



CLINICAL PROFILE AND COMPLICATIONS OF PERIPHERALLY INSERTED CENTRAL CATHETER (PICC) LINE AMONG NEONATES.

Neonatology

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ABSTRACT

Introduction: Peripherally Inserted Central Catheters (PICC) are commonly used in neonatal practice in the West. In India, use of PICC line is restricted to neonatal intensive care units (NICU) in some of the premiere institutes only. The present study throws light on clinical profile and complications of PICC line in NICU and gives emphasis on its use in effectively managing the tiny neonates, especially very low birth weight (VLBW) extremely low birth weight (ELBW) neonates. **Objectives Of The Study:** 1. To describe the Indications of PICC line in neonates -IV fluids therapy, Parental Nutrition, Hypoglycaemia, antibiotics therapy. 2. To study the various aspects of procedure and complications of PICC lines. **Methodology:** The present study was carried out amongst 70 newborns in all sick neonates, preterms, terms, low birth weight babies, very low birth weight babies who required PICC line during the study period in the Department of pediatrics, ESIC-PGIMSR, Bangalore were included in the study. Clinical profile and complications of PICC line was noted. **Results:** 70 neonates were included in the study. Neonates with birth weight between 1- 2.5kg were majority (82.9%). Mean length of the neonates was 46.3cm. Preterms were 62 (88.6%). Males were 43(61.4%) and male: female ratio was 1.7:1. LSCS delivery was 52(74.3%). Inborn were 67 (95.7%). It was noted that indication for insertion of PICC line majority(94.3%) is for prolonged IV fluids administration. First attempt were 45.7%. Time taken for the procedure was 0- 30min (60%). Change of dressing was only once in 60%. Site of insertion was lower limb vein in 77.1%. Duration of indwelling period were 8-13 days (77.1%). Occlusion of PICC line occurred in 6 neonates(8.5%); sepsis was proven in 3 neonates (4.2%), migration in 2 neonates (2.8%) and there was bleeding at insertion site in 1 neonates (1.4%) only. **Conclusion:** PICC lines are easy to insert and safe in neonates including extreme preterms. Lower limb veins are the best vein for insertion of PICC line in neonates.

KEYWORDS

PICC line, neonates, complications

BACKGROUND

The survival of an increasing number of very-low birth weight and critically ill neonates heightens the need for parenteral nutrition to support growth, as well as intravenous fluids and medications. As a result, caregivers are continually being challenged to improve the methods by which they provide safe and consistent vascular access to this vulnerable population.

Although many infants will benefit from central venous access achieved using a PICC, the CDC 2002 recommends that patients who require more than 6 days of therapy should be considered for more than a PIV (Peripheral IntraVenous). The placement of pre-emptive PICCs has been shown to be safe and effective in infants with anticipated postoperative hospital stays of 4–7 days [1].

PICCs offer neonates numerous advantages over other vascular access devices and provide a safe, effective alternative for providing required therapies. When a PICC is used appropriately, the risk of complications is low.

Placement of the PICC with the tip residing in the superior or inferior vena cava provides increased blood flow with resultant increased hemodilution of infusates. This allows the safe delivery of more concentrated parenteral nutrition, increased dextrose-containing solution with higher caloric density, and medications (e.g., vancomycin, phenobarbital) known to damage the peripheral veins with repeated use. [2]

Trauma to the vein, as well as potential decrease in dwell time leading to the development of chemical phlebitis, is related to the composition of the infusate (i.e., osmolality, pH, chemical properties) [21].

Complications are malposition of catheter, bleeding, catheter related blood stream infection, catheter migration, catheter dislodgement, dysarrhythmias, myocardial perforation, thrombosis. Catheter care and maintenance: All nurses who care for infants with PICCs must be knowledgeable about effective management to prolong the catheter's dwell time and prevent complications and injury to the infant.

METHODS

It is an Observational Prospective Cross Sectional Study done between January 2020 to June 2021 for 18 months in the department of paediatrics. Neonates admitted to NICU requiring PICC line, those who are willing to participate were considered. Consent from the

parents and ethical clearance from institute was taken. Based on the previous literature the proportion of babies requiring PICC lines were found to be 3% of total babies delivered. Calculated sample size with 80% power, alpha of 0.05, design effect of 1, and relative precision of 4% will be seventy⁸³.

