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EDITORIAL

Obstruction of peripherally inserted central catheters in newborns: prevention is the best intervention



Obstrução de cateteres centrais de inserção periférica em neonatos: a prevenção é a melhor intervenção

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Received 18 May 2015

Peripherally inserted central catheters have become essential devices for continuous or intermittent administration of intravenous therapy, from intermediate to long-term, especially in the intensive care of newborns.¹ Known in clinical practice as PICCs, the acronym for peripherally inserted central catheters, they are used for infusion of fluids, drugs, parenteral nutrition and blood products, promoting improved quality of care as they are associated with reduction of pain and stress caused by the need for multiple peripheral venipuncture procedures, as well as with a presumed lower risk of complications associated with central venous catheters.^{1,2}

Since the first clinical reports of PICC use in the 1970s, technological improvement of raw materials, insertion techniques and performance in the infusion volume maintenance of small-diameter catheters allowed advances in the care of newborns, particularly in the administration of drugs and solutions with extreme pH and osmolarity, or solutions that are vesicant or irritant to tissues.^{2,3}

In spite of the benefits, the use of PICC in newborns is characterized as a complex procedure and requires the use

of guidelines and monitoring of results, aiming at implementing good practices and prevention of complications related to catheter insertion, maintenance and removal. It is noteworthy that, although PICCs are inserted into peripheral veins, daily care in the prevention of complications differs from that intended to newborns with a peripheral intravenous catheter, as the dimensions and location of the catheter tip resemble those of central venous insertion.^{3,4}

In neonates, the main complications related to the use of PICC are catheter-related bloodstream infections, as well as catheter obstruction, migration and displacement.^{1,3} Similar to what occurs with children, a meta-analysis of studies on adult patients demonstrated that, compared to central catheters, PICCs were associated with higher risk for malpositioning, thrombophlebitis and mechanical malfunctions.⁴

When studying 559 newborns who used 626 PICCs, the main causes of complications identified were presumed sepsis, obstruction, edema or infiltration, catheter breakage, accidental removal, phlebitis, pleural effusion and malpositioning.⁵ The incidence of complications in newborns varies markedly among studies, from zero to 34%, with obstruction being highlighted as one of the major mechanical complications.⁵⁻⁸

PICC obstruction may arise from thrombotic or non-thrombotic, partial or total occlusion of the catheter lumen, which limits or prevents the administration of solutions or aspiration of blood through the device.² It impairs patient

DOI of original article:

<http://dx.doi.org/10.1016/j.rpped.2015.05.003>

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safety by causing therapy delay or interruption. The use of larger caliber PICCs may be associated with increased risk of occlusion and venous thrombosis development, whereas the use of smaller-caliber ones can contribute to PICC obstruction or other mechanical malfunctions.¹ The non-thrombotic causes of catheter obstruction are varied and could result from the presence of mineral, lipid and drug precipitates, catheter folds, sutures that are too tight, and malpositioning of the catheter due to its placement against the vessel wall or being compressed by the collarbone or first rib.⁹ Studies indicate that most PICC obstructions are thrombotic and result from fibrin deposition inside or around the catheter tip, with possible evolution to severe secondary complications, such as infection and catheter-related thrombosis.^{2,9}

In an article published in this issue, Balaminit et al.¹⁰ studied the efficacy of two low molecular-weight heparin concentrations in the clearance of 76 PICCs removed from newborns after being used and stored for up to six months for inclusion in the study. The assessed PICCs were submitted to a technique to promote the occurrence of thrombotic obstruction and then randomized into two groups – one selected to receive a dose of 25U/mL of heparin, and the other, a dose of 50U/mL. The technique used for catheter clearance was the negative pressure method with a three-way cannula, and in each study group a professional was responsible for implementing the proposed technique in all catheters from that group. The findings indicated a higher rate of PICC clearance in the group of catheters in which the higher concentration of heparin was used.

The use of heparin, including the low-molecular weight type, has been described in the prevention of PICC thrombotic obstruction.^{11–13} The use of heparin as an anticoagulant is most often used in the intermittent maintenance of catheters and shows controversial results; however, as continuous infusion, in PICC occlusion prophylaxis in newborns, a study published in the Cochrane database concluded that there was a preventive effect, although without enough power to determine secondary adverse events, requiring clinical follow-up of the results.^{11–14} Therefore, despite controversies, the antithrombotic activity of heparin may be considered in clinical practice for obstruction prevention; however, thrombolytic action is not attributed to this drug, as proposed in the study by Balaminit et al. Their findings were probably influenced by the negative pressure technique and the differences between groups suffering the influence of the mode of implementation of the catheter mechanical clearance technique, presupposing that the professional from the higher heparin concentration group performed the clearance technique more effectively.

For PICC clearance, mechanical techniques with different variations have been described and routinely used in clinic practice, demonstrating some success rates, although they must be used with stringent criteria due to the risk of thrombus displacement inside the catheter and into the neonate's bloodstream.^{14–16} To date, regarding thrombolytic agents, more adequately called fibrinolytic agents, there are six known drugs, with alteplase being one of the most often studied for catheter obstruction reversal, despite adverse reactions that restrict its use.^{9,16,17}

Studies have shown that PICC obstruction is characterized as a preventable adverse event, through the institution

of judicious care and interventions, constantly updated based on the best evidence that support the practice when handling the catheter.^{1,3,8} In addition, care structure that promotes interdisciplinary interventions for individual management of newborns with PICC, based on the monitoring of results obtained in each clinical setting and on the institution of continuous improvement measures, are still the best procedures to promote catheter removal due to the end of the treatment and prevent complications that can compromise the quality of intravenous therapy.

Funding

This study did not receive funding.

Conflicts of interest

The author declares no conflicts of interest.

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