

COMPLICATIONS OF PERIPHERALLY INSERTED CENTRAL CATHETER (PICC) IN NEONATES¹

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ABSTRACT

Peripherally Inserted Central Catheter (PICC) is an intravenous device whose distal end is located in the vena cava, becoming a central venous catheter; despite its benefits, can aggregate risk to the neonates. Aimed to characterize and analyze the PICC complications in neonates. An exploratory, descriptive, documentary and retrospective research with a quantitative approach; ethical principles met. The research place was the Service of Medical and Statistics Archive in a university hospital of Curitiba. The sample consisted of all PICC inserted from July to December 2009 in neonates hospitalized in the NICU; data collection occurred on records, between July and August 2010. There were totalized 45 PICC, inserted in 36 neonates. The complications that led to the device withdrawal were: traction (20,4%), extravasation (18,1%), edema and death (9% each), fracture, hyperemia, spontaneous and positive culture (6,8% each), and obstruction (2,2%). It is suggested the elaboration of a clinical guideline for professionals who manipulate the PICC.

Keywords: Neonatal Nursing. Newborn. Catheterization Central Venous. Complications. Technology.

INTRODUCTION

Intravenous therapy is a therapeutic approach which enables safe and effective treatment for hospitalized patients. Ensure the achievement and maintenance of intravenous in neonates and prevent infections and other complications are constant challenges for the nursing staff⁽¹⁾, since the physiological immaturity and capillary fragility of this clientele. Intravenous therapy is performed by obtaining the venous access, which is divided into central and peripheral as the location of the tip of the device.

The Peripherally Inserted Central Catheter (PICC) is intravenous device inserted into a peripheral vein with characteristics of central venous access, because of the location of the proximal portion of the cardiac intravenous silhouette⁽²⁾.

Among the benefits of PICC has been the small number of daily punctures, with consequent minimization of pain in neonates, stability venous access, ease of insertion when compared to central catheters, long-term, lower risk of occurrence of chemical phlebitis, extravasation infiltration of liquids, among others^(1,3).

However, complications can be observed, which are classified according to the size of their effects, characterized as local (near the insertion site, are rarely serious and can be recognized early by objective evaluation) can be observed and systemic (reaches the whole body system and offers tangible risk of death to the patient). Those are local complications - bruising, thrombosis, phlebitis (mechanical, chemical, bacterial and post-infusional), thrombophlebitis, infiltration, extravasation, local infection, venous spasm, obstruction and fracture; and systemic -

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septicemia, circulatory overload, pulmonary edema, air embolism, shock, and rapid infusion catheter embolism^(3,4).

Although the risk factors related to use of PICC has become subject to national and international research should also consider the analysis of complications bring the scientific evidence supporting the care provided scientific clinical nursing practice.

This article refers to the stage of a dissertation thesis and culminated in the completion of undergraduate degree in nursing, which aimed to characterize and analyze the PICC complications in neonates.

METHODOLOGY

This is an exploratory, descriptive and documentary retrospective research with quantitative approach. It was held at the Department of Medical Records and Statistics (SAME) of a university hospital in Curitiba, with records of patients who were admitted to the Neonatal Intensive Care Unit (NICU).

The data collection occurred from July to August 2010. The object of the research was the PICC inserted in neonates. Inclusion criteria were: medical records of hospitalized neonates in the NICU that used the PICC during hospitalization; PICC insertion in the period July-December 2009; records were available during the collection period.

It was developed an instrument to collect data to identify socio-demographic, clinical and outcome variables (reasons for catheter removal as obstruction, disruption of the catheter leakage, drift, local edema, medical request, elective, hyperemia, spontaneous death variables, discharge / transfer and positive culture). For data analysis we used basic descriptive statistics by calculating the minimum, maximum, mean value, absolute, relative standard deviation and frequency and used the SPSS software version 15 Evaluation. It was also calculated the rate of infection per thousand catheter⁽⁵⁾ days as the following formula:

Rate of infection per 1,000 catheter days = $\frac{\text{total number of infection cases}}{\text{number of days of catheter}} \times 1000$ days

The study was approved by the Ethics Committee in Research of the Department of Health Sciences, Federal University of Paraná in the registry CEP/SD 935.060.10.06. Ethical standards established by Resolution n. 196 of 1996 of the National Health Council have been met.

RESULTS AND DISCUSSION

Totaled 45 PICC inserted in 36 neonates with 24 PICCs (53,3%) neonates were inserted into male and 21 (46,6%) in female newborns. As for the type of birth, it was observed that 10 (27%) neonates were born vaginally and 26 (73%) cesarean (Table 1).

Table 1 - Sociodemographic variables (n = 36). Curitiba, PR 2009.

