Original Research Article

Central lines in a tertiary NICU its Indication & outcome– A descriptive study

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Abstract

Introduction: Vascular access especially in critically ill and preterm neonates is a major life saving procedure. There is a need for a sustained access for medications and providing the essential nutrition in sick babies. Various techniques and sites are used for IV lines in the intensive care. There are also some known and associated complications with central lines. Objectives: To describe the indications for insertion, indication for removal, type of central line and outcome of central lines placed in neonates. **Methodology:** This is an audit of central lines inserted in a tertiary care neonatal ICU between January 2016 to December 2016. **Results:** A total of 284 central lines either as umbilical, central or PICC lines were inserted. 63% of the lines were inserted through the umbilical vein and 21% through the femoral route mostly in surgical neonates. The most common central line inserted was the umbilical catheter (66%). The medical team inserted 73% of the lines while the remaining 27% was by the surgical team. Central lines in our unit were associated with minimal complications with only 3 babies posing with prolonged bleeding from insertion site. The most common indication for insertion was for infusion of multiple medications (62.7%) and inotropes (9.9)%. Majority of the lines were removed when the indication for use ceased (66.2%). **Conclusion:** Umbilical line is the most common central line inserted in neonates followed by surgical long lines. Indications for use can be varied and complications are minimal if proper technique and care is followed.

Key words: Umbilical venous catheters, Vascular access, Neonates

Introduction

Achieving venous access to manage the critically ill neonate is very crucial and cannot be over emphasized. Having a peripheral venous access is generally quick and serves immediate requirement in seriously ill neonates. Though many of them can be managed on peripheral IV access alone, some of them need the placement of a central line to administer toxic, high osmolar drugs and inotropes [1].

Apart from this, a seriously ill neonate needs multiple medications needing frequent titration. In such a situation, peripheral IV lines may not be reliable and hence there is need for a central line. A common experience in most of the neonatal units is the inability to obtain peripheral IV line even in a stable baby despite multiple attempts by experienced health care provider. Even this situation leads to considering the insertion of a central line albeit for a brief period. Reliable venous access through indwelling central venous lines allows minimal handling of sick infants decreases the chance of fluid extravasation and supports use of total parenteral nutrition for a prolonged period.

Central venous lines are sometimes necessary during resuscitation and frequently in post resuscitation management of preterm neonates. This is achieved by inserting umbilical venous catheter which later get replaced with a percutaneous central venous catheter (PICC line) or surgically placed central line [2]. Common site of PICC line placement is in cephalic or basilic vein and that for surgical central line is femoral or saphenous vein.

Literature search yielded several studies regarding the indications and complications of central lines in

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neonates. There are very few exclusive neonatal studies from India and are focused on surgically placed central lines. We have prospectively studied all the aspects related to placement of central venous catheter in neonates over a period of one year and presented the descriptive data. This helps to have baseline information on usage of central lines in neonatal unit and serves to compare ourselves and other tertiary neonatal units which have similar data.

Objective

To study the indications for insertion, indication for removal, type of central line and outcome of central lines placed in neonates.

Material and Methods

This is a prospective descriptive study conducted in a tertiary neonatal unit between January 2016 and Dec 2016.

Subjects: All neonates who had a central line placed at any time during their stay in our unit were included in our study. Babies who were transferred to our unit with a central line already placed in another unit were excluded.

Intervention: Umbilical venous catheter (UVC) and PICC lines were placed by the medical team. UVCs were placed by the postgraduates in Pediatrics and PICC lines by the consultant neonatologists. Surgical central lines were placed by pediatric surgeons either when medical team was unable to obtain the central venous access or primarily if the baby was taken up for surgery.

All the procedures were as per the standard operating procedure published in our unit protocol book. Removal of the catheters was decided by the consultants depending on the requirement and clinical condition.

We used Umbilical venous catheter (Vygon, France) of size 3.5Fr or 5Fr depending on the size of the baby. PICC line used was Epicutaneocath (Vygon, France) 24G and the central line used for surgical placement was Leader Flex (Vygon, France) 22G and 8 cms in length.

