

CHARACTERISTIC OF CATHETERS AND OF CHILDREN WITH ONCOHEMATOLOGICAL DISEASE*

Liziane Barros Linares Machado¹, Deborah Antunes de Moura², Lucas Bastos Carneiro da Cunha², Karinne Cristinne da Silva Cunha³

ABSTRACT: The objective in this study was to identify the clinical profile of children/adolescents with onco-hematological diseases and the characteristics of the catheters they use. Descriptive study with quantitative approach of 78 epidemiological surveillance forms. The scenario was a pediatric onco-hematology outpatient clinic. The data were collected in August 2015. It was observed that 32 (59%) of the patients using a totally implanted catheter were male, and seven (53%) patients with a peripherally inserted central venous catheter were female. Ages ranged between 10 and 16 years. The main diagnosis was acute lymphoid leukemia in both. The mean length of use of the totally implanted catheter was 303 days, against 55 days for the peripherally inserted central venous catheter. The end of the treatment is the main motive for the withdrawal of both. The lack of completed information in the forms limited this research. In conclusion, these devices are effective and safe for chemotherapeutic treatment.

DESCRIPTORS: Child; Hematology; Catheters; Nursing; Chemotherapy.

CARACTERÍSTICA DOS CATETERES E DE CRIANÇAS PORTADORAS DE DOENÇA ONCOHEMATOLÓGICA

RESUMO: O objetivo deste estudo foi identificar o perfil clínico de crianças/adolescentes com doença oncohematológica e as características dos cateteres utilizados por estes. Estudo descritivo, com abordagem quantitativa de 78 fichas de vigilância epidemiológica. O cenário foi um ambulatório de oncohematologia pediátrica, os dados foram coletados em agosto de 2015. Observou-se que 32 (59%) dos portadores de cateter totalmente implantado eram do sexo masculino, e sete (53%) dos portadores de cateter epicutâneo eram do sexo feminino, a idade variava entre 10 e 16 anos, o principal diagnóstico foi leucemia linfóide aguda em ambos. A média de utilização do cateter totalmente implantado foi 303 dias, enquanto do cateter epicutâneo foi 55 dias, o término do tratamento é o principal motivo de retirada de ambos. A falta de preenchimento de informações nas fichas foi limitador desta pesquisa. Concluímos que estes dispositivos são eficazes e seguros para tratamento quimioterápico.

DESCRIPTORIOS: Criança; Hematologia; Cateteres; Enfermagem; Quimioterapia.

CARACTERÍSTICA DE LOS CATÉTERES Y DE NIÑOS PORTADORES DE ENFERMEDAD ONCO-HEMATOLÓGICA

RESUMEN: La finalidad del estudio fue identificar el perfil clínico de niños/adolescentes con enfermedad onco-hematológica, así como las características de los catéteres utilizados por ellos. Estudio descriptivo, con abordaje cuantitativo de 78 fichas de registro epidemiológicas. El contexto fue el de un ambulatorio de onco-hematología pediátrica y los datos fueron obtenidos en agosto de 2015. Se observó que 32 (59%) de los portadores de catéter totalmente implantado eran de sexo masculino, y que siete (53%) de los portadores de catéter epicutáneo eran de sexo femenino; la edad variaba entre 10 y 16 años; el diagnóstico principal fue el de leucemia linfóide aguda en ambos sexos. La media de utilización del catéter totalmente implantado fue de 303 días, mientras del catéter epicutáneo fue de 55 días; el término del tratamiento es el principal motivo de retirada de ambos. La falta de informaciones en las fichas de registro fue un factor limitador de esta investigación. Se concluye que estos dispositivos son eficaces y seguros para tratamiento quimioterápico.

DESCRIPTORIOS: Niño; Hematología; Catéteres; Enfermería; Quimioterapia.

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¹RN. Master's student in Health and Technology. Head Nurse, Pediatric Onco-Hematology Service, Hospital Federal da Lagoa. Rio de Janeiro, RJ, Brazil.

²Nursing Undergraduate. Universidade Federal do Estado do Rio de Janeiro. Rio de Janeiro, RJ, Brazil.

³RN. Ph.D. in Neuroimmunology. Nursing Professor and Graduate Program in Health and Technology at Espaço Hospitalar, Universidade Federal do Estado do Rio de Janeiro. Rio de Janeiro, RJ, Brazil.

