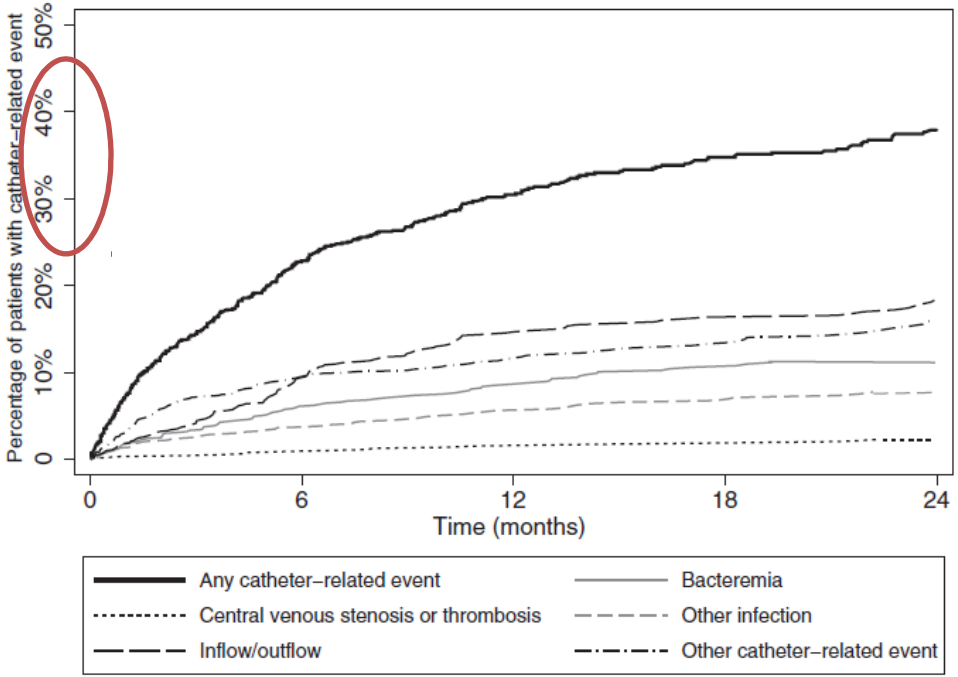


Figure 2. Cumulative incidence of catheter-related events. Percentage of patients who have experienced at least 1 catheter-related event from the time of tunneled catheter insertion (in months). The top black line is the first of any catheter-related event (eg, bacteremia or inflow/outflow) while the other lines are cause specific (eg, first bacteremia irrespective of other complications). Death, transplantation, recovery, and starting peritoneal dialysis therapy were considered competing events. Censoring events were transfers, losses to follow-up. or end of study follow-up.

Dysfonction mécanique

ncapacité à fournir un débit suffisant pour une dialyse adéqu

KDOQI: failure to attain and maintain an extracorporeal

blood flow, Qb, of 300 mL/min or greater at a prepump

arterial pressure more negative than −250 mm Hg.

Table I. Proposed Definitions for Catheter Dysfunction.[3,5,8]

High arterial pressures (<−250 mm Hg)
High venous pressures (>250 mm Hg)
High pressure alarms
Decreased blood flow rates
Inability to withdraw and/or flush catheter lumens
Need to reverse lines
Reduced urea clearance (Kt/V < 1.2, or urea reduction ratio < 65%)

Incidence: 30% des patients une dysfonction/séance/moi

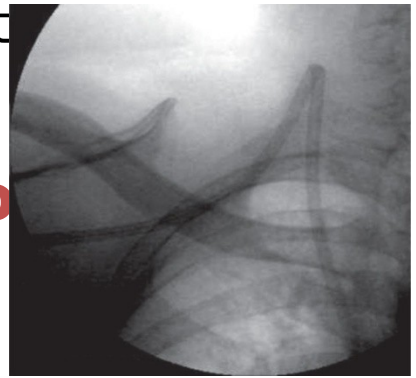
Étiologies de la dysfonction des cathéters

Précoces: première semaine

Mécaniques

- Position incorrecte:
  - bout de KT contre une paroi vasculaire
  - Loin de la jonction VC/Oreillett
- Plicature

=> **Repositio**



Tardives

- Agressions répétées/turbulences
- + Inflammation + coagulation

=> Thrombose :Catheter-related thrombosis CRT

Prévention des thrombi liés au cathéter

- Verrou à base d'anticoagulant: Citrate de sodium 4% ou Héparine ou Bicarbonate
- Pré-CLOT trial: tPA *tissue Plasminogène Activator*

  Plus efficace mais plus coûteux
- Antiagrégants plaquettaires: effet controversé
- Anticoagulation systémique: risque hémorragique > bénéfice