Data collection: Basic demographic data were noted from the admission record. Indications for insertion, for removal and complications if any were prospectively collected in a predesigned case report form.

Results

We had a total of 284 central line inserted during the study period. One hundred and fifty-six (55%) were males and rest were females. Baseline characteristics are depicted in table 1. The commonest type of Central line placed was UVC. Figure 1 depicts the different type of Central venous access devices placed in our unit during the study period.

Two hundred and seven (73%) were placed by medical team and rest by the surgical team.

One hundred and seventy-nine (63%) catheters were placed through umbilical route. This was followed by Femoral route in 60 (21%). Saphenous vein was catheterized in 22 (7.8%), Cephalic vein in 20 (7%), Basilic vein in two (0.7%) and one baby had catheterization of internal jugular vein.

Complications during insertion were minimal. Two hundred and seventy-nine (98.2%) babies did not have any complications during insertion. 3 babies had prolonged bleeding needing pressure dressing, one had false passage into some unknown vein and one attempt was unsuccessful. Commonest indication for insertion was multiple medications and commonest indication for removal was cessation of indication. The details of all indications are depicted in table 2.

Table-1: Baseline characteristics.

Parameter	Median	IQR	Range
Birth weight in grams	2400	1495 - 2900	500 - 5200
Gestation in weeks	37	32 - 38	25 - 40
Age at insertion in hours	24	3 - 144	0.5 - 696
Duration of Central line in hours	96	48 - 144	6 - 504

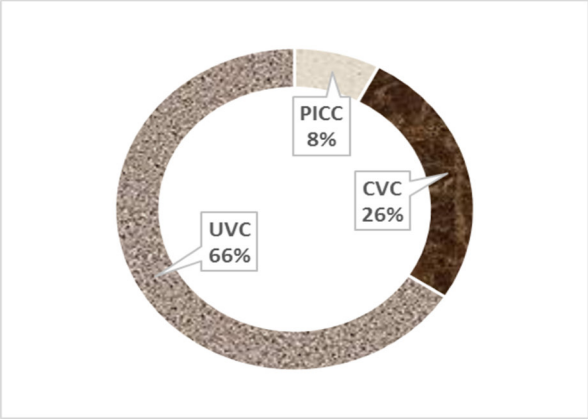

Figure-1: Proportion of different types of Central lines placed

Table-2: Indication for insertion and removal of central venous catheters.

Indication for insertion			Indication for removal of CVAD		
	n		n		n
Multiple	178	Multiple	178	Multiple	178
Inotropes	28	Inotropes	28	Inotropes	28
Ex Transfusion	22	Ex Transfusion	22	Ex Transfusion	22
PIV issues	20	PIV issues	20	PIV issues	20
TPN (parental nutrition)	18	TPN (parental nutrition)	18	TPN (parental nutrition)	18
Hypoglycaemia	15	Hypoglycaemia	15	Hypoglycaemia	15
Antibiotics	3	Antibiotics	3	Antibiotics	3
All indications	284	All indications	284	All indications	284

Among babies who had central venous catheter placed, 41 (14%) died and 33 (12%) got discharged against medical advice. Among all the babies who had UVC, 12% died, who had CVC, 17% died and those who had PICC line 23% died. Conversely, of all the babies in the study who died, 23 (56%) had UVC, 13 (32%) had CVC and 5 (12%) had PICC line.

Discussion

Vascular access is pivotal especially in critically ill and preterm neonates. The need for central venous lines arises from inadequate peripheral venous access for necessary therapeutic interventions and parenteral nutrition. We present an analysis of central lines that were inserted during a period of one year in our unit which cares to pre-terms, terms and a variety of surgical new borns

Mactier et al published data on 42 central lines inserted mainly in preterm neonates with birth weights ranging between 700-1420 grams and gestational age between 25-32 weeks [3]. Cartwright presented an extensive study in which the babies weighed between 340-5320 grams and aged 22-42 weeks [4]. Jadhav et al in their study of 75 percutaneous central lines noted that the babies weighed between 750-3500 grams. There was a predominance of male babies in their study [5]. The babies included in our study varied between gestational ages of 25-40 weeks and weighed between 500-5200 grams. It is interesting to note how neonatal care has evolved over last four decades and care is now being extended to babies of much smaller weight and gestation.