All neonates in whom PICC line was inserted were included in the study.

PROCEDURE

In our study birth weight, length, gestational age, gender, mode of delivery, place of birth were considered. Single lumen catheter was used which were made up of polyurethane and size 1Fr for babies with birth weight <1500gms, 2 Fr for babies >1500gms. Under aseptic precautions PICC Line was inserted. If the neonate cries during the procedure, sterile gauze soaked in 5% dextrose solution was put in baby's mouth to calm down the baby. PICC lines were mostly inserted through long saphenous vein in lower extremity and basilic / medial cubital vein in upper extremity. The time taken for the procedure, the number of attempts at insertion and the duration of indwelling period from the onset of insertion of PICC line was studied.

Post-insertion Care: After insertion of PICC line up to a desired length, haemostasis was secured at the entry point. The area is cleaned and dried. The number of dressing changes required during indwelling period was also studied. A canula or a three-way adaptor was connected to the PICC line. Care should be taken to secure these devices. Heparinised normal saline (1 unit/ml) is started at the rate of 1 ml/hr infusion till chest x-ray confirmation of PICC Line tip position at appropriate place is done. As PICC Lines could not be aspirated, checking for blood return is not a means of assessing PICC Line position before use. Confirmation of PICC line position could only be undertaken by performing an x-ray. After that, administration of IV fluids, parental nutrition, hypertonic solutions, antibiotics were started. Regular PICC line inspection should be done and whenever any blood, fluid soakage or lifting of dressings were seen, dressing should be changed immediately. Policy to change the dressing in our centre was soakage of dressing. PICC line tip will be sent for culture-sensitivity routinely after removal. PICC line complications like occlusion, migration, sepsis, bleeding were studied. Statistical analysis: Data will be analyzed using appropriate descriptive and inferential statistics. The categorical type data will be expressed in terms of frequencies and percentages whereas the numeric continuous data as mean±SD. Risks will be calculated in terms of odd ratio. Since, odds ratio is positively skewed so log of odds ratio will be used to

construct the 95% CI which will be subsequently converted into original scale by taking exponential transformation. All complications and severity of the conditions will also be expressed as frequencies, percentages.

RESULTS

Out of 580 NICU admissions during study period 70 neonates required PICC line insertion.

- Majority of the neonates were with birth weight between 1- 2.5kg (82.9%)
- Mean length of the neonates was 46.3cm.
- Majority of the neonates were preterm babies (88.6%).
- Majority of neonates were males (61.4%) and the male: female ratio was 1.7:1
- Majority of the neonate were born through LSCS (74.3%). (Table 6 & figure 14)
- Majority of the children were inborn (95.7%)
- In majority of the neonates the indication was for prolonged IV fluids (94.3%)

Table 8:- Distribution of study group based on indication for insertion:-

Indication	Number	Percentage
IV fluids therapy	66	94.3
Parenteral nutrition	29	41.4
Antibiotics therapy	29	41.4
Hypoglycemia	4	5.7

*Multiple responses

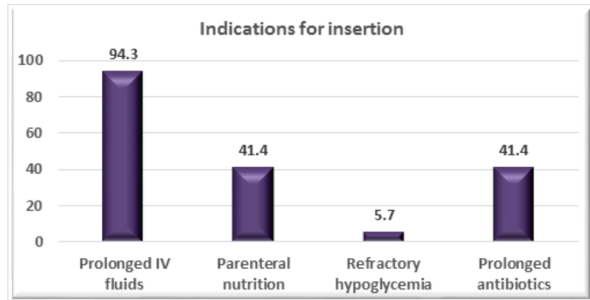


Figure 16:- Distribution of study group based on indication for insertion.

In majority of the neonates the PICC line was secured in the first attempt. (n=32, 45.7%)

Table 9:- Distribution Of Study Group Based On Number Of Attempts:-

Number of attempts	Number	Percentage
One	32	45.7
Two	26	37.1
Three	12	17.2

The time taken for the procedure in majority of the neonates was 0-30min (60%)

Time taken for the procedure	Number	percentage
0- 30min	42	60
30 - 60min	20	28.5
60-90min	08	11.5

Majority of the neonates required a change of dressing only once. (60%)

In majority of the neonates the site of insertion was lower limb vein (77.1%)

In majority of the neonates the duration of indwelling period was between 8 to 13days (77.1%).