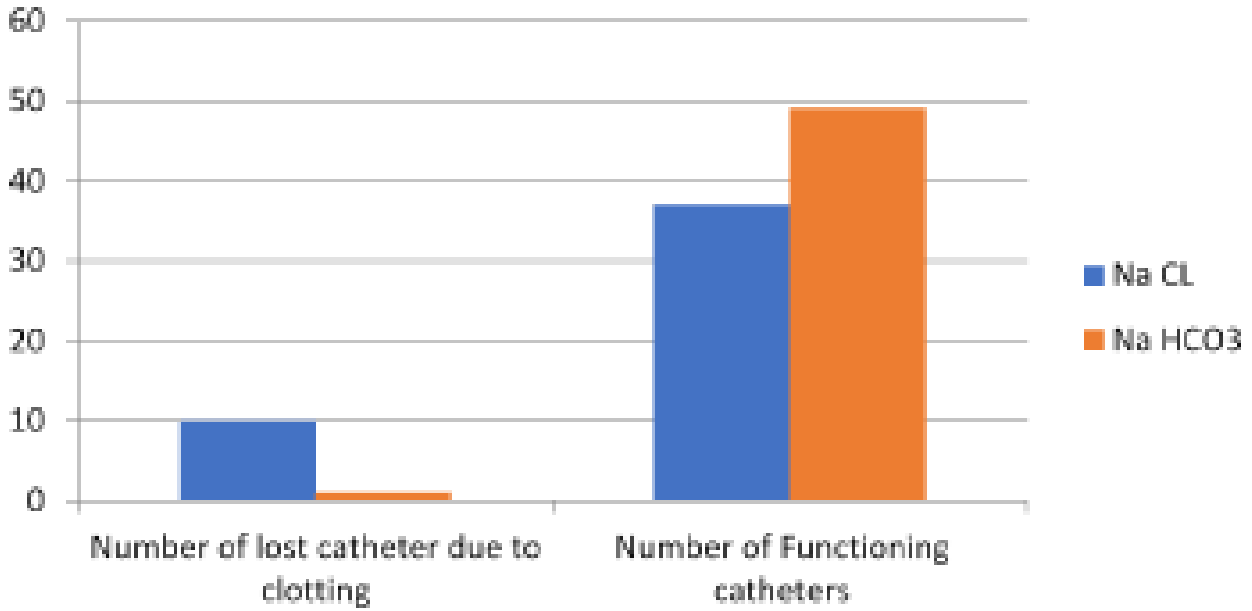


Figure 2. Shows the Kaplan-Meier survival curves for the time course of the lost and functioning catheters in both Na CL Lock solution and Na HCO3 Lock solution groups due to clot formation during aperiod of 6 months.P = 0.003.

Ttt des thrombi liés aux cathéters

- Purge par sérum physiologique en flash (rupture du KT et d'emboles)
- Enlever?
  - Oui si alternative vasculaire

    Sinon
- Injection possible mais pas l'aspiration: Anticoagulation systémique via le KT
- Occlusion totale: thrombolyse
- Échec et pas d'infection: changement sur guide

Ann Vasc Surg. 2018 Aug;51:298-305.

CRT: place de l’anticoagulation systémique

Cathéter en place

- HNF en IV, bolus 60ui/Kg puis 12 ui/kg/h TCA 1.5 à 2.5
- HBPM: risque hémorragique
- AVK: INR 2,5 à 3,5
- Si efficace: à garder tant que le KT est en place

Cathéter enlevé

- Anticoagulation x 6 sem
- Début / risque d’embolie
  - Faible: Au moment de l’ablation
  - Élevé: 5 jours avant
- Thrombus < 1.5cm: arrêt précoce

Ann Vasc Surg. 2018 Aug;51:298-305.

Traitement des CRT: Thrombolyse

- Activateur tissulaire du plasminogène t-PA (altéplase et reteplase) => succès ds 83% à 98%

Type	Dose	Time	Delivery
Nonfunctioning catheter (Qb < 150/200 mL/min or inability to withdraw) (short or long dwell)	Typical dose: 2 mg tPA instillation (1 mg in each lumen) Alternative dose: 2 mg tPA per lumen	30 min after instillation (short dwell) Alternative: wait additional 2 h (long dwell) if 30 min fails[28]	tPA instilled as dwell for 30-60 min Alternatives: push one-third of dose every 10 min; advance the initial pushed tPA at 10- to 15-min intervals with 0.3 mL saline, or deliver via infusion pump over 30 min
Poor functioning catheter with dialysis stopped	2-4 mg tPA	As above	As above
Poor functioning catheter with dialysis ongoing (eg, Qb > 200 mL/min) but frequent alarms (intradialytic infusion)	2-4 mg tPA	Over 1 h	Via infusion pump—delivered in the dialysis circuit with catheter lumens reversed for 30 min, then with normal positions for next 30 min
Poor functioning catheter post dialysis (lock, post hemodialysis dwell, overnight dwell)	1-2 mg tPA per lumen	Until next dialysis	tPA instilled as push; allowed to dwell in catheter lumen for 48-72 h, until the next hemodialysis session

Note. tPA = tissue plasminogen activator.

Ann Vasc Surg. 2018 Aug;51:298-305.

t-PA > Urokinase

Table 2. Catheter-locking solutions in the management of catheter dysfunction

Study (Reference)/Design	Intervention	Results
Haire *et al.*, 1994 (55) Randomized (n=50)	Urokinase (10,000 IU/ml) versus tPA (2 mg)	tPA significantly better in restoring catheter function
Savader *et al.*, 2001 (52) Prospective (n=55)	rtPA infusion (2.5 mg over 3 h)	91% technical success rate; primary patency low but improved secondary patency
Little and Walshe, 2002 (54) Prospective (n=336)	tPA (1 mg/ml); dwell time 2–8 h	Patency declined with successive use; median patency only 5–7 treatments
Haire *et al.*, 2004 (56) Randomized (n=180)	Urokinase (5000 IU/ml) versus placebo	Urokinase significantly better in restoring catheter function
Falk *et al.*, 2004 (49) Retrospective (n=19)	Reteplase (0.4 units); dwell time 30 min–1 h	Initial patency 88%; no adverse events
Macrae *et al.*, 2005 (50) Randomized (n=60)	tPA (1 mg/ml); dwell time 1 h versus 48–96 h	Initial patency 78% but short-lived; median patency only 6 treatments

tPA, tissue plasminogen activator; rtPA, recombinant tPA.

Échec ???

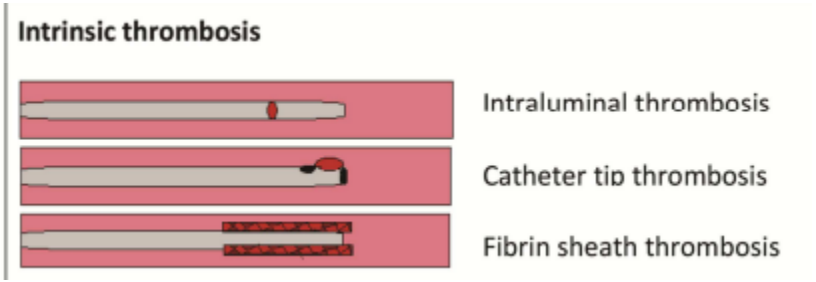
Clin J Am Soc Nephrol 8: 1234–1243, July, 2013

Engainement de fibrine « *fibrin sheath* »

A fibrin sheath extending from the cuff to the tip of the catheter.