The increasing survival rate of extremely premature low birth weight babies who have a requirement of prolonged IV access has pressed the widespread usage of central lines in neonatal units all over the world. During the first two weeks of life, umbilical vessels provide a rapid venous access and can also be of great help in critically ill neonates for urgent administration of drugs, fluids, exchange transfusions and central venous pressure monitoring [6]. Moreover, umbilical line catherization is relatively easy and has fewer complications [7]. In parallel to this, the commonest

route of central line placement in our unit was the umbilical vein (63%) as majority of them were inserted immediately after birth as either part of resuscitation or for preterm care. However, a few of these were later replaced by PICC lines or central lines by venous cut down. Among the lines inserted in surgical cases, the femoral route was preferred (21%). The least commonly used site was the internal jugular vein that was catheterized in only one case.

In the data published from St. Johns Hospital, Bangalore, the frequently used sites were femoral (41) followed by internal jugular (27) and subclavian veins (21). Femoral route was preferred in this study as it was easily accessible and safer to introduce an IV catheter [8]. This was in contrast with data published by Jadhav et al who chose the internal jugular vein (60%) over the femoral vein (34.6%) and subclavian vein (5.3%) for percutaneous venous access [5].

The commonest central lines in our audit were umbilical lines (66%) followed by Central venous catheters (26%) and PICC lines (8%). Contrary to our data, Gomes and Nascimento from Portugal stated that among the 130 lines they analyzed, there was a predominance of PICC lines (54.2%) over umbilical lines (29.2%) in the NICU [9].

With respect to the team which inserted the central lines, 73% of the lines were inserted by the medical team and the remaining by the surgical team. All the umbilical catheters were inserted by the residents working in the NICU, PICC lines by the neonatal consultants and the central lines by the surgical consultants.

The only other available data about the team of insertion was from the Portugal study, where there was a prevalence of nurses (22.3%) obtaining vascular access. Central venous catheterization by direct vein punctures was performed by medical residents undergoing training. Only 13.2% of catheters were inserted by intensive care doctors, and 5.3% by surgeons and surgical residents [9].

Central line and PICC lines when inserted under strict aseptic technique in very sick and extremely premature neonates can provide sustainable IV access for various indications. In our study the most common cause for central lines was for infusion of multiple medications (62.7%). Jadhav et al mentioned reasons like failure of peripheral venous access (78%), parenteral nutrition (16%) and shock resuscitation (5%) [5]. Rao et al too quoted similar reasons among the indications[8]. In another study by Bhatt et al, the absence of a good peripheral venous access and requirement of an IV line for fluid resuscitation were the leading causes for inserting a central line in the NICU [10].

Though central line insertion in a neonate is associated with many complications, the risks outweigh the benefits of the procedure. 98.2% of the central lines did not have any major complications. Only three neonates required pressure dressing for prolonged bleeding from the IV site. We found that of 284 lines, 66.2% were removed when the indication for insertion ceased. 23.9% of the babies either died or were discharged against medical advice.

The incidences of catheter malfunction and line related sepsis were 4.9% and 3.5% respectively. Bhatt et al reported very low incidences of sepsis (15) and malposition (7) in their study [10]. In the South Thames audit mal position of umbilical lines (16.5%) and sepsis of percutaneous long lines (14%) were the complications noted [6].

In the Portugal study, central venous catheter removal was indicated, predominantly, by mechanical and infectious complications (47.7%). Death occurred in 15 cases but none were related to catheter related sepsis [9]. Similarly, Jadhav et al noted complications like displacement and malposition in their audit [5].

Conclusion

The commonest central line placed in neonates is the umbilical venous catheter. More than quarter of the central lines are surgically placed long lines. Complication rates associated with central lines are minimal.

Abbreviations

CVC = Central venous catheters; PICC = Peripherally inserted central catheters; UVC = Umbilical venous catheters; IV = Intravenous; NICU = Neonatal intensive care unit

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