

Ethanol Lock Therapy in Children with Intestinal Failure: Infection Prevention and Vascular Preservation

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Disclosures

I have no relevant disclosures.

Intestinal Failure

- Intestinal failure (IF) patients require a central venous catheter for parenteral nutrition (PN), etc.
- Risks
 - Central line associated blood stream infections (CLABSI)
 - Intestinal failure associated liver disease
 - Repeated line placements
 - Disruption of nutritional rehabilitation
 - Venous thrombosis
- Intestinal transplantation

Ethanol Lock Therapy

- Decreased infection rates¹⁻⁴
 - Bactericidal and fungicidal
- Concerns⁵⁻⁶
 - Line integrity
 - Thrombosis

Objectives

Primary

- Examine the association between ethanol lock therapy (ELT) and CLABSI rates in IF patients receiving home PN.

Secondary

- Evaluate the rates of central venous thrombosis and catheter rewires, repairs, and replacements while on and off ELT.

Study Design

- Retrospective cohort study, unplanned crossover
 - Children's Hospital of Philadelphia Intestinal Rehab Program receiving home PN
 - 2011 - 2014
 - Silicone, tunneled central line
 - Daily locks
 - 70% ethanol
 - ≥ 4 hours while off PN

CHOP ELT Guidelines

Eligibility Criteria:

- ≥ 6 mo of age
- Anticipated line duration ≥ 3 mo
- 1+ CLABSI
- Only silicone catheters

Plus one of the following:

- Short Bowel Syndrome
- Immunocompromised
- Listed for transplant

Exclusion Criteria:

- ≤ 6 mo of age
- Allergy or intolerance to ethanol
- Polyurethane or other material catheter
- Pregnant or breastfeeding
- Central line tunnel or exit site infection

- ✧ Final concentration of ELT is 70%
- ✧ Recommended dwell time: 4 – 24 hours

Data Collection

- CLABSI
- Central line
 - Replacement
 - Rewire
 - Repair
 - Associated thrombosis

- All data per 1,000 catheter days
- On and off ELT
- Start – first central line while being followed at CHOP
- End – central line discontinued or transfer of care

Results

- 26 patients
- 6 months to 22 years at ELT initiation
- 537 days off and 447 days on ELT

Patient Demographics

Age, y ¹	2.6 (1.1, 4.3)	Intact ICV, %	35
Sex, % female	38	Small Intestinal length, cm ¹	62.5 (30, 109)
Etiology of IF, %		Intact colon, %	96
Volvulus	19	Colon in continuity, %	65
Gastroschisis	15		
Intestinal Atresia	23		
Necrotizing Enterocolitis	23		
Pseudoobstruction	15		
Hirschsprung disease	8		
Other	15		

¹ median (IQR)

Central Line Outcomes

	Off ELT	On ELT	p-value	RR	NNT
Total Catheter days	13954	11817	0.77		
Median, (IQR)	389 (67, 692)	351 (285, 628)			
Total CLABSI	7.1	0.8	<0.001	0.11	159
CVC ¹					
Replacement	7.4	0.8	<0.001	0.11	151
Rewire	3.6	2.3	0.59	0.64	769
Repair	0.3	1.4	0.03	4.67	
CVC associated thrombi	1.4	0.2	0.002	0.14	833

¹ CVC, central venous catheter

CLABSI Organisms

	Off ELT	On ELT
<i>Staphylococcus</i>	38	6
<i>Klebsiella</i>	26	1
<i>Enterobacter</i>	10	0
<i>Candida</i>	20	0
<i>Escherichia</i>	7	1
<i>Enterococcus</i>	16	2
<i>Streptococcus</i>	3	1
Other ¹	23	0
Polymicrobial	34	1

¹Other organisms: *Citrobacter*, *Pseudomonas*, *Acinetobacter*, *Leuconostoc*, *Corynebacterium*, *Neisseria*, *Serratia*, *Bacillus*, *Stenotrophomonas*, *Rhizobium*

Study Evaluation

Advantages

- Number of patients
- Patients as own controls
- Length of follow up

Disadvantages

- Small sample size
- Retrospective
- Lack of data prior to care at CHOP

Conclusions

- 70% ELT was associated with a significant reduction in the rates of CLABSI (89%) and central line replacement (93%).
- No increase in the rate of central line associated thrombus formation associated with ELT.
- ELT is effective at preventing CLABSI in children with intestinal failure
- ELT may reduce the need for line replacement without an increased incidence of central line associated thrombosis.

Thank You!

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References

1. Pieroni KP, Nespor C, Ng M, et al. Evaluation of ethanol lock therapy in pediatric patients on long-term parenteral nutrition. *Nutr Clin Pract* 2013;28(2):226-31.
2. Wales PW, Kosar C, Carricato M, et al. Ethanol lock therapy to reduce the incidence of catheter-related bloodstream infections in home parenteral nutrition patients with intestinal failure: preliminary experience. *J Pediatr Surg* 2011;46(5):951-6.
3. Oliveira C, Nasr A, Brindle M, et al. Ethanol locks to prevent catheter-related bloodstream infections in parenteral nutrition: a meta-analysis. *Pediatrics* 2012;129(2):318-29.
4. Ardura MI, Lewis J, Tansmore JL, et al. Central catheter-associated bloodstream infection reduction with ethanol lock prophylaxis in pediatric intestinal failure: broadening quality improvement initiatives from hospital to home. *JAMA Pediatr* 2015;169(4):324-31.
5. Abu-El-Hajja M, Schultz J, Rahhal RM Effects of 70% ethanol locks on rates of central line infection, thrombosis, breakage, and replacement in pediatric intestinal failure. *J Pediatr Gastroenterol Nutr* 2014;58(6):703-8.
6. Mermel LA, Alang N Adverse effects associated with ethanol catheter lock solutions: a systematic review. *J Antimicrob Chemother* 2014;69(10):2611-9.
