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The PICC-related complication in Hemato-Oncological patients for the administration of chemotherapeutic drugs

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ABSTRACT

Majority of malignant diseases require therapy with chemotherapeutic agents for medium to long term time duration. Duration, feasibility and ease of placement, comfort and rate of complications in patients are of utmost importance in choosing the type of catheter placement. In light with this peripherally inserted central venous catheter (PICC) have added advantage over to conventional central venous catheters. The aim of this study was to evaluate the rate of infection related to PICC, the duration and outcome of PICC in oncological patients. A longitudinal study was conducted to look at the PICC (Peripherally Inserted Central Catheter)-related complication rates which occurred in inpatient and outpatient settings on patients who had a PICC line inserted for the administration of chemotherapeutic drugs, between 2015 to 2019, a period of five years. A total of 865 patients with PICC line were analysed. Pertinent patient demographics as well as catheter-related factors were collected. The data was analysed by using excel and association between duration and complication is compared using chi-square test. $p < 0.05$ is considered as significant to identify catheter related complications and the outcome of PICC line in relation to the removal of the line. The Retrospective data analysed so waiver of consent is taken on the day of PICC line insertion and the institutional ethical clearance have been taken for this study. As the data is taken retrospectively from the patient records with anonymity being maintained, no actual consent is required in this study. Approval from the hospital ethical committee got. Also during PICC insertion an informed consent is taken from all subjects. The PICCs placed for 865 patients, each between the duration of 3 months to 6 months were analysed. The most suitable vein for the insertion was the basilic vein (85%). Our study suggests, PICC are an excellent option for various diagnostic and therapeutic interventions and offer clinicians and nurses a safe and effective option for central access. The data of this study shows PICC to be more cost-effective in terms of longer duration of use and have lower complication rates than the conventional CICC and hence has to be promoted more in patients for chemotherapy drug administration.

Keywords: Peripherally Inserted Central Venous Catheter, Malignancy, Catheter-Related Complication, Duration.

1. CONTRIBUTION OF THE PAPER

What is already known?

- Peripherally Inserted Central Catheters (PICC) provide medium term venous access upto few weeks.
- PICC are easily accessible due to their peripheral exit site.
- PICC lines are capable of delivering the same caustic medications and fluids at similar flow rates as that of other central catheters.

What this paper adds?

- This review demonstrates that the duration of use of PICC is relatively longer for more than 3 months.
- This review establishes the fact that the infection rate and treatment complication is much lower in PICC use for chemotherapy administration.
- The assessment proves that use of PICC is more cost effective in-terms of longer duration of usage and lesser complication and infection rates.

2. INTRODUCTION

Peripherally inserted central catheters (PICCs) are a subset of central venous catheters¹. They are 50 cm to 60 cm long single, double or triple lumen catheters that are placed in a peripheral arm vein and terminate in the thorax². PICCs have several advantages over other central catheters^{1,3}. They provide medium-term venous access for several weeks up to 6 months, whereas non-tunneled CICC (Conventionally Inserted Central Catheter) typically can be used for several days^{1,2,3,4}. PICC are easily accessible due to their peripheral exit site and are capable of delivering the same caustic medications and fluids at similar flow rates compared to other central catheters^{2,3,5}. PICC can be easily placed and removed at the bedside by nursing staff whereas other central catheters, such as tunneled catheters and central ports, must be placed surgically^{2,3,6,7,8}. Also PICC can be used in thrombocytopenic patients (platelet count less than 50,000/mm), whereas central ports have increased risk of hematoma with recurrent needle punctures required for access. Here we assessed our clinical data associated with the duration of PICC use, the vessel used for the placement of the catheter, type of malignancy and complications including infection, and other notable findings^{1,2,3,7,8,9, 10,11}.

3. PATIENTS AND METHODS

A retrospective study was conducted to look at the PICC-related complication rates on all the patients with in both in-patient and out-patient settings with a PICC line inserted for the administration of chemotherapeutic drugs. The data from 2015 to 2019 for a period of 5 years was collected. A total of 865 patients with PICC line were analysed. Pertinent patient demographics as well as catheter-related factors were collected. The data were analysed to identify catheter related complications and the outcome of PICC line in relation to the development of complication and removal of the line and the duration of the PICC line insitu.

The medical records of 865 patients with oncological conditions including hematologic cancers and solid tumors on whom PICC was installed at Healthcare Global Hospital from 2015 to 2019 were retrospectively reviewed. Patient records/date were randomized and deidentified before analysis. Since the data were analysed anonymously, patient consent was not necessary. Consent of the ethics committee and authorization from the hospital was obtained to perform the study (Ethics Committee reference No: REG.No.: ECR/386/INST/KA/2013/RR-19).