Source. Courtesy of *The Atlas of Dialysis Vascular Access* by Dr. Vacchharajani, esrdncc.org/wp-content/uploads/2015/12/Access-Atlas.pdf.

Biofilm: Fibrinogen, Lipoproteine, Albumine, Facteurs de coagulation Adhésion de leucocytes, microorganismes Puis dépôt de collagène et migration de cellules musculaires lisses



- Ttt endovasculaire/ stripping, rupture
- KDOQI: angioplastie au ballon puis changement du KT sur guide

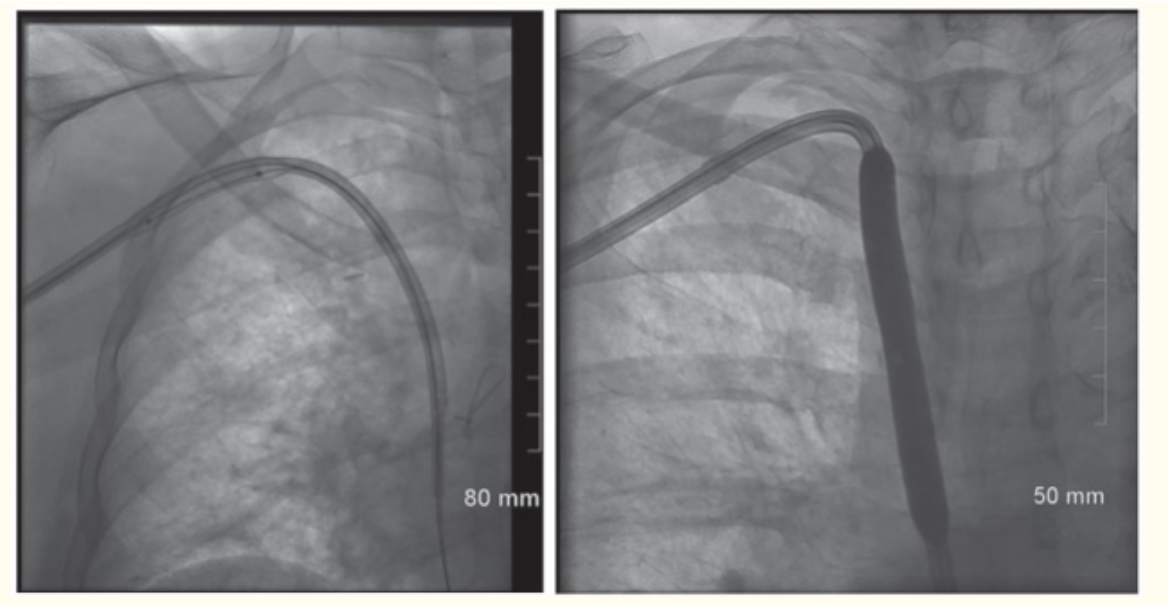
Table 3. Endovascular procedures in the management of catheter dysfunction

Study (Reference)/ Design	Intervention	Results
Duszak *et al.*, 1998 (61) Retrospective (n=68) 56	*De novo* catheter placements versus catheter exchange	No significant difference in patency or infections
Merport *et al.*, 2000 (62) Randomized (n=30) 57	Fibrin sheath stripping versus catheter exchange	Immediate technical success 97%, but primary patency significantly better in the exchange group
Janne d'Othée *et al.*, 2006 (63) Retrospective (n=66)	Fibrin sheath stripping versus catheter exchange versus angioplasty disruption and exchange	All 3 equivalent in terms of technical success, patency, and complications
Oliver *et al.*, 2007 (64) Randomized (n=47)	Catheter exchange versus angioplasty disruption and exchange	Improved patency and statistically significant increased blood flow and urea replacement ratio in the exchange group

- Nouveau KT = changement sur guide
- Stripping: bon résultat initial mais risque de récidive

- Angioplastie puis changement KT > changement KT

Cathéter « incrusté » : *Embadded catheter*



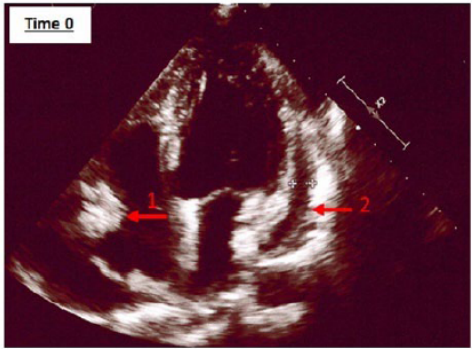
Balloon-assisted endoluminal dilatation for the removal of embedded catheters.

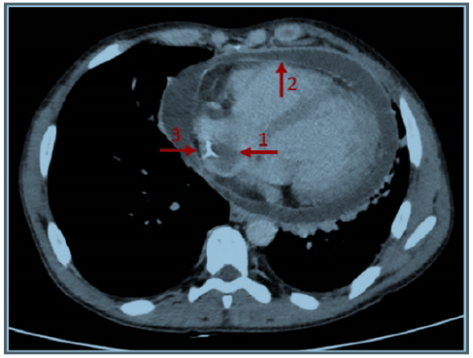
Source. Photo courtesy of Dr Adnan Hadziomerovic, Department of Medical Imaging, The Ottawa Hospital and University of Ottawa.

Thrombus de l'oreillette droite
Catheter-related right atrial thrombosis (CRAT)

JVA The Journal of Vascular Access

- H, 42 ans
- HD/KT tunnelisé
- Fièvre,
- Dysfonction KT
- AVK + thrombolyse loco-régionale: Lock/Urokinase 50 000 ui/ml + Corticoides
- Disparition du thrombus à J42
- KT fonctionnel





- 5.4 % à 18% des KT
- Bout de KT /oreillette
- Pronostic vital
- Ttt: Pas de guidelines
  - Ablation du KT
  - Anticoagulation
  - Thrombolyse systémique
  - Thrombectomie chirurgicale

Rossi et al. The Journal of Vascular Access 1–4

Figure 2. Trans-thoracic echocardiogram1: right atrial thrombus (2.8 x 2.2 cm)- 2: pericardial effusion - 3: catheter tip placed within the right atrium.

