



SAFETY AND FEASIBILITY OF PERIPHERALLY INSERTED CENTRAL VENOUS CATHETERS (PICC) IN CHILDREN WITH CANCER: EXPERIENCE IN A RESOURCE LIMITED SETTING.

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ABSTRACT **Background:** Peripherally inserted central venous catheter (PICC) is a simple and convenient option for long term intravenous access. In developing countries, its use has been increased recently. We prospectively assessed the feasibility of PICC use, determined the PICC related complications in children with malignancies in a newly developed pediatric oncology unit. **Results:** Forty five patients were enrolled between January-2017 to December-2018. A total of 48 PICCs were inserted. Insertion success rate was 96%. Catheter maintenance success rate was 73%; and median catheter life span was 142 days per device. PICC related complications were seen in 4.7/1000 catheter days, among which 2.5/1000 catheter days required line removal. Infections and catheter occlusion were the common complications. **Conclusion:** In a resource limited setting, use of PICC is safe and feasible. This can be considered as a suitable option for prolonged venous access, repeated blood sampling and chemotherapy administration in children with malignancies.

KEYWORDS : Safety and feasibility, Central Catheter, Paediatric Oncology.

INTRODUCTION

Long term venous access is a critical component in pediatric oncology care. This is frequently required for intravenous chemotherapy administration, hydration, antibiotics administration, blood and blood products transfusion, parenteral nutrition and other supportive care. For venous access a peripheral line, implantable port, conventional central venous catheter or peripherally inserted central venous catheter (PICC) can be used depending upon the institutional policy, availability, and physician's expertise and experience [1,2]. In resource limited settings, majority of the children are managed with peripheral intravenous lines. PICC, a catheter inserted percutaneously via a peripheral vein with the tip residing in superior vena cava provides a consistent and convenient intravenous access. It reduces the discomfort associated with repeated venipunctures and reduces the incidence of extravasations of chemotherapeutic agent [3,4]. For long term maintenance it requires meticulous care for prevention of catheter related complications [5]. In this study we assessed the safety, feasibility and acceptability of PICC use, determined the PICC related complications in pediatric cancer patients of a newly developed pediatric oncology unit.

MATERIALS AND METHODS

This study was carried out in a new pediatric oncology unit at a tertiary care hospital in eastern zone of India. All cases (less than 15 years) registered to pediatric oncology department, Sum Hospital, Bhubaneswar, who had a PICC inserted between January 2017 to December 2018 were prospectively followed up. The last date of follow up was 20th February 2018. Information related to underlying disease, date of insertion, complications, date of removal and reason for removal was recorded.

RESULTS

Total 288 paediatric oncology patients were registered between January-2017 to December-2018. Out of 247 patients started treatment at our centre, 45 underwent PICC insertion. Total 48 PICC lines were inserted in 45 patients. Three patients had twice PICC insertion done during the 24 months study period. In two cases there was failure at first attempt of catheter insertion. Insertion success rate was 96% (48 out of 50). Insertion and maintenance was done by a team of trained four staff nurses and a paediatric medical oncologist. Single lumen 18 gauge (4Fr) Bard Groshong PICC was used for all. It has a three-way valve at the catheter tip which is designed to remain closed to prevent reflux of blood into the catheter. All the insertion procedures were done under direct observation without any image guidance. There was no

insertion related significant complications documented during the procedure. Tip position was confirmed by roentgenogram. Four patients required repositioning of catheter after initial insertion.

Patient population consisted of 24 boys and 21 girls. Median age at the time of PICC insertion was 5 years (range 1–14 years) and median weight was 22 kg (range 9–55 kg). Thirty seven patients (82%) had hematolymphoid malignancies and 8 (18%) had solid tumours. Sixty five percent (n=31) catheters were inserted in the left arm and 35% (n=17) in the right arm. The decision of site of insertion was taken by the paediatric oncologist taking into account availability of suitable vein and patient's preference. The primary diagnosis was acute lymphoblastic leukemia, acute myeloid leukemia, ewing sarcoma and rhabdomyosarcoma in 29, 9, 5 and 2 patients respectively.