Socio-demographic variables	n	Average	Median	Standard deviation	Minimum value	Maximum value
Parkin	36	29,62	29	4,41	23	40
Birth weight (grams)	36	1328,22	1000	845,99	540	3640
Apgar (0 minute)	36	4,56	5	2,72	0	8
Apgar (5 minutes)	36	7,78	8	1,62	1	10
Weight at insertion	36	1299,96	1045	838,70	450	3560

SOURCE: The author (2011).

The Parkin variable estimates a score of gestational age based on physical characteristics of the neonate. The weight was considered extremely low birth weight both at birth (540 grams) as the day of insertion of PICC (450 grams). When considering the clinical characteristics of the sample, there was observed an extremely low birth weight in neonates, who

needed care that would ensure growth and development because it is the leading cause of hospitalization in the neonatal ICU, and which are responsible for high rates of morbidity and mortality^(6,7,8).

The mean duration of catheter use in this study was 14,82 days and standard deviation of 15,06, with a minimum of zero and maximum of

78. In a study with infants and children⁽⁶⁾ the average time was 14,5 days, confirming the data from this study (14,82 days). However, both are incompatible with recommendations in the literature, which indicates a minimum stay of six days with eight weeks on average⁽⁹⁾.

The pre-existing infection, according hematologic score⁽¹⁰⁾, assigns points changes in leukocyte and platelet count and when the total is greater than or equal to 3 sets up the presence of infection; in this study was revealed a 35,5 % (n = 16) of cases . It is noteworthy that 80% (n = 29) of the neonates had used just a PICC, and the remainder used two or three PICC. Regarding the insertion of two or more PICC catheter is the central gateway and colonization of microorganisms that spread quickly into the bloodstream, apparel that occurs mainly in ICU patients due to microbiota that are exposed⁽⁹⁾.

The PICC inserted were BD[®] brand, made with silicone and gauge 26 Gauge. All punctures were performed by nurses of the sector duly qualified. Observed preference for puncture in the upper limbs, which totaled 77,7% , of which 51,1 % were inserted in the right arm (MSD) as compared to the left, is the ideal site due to favorable anatomy for progression catheter^(3,4).

Most of the indication for use was due to prematurity (38 to 84,4%); intravenous therapy (31 to 68,8%) and antibiotics (ATB) (26 to 57,7%). There were more than one indication criteria for the use of PICC. Literature corroborate the research, pointing prematurity, administration of total parenteral nutrition (NPT), other classes of medications⁽⁶⁾, and ATB as predominant indicators for PICC insertion⁽¹¹⁾. It was found that 28 (80%) of the infants received analgesia prior to insertion, and the predominant use of morphine in 83,3% of cases.

There was predominant of the catheter tip location in the superior vena cava (33 to 74,2%). The vena cava is the ideal location of the catheter tip⁽⁹⁾, other studies do not describe site exact location only indicate a higher frequency of PICC inserted into the central vein^(7,12). These data reinforce the ability of nurses to puncture and advancement of the catheter to be important factors for proper location of the tip of the device.

Among the reasons for removing the PICC there were those described in Table 2. It was considered 'elective' the end of intravenous therapy and medical request for suspected infection.

Table 2 – Reasons for withdrawal of the PICC (n = 45). Curitiba, PR 2009.

Variables	Complications	Categories	Absolute frequency	Relative frequency
Reasons for removal		Elective	10	22,2%
		Medical request	6	13,3%
		Spontaneous	1	2,2%
	Places	Traction Extravasation	9	20%
	Places	Edema	8	17,7%
	Places	Fracture	1	2,2%
	Places	Hyperemia Obstruction	1	2,2%
	Places	Death	1	2,2%
	Places	Positive culture	1	2,2%
	Systemic		4	8,8%
	Systemic		3	6,6%

SOURCE: The authors (2011).

In 2010, the literature indicated that the major complications that resulted in catheter removal

were obstruction, infiltration, suspected contamination, drift, break, accidental removal,

phlebitis, cyanosis and migration⁽⁶⁾. In 2011, it was observed 17 (30,9%) obstruction of the lumen, nine (16,4%) rupture of the catheter and two (4,9%), phlebitis⁽¹³⁾.

A latest study shows the prevalence of 33 (39,3%) of non-elective removal of 86 catheters observed, 11 (13,1%) removed for obstruction, eight (9,5%) due to rupture of the catheter, six (7,1%) per limb edema, five (6%) for suspected infection, accidental removal, poor perfusion and extravasation one (each with 1,2%)⁽¹⁴⁾.

In this research, found the 45 catheters, 28 catheters (62,2%) developed complications that led to the removal of the device, and these local and systemic. Local complications accounted for 21 (46%) and this group stands out traction and overflow with the most frequent, although belonging to this category: edema, fracture, hyperemia, and obstruction, with less frequent. The systemic complications, death represented by the RN and positive culture corresponded to 15,5% (7) of the reasons for catheter removal.