Thrombus de l’oreillette droite
Catheter-related right atrial thrombosis (CRAT)

Thrombus < 6 cm

- Enlever KT
- Anticoagulation

Thrombus > 6 cm

Anticoagulation CI

Anomalies cardiaques

- Thrombectomie chirurgicale

Sténoses des veines centrales

Symptômes

Tardifs

Dépendent de la localisation

- Œdème brachial
- Douleurs
- Circulation veineuse collatérale
- Syndrome cave sup
- Rarement: pleurésie
- Dgc: Doppler, Angioscanner ou angioIRM

Traitement

- Sténoses symptomatiques
- Angioplastie +++ svt sans stent
- Chirurgie: si échec ou récidive < 3 mois

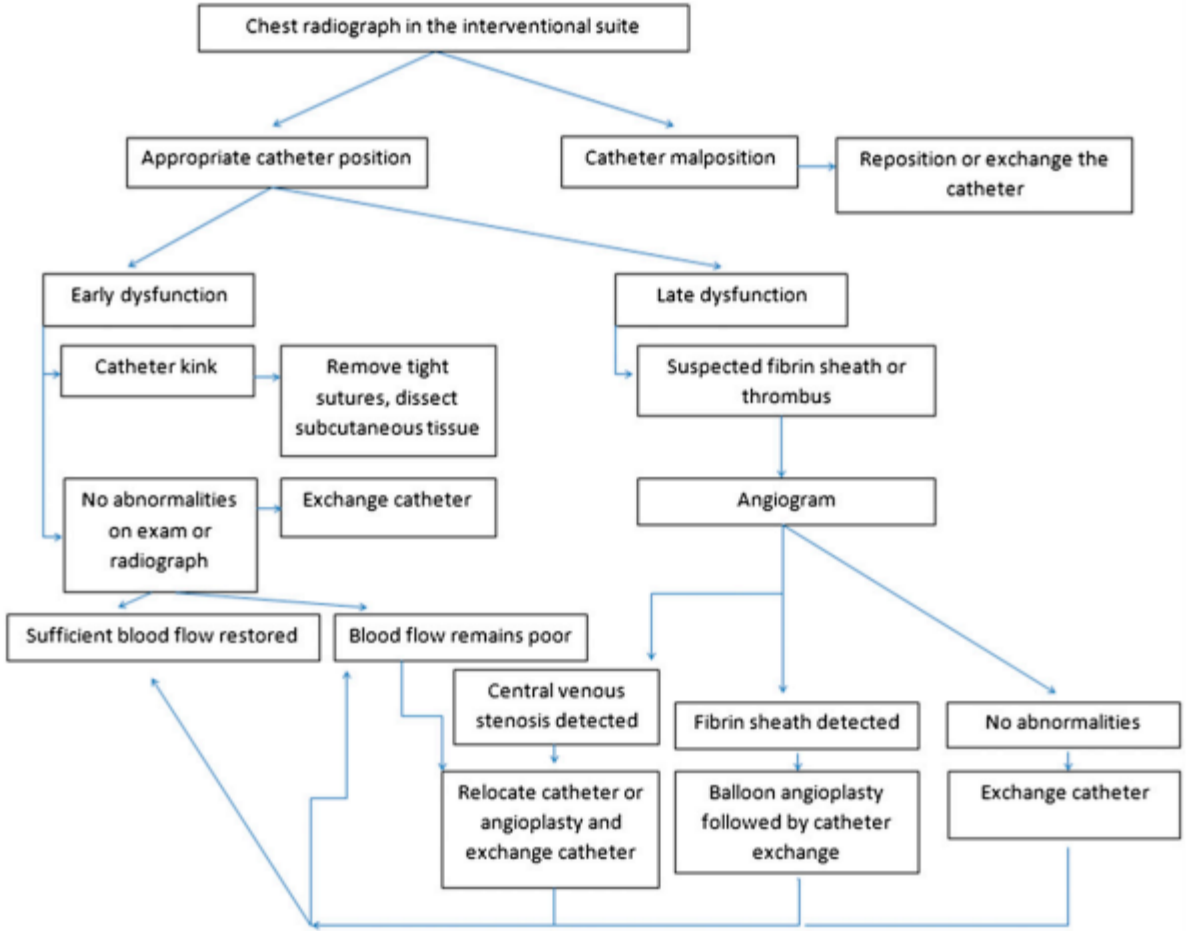


Figure 5. | Algorithm for the endovascular management of dysfunctional catheters in the interventional suite.

Complications Infectieuses

ILC: Infections liées au Cathéter

CRI Cathéter-related infection

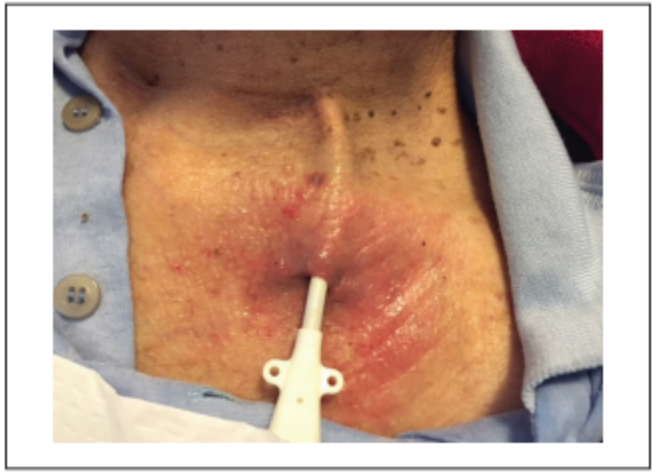
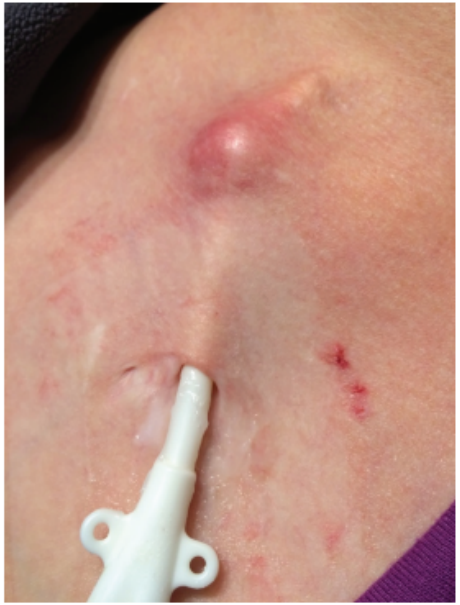


Figure 2. Exi -site / -fection.



ure 3. Tunnel infection.

