"Line Sepsis" - Patients on Home Parenteral Nutrition - Full Clinical Guideline - DERBY

Reference no.:CG-GASTRO/2018/020

Management of suspected catheter related blood stream infection in Home Parenteral Nutrition Patients

1. Introduction

This is a practical guideline to aid in the management of suspected catheter related blood stream infection (CRBSI), "line infection", in patients on home parenteral nutrition (HPN), it is not designed for the management of hospital patients on PN via a PICC or multilumen temporary CVC. It is not a replacement for referral to the appropriate teams, e.g Nutrition support team, gastroenterology, microbiology.

Anyone admitted to this hospital on HPN should be referred as soon as possible to the Nutrition Support team (x 85775)

CRBSI is an important cause for morbidity in patients on HPN. It is a serious and potentially life threatening complication and needs to be recognised and treated promptly and effectively

2. Aim and Purpose

To offer guidance for all clinical staff treating adult patients on HPN admitted with suspected CRBSI.

3. Definitions, Keywords

ANTT – aseptic no touch technique

CRBSI – catheter related blood stream infection

HPN - Home parenteral nutrition

CVC – central venous catheter

PICC – peripherally inserted central venous catheter

PN – parenteral nutrition

AKI – acute kidney injury

CKD – chronic kidney injury

Na – Sodium

K – Potassium

Mg – magnesium

UC – ulcerative colitis

IBD – inflammatory bowel disease

E Mix – St Mark's Electrolyte Mix

WHO – World Health Organisation

Keywords; line infection, catheter related blood stream infection

4. Guideline

CRBSI should be suspected in any patient on HPN presenting to ED with fever, rigours, abdominal pain, nausea, lethargy or raised inflammatory markers, particularly when the symptoms occur on infusing their parenteral nutrition. It is important to consider other sources of infection.

Local exit site infection in a tunnelled line is rarely associated with systemic infection (O'Grady et al. 2011). More extensive infection including tunnel infection, cuff infection or pocket infection are indications for blood cultures and subsequent line removal.

Risk factors for line infection

Opiate use, implanted port, multi lumen catheter, daily infusions, increased frequency of lipid infusions, length of time CVC in place, compliance, CVC used for medication and/or blood drawing and smoking are all risk factors for CRBSI (Richards et al. 1997; Pironi et al. 2012) (Buchman et al. 2014)

Treatment

On suspicion of a CRBSI paired blood cultures should be taken peripherally and from all lumens of the CVC using aseptic no touch technique (ANTT) and labelled appropriately with line/peripheral and time taken. This should be done on both the ICM order AND by labelling the blood culture bottles. This is very important as time to positivity is diagnostic of a CRBSI (Blot et al. 1999; Al Wohoush et al. 2010) (Raad et al. 2004), i.e if the blood culture from the line is positive before the peripheral blood cultures. Once blood cultures have been taken, antibiotics should be started and given through the line and locked in the line, NOT flushed through. For gentamicin and vancomycin, the gentamicin should be given first, and the vancomycin second and left in the line (Messing et al. 1990). The current recommendation is for vancomycin and gentamicin to be used and dosed according to the current dosing guidelines Trust Policies Procedures & Guidelines catalog › Contents of Drug Charts e.g. Gentamicin, Vancomycin. See Line Locks – antibiotic guide.

If the patient is displaying signs of septic shock, antibiotics should be given immediately and the line removed at the first opportunity.

Parenteral nutrition should not be given during treatment for CRBSI. The daily requirements for fluid and electrolytes should be given using peripheral intravenous fluids with the addition of magnesium, calcium and phosphate if necessary. 4% dextrose provides 40g glucose per litre and 5% dextrose provides 50g glucose per litre. 50-100g glucose per day is sufficient to prevent starvation ketosis (NICE 2013). Very few people will be unable to continue to eat and drink as they would normally, and will gain some calories from this.