The 48 PICCs were in situ for a total 5307 catheter days. Median catheter life span was 142 days per device (range 14 to 248 days). Catheter life span was calculated from date of insertion to date of removal. Seven PICCs (15%) were still in situ at time of last data collection (February 2019). Catheter was removed electively in 58% (n=28) and in 27% (n=13) it was removed prematurely due to some complications. Catheter maintenance success rate was 73%. This was defined by the percentage of patients who maintained their catheter for the duration of intended purpose such as completion of therapy, discharge or death. Common indications requiring premature PICC removal were systemic infections in 5, local infections in 2, catheter blockage in 4 and accidental dislodgement in 2 catheters (Table-1). Among the systemic infections 3 catheters had culture proven infection and in 2 it was culture negative clinically suspected infection. The isolated organisms from PICC culture were klebsiella pneumoniae in two and candida albicans in one catheter. Catheter blockage was seen in 21% (n=10) and was the most common complication. Catheter patency was regained in 6 lines with the use of urokinase (range 1-3 doses). Six (12%) catheters had breakage/external leakage, and all were repaired using the repair kit.

Table-1: Causes of PICC removal

Causes of PICC removal (n=48)			
	No of PICC	Percentage	Rate per 1000 catheter days
Elective removal	28	58.3	5.28
Patient expired	4	8.3	0.75
Completed therapy	23	48	4.33
Any other	1	2	0.19

PICC related complication	13	27.1	2.45
Systemic infection	5	10.4	0.94
Local infection	2	4.2	0.38
Catheter blockage	4	8.3	0.75
Accidental removal	2	4.2	0.38
In situ at study completion	7	14.6	--

DISCUSSION

Central venous access can be achieved in 3 different ways - conventional central venous catheter, implantable port or PICC. Though implantable ports have a prolonged life, the device cost is high and maintenance is costly. Their insertion requires skilled surgical expertise, general anaesthesia and operation theatre time. Conventional central venous catheters have a relatively short life; again it requires skilled expertise and general anaesthesia. Their maintenance is cumbersome and is associated with significant morbidity [6]. PICC is relatively easier to insert and remove. Insertion can be done on bedside under local anaesthesia. Maintenance is less cumbersome than implantable ports or conventional central venous catheter [7]. Cephalic, basilic and antecubital veins are used most frequently. In developed countries PICC use is the standard of care; but there are only a few studies from developing country.

We did PICC insertion by specially trained nurses under supervision of a paediatric medical oncologist. Our success rate of insertion was high (96%) even without the use of image guidance. Various studies have reported success rate over 90% in children. [3,8]. We did not encounter any major insertion related complications like hemothorax, pneumothorax, atrial perforation or arrhythmia. Though image and fluoroscopy guidance is recommended for PICC insertions we found that it can be safely inserted with direct observation by well trained personnel.

PICCs have been successfully placed for median periods from 13 to 161 days (range up to 512 days) in children with cancer [9,10]. In our study, the 48 PICCs were placed in situ for a median of 142 days ranging from 14 to 248 days. The incidence of PICC-related complications has been reported to be 2.2 to 16.0/1000 catheter days [10-12]. In our study, 25 out of 48 had PICC related complication (4.7/1000 catheter days), among which 13 required removal of PICC (2.45/1000 catheter days). Our most common reason for PICC removal was infection. Considering our patients group of highly immune suppressed children on intensive chemotherapy, majority being aggressive hematolymphoid malignancies, the rate of infection seems acceptable. Periodic family counselling, well trained nursing staffs, a very close supervision, utmost hand hygiene, and sterile precaution during insertion, dressing and flushing are essential to reduce infection rate. Catheter with valves like Bard Groshong have a lower incidence of infection compared to catheter without valves, since it prevent the backflow of blood to the catheter lumen. Our study from a newly developed pediatric oncology unit in resource limited setting showed acceptable and comparable complication profile as reported in previous literatures.

CONCLUSION

In resource limited settings the use of PICC is safe and feasible. This can be considered as a suitable option for prolonged venous access, repeated blood sampling and chemotherapy administration in children with malignancies.

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