Tunnelite
Erythème, tuméfaction et/ou douleur > 2cm

l'orifice
Erythème, tuméfaction et/ou

bactériémie liée au cathéter
Fièvre > 38°c ou frissons ou hypotension sans aucune cause évidente

Diagnostic infection liée au cathéter quels prélèvements ?

Cathéter en place

- **Ecouvillonnage site d'insertion**
- Hémocultures standard
- **Hémocultures appariées:**
  - **centrales**
  - **périphériques**

Cathéter enlevé

- **Extrémité distale du cathéter**
- Hémocultures (48h)

Hémocultures appariées qualititatives

- Sur KT tunnelisé
  - 1 Hc sur KT > 100 UFC/ml évoque une infection même isolée

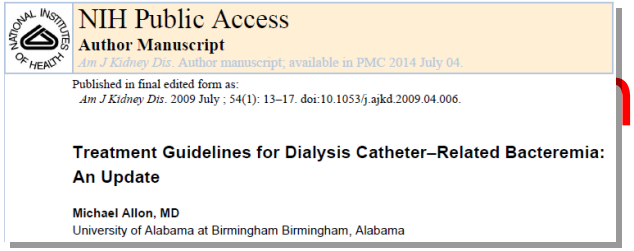
Capdevilla, EJCM

- Comparer temps de positivité des hémocultures

Si HC sur KT positive > 2 heures avant HC périph

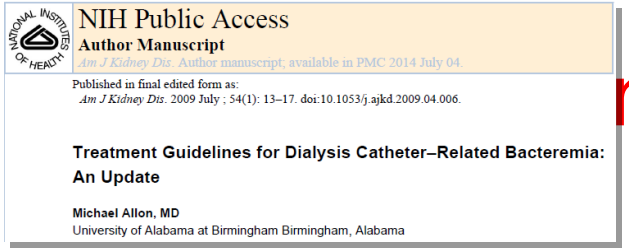
Bactériémie liée au KT

Se = 91%, Sp = 94% Blot, Lancet 1999



nostic en HD (ambulatoire)

- HC périphérique souvent non réalisable:
  - Épuisement vasculaire
  - Épargne vasculaire
- CEC: pas de différence entre sang périphérique et celui du cathéter
- Centres d'hémodialyse à distance des laboratoires: délai entre prélèvement et incubation variable



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Treatment Guidelines for Dialysis Catheter–Related Bacteremia: An Update

Michael Allon, MD
University of Alabama at Birmingham Birmingham, Alabama

nostic en HD (ambulatoire)

- Limites => exiger moins de preuves
- Définition pratique: HC positive chez un patient symptomatique en absence d'autre source d'infection

Because of these limitations, diagnosis of catheter-related bacteremia in a dialysis outpatient setting may require a lower standard of proof than in hospitalized patients. One practical definition used in some dialysis studies has been the requirement of positive blood cultures (drawn from blood tubing) in a symptomatic patient (fever or chills) in the absence of clinical evidence of an alternate source of infection.[6-8] There is no consensus about the

Table 1 Organisms responsible for hemodialysis central venous catheter-related bloodstream infections.

Organism	Percentage reported*
Gram-positive cocci	52–85%
Staphylococcus aureus	22–60%
Staphylococcus epidermidis	9–13%
Meticillin-resistant *Staphylococcus aureus*	6–29%
Enterococcus faecalis	2–18%
Gram-negative bacilli	20–28%
Pseudomonas aeruginosa	2–15%
Enterobacter cloacae	9%
Escherichia coli	10%
Acinetobacter species	13%
Serratia marcesens	1–2%
Klebsiella pneumoniae	6%
Polymicrobial	16–20%
Acid-fast organisms	Rare
Fungi	Rarely reported

*Percentages do not add up to 100% because data are drawn from different sources.

NDT Plus (2010) 3: 234–246
doi: 10.1093/ndtplus/sfq041

NDT PLUS
Nephrology Dialysis Transplantation

Special Feature

Diagnosis, prevention and treatment of haemodialysis catheter-related bloodstream infections (CRBSI): a position statement of European Renal Best Practice (ERBP)

Raymond Vanholder[1], Bernard Canaud[2], Richard Fluck[3], Michel Jadoul[4], Laura Labriola[4], A. Marti-Monros[5], J. Tordoir[6] and W. Van Biesen[1]

Traitement empirique

- D.1.8 When haemodialysis catheter infection is suspected, primary antibiotic approach should be inspired by the previously recorded responsible organisms in the unit. If both gram-positive and gram-negative organisms are registered on a regular basis, both types should be covered with eventual refining of the antibiotic regime once the organisms and their sensitivities are known.

- D.1.11 For methicillin-sensitive *S. aureus*, haemodialysis patients should receive cefazolin.

- D.1.10 Vancomycin or teicoplanin is the first choice for empirical therapy of gram positives in settings where MRSA is highly prevalent.