Composition of commonly used intravenous crystalloids (BNF 2017):

	Na mmol/L	Cl mmol/L	K mmol/L	HCO_3 mmol/L	Ca^{2+} mmol/L	Mg^{2+} mmol/L	Glucose g	Osm mOsml/L
0.9% Saline	150	150	0*	0	0	0#	0	300
Hartman's	131	111	5	29	2	0	0	278
0.18% Saline/4% dextrose	30	30	0*	0	0	0#	40	
0.45% Saline/5% dextrose	77	77	0*	0	0	0#	50	

*20-40 mmol/L as ready prepared bags for ward administration.

#can be added by pharmacy, usually 10-20 mmol/L

Electrolyte concentration of gastrointestinal secretions(NICE 2013):

	H^+ mmol/L	Na mmol/L	K mmol/L	Cl mmol/L	HCO_3 mmol/L
Gastric	40-60	20-80	5-20	100-150	
Biliary		120-140	5/15	80-120	30-50
Pancreatic		120-140	5/15	40-80	70-110
Jejunum		140	5	135	8
Established Ileostomy		50-100	4-5	25-75	0-30
Newly formed stoma, high stoma, high output ileostomy		100-140	4-5	75-125	0-30

Monitoring

Blood culture results should be reviewed at 48 hours, if not previously positive. Blood cultures can be assumed to be negative if a result has not been flagged as positive. If blood cultures are negative, parenteral nutrition should be restarted and an alternative diagnosis sort. If infusion of PN precipitates fever or rigours, repeat paired culture should be sent.

Antibiotics should be adjusted as directed by culture results. Antibiotics should be continued through the line for at least 7 days (Small 2015). Blood cultures should be repeated at day 5 and if negative PN can be restarted after 7 days completed antibiotics.

If blood cultures are positive, treatment should be adjusted if necessary and antibiotics continued, all positive blood cultures should be discussed with a microbiologist to determine the appropriate antibiotic choice and duration, making sure that the microbiologist is aware that this is a HPN patient with a CRBSI and their line is for salvage. Antibiotics should be given down the line.

Blood cultures should then be repeated after 5 days. If they remain positive, the line should be removed.

Once PN has been successfully restarted the patient can be discharged home.

Staph Aureus

If the blood cultures are positive for staph. Aureus, the line should be removed, see below. Blood cultures should be repeated at 48 hours and advice sought from microbiology regarding the appropriate antibiotic. If cultures remain positive, a deep seated site for infection should be looked for, e.g endocarditis, discitis or osteomyelitis.

Indications for line removal

If the line is infected with Staph aureus, candida or other fungus, the line should be removed. If this is the 3rd infection in the same line, removal should be considered. If this is a precious line, and removal would compromise patient care, attempt can be made to salvage the line (Bond et al. 2017). This would need close liason with the Nutrition consultant and microbiology consultant. The line should be removed if there is a failure to clear the infection, ie positive cultures after adequate and appropriate treatment.

If there is a tunnel infection, the line can not be salvaged, equally if there is an implanted port (used very rarely in UK for HPN), the line should be removed.

Any infection in a dual/multilumen catheter is an indication for removal.

If the line is damaged and infected it should be removed.

If the line has displaced and the tip is not in the optimal place, again it should be removed.

Further management:

If the line is infected with staph. Aureus, enterococcus or candida, screening for endocarditis is recommended with echocardiogram.
Ophthalmology review is recommended for candida infection to look for candida endophthalmitis
In the event of line removal, a replacement tunnelled cuffed CVC can be inserted after 7 days appropriate antibiotic therapy in uncomplicated line infection and after 10-14 days in staph aureus or fungal infection.
Watch out for septic emboli in patients who have had a line infection and have a low threshold for investigating particularly for discitis.

5. References (including any links to NICE Guidance etc.)

Al Wohoush, I., J. Cairo, G. Rangaraj, B. Granwehr, R. Hachem, and I. Raad. 2010. 'Comparing quantitative culture of a blood sample obtained through the catheter with differential time to positivity in establishing a diagnosis of catheter-related bloodstream infection', *Infect Control Hosp Epidemiol*, 31: 1089-91.