Table 13: Distribution Of Study Group Based On Duration Of Indwelling Period

Duration of indwelling period	Number	Percentage
≤7days	14	20
8 – 13days	54	77.1
≥14days	02	2.9

Occlusion of PICC line occurred in 6 (8.5%) neonates; sepsis was proven in 3 (4.2%) neonates, migration in 2(2.8%) neonates and there was bleeding at insertion site in 1 (1.4%) neonate only.

Table-14 Distribution Of Study Group Based On Complication

Complication	Number	Percentage
Occlusion	06	8.5
Sepsis	03	4.2
Migration	02	2.8
Bleeding	01	1.4

*Multiple responses

In 4% of the neonates, the tip culture sensitivity showed coagulase negative staphylococcus aureus (CoNS)

DISCUSSION

In our study, 82.8 % neonates had birth weight less than 2500g. Similar results were observed in study conducted by Uygun I et al⁹⁴ and Hoang V et al⁹⁵.

In this study, we found a male preponderance with male:female ratio of 1.7:1. Similarly, male preponderance was seen in studies conducted by Sahoo et al⁸³.

In the present study majority enrolled were 88.6% of premature neonates. Similarly, in a study conducted by sahuo et al⁸³, premature neonates constituted 89.7%.

In present study, the common indication of insertion of PICC line was prolonged IV fluids (94.3%). Similar to a study done by Uygun I et al⁹⁴, in which the most common indication of insertion for PICC line was for securing IV access (53%).

In the present study PICC line was established with first attempt itself in 45.7% study cases, similar to study done by Raghavan et al² and Sahoo et al⁸³.

In the present study the indwelling period were 8- 13 days (77.1%) similar to Arnab et al⁹⁶ study.

In present study, there was greater ease and higher success of insertion, showing a success rate of 45.7% in first attempt. Similar results were seen in the study conducted by Neubauer³² (63.6%) and Ragavan et al².

The major complications encountered during study were occlusion (8.5%), sepsis (4.2%), migration (2.8%) and bleeding (1.4%) and similar results were seen in the study conducted by sahuo et al⁸³.

In present study the catheter occlusion rates reported for PICC lines was 8.5% more than sepsis rates which was 4.2%, which is similar to a study conducted by Ravi et al³ and Prian et al⁹³ in which the occlusion rates ranged from 1.5% to 15%.

In present study, it is found that PICC line migration occurred in 2.8% cases. In studies conducted by Beattie et al⁸⁸, Fioravanti et al⁸⁹, Aiken et al⁹⁰ reported PICC line migration had caused pericardial effusion and tamponade which we did not see in our study.

Even death has been reported in neonates due to cardiac tamponade related to PICC line.^{91,92}

In the present study, catheter related sepsis was seen in 4.2% of the neonates which is similar to study done by Ravi et al³, had reported the lower incidence of catheter related sepsis associated with PICC line (2%) as compared to other central venous devices (3 – 20%) or peripheral venous catheters (4.6 – 9%).

In present study sepsis was attributed to PICC line by isolation of organism from PICC line tip culture and sensitivity in 4% of cases.

In present study intravenous catheter-related infections were 0. Similar to study done by Hampton⁸⁵ reported that the rate of catheter related septicemia leading to systemic sepsis is low, occurring in less than 1% of neonates

CONCLUSION

PICC lines are easy to put and safe in neonates including extreme preterms. Lower limb veins are the best vein for insertion of PICC line

in neonates especially in preterm babies. Better understanding of procedure, post insertion care of PICC lines and detection of complications at the earliest opportunity prevents major complications. PICC line should be recommended for routine use in NICU, catering large number of preterm, low birth weight neonates.

Limitation:-

1. Small sample size.
2. Comparison between upper limb and lower limb was not done since we chose long saphenous vein in most of the neonates.
3. Single centre study.