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- Inspirée de l'écologie de l'unité d'HD
- Si les CGP et les BGN sont enregistrés avec des prévalences équivalentes, l'antibiothérapie empirique doit couvrir les deux types de spectres par Vancomycine + aminoside ou Vanco + CGIII
- En cas de faible prévalence de staph métiR, la céfazoline est une bonne alternative

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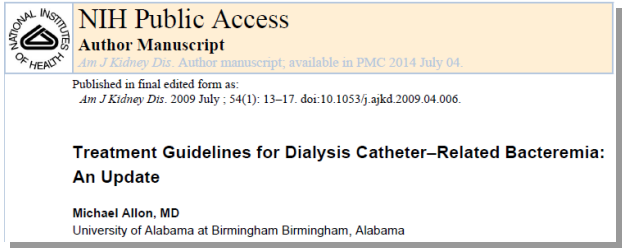
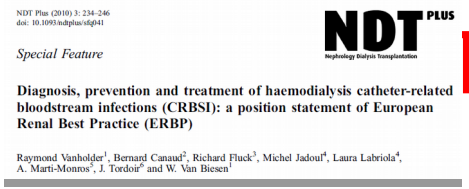
Infection de l'orifice sans fièvre

- D.1.7 For exit-site infection without fever, topical antibiotic application can be considered as an alternative. If infection does not resolve, systemic antibiotics should be administered. For tunnel infection without fever, systemic antibiotics are the preferred option, although peroral treatment may be sufficient. If these treatments fail, the catheter should be removed.

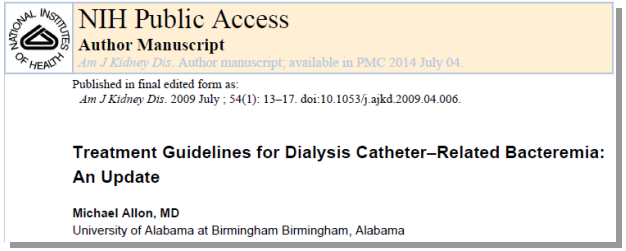
- Antibiothérapie locale
- Évolution défavorable: antibiothérapie générale
- Pour la tunnelite:
  - ATB générale,
  - Si l'évolution est défavorable, il faut enlever le cathéter





Γ Après culture

- Adaptation de l’antibiothérapie selon l’antibiogramme
- Préférer Céfazoline à la Vancomycine en cas de staph MétiS
- Privilégier les antibiotiques dont la pharmacocinétique permet leur administration uniquement après chaque séance d’hémodialyse: vancomycine, céfazoline, aminosides, ceftazidime et daptomycine
- Les BGN sont généralment sensibles aux aminosides et aux CGIII, les CGIII sont préférées pour éviter le risque d’ototoxicité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Durée du traitement

- Patients non compliqués: 3 semaines
- Localisation secondaire: 6 semaines

NDT Plus (2010) 3: 234–246
doi: 10.1093/ndtplus/sfq041

NDT PLUS
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Si on garde le cathéter …

- D.1.6 If a catheter is not removed, blood cultures should be checked 1 week after completion of antibiotic treatment, and if those cultures remain positive, the catheter should be removed.

- HC une semaine après la fin de l’antibiothérapie
- Si HC positive => ablation du cathéter

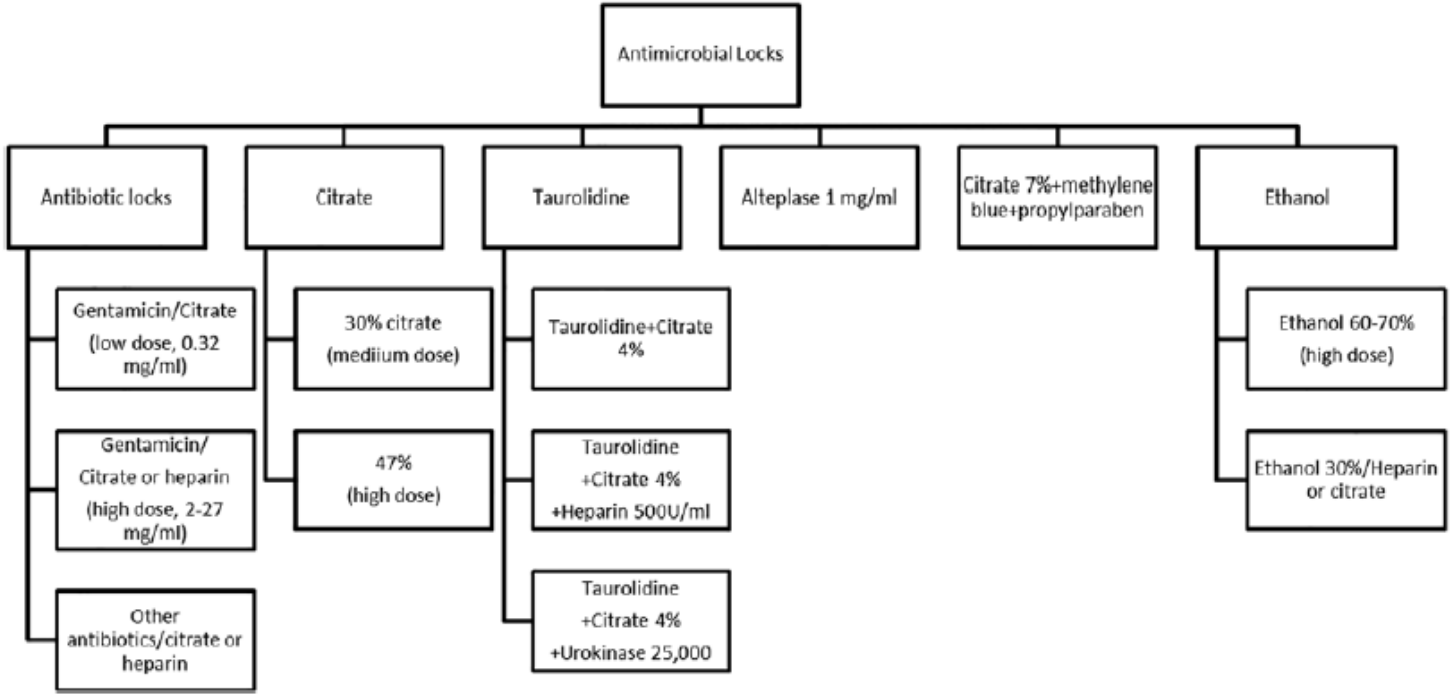


Figure 3 Antimicrobial locks used for the prevention of catheter associated blood stream infection in the hemodialysis catheters.