Corresponding author:

Liziane Barros Linares Machado
Universidade Federal do Estado do Rio de Janeiro
Rua da Passagem, 130 - 22.290-031 - Rio de Janeiro, RJ, Brasil
E-mail: lizblinares@yahoo.com.br

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● INTRODUCTION

Childhood tumors tend to be embryonic, in the endothelial-reticular system, central nervous system, connective tissue and viscera⁽¹⁾. They are considered as a set of tumors that happens under the age of 15 years. The youngest pediatric age ranges (0 to 4 years) are the most prone to the development of cancer. Overall, tumors common in adults rarely happen in children⁽¹⁾.

Childhood cancer cannot be considered as a simple disease, but as a range of different malign conditions⁽²⁾.

In Brazil as well as in developed countries, cancer already represents the first cause of death among children and adolescents between 1 and 19 years of age (7% of the total), considering all regions⁽³⁾.

In the course of 2016 and 2017, 12,600 new cancer cases are expected in children and adolescents in Brazil. The most affected regions are: Southeast and Northeast, ranging between 6,050 and 2,750 new cases, followed by the South with 1,320, Central-West 1,270 and North with 1,210⁽³⁾.

During the outpatient treatment of children or adolescents with oncohematological diseases, countless hospitalizations are needed and, to achieve a successful treatment, establishing an indwelling venous access is fundamental.

Therefore, an indwelling venous access that enhances confidence in the administration of chemotherapeutic drugs is paramount in the management of cancer patients. The accesses these patients use are known in the hospital context as: totally implanted central venous catheter (CVC-TI), semi-implanted central venous catheter (CVC-SI) and peripherally inserted central catheter (PICC).

At the place of study, the most commonly used catheters are: the totally implanted catheter and the peripherally inserted central catheter. Therefore, we will limit ourselves to these two devices.

At this sector, part of the patients are not hospitalized, but come for outpatient care. They stay at their homes and only visit the hospital for chemotherapeutic treatment, consultations and maintenance of their devices.

The totally implanted catheters are also known in the hospital context as Ports or Porta-caths. The distal end of these silicon rubber devices is linked to a chamber for puncturing installed in the subcutaneous tissue of the thoracic region on a bony protuberance⁽⁴⁾.

These catheters serve to infuse chemotherapeutic drugs, serum, antibiotics, blood and blood components, parenteral nutrition, contrast fluids or any other intravenous fluid and blood sample collection for laboratory tests. A trained professional, preferably a nurse, should puncture these catheters. They are well accepted among the patients, as they do not require home care and interfere minimally in the self-image⁽⁴⁾.

The peripherally inserted central venous catheter (PICC) is an intravenous device that is introduced through a superficial vein and progresses until the superior or inferior vena cava and permits the infusion of solutions with extreme pH and osmolarity, such as vesicant or irritant drugs that are frequently used in onco-hematological treatment⁽⁵⁾.

It is not only up to the multiprofessional team to decide on what type of catheter to use in children or adolescents, but also up to the responsible family member, who should agree with the type of catheter chosen and the insertion site. When the patient and relative are allowed to participate in the implantation of the catheter, the impacts of any change in the body image can be reduced, and the child or adolescent can discover the limitations the treatment imposes⁽⁶⁾.

This study is relevant because it focuses on two different types of devices used for the chemotherapeutic treatment of children and adolescents, reports on one device surgically implanted by physicians and another by the nurse. It is shown that, provided that they are correctly indicated and handled, these devices are able to reach the proposed objective, which is to provide uninterrupted and safe treatment for the patient, also showing that the PICC can be a great ally in the treatment of our patients. This supports its increasing use in pediatric oncology as the first-choice, instead of as a

secondary catheter.

In this context, the objective in this research was to identify the clinical profile of children/adolescents with onco-hematological conditions and the characteristics of the catheters used for their treatment.

● METHOD

A descriptive and retrospective study was undertaken in August 2015 with a quantitative approach of secondary data, collected from 78 epidemiological surveillance forms of 60 children who used one or more catheters in the course of their treatment.

The scenario chosen for the data collection was a pediatric oncohematology outpatient clinic at a federal hospital in the city of Rio de Janeiro. The data collection was based on the items on the epidemiological surveillance form. This form was developed by the pediatric oncohematology team in cooperation with the hospital infection control committee (CCIH) at the hospital, as a strategy to improve the control of the catheter handling.