Blot, F., G. Nitenberg, E. Chachaty, B. Raynard, N. Germann, S. Antoun, A. Laplanche, C. Brun-Buisson, and C. Tancrede. 1999. 'Diagnosis of catheter-related bacteraemia: a prospective comparison of the time to positivity of hub-blood versus peripheral-blood cultures', *Lancet*, 354: 1071-7.

BNF. 2017.

Bond, A., A. Teubner, M. Taylor, C. Cawley, A. Abraham, M. Dibb, P. R. Chadwick, M. Soop, G. Carlson, and S. Lal. 2017. 'Assessing the impact of quality improvement

measures on catheter related blood stream infections and catheter salvage: Experience from a national intestinal failure unit', *Clin Nutr*.

Buchman, A. L., M. Opilla, M. Kwasny, T. G. Diamantidis, and R. Okamoto. 2014. 'Risk factors for the development of catheter-related bloodstream infections in patients receiving home parenteral nutrition', *JPEN J Parenter Enteral Nutr*, 38: 744-9.

Messing, B., F. Man, R. Colimon, F. Thuillier, and M. Beliah. 1990. 'Antibiotic-lock technique is an effective treatment of bacterial catheter-related sepsis during parenteral nutrition', *Clin Nutr*, 9: 220-5.

NICE. 2013. "Intravenous fluid therapy in adults in hospital." In.: National Institute for health and care excellence.

O'Grady, Naomi P., Mary Alexander, Lillian A. Burns, E. Patchen Dellinger, Jeffrey Garland, Stephen O. Heard, Pamela A. Lipsett, Henry Masur, Leonard A. Mermel, Michele L. Pearson, Issam I. Raad, Adrienne G. Randolph, Mark E. Rupp, Sanjay Saint, and Committee the Healthcare Infection Control Practices Advisory. 2011. 'Guidelines for the Prevention of Intravascular Catheter-related Infections', *Clinical Infectious Diseases: An Official Publication of the Infectious Diseases Society of America*, 52: e162-e93.

Pironi, L., O. Goulet, A. Buchman, B. Messing, S. Gabe, M. Candusso, G. Bond, G. Gupte, M. Pertkiewicz, E. Steiger, A. Forbes, A. Van Gossum, and A. D. Pinna. 2012. 'Outcome on home parenteral nutrition for benign intestinal failure: a review of the literature and benchmarking with the European prospective survey of ESPEN', *Clin Nutr*, 31: 831-45.

Raad, I., H. A. Hanna, B. Alakech, I. Chatzinikolaou, M. M. Johnson, and J. Tarrand. 2004. 'Differential time to positivity: a useful method for diagnosing catheter-related bloodstream infections', *Ann Intern Med*, 140: 18-25.

Richards, D. M., N. A. Scott, J. L. Shaffer, and M. Irving. 1997. 'Opiate and sedative dependence predicts a poor outcome for patients receiving home parenteral nutrition', *JPEN J Parenter Enteral Nutr*, 21: 336-8.

Small, Mia. 2015. 'Complications of cenral venous catheters: current perspectives'. http://www.stmarksacademicinstitute.org.uk/content/uploads/2015/12/14.00-Complications-of-CVCs-Small2015.pdf.

6. Documentation Controls

Development of Guideline:	Dr Catherine Fraser Gastroenterology Consultant
Consultation with:	Dr Lee Reed, Microbiology Consultant, Julia Lacey, Antimicrobial Pharmacist
Approved By:	5th Jan 2018 Colorectal Surgery 8th June 2018 Nutrition Business Meeting September 2018 Medical Division
Review Date:	September 2021
Key Contact:	Dr Catherine Fraser

7. Appendices

Vancomycin monograph: Vancomycin Monograph

Gentamicin monograph: Gentamicin Prescription Chart