

Use of Peripherally Inserted Central Catheter to Perform Hematopoietic Stem Cell Transplantation

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Utilização de Cateter Central de Inserção Periférica para Realização de Transplante de Células-Tronco Hematopoiéticas Uso de Catéter Central de Inserción Periférica para Realizar Trasplante de Células Madre Hematopoyéticas

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ABSTRACT

Introduction: Safe venous access is essential for patients undergoing hematopoietic stem cell transplantation (HSCT) and the nurse participates in the entire decision-making process and maintenance. **Objective:** To systematize the experience of nurses in using the peripherally inserted central catheter (PICC) to perform HSCT in a bone marrow transplant center of a public institution that is a national oncology reference. **Method:** Descriptive study based in Jara Holliday's systematization. **Results:** The experience of using PICC to perform HSCT at the transplant center investigated began in 2017. During the implementation of the new routine, obstacles related to the team's resistance, patient acceptance, availability of adequate material and qualified professionals were detected. Regarding quality and safe intravenous therapeutic assistance for the patient, 130 PICC have been implanted in the last six years (2017-2022), accounting for 32% of the total number of catheters used to perform autologous, related allogeneic, unrelated allogeneic and haploidentical transplants in the last year. 80% of PICC was removed due to hospital discharge and 20% due to thrombosis (2%), obstruction (8%), death (5%) and fever (5%) confirming the success of this procedure in the center investigated. **Conclusion:** Despite the difficulties, the implementation and use of PICC for the infusion of hematopoietic stem cells has shown good results and contributed to obtaining safe vascular access in HSCT. **Key words:** nursing; catheterization; catheterization, central venous; catheterization, peripheral; hematopoietic stem cell transplantation.

RESUMO

Introdução: O acesso venoso seguro é indispensável aos pacientes no transplante de células-tronco hematopoiéticas (TCTH), e o enfermeiro participa de todo o seu processo de decisão e manutenção. **Objetivo:** Sistematizar a experiência de enfermeiros na utilização do cateter central de inserção periférica (CCIP) para a realização de TCTH em um centro de transplante de medula óssea de uma instituição pública, referência nacional em oncologia. **Método:** Estudo descritivo elaborado a partir da sistematização criada por Oscar Jara Holliday. **Resultados:** A experiência de utilização do CCIP, para a realização de TCTH, no centro de transplante estudado, teve início em 2017. Durante a implementação da nova rotina, surgiram obstáculos relacionados à resistência da equipe, aceitação dos pacientes, disponibilidade de material adequado e profissionais habilitados. Pensando na assistência terapêutica endovenosa de qualidade e segura para o paciente, registrou-se a marca de 130 CCIP implantados nos últimos seis anos (2017-2022), o que representou 32% do total de cateteres utilizados no último ano para realização de transplantes autólogos, alogênicos aparentados, alogênicos não aparentados e haploidenticos. Outro dado referente ao sucesso desse procedimento nesse centro mostra que 80% dos CCIP foram retirados por motivo de alta e os outros 20% por trombose (2%); obstrução (8%); óbito (5%); e febre (5%). **Conclusão:** Observa-se que, apesar das dificuldades enfrentadas, a implementação e a utilização de CCIP para infusão de células-tronco hematopoiéticas têm apresentado bons resultados e contribuem para a prática de obtenção de acesso vascular seguro no TCTH.

Palavras-chave: enfermagem; cateterismo; cateterismo venoso central; cateterismo periférico; transplante de células-tronco hematopoiéticas.

RESUMEN

Introducción: El acceso venoso seguro es fundamental para los pacientes sometidos a trasplante de células madre hematopoyéticas (TCMH) y el personal de enfermería participa en todo el proceso de toma de decisiones y mantenimiento de este acceso. **Objetivo:** Sistematizar la experiencia de enfermeros en el uso del catéter central de inserción periférica (PICC) para realizar trasplante de células madre hematopoyéticas en un centro de trasplante de médula ósea de una institución pública de referencia nacional en oncología. **Método:** Estudio descriptivo elaborado a partir de la sistematización realizada por Oscar Jara Holliday. **Resultados:** La experiencia de utilizar el PICC para realizar el TCMH en el centro de trasplante estudiado se inició en 2017. Durante la implementación de la nueva rutina surgieron obstáculos relacionados con la resistencia del equipo, aceptación del paciente, disponibilidad de material adecuado y profesionales calificados. Pensando en una asistencia terapéutica intravenosa de calidad y segura para el paciente, nos lanzamos y elevamos la marca de 130 PICC implantados en los últimos seis años (2017-2022), lo que representó en el último año el 32% del total de catéteres utilizados para realizar trasplantes autólogos, alogénicos relacionados, alogénicos no relacionados y haploidenticos. Otro dato referente al éxito de este procedimiento en nuestro centro muestra que el 80% de los PICC se retiraron por alta y el otro 20% por trombosis (2%); obstrucción (8%); muerte (5%) y fiebre (5%). **Conclusión:** Al final de este informe, observamos que, a pesar de las dificultades enfrentadas, la implementación y el uso de PICC para la infusión de células madre hematopoyéticas mostró buenos resultados y contribuyó para la práctica de obtener un acceso vascular seguro en el TCMH. **Palabras clave:** enfermería; cateterismo; cateterismo venoso central; cateterismo periférico; trasplante de células madre hematopoyéticas.