4. STATISTICAL ANALYSIS

Descriptive statistics were used to analyse the study data pertaining to PICC line usage for administration of chemotherapy in oncology patients in terms of the age of patient, gender, type of oncological disease condition, vessel used for PICC installation, duration and reason for removal prior to treatment completion.

5. RESULTS

Table 1: Age distribution of patients and peripherally inserted central catheters

Age range	n= 865 (%)
< 20 years	27 (3.1)
20 – 40 years	225 (26)
41 – 60 years	404 (46.7)
> 60 years	209 (24.2)

Inference: The above table-1 depicts the demographic data of the patient in which majority of them were between 41 to 60 years (46.7 %) and 225 (26 %) belongs to the age group of 20 to 40 years.

Table 2: Gender distribution of patients with peripherally inserted central catheters

Gender	n= 865 (%)
Male	453 (52%)
Female	412 (48%)

Inference: Majority, 52% (453) were female and 48% (412) were male.

Table 3: Distribution of patients with peripherally inserted central catheters based on type of malignancy

Malignancy type	n= 865 (%)
Solid tumour	571 (66%)
Hematological malignancy	294 (34%)

Inference: Majority, 66% were with solid tumor and 34% were with hematologic malignancies.

Table 4: Distribution of patients with peripherally inserted central catheters based on type of insertion vein selected

Insertion vein	n= 865 (%)
Left Basilic	579 (67%)
Right Basilic	152 (18%)
Left Brachial	53 (8%)
Right Brachial	27 (3%)
Left Cephalic	46 (5%)

Inference: Left Basilic Vein was the choice of vessel for insertion in majority of patients (67%)

Table 5: Duration of PICC line usage

Duration	n= 865 (%)
Below 3 months	213 (25%)
Above 3 months	652 (75%)

Inference: Majority of patients (75%) had the PICC line in situ for more than 3 months duration

Table 6: Outcome Analysis/Infection rate of PICC line

Outcome	n= 865 (%)
Removal on treatment completion	801 (92.3%)
Removal related to complication	20 (2.6%)
Others (death & fall outs)	44 (5.1%)

Inference: Majority (92.5%) completed treatment with no apparent complications. In only 2.6% of the cases the catheter was removed due to complication.

6. DISCUSSION

Overall during the study period, the data regarding 865 PICC installations were analysed. Among these 865 patients, 404 patients (46.7%) were between 41 – 60 years (Table-1), 453 patients (52%) were males (Table-2), 571 patients (66%) had solid tumours (Table-3), 579 patients (67%) the left basilica vein was used for PICC insertion (Table- 4). In only 20 patients (2.6%), the PICC was removed owing to complication (Table-5). Whereas, in majority of the patients 800, (92.3%) PICC was removed only after the completion of treatment (Table- 6). The procedure was performed at the patients' bedside. The basilica vein was the first choice for installation. The position of the catheter tip was determined radiographically to confirm whether all PICCs were placed correctly. The exit site of the PICC line was cleaned once a week^{1,2,3,4,9,10}. When not in use the PICCs were connected with a portable disposable infusion pump^{1,2,3,11,12,13}.

Until recently, peripheral vein or CVC had been used at our institution for the treatment of cancers. However, it has been reported that catheter insertion into veins such as the subclavian or internal jugular vein carries the risk of arterial puncture, hematoma, and risk of hemothorax and pneumothorax. Conversely, these complications are reportedly decreasing through the use of PICC, and correspondingly the efficacy of PICC is higher compared to that of the conventional catheters^{1,2,3,14,15}. According to Thiagarajan et al, catheter-related infection is significantly lower with PICC compared with CVC, as only 2% of 390 pediatric and young adult patients (median age: 5.4 y, range: 0 to 21 y) who received PICCs developed catheter-related sepsis^{2,3,16,17}. Similarly, study reported by Beatrice et al, in 192 patients studied in both IP & OP settings over a 7month period for a total of 5218 PICC days, reports that PICCs appear safe to use with acceptably low rates of infectious or thrombotic complications^{1,3}. Catheter occlusions and accidental withdrawal were the most common complications, both potentially avoidable with appropriate preventive measures Peripherally Inserted Central Venous Catheters in Oncology Patients^{1,2}. In a retrospective longitudinal study conducted by Gaurav Dwivedi et al, at SMH cancer center, New Delhi, 201 onco-hematological patients were analysed and the average rate of infection was found to be only 3.15%³. The current study findings also strongly imply the use of PICC over CVCs owing to lower rates of infection 2.6% and a longer duration of PICC insitu, over 75% above 3 months of duration.

7. CONCLUSION

Our study suggests, PICC are an excellent option for various diagnostic and therapeutic interventions and offer clinicians and nurses a safe and effective option for central access. The data of this study shows PICC to be more cost-effective in terms of longer duration of use and have lower complication rates than the conventional CVCs and hence has to be promoted more in patients for chemotherapy drug administration.

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