The forms of children and adolescents who during their outpatient monitoring used the totally implanted and/or peripherally inserted central venous catheter were included in the study. The forms were used of catheters that were no longer used, that is, which had been removed between July 2011 and April 2015.

The collected data referred to the different types of handling of the devices, main problems, besides data on the user, such as age, sex, and disease, among others.

Forms of children and adolescents who used more than two catheters in their oncohematology treatment were excluded. Seventy-eight forms were selected and analyzed out of 90 epidemiological surveillance forms.

The results obtained in the data collection were organized in a worksheet. The variables were subject to descriptive analysis based on the comparison with the literature and the data were displayed in tables.

This study was submitted to the Research Ethics Committee at UNIRIO and approved under opinion 1.213.979. As the researcher had no direct contact with the children and adolescents who used the catheters, a waiver was requested for the use of the free and informed consent form.

● RESULTS

According to the data, two types of catheters were used in the oncohematology outpatient treatment: the totally implanted catheter in 81% (n=63) and the peripherally inserted central venous catheter in 19% (n=15).

As verified, 59% (n=32) of the patient sample using the totally implanted catheter was male. The prevalent age range was between 11 and 16 years in 18% (n=10). What the medical diagnosis of these male catheter patients is concerned, Acute Lymphoid Leukemia (ALL) stands out with 37% (n=20). The female patients using the totally implanted catheter corresponded to 41% (n=22). The most representative age range was between 0 and 10 years with 15% (n=8). The most incident medical diagnosis in the female group was also ALL with 28% (n=15) (Table 1).

Concerning the age of the PICC patients, the prevalent age range was between 11 and 16 years with 68% (n=9). The preponderant diagnosis was ALL with 53% (n=7).

Table 1 – Quantitative distribution of sex, age and diagnosis of the totally implanted catheter and PICC patients. Rio de Janeiro, RJ, Brazil, 2016

CVC-TI														
Sex/Age	0 to 5		6 to 10		11 to 16		No information		Total					
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Female	8	15	8	15	0	0	6	12	22	41				
Male	8	15	4	8	10	18	10	18	32	59				
Total	16	30	12	22	10	18	16	30	54	100				
PICC														
Sex/Age	0 to 5		6 to 10		11 to 16		No information		Total					
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Female	1	8	2	15	4	30	0	0	7	53				
Male	1	8	0	0	5	38	0	0	6	47				
Total	2	16	0	0	9	69	0	0	13	100				
CVC-TI														
Sex/ Diagnosis	AML		ALL		Hodgkin Lymphoma		Non- Hodgkin Lymphoma		Histiocytosis		Myelodysplasia		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Female	4	7	15	28	1	2	0	0	1	2	1	2	22	41
Male	2	4	20	37	3	5	7	13	0	0	0	0	32	59
Total	6	11	35	65	4	7	7	13	1	2	1	2	54	100
PICC														
Sex/ Diagnosis	AML		ALL		Hodgkin Lymphoma		Non- Hodgkin Lymphoma		Histiocytosis		Myelodysplasia		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Female	0	0	3	23	4	30	0	0	0	0	0	0	7	53
Male	0	0	4	30	2	17	0	0	0	0	0	0	6	47
Total	0	0	7	53	6	47	0	0	0	0	0	0	13	100

Source: Master's thesis Machado LBL, 2016

As regards the insertion site of the totally implanted catheter (Table 2), the right hemithorax was the most used site with 50% (n=39), followed by the left hemithorax with 14% (n=11). The upper left and right limbs and the right jugular were also used, but less frequently.

The data surveyed for the PICC insertion reveal that the upper right limb was the most used with 11% (n=9), followed by the upper left limb with 6% (n=5).

Table 2 – Quantitative distribution of insertion sites of the totally implanted catheter and PICC. Rio de Janeiro, RJ, Brazil, 2016

	RHT		LHT		URL		ULL		Right Jugular		No information		Total	
	n	%	n	%	n	%	n	%	n	%	N	%	n	%
CVC-TI	39	50	11	14	4	5	6	8	0	0	3	4	63	81
PICC	0	0	0	0	9	11	5	6	1	1	0	0	15	19
Total	39	50	11	14	13	17	11	14	1	1	3	4	78	100
	Mean (days)				Shortest time (days)				Longest time (days)					
CVC-TI	303				11				928					
PICC	55				9				154					

Source: Master's thesis Machado LBL, 2016

When analyzing the presence of possible problems in the use of the totally implanted catheter (Table 3), it was observed that 84% (n=53) of the sample did not present any problem with the catheter. This fact can be related to the initial implantation of the surveillance form at the sector, where the team was being trained to complete it. This fact represents a gap in our study.