Hemodialysis International 2018

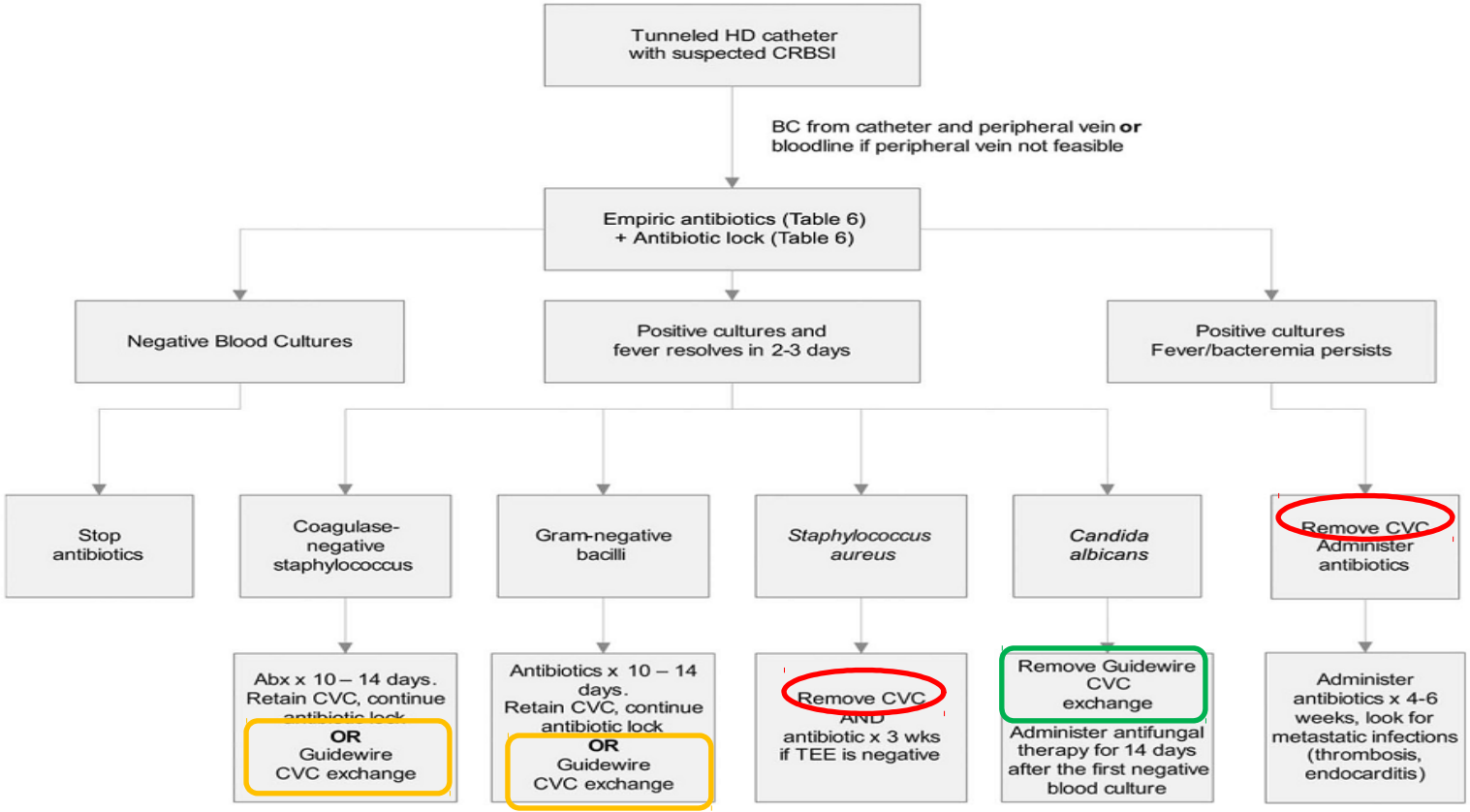
Table 3 | Summary of clinical trials using prophylactic antimicrobial lock (AML) for catheter-related bacteremia (CRB) associated with hemodialysis catheters (CVC)

First author, year	Subject number	Antimicrobial lock (AML)	Controls (C) (U/ml)	CRB rate AML vs C/1000 CVC days	*P*-value
Pervez, 2002[97]	36	Gentamicin 20 mg/ml+citrate 4.67%	Heparin 1000	0.62 vs 2.11	NA
Dogra, 2002[142]	83	Gentamicin 27 mg/ml+citrate 1%	Heparin 5000	0.3 vs 4.2	0.0003
McIntyre, 2004[143]	50	Gentamicin 5 mg/ml+heparin 5000 U/ml	Heparin 5000	0.3 vs 4	0.02
Nori, 2006[144]	30	Gentamicin 4 mg/ml+citrate 3.13%; or	Heparin 5000	0 vs 4	0.008
Venditto, 2010[109]	265	Gentamicin 2 mg/ml+heparin 5000 U/ml	Heparin 5000	0.4 vs 2.9	0.06
Onder, 2009[145]	43	Tobramycin 5 mg/dl+TPA 1 mg/ml	Heparin 5000	6.2 vs 16.8	0.2
Bleyer, 2005[146]	60	Minocycline 3 mg/ml+EDTA 30 mg/ml	Heparin (dose NA)	0 vs 0.47	0.35
	30	Minocycline 3 mg/ml+EDTA 30 mg/ml	Heparin 5000	0.4 vs 4	0.02
Saxena, 2005[147]	96	Cefotaxime 10 mg/ml+heparin 5000 U/ml	Heparin 5000	1.65 vs 3.13	NA
Saxena, 2006[148]	113	Cefotaxime 10 mg/ml+heparin 5000 U/ml	Heparin 5000	1.44 vs 3.15	<0.001
Al-Hwiesh, 2007[149]	63	Vancomycin 25 mg/ml+gentamicin 40 mg/ml+heparin 5000 U/ml	Heparin 5000	4.54 vs 13.11	0.05
Kim, 2006[150]	120	Cefazolin 10 mg/ml+gentamicin 5 mg/ml+heparin 1000 U/ml	Heparin 1000	0.44 vs 3.12	0.031
Allon, 2003[35]	50	Taurolidine 1.35%+citrate 4%	Heparin 5000	0.6 vs 5.9	<0.001
Betjes, 2004[108]	58	Taurolidine 1.35%+citrate 4%	Heparin 5000	0 vs 2.1	0.047
Solomon, 2010[33]	110	Taurolidine 1.35%+citrate 4%	Heparin 5000	1.4 vs 2.4	0.1
Weijmer, 2005[30]	291	Trisodium citrate 30%	Heparin 5000	1.1 vs 4.1	<0.001
Winnett, 2008[110]	413	Trisodium citrate 46.7%	Heparin 5000	0.81 vs 2.13	<0.001
Power, 2009[31]	232	Trisodium citrate 46.7%	Heparin 5000	0.7 vs 0.7	0.9
Venditto, 2010[109]	265	Trisodium citrate 46%	Heparin 5000	3.4 vs 2.9	NS