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INTRODUCTION

Hematopoietic stem cell transplantation (HSCT), also known as bone marrow transplantation, is a treatment performed in phases: pre-, intra-, and post-HSCT. In pre-HSCT, conditioning occurs, a period in which high-dose chemotherapy is administered, which may or may not be associated with total body irradiation, followed by the infusion of hematopoietic stem cells (CTH)¹. HSCT consists of a therapeutic modality for the treatment of malignant or non-malignant oncohematological diseases, solid tumors, genetic and metabolic diseases^{2,3}. It is an extraordinarily complex procedure with a curative potential that allows the treatment of diseases that were previously invariably fatal^{2,3}.

During HSCT, patients are followed up by a multiprofessional team. Nurses play a fundamental role in assisting these patients, having as attributions the administration of chemotherapeutics, blood collection for exams, Cth infusion, among others⁴.

HSCT requires prior preparation of patients for its performance, one of the important requirements is to obtain a safe venous access by central venous catheter (CVC). These catheters are necessary because, throughout the treatment period, the patient receives large volumes of hydration, electrolyte replacements, transfusions, Cth infusion, as well as sample collection for laboratory tests. The presence of a CVC prevents patients from undergoing multiple punctures¹.

Cancer patients often go a long way to reach HSCT, most of them, peripheral venous access is greatly compromised due to the poly treatment received previously. Among the possibilities of a vascular access device, the peripherally inserted central catheter (PICC) is frequently seen in onco-hematological patients, being an advanced, specialized practice of lower risk for the patient, and is configured as an alternative to the Hickman-Broviac tunneled CVC and the short-stay catheter^{5,6}.

The PICC is inserted into a peripheral vein of the arm (basilic, brachial or cephalic), with a central tip location (Cavo atrial junction), not requiring the presence of an anesthesiologist and surgeon. Among the CVC, it is the one that demonstrates the best cost-benefit ratio: less traumatic insertion, lower risk of chemical phlebitis and extravasation, dispenses with the operating room and can even be inserted into the patient's bed, requiring only an X-ray to confirm its location after insertion⁵. The Federal Council of Nursing (Cofen), through Resolution 258/2001⁷, recognizes the implementation of the PICC as a competence of nurses, provided that they have received training through training and qualification courses⁸. Thus, the objective of this study was to systematize the

experience of nurses in the use of PICC for HSCT in a bone marrow transplant center of a public institution, a national reference in oncology.

METHOD

Descriptive study with the intention of presenting the implementation of PICC use in a bone marrow transplant center for HSC infusion.

The construction of the reflection was based on the systematization of Oscar Jara Holliday⁹. It proposes the understanding of the experience, with the identification of relationships and contradictions, based on the organization in five stages: I) starting point; II) initial questions; III) recovery of the lived process; IV) background reflection; V) arrival points.

The scenario of this report is a public center, located in the State of Rio de Janeiro, composed of 16 inpatient beds, an outpatient clinic, and a day hospital for pre- and post-HSCT follow-up of adult and pediatric patients. On average, 90 HSCT are performed per year, including autologous, related allogeneic, unrelated allogeneic and haploidentical transplants.

This research was approved by the Research Ethics Committee (CEP) of the National Cancer Institute (INCA) under opinion number 6.275.574 (CAAE: 71260923.8.0000.5274), respecting the ethical precepts of research involving human beings, according to the guidelines of the Resolution of the National Health Council (CNS) n°. 466, of December 12, 2012¹⁰.

RESULTS

The experience had as its starting point the participation of two nurses in the 1st *Bone Marrow Transplantation Conference* held at the Hospital Complex of Niterói/RJ, in April 2017. During the event, PICC was presented as a safe venous access resource for HSCT, not only as a resource for post-transplant treatment, but also as an option for HSCT conditioning and infusion. It is noteworthy that the use of CIPP in the center referenced in this research had already occurred since 1991, however, the material, the technique used, and the indications were different.