Nevertheless, one problem was the hyperthermia, representing 3% (n=2). The other 13% (n=1) were equally related to the following problems: phlebitis, pulmonary secretion due to bad catheter positioning in pleural region, catheter twisted in subclavian artery, bacteremia, infection, extravasation, pleural effusion, exteriorization of front, exteriorization of needle.

The reasons were analyzed that led to the removal of the totally implanted catheter. The highest percentage was not identified with 36% (n=23), which can be related to the first forms that were used to monitor this catheter, as the team was still adapting to the new tool. Next ranks the end of the treatment with 27% (n=17), followed by death with 14% (n=9). Infection comes fourth with 9% (n=6) of the catheters removed. The infection was diagnosed after the result of the catheter blood culture collection gave a positive result.

Table 3 – Quantitative distribution of problems and reasons for removal of totally implanted catheter. Rio de Janeiro, RJ, Brazil, 2016

Reason for removal	Problems				
	n	%	n	%	
Death	9	14	Phlebitis	1	2
Infection	6	9	Pulmonary secretion	1	2
Bad functioning	1	2	Catheter twisted in subclavian artery	1	2
End of treatment	17	27	Bacteremia	1	2
Edema	1	2	Extravasation	1	2
Bacteremia	1	2	Pleural effusion	1	2
End of chemotherapy	3	5	Exteriorization of front	1	2
Granuloma with porth exposure	1	2	Hyperthermia	2	3
Catheter in ventricle	1	2	Exteriorization of needle	1	2
Transplantation	1	2	No problems	53	84
Notspecified	23	36	Infection	1	2
Total	64	100	Total	64	100

Source: Master's thesis Machado LBL, 2016

As regards the reasons that led to the handling of the totally implanted catheter (Table 4), blood collection stood out, totaling 1,573 manipulations, followed by equipment change with 1,373 manipulations.

The catheter activation and deactivation resulted in 1,119 manipulations.

Other reasons were also identified, but less frequently, such as the installation of chemotherapeutic drugs and catheter maintenance, performed once every 30 days to change the heparin solution used to maintain the catheter permeability.

Table 4 – Quantitative distribution of reasons for manipulation of totally implanted catheter. Rio de Janeiro, RJ, Brazil, 2016 (continues)

	Total	Mean	Mode	Median	Standard Deviation
Chemotherapy	364	6	1	6	5.5429
Blood Collection	1573	19	13	19	19.7116
Maintenance	348	6	1	6	5.8203

Lock Therapy	28	2	2	2	0.7432
Others	281	5	2	5	5.6342
Number of Activations/ Deactivations	119	15	12	15	12.3890
Equipment Change	1373	14	10	14	21.06414
Total Use	1119	15	12	15	12.3890

Source: Master's thesis Machado LBL, 2016

Next (Table 5), data are presented on the PICC. As regards the caliber, the most frequent is No. 03, corresponding to 80% of the total (n=12). As for the purpose of the catheter manipulation, the PICC was most used to collect blood (n=127), followed by chemotherapy (n=51).

To activate the catheter, the heparin solution needs to be removed through aspiration, after administering a saline solution flush to enable its use.

After a single activation, blood can be collected, chemotherapy can be administered, maintenance can be done, among other manipulations, which explains why the number of catheter activations/deactivations is lower than the combination of all.

The most significant reasons for removal are the end of chemotherapy and obstruction, both corresponding to 20% (n=3) each. In addition, in 13% (n=2) of the catheters, the reason for removal is not described. Only one case of infection occurred, equaling 7% (n=1).