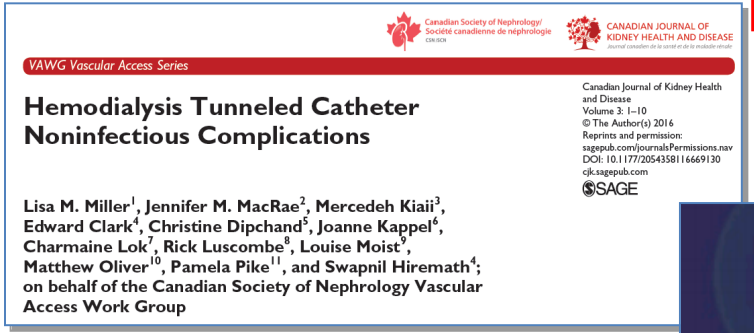
Abbreviations: CRB, catheter-related bacteremia; CVC, central venous catheter; EDTA, ethylenediaminetetraacetic acid; NA, not available; NS, non-significant; TPA, tissue plasminogen activator.

Catheter-related blood stream infection (CRBSI) among patients who are undergoing hemodialysis (HD) with tunneled catheters. **(IDSA Guidelines 2009)**

BC, blood culture; CVC, central venouscatheter; TEE, transesophageal echocardiograph.



Lecture



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CANADIAN JOURNAL OF KIDNEY HEALTH AND DISEASE

VAWG Vascular Access Series

Hemodialysis Tunneled Catheter Noninfectious Complications

Lisa M. Miller[1], Jennifer M. MacRae[2], Mercedeh Kiaii[3], Edward Clark[4], Christine Dipchand[5], Joanne Kappel[6], Charmaine Lok[7], Rick Luscombe[8], Louise Moist[9], Matthew Oliver[10], Pamela Pike[11], and Swapnil Hiremath[4]; on behalf of the Canadian Society of Nephrology Vascular Access Work Group

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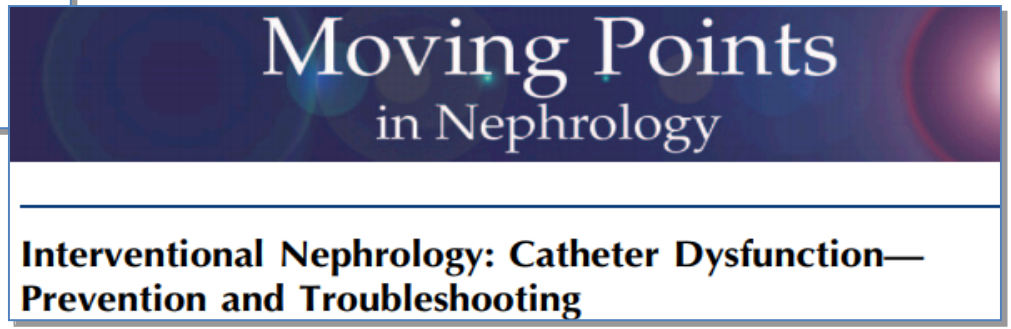
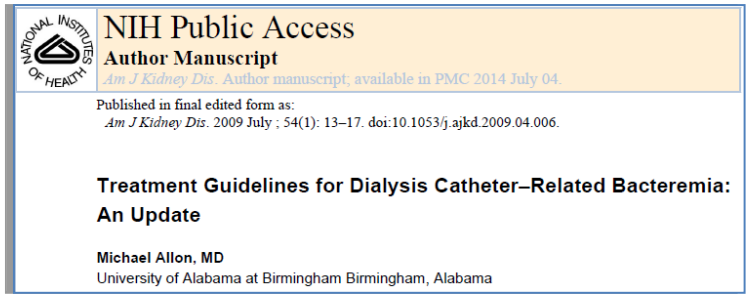


Moving Points in Nephrology

Interventional Nephrology: Catheter Dysfunction—Prevention and Troubleshooting



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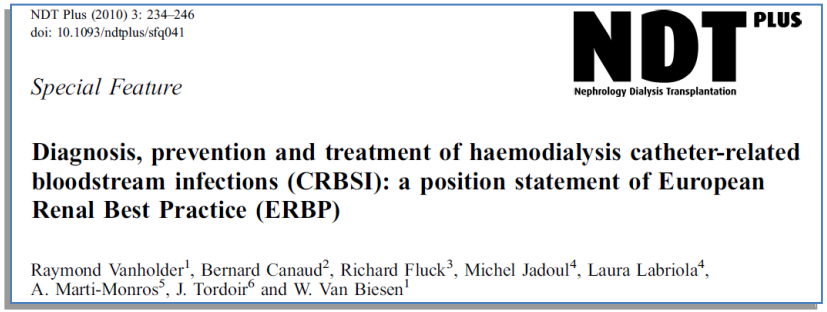
Treatment Guidelines for Dialysis Catheter–Related Bacteremia: An Update

Michael Allon, MD
University of Alabama at Birmingham Birmingham, Alabama



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Nephrology Dialysis Transplantation

Special Feature

Diagnosis, prevention and treatment of haemodialysis catheter-related bloodstream infections (CRBSI): a position statement of European Renal Best Practice (ERBP)

Raymond Vanholder[1], Bernard Canaud[2], Richard Fluck[3], Michel Jadoul[4], Laura Labriola[4], A. Marti-Monros[5], J. Tordoir[6] and W. Van Biesen[1]