When analyzing the complications as reasons for removing the data, it was observed that this study agrees with the above literature, considering that local complications occur by mechanical reasons. Nevertheless, it has been the elective cause as the main reason for withdrawal from the device found in this research and literature.

The PICC has lower incidence rates of complications when compared with central venous catheters⁽²⁾, as well as lower infection rate and low cost for insertion⁽⁵⁾. In order to minimize the complications that led to the removal of the device, it is considered that the maintenance of the catheter requires constant attention by professionals who handle⁽⁶⁾. In this research there were seven cases of confirmed

infection. The infection factor - blood or catheter tip culture - was positive in three cases. The isolated microorganisms were threefold: coagulase negative *Staphylococcus*, *Staphylococcus aureus* and *Enterococcus*.

The infection rate was 10,74 per thousand catheter days. Study with Brazilian neonates with similar populations showed a rate of 15,0 per thousand catheter days in 2010 and 2011 after the educational intervention decreased to 1,78⁽¹⁵⁾.

FINAL CONSIDERATIONS

The grounds for removal of PICC more applicants in the unit were searched local complications, especially for traction and overflow, which directly gives the nursing care, maintenance and manipulation of the catheter. It is emphasized the need for ongoing evaluation of the approach, the catheter and infused solutions in order to prevent such complications as well as training and constant updates of professionals involved in the care of the neonate. .

Seeking quality care for the newborn, whose aim is to minimize the early withdrawal of PICC and reduce complications identified in this research, it is suggested the development of a clinical guideline for health care professionals who insert, manipulate and withdraw intravenous device, emphasizing care to minimize complications and the importance of documentation of observed data; furthermore, a program of continuous education to encourage the adoption of evidence-based practices to reduce local complications, especially traction and extravasation.

COMPLICAÇÕES DO CATETER CENTRAL DE INSERÇÃO PERIFÉRICA (PICC) EM NEONATOS

RESUMO

Cateter Central de Inserção Periférica (PICC) é um dispositivo intravenoso cuja extremidade distal situa-se na veia cava, configurando-se cateter venoso central. Apesar de seus benefícios, pode agregar riscos aos neonatos. Objetivou-se caracterizar e analisar as complicações do PICC no neonato. Pesquisa exploratória, descritiva e documental retrospectiva com abordagem quantitativa; preceitos éticos atendidos. O local de pesquisa foi o Serviço de Arquivo Médico e Estatístico, em um hospital universitário de Curitiba. A amostra compôs-se de todos os PICC inseridos de julho a dezembro de 2009, em neonatos hospitalizados na UTIN; a coleta de dados ocorreu em prontuários, entre julho e agosto de 2010. Totalizou-se 45 PICC, inseridos em 36

neonatos. As complicações que culminaram à retirada do dispositivo foram: tração (20,4%), extravasamento (18,1%), edema e óbito (9% cada), fratura, hiperemia, espontânea e cultura positiva (6,8% cada) e obstrução (2,2%). Sugere-se a elaboração de diretriz clínica aos profissionais que manipulam o PICC.

Palavras-chave: Enfermagem Neonatal. Recém-nascido. Cateterismo Venoso Central. Complicações. Tecnologia.

COMPLICACIONES DEL CATÉTER CENTRAL DE INSERCIÓN PERIFÉRICA (PICC) EN NEONATOS

RESUMEN

Catéter Central de Inserción Periférica (PICC) es un dispositivo intravenoso cuyo extremo distal se encuentra en la vena cava, formando el catéter venoso central. A pesar de sus beneficios, puede agregar riesgos a los recién nacidos. El objetivo fue caracterizar y analizar las complicaciones del PICC en el neonato. Investigación exploratoria, descriptiva y documental retrospectiva con enfoque cuantitativo; en conformidad con los preceptos éticos atendidos. El local de investigación fue el Servicio de Archivo Médico y Estadístico, en un hospital universitario de Curitiba. La muestra estuvo compuesta por todos los PICC insertados desde julio hasta diciembre de 2009, en neonatos hospitalizados en la UTIN; los datos se obtuvieron de prontuarios, entre julio y agosto del 2010. Fueron 45 PICC, insertados en 36 neonatos. Las complicaciones que resultaron en la retirada del dispositivo fueron: tracción (20,4%), extravasación (18,1%), edema y óbito (9% cada), fractura, hiperemia, espontánea y cultura positiva (6,8% cada) y obstrucción (2,2%). Se sugiere la elaboración de directriz clínica para los profesionales que manipulan el PICC.

Palabras clave: Enfermería Neonatal. Recién Nacido. Cateterismo Venoso Central. Complicaciones. Tecnología.

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