Table 5 – Quantitative distribution of catheter caliber, goals of manipulation and reasons for removal of PICC. Rio de Janeiro, RJ, Brazil, 2016

Caliber	Total				
	N	%			
3	12	80			
4	2	13			
No information	1	7			
Total	15	100			
Reasons for Manipulation	Total	Mean	Mode	Median	Standard Deviation
Chemotherapy	51	3,4	1	3	2,58
Blood collection	127	8,46	4	5	7,56
Maintenance	48	3,2	0	2	3,54
Activations/Deactivations	105	7	7	6	5,55
Reason for removal	Total				
	N	%			
Infection	1	7			
Cathetertraction	1	7			
Hole in insertion ostium	1	7			
Length cut	1	7			
Trajectory hyperemia	1	7			
Medical request	1	7			
Presence of thrombus	1	7			
End of chemotherapy	3	20			
Obstruction	3	20			
No information	2	13			
Total	15	100			

Source: Master's thesis Machado LBL, 2016

● DISCUSSION

The profile of the patients using the investigated totally implanted catheter demonstrates similarities with the existing literature. According to Table 1, 59% (n=32) of the totally implanted catheter users were male, between 11 and 16 years of age and the most prevalent diagnosis was Acute Lymphoid Leukemia (ALL) with 37% (n=20). A sample of 61 histories of children and adolescents who had gone through surgery to implant a totally implanted catheter revealed that adolescents between 10 and 17 years were the most frequent group, 59% of this sample being male⁽⁷⁾.

In another study of 1,472 patients diagnosed with acute lymphoid leukemia, 883 (56.59%) of these patients were male and 639 (43.41%) female⁽⁸⁾. This result can be related to the fact that the prevalence of acute lymphoid leukemia is higher in men than in women.

Most patients who used the PICC are female and the preponderant diagnosis is also ALL. This result is in accordance with a pediatric oncohematology study on the diagnosis, but differs with regard to gender⁽⁹⁾. In addition, in another study, the preponderance of the male sex in the use of this catheter is shown⁽¹⁰⁾.

In yet another study, it is shown that the most frequent diagnosis in the use of the PICC was Non-Hodgkin Lymphoma⁽¹¹⁾.

Leukemias are the most common type of childhood cancer under the age of 15 years in most populations, corresponding to 25 to 35% of all types. In the same age range, lymphomas, central and sympathetic nervous system tumors, rhabdomyosarcomas, Wilms' tumor, retinoblastomas and bone tumors are frequently diagnosed⁽¹⁻²⁾.

A greater predominance of ALL cases exists in comparison with other hematological diseases⁽⁸⁾. The studies developed by the authors cited above are in accordance with the data surveyed in our research, in which ALL and the male sex rank higher regarding other oncohematological diseases.

In the analysis demonstrated in Table 2, it was observed that the right hemithorax (RHT) was the most used site to implant the totally implanted catheter with 50% (n=39), followed by the left hemithorax (LHT) with 14% (n=11). In a study of 61 catheters, it was revealed that these are normally inserted in the infraclavicular region. In this study, we observed that the preferred vein was the right subclavian with 68.9% of the sample, followed by the left subclavian with 3.3% and the right axillary vein with 1.6% of this total⁽⁷⁾.

Concerning the insertion site, for the PICC, the most selected site was the upper right limb, followed by the upper left limb and the right jugular vein, similar to another study⁽¹²⁾. In addition, in one study, the preponderant selection of the upper right limb is shown⁽¹³⁾.

In one research, a higher rate of successful insertion in the first attempt was shown in the upper right limb than in the upper left limb⁽¹⁴⁾. Nevertheless, in some studies, the selection of the non-dominant arm⁽¹⁵⁻¹⁶⁾ is shown, being mostly the upper left limb⁽¹⁴⁾.

In the literature, the right jugular vein is one of the final options for insertion due to the difficult fixation, greater risk of catheter migration and infection. The external right jugular vein is preferred to the left, in view of the risk of ascending to the internal jugular vein instead of the vena cava. This thesis is in accordance with the result, in that only one puncture was done in the right jugular, as found in this research⁽¹⁵⁻¹⁷⁾.

In another research, the patients affirm that they are more satisfied with the catheter when located below the shoulder⁽¹⁸⁾, like in the upper limbs. This finding is in accordance with the 93% of PICC inserted in the upper limbs in this research.

Table 2 displays the analysis of problems in the use of the totally implanted catheter. In 84% (n=53) of the study sample, there was no problem with the use of the catheter. One problem was hyperthermia though, representing 3% (n=2). The other 13% (n=1) were equally related to the following problems: phlebitis, pulmonary secretion due to bad catheter positioning in pleural region, catheter twisted in subclavian artery, bacteremia, infection, extravasation, pleural effusion, exteriorization of front,

exteriorization of needle.