Then, the question arose: "How to insert the practice of using PICC for HSC infusion in a public bone marrow transplant center?"

At first, the possibility of inserting the new practice was forwarded to the service management, in order to verify the feasibility of training the nursing team and the availability of the material. Soon after, the training of nurses began on a voluntary basis.

The first class took place in June 2017, composed of five nurses. Due to the covid-19 pandemic, the second class was formed four years later in January 2021, composed of four more nurses. The course addressed PICC insertion using the modified Seldinger technique and ultrasound-guided venipuncture.

The theoretical classes had a workload of 16 hours and were conducted in person, covering topics such as: anatomy, pharmacology, individualized catheter indication, formation of vascular access teams, types of PICC, local anesthesia, ultrasound, *zone insertion method*(ZIM), catheter tip location, complications, and puncture technique. Subsequently, the 40-hour practical training was conducted under the supervision of a qualified professional. The nurses were considered able to perform the procedure after ten punctures.

For the implementation and systematization of the new practice in the sector, a standard operating procedure (SOP) was established, which is reviewed and updated annually. And thinking about quality and safe intravenous therapeutic care for the patient, the center of this study reached the mark of 130 PICCs implanted in the last six years (2017-2022), which represented in the last year 32% of the total number of catheters used to perform autologous, related allogeneic, unrelated allogeneic and haploidentical transplants. Another finding regarding the success of this procedure showed that 80% of the PICCs were removed due to discharge and the other 20% due to: thrombosis (2%); obstruction (8%); death (5%); and fever (5%). These data were also seen in the Garnica study¹¹, in which 78% of patients continued with PICC until the end of treatment, only withdrawing due to discharge.

The maintenance of the PICC until the end of the indication is one of the main foundations of intravenous therapeutic assistance that guide its use. Therefore, the premature removal of the catheter, due to complications, has an influence on the care provided to the patient and on the nursing workflow¹².

The nurses created a database to monitor the results with the PICC numbers implanted, complications, date of implantation, date, and reason for withdrawal.

To perform the procedure, the following routine was established to be followed by qualified nurses:

- » Clinical evaluation of patients for indication and contraindication of PICC insertion through anamnesis and physical examination.
- » Evaluation of the venous network with the use of ultrasound.
- » Patient guidance on the procedure.
- » Use of personal protective equipment.
- » Aseptic and sterile insertion technique.

- » Performing the puncture.
- » Request for confirmation of the catheter position by radiography, as well as the interpretation of the result.
- » Be careful at the time of insertion not to pull or reinsert the catheter.
- » Patient monitoring during the procedure.
- » Record of the procedure in the medical record and in the database.

These steps are described in the flowchart for the insertion of the CCIP (Figure 1).

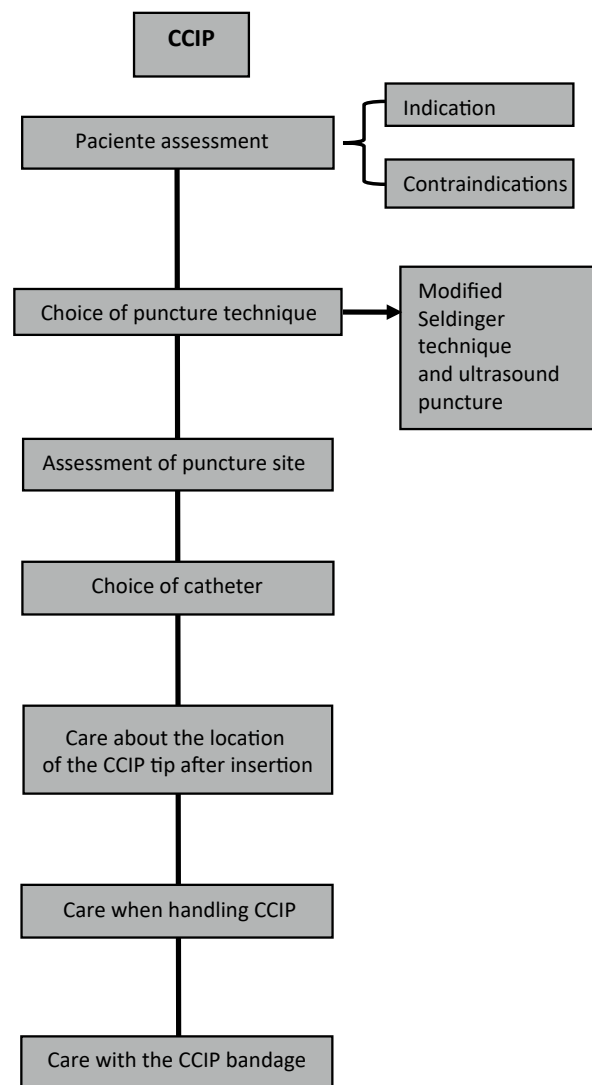


Figure 1. Flowchart for PICC insertion

Caption: PICC = peripherally inserted central catheter.

