Peripherally Inserted Central Catheter Experience in Long-Term Home Parenteral Nutrition Patients

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Abstract

Parenteral nutrition is administered through a central venous catheter(CVC). Peripherally inserted central catheters (PICC) are appropriate for home parenteral nutrition (HPN). The objective of this study was to examine a group of HPN patients with a PICC in place for more than six months, and the complications associated with PICC removal. Medical records from one home infusion pharmacy were retrospectively reviewed for PICC characteristics and complications leading to removal. Nineteen adult HPN patients had 26 PICC placements. Total PICC days were 22,262 with a mean of 856 (265-2500) days. Seven PICCs were in place for 3 to greater than 5 years. The overall complication rate was 0.58/1000 CVC days. Catheter related bloodstream infection (CRBSI) was the main cause of PICC removal. There was no evidence of symptomatic thrombosis. Patients experienced no infusion related complications. The PICCs were 88% polyurethane, 65% double lumen, and 54% were 5 Fr. No patient received alcohol or antibiotic lock therapy, and 8 patients had successful alteplase administered at least one time. All patients needed caregiver assistance for site care and dressing changes, but were independent in HPN infusion and flushing. This group of patients demonstrated that PICCs are a viable option HPN administration. The PICC overall complication rate was very low, and the most frequent complication leading to removal was CRBSI. The infection rate of 0.36/1000 CVC days is considered very low in an HPN population. This is the only HPN infusion study to date reporting 7 PICCs lasting 3 or more years, with 2 lasting greater than 5 years without complications resulting in removal. Patients received their prescribed therapy reliably and without interruption with this device. Larger studies are needed to confirm the efficacy of maintaining a PICC for very long-term HPN administration.

Keywords: *Home Parenteral Nutrition, PICC, CVC complications*

Background

Parenteral nutrition is administered through central venous catheters (CVCs). Devices typically used for infusion of long-term home parenteral nutrition (HPN) in patients with intestinal failure include tunneled catheters, infusion ports, and peripherally inserted central catheters (PICCs). These devices are often referred to as a patient's lifeline. Successful HPN administration is dependent upon maintaining the CVC for many years without complications that lead to removal. These complications include catheter-related bloodstream infection (CRBSI), localized site and pocket infections, thrombotic and occlusion events, and CVC malfunctions.[1]

A PICC is considered a device appropriate for therapy of any duration,[2] and may remain in place for many months. Tunneled CVCs or infusion ports have a potential lifespan of many years.[3] Often, PICCs are inserted when HPN is initiated before hospital discharge, with a plan for eventual replacement with a permanent device after a patient requiring HPN is stable in the outpatient setting. The Sustain Registry, a research database created to collect outcomes on patients requiring HPN in the United States, reported that the majority of the 292 adults in this registry used a PICC to administer their HPN.[4] In practice, patients requiring HPN often have PICCs that remain in place for months to years.

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http://dx.doi.org/10.1016/j.java.2016.12.001

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The objective of this study was to examine a group of patients requiring HPN with a PICC in place for more than 6 months, and the complications associated with PICC removal.

Methods

Permission was obtained from 1 home infusion pharmacy to conduct a retrospective review of medical records from January 2005 to April 30, 2016, for PICC insertion date, duration of access, material type and size, and complications leading to removal. PICCs in place for >6 months were included. Data collection also included patient age, gender, diagnosis, HPN solution, volume and cycle, use of lock and anticoagulation therapies, PICC tip location, and caregiver identification.

Results

Nineteen adult patients requiring HPN had 26 PICC placements. This group was a 13% cohort of the pharmacy's total HPN population, who otherwise had tunneled or infusion port CVCs in place. Women represented 57% of patients with an average age of 52 years, and 68% of all patients had a diagnosis of short bowel syndrome. Total PICC days were 22,262 with a mean of 856 days (range = 265-2500 days). Two PICCs were in place for >5 years, 5 PICCs were in place for 3-5 years, 14 PICCs were in place for 1-3 years, and 5 PICCs were in place for <1 year but >6 months.

Catheter material consisted of 23 polyurethane PICCS, including 10 power injectable devices. Three PICCs were silicone with valved-tip design. There were no antimicrobial PICCs. The 2 PICCs in place for >5 years were both non-power injectable polyurethane. The majority (n = 14) were 5F size followed by 4F (n = 5) and 6F, 7F, and 8F sizes (n = 1 each). Four PICCs did not have French size on record. Seventeen (65%) were double-lumen and 9 were single-lumen PICCs. In the ≥3 year group of 7 PICCs, there were more double-lumen (n = 5) than single-lumen (n = 2) devices.

The HPN therapy included fat emulsion for 16 patients, which increased the viscosity of the solution. The volume of the infusions ranged from 1000-3500 mL infused over an 8-24 hour time period. Rates per hour ranged from 100-300 mL/h and were not affected by French size or lumen number. There were no reported infusion-related problems despite these high infusion rates and the viscosity of the lipid-containing parenteral nutrition formula.

None of the patients used alcohol or antibiotic lock therapy for infection prophylaxis. Eight patients had successful alteplase therapy at least once for thrombotic occlusion.

Only 8 PICCs had insertion reports that confirmed tip location at the preferred cavoatrial junction. Fifteen patients had previously existing PICCs and did not transfer their insertion records when coming onto the service with the home infusion pharmacy. Three patients had no insertion report available from the discharging hospital.

All patients had home health registered nurses or trained family caregivers to deliver PICC site care. None of the patients were able to administer self-site care due to the location of the insertion site. All patients were independent in the administration of their HPN infusion.

Table 1. Complications Leading to Peripherally Inserted Central Catheter (PICC) Removal

Patient	PICC Days	Complication Leading to Removal
1	827	Damaged
2	1816	Age/routine change
	308	Lost to follow-up
3	520	CRBSI
	352	CRBSI
4	911	CRBSI
5	365	Discontinued therapy
6	909	CRBSI
	395	Damaged
7	264	CRBSI
8	615	Damaged
	238	Damaged
9	1537	Age/routine change
	707	N/A
10	1377	CRBSI
	578	Malposition
11	1335	CRBSI
12	672	Discontinued therapy
	472	Discontinued therapy
13	1970	Lost to follow-up
14	2500	N/A
15	492	N/A
16	1507	CRBSI
17	210	N/A
18	771	Discontinued therapy
19	614	N/A

CRBSI = Catheter-related bloodstream infection; N/A = Not applicable.

Table 1 lists reasons for PICC removal and Figure 1 displays rates of complications leading to PICC removal. The primary cause for removal was CRBSI (n = 8) followed by damaged catheter material (n = 4), discontinuation of