In the literature, it is shown that catheter-related complications can be classified as: early complications between the first 48 hours up to seven days after the implantation of the catheter or even at the moment of its first use, and late complications occurring after this period⁽⁷⁾. This same study does not present sufficient data to classify these complications.

In a study involving deep catheters, complications like obstruction stand out, followed by infection, extravasation, thrombosis and catheter dislocation⁽¹⁹⁾.

In another study, out of the 71 catheters implanted, infection was detected 23 times, leading to the removal of eight devices⁽²⁰⁾. The conduct adopted to manage these infectious complications included the confirmation of the infection through comparison between the blood culture collected from the catheter and the peripherally collected blood culture. After identifying the infection site and identifying the microorganism, the appropriate antibiotics therapy was established.

In one study, the analysis evidenced that the main catheter-related complications were late complications, including generalized bacteremia with (8.43%), followed by local inflammation of the skin and subcutaneous tissue (1.2%), venous thrombosis (2.41%), catheter migration (1.2%) and skin necrosis on the porth chamber (2.41%)⁽²¹⁾.

An intravenous device like the CVC-TI can cause damage to the patient, mainly when hospitalized. Among this damage, infection can cause sepsis and the interruption of the treatment⁽²²⁾.

In Table 2, the reasons for catheter removal could also be identified. The most frequent reason was not identified, corresponding to 36% (n=23), followed by the end of treatment with 27% (n=17), and death with 14% (n=9). Infection corresponds to 9% (n=6). Complications like obstruction are relevant in the studies cited. In our study, however, this complication did not appear, but infection is an important reason for removing the device.

Based on the analysis of the data, the motives could be detected that resulted in the manipulation of the totally implanted catheter. As demonstrated in Table 4, blood collection was the most important reason for catheter handling, followed by equipment change. The catheter activation and deactivation and the installation of chemotherapy were less frequent. In the literature, skin antisepsis, puncture of the totally implanted catheter and dressing were the most frequently mentioned reasons for catheter manipulation cited in research⁽²⁰⁾.

Other catheter manipulation-related nursing care is mentioned though, such as pre and post-operative care, medication administration, dressings and maintaining permeability⁽²⁰⁾.

As for the goal of PICC use, most cases were related to blood collection. In other study, however, the catheter was most used to administer chemotherapeutic drugs⁽⁹⁾, which was the second highest frequency in this study.

In the results found, the most frequent reasons for removal were the end of chemotherapy and obstruction, in line with another study that shows the end of treatment as the most frequent reasons for removal⁽¹⁰⁾.

In other studies⁽⁹⁻¹¹⁾, the most frequent reason for removal was infection, differently from our study, as only one case of infection was found. The result is very positive, as these are immunosuppressed patients⁽¹²⁾.

There are different reasons for manipulating these two different devices. Nevertheless, it is only when adding up these reasons that we get an idea of how much they are manipulated for the different procedures, by the medical team as well as by the nurses, and of the extent to which proper care could avoid an early or late complication.

● CONCLUSION

The analysis of the data from the epidemiological surveillance forms allowed us to identify the

profile of our patients and the main characteristics of the catheters they used for their treatment.

As identified, 32 (59%) patients using a totally implanted catheter are male, with higher incidence in the age range between 11 and 16 years. The most frequent condition among these patients is ALL.

Among the PICC patients, the female sex corresponds to 53% (n=7). The patients are between 11 and 16 years of age and ALL is the preponderant diagnosis.

These study results suggest that the PICC is safe to administer various cycles of chemotherapy, as the mean length of catheter use of 55 days characterizes it as an indwelling catheter, permitting its use until the end of the treatment. In addition, the low infection rate shows how the use of the PICC is reliable and effective in pediatric oncohematology treatment.

The lack of completion of some information on the forms limits this research, causing a loss of precision in the data, so that results were inferred that could have been more precise.

Despite the advantages these devices offer, they should be handled by trained professionals for the correct performance of the technique as, occasionally, the lack of skill can be associated with complications like infection, obstruction, chemotherapeutic extravasation, among others.

In conclusion, the low rates of complications found in this study confirm the safety and convenience of using the CVC-TI and PICC in children and adolescents with oncohematology diseases using chemotherapy over a long period.

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