The experience with the use of PICC in the center in question was limited to some patients undergoing post-HSCT treatment, due to the lack of qualified professionals, as well as the lack of adequate material and

little knowledge about the suitability of the material for the practice of HSCT infusion.

The use of PICC as a vascular access technology has increased its reach in the hospital environment, due to its advantages over CVCs and the possibility of its use for treatment and outpatient follow-up, positively impacting patients' quality of life and recovery¹³.

The use of ultrasound in the location of the veins allows the evaluation of the caliber, flow, and course of the vessel, reducing the number of puncture attempts, in addition to assisting in the choice of the appropriate catheter caliber, which reduces tissue trauma and prevents mechanical phlebitis¹⁴.

Given these advances and from the training of a larger number of nurses, it was possible to implement the practice of PICC implantation to perform HSCT from the conditioning regime to the post-transplant. However, some difficulties were experienced along the way, such as the acceptance of the team and the maintenance of the regular availability of the material.

Regarding the HSC infusion using the PICC, there was no significant difference in the time of this infusion. What is perceived is that when the volume is larger, the flow is slower; however, this is also observed in other catheters, as described by Milczarek¹⁵.

Costa et al.¹⁶ reinforce these reflections and point out the weaknesses for the implementation of PICC use: institutional means – absence of qualified professionals, lack of knowledge of medical and nursing teams, shortage of professionals resulting in increased workload, and difficulty in accessing ultrasound equipment; clinical characteristics – impaired venous network; individual skills – inability of nurses to identify the need for PICC insertion.

According to Salvador¹⁷, the insertion of innovative technologies entails differentiated demands, almost always with an increase in the workload and the need for multidisciplinary knowledge. Resistance to change is understandable, given that the complexity involved in the HSCT process already demands a high workload from nurses^{17,18}.

Resistance to change was also experienced by patients who were surprised that the PICC was implemented by nurses. This barrier was overcome through guidance to the patient on the procedure. Some studies argue that, because PICC is still a recent technology for obtaining venous access in adult patients, the lack of knowledge about its advantages and benefits justifies a certain difficulty in accepting the device^{16,19}. In HSCT services, health education is an essential part of the nurse's work process, especially to guide care after hospital discharge. Therefore, the guidelines on PICC to patients are an

important strategy to benefit the assistance provided in intravenous therapy.

Thus, nurses who provide in fusional intravenous therapeutic care to patients undergoing HSCT must have specific skills and clinical expertise aimed at this population. The engagement of the nursing team in the transplant is essential and reinforces that the nursing team can be responsible for the insertion, maintenance, and removal of the PICC. This provides nurses' practice with visibility and the guarantee of their autonomy within the scope of interdisciplinary work^{11,12}.

This article aims to contribute to the development of practices related to safe vascular access in HSCT, with minimal risk of complications, and to the possibility of intermittent outpatient use after transplantation, as well as to strengthen the autonomy and empowerment of nurses working in HSCT. The inclusion of the population from only one transplant center is considered a limitation of this study.

CONCLUSION

In the context of HSCT, updates are constant, always presenting themselves as challenges for nursing, requiring training, permanent education, and adaptation to new practices from these professionals. Despite the difficulties faced, the implementation and use of PICC for HSC infusion have shown satisfactory results and contribute to the practice of obtaining safe vascular access in HSCT. However, such a procedure must be performed by qualified nurses with expertise for the follow-up of patients and for the proper maintenance of catheters.

CONTRIBUTIONS

Vanessa Bastos de Oliveira, Graciela Machado Piereck de Sá and Simone Pereira Lermontov contributed substantially to the design and/or planning of the study; in obtaining, analyzing and/or interpreting the data; in writing and/or critical review. Luiza Leite de Andrade, Valéria Gonçalves da Silva, Sylvia Gonzalez de Queiroz and Luana Sena Pimenta contributed substantially to the design and/or planning of the study; in obtaining, analyzing and/or interpreting the data. All authors approved the last version to be published.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

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