

Risk factors for extravasation in peripheral catheters in children with cancer

Fatores de risco para extravasamento em cateteres periféricos em crianças com câncer

Factores de riesgo para extravasación en catéteres periféricos en niños con cáncer

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How to cite:

Santos LM, Cerqueira LF, Almeida AH, Silva BS, Gomes e Silva CS, Avelar AF. Risk factors for extravasation in peripheral catheters in children with cancer. Acta Paul Enferm. 2022;35:eAPE0059966.

DOI

<http://dx.doi.org/10.37689/acta-ape/2022A00059966>



Keywords

Pediatric nursing; Child hospitalized; Infusions intravenous; Drug therapy; Catheterization, Peripheral; Extravasation of diagnostic and therapeutic materials

Descritores

Enfermagem pediátrica; Criança hospitalizada; Infusões intravenosas; Quimioterapia; Cateterismo periférico; Extravasamento de materiais terapêuticos e diagnósticos

Descriptores

Enfermería pediátrica; Niño hospitalizado; Infusiones intravenosas; Quimioterapia; Cateterismo periférico; Extravasación de materiales terapéuticos y diagnósticos

Submitted

March 15, 2021

Accepted

December 15, 2021

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Abstract

Objective: To estimate extravasation incidence related to short peripheral intravenous catheters in children and adolescents with cancer and its association with demographic, clinical, catheterization and previously used intravenous therapy characteristics.

Methods: This was a longitudinal and prospective study, carried out with children/adolescents aged between 29 days and 16 years, hospitalized in an oncology unit of a pediatric hospital, submitted to the administration of drugs and solutions through a short peripheral intravenous catheter. Data collection took place through observation of peripheral intravenous catheterization and participants' medical records.

Results: A total of 299 peripheral intravenous catheters were assessed, performed in 73 children and 23 adolescents, with an incidence of extravasation of 8.7%. According to multivariate analysis, risk factors for extravasation occurrence were history of difficulty in peripheral venous puncture, previous intravenous therapy use, occurrence of complications, inability to visualize and palpate the vein.

Conclusion: A high incidence of extravasation was observed in children and adolescents with cancer in a city in the state of Bahia, associated with previous intravenous therapy use, history of complications, history of difficulty in peripheral intravenous catheterization, lack of vein visibility and palpability.

Resumo

Objetivo: Estimar a incidência de extravasamento relacionada a cateteres intravenosos periféricos curtos em crianças e adolescentes com câncer e sua associação com características demográficas, clínicas, da cateterização e terapia intravenosa utilizada previamente.

Métodos: Tratou-se de um estudo longitudinal e prospectivo, realizado com crianças/adolescentes com idade entre 29 dias a 16 anos, hospitalizados em unidade de oncologia de um hospital pediátrico, submetidos à administração de fármacos e soluções por cateter intravenoso periférico curto. A coleta de dados ocorreu mediante observação do cateterismo intravenoso periférico e prontuário do participante.

Resultados: Foram avaliados 299 cateteres intravenosos periféricos, realizados em 73 crianças e 23 adolescentes, com incidência de extravasamento de 8,7%. Conforme análise multivariada os fatores de risco para a ocorrência de extravasamento foram: histórico de dificuldade de punção venosa periférica, uso prévio de terapia intravenosa, ocorrência de complicações, impossibilidade de visualizar e palpar a veia.

Conclusão: Observou-se elevada incidência de extravasamento em crianças e adolescentes com câncer de uma cidade do Estado da Bahia, associada a uso prévio de terapia intravenosa, antecedentes de complicação, histórico de dificuldade da CIP, ausência de visibilidade e palpabilidade da veia.

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Conflicts of interest: nothing to declare.

Resumen

Objetivo: Estimar la incidencia de extravasación relacionada con catéteres intravenosos periféricos cortos en niños y adolescentes con cáncer y su relación con características demográficas, clínicas, del cateterismo y terapia intravenosa utilizada previamente.

Métodos: Se trató de un estudio longitudinal y prospectivo, realizado con niños/adolescentes entre 29 días y 16 años de edad, hospitalizados en unidad de oncología de un hospital pediátrico, sometidos a la administración de fármacos y soluciones por catéter intravenoso periférico corto. La recopilación de datos se realizó mediante observación del cateterismo intravenoso periférico y la historia clínica del participante.

Resultados: Se evaluaron 299 catéteres intravenosos periféricos, realizados en 73 niños y 23 adolescentes, con una incidencia de extravasación de 8,7 %. De acuerdo con el análisis multivariado, los factores de riesgo para la ocurrencia de extravasación fueron: historial de dificultad de venopunción periférica, uso previo de terapia intravenosa, episodios de complicaciones, imposibilidad de visualizar y palpar la vena.

Conclusión: Se observó una elevada incidencia de extravasación en niños y adolescentes con cáncer de una ciudad del estado de Bahía, asociada al uso previo de terapia intravenosa, antecedentes de complicaciones, historial de dificultad del CIP, ausencia de visibilidad y palpación de la vena.

Introduction

In 2018, it was estimated in Brazil that there would be 12,500 new cases of childhood cancer among the population aged zero to 19 years. In this population, the most common types of cancer are related to blood and lymphatic system cells and nervous system tumors. For treatment, chemotherapy, radiotherapy, surgery and hematopoietic stem cell transplantation can be used.⁽¹⁾

Intravenous chemotherapy is the most used modality, however, it increases the risk of adverse events, compromising the performance of harm-free child/adolescent care.⁽²⁾ In addition to chemotherapy, there are other drugs and solutions that are administered, such as antibiotics, antiemetics, electrolytes, anticonvulsants, antipyretics, which can potentiate damage to the vascular endothelium and extravasation occurrence.

Among these classes of drugs, some have hydrogen potential (pH) and osmolarity, which, according to the American Infusion Nurses Society, can be considered at risk for the development of complications of intravenous therapy, including extravasation, especially those with osmolarity greater than 900 mOsm/L.⁽³⁾

Extravasation is defined as the exit of drugs or solutions with vesicant properties from the vessel to adjacent tissues, being identified through signs and symptoms such as pain, swelling, change in skin color (commonly redness or whitening), leakage of fluids into the peripheral intravenous access site and blistering.⁽³⁾ This complication can damage children's skin around the catheter insertion site, through lesions such as necrosis, blisters,^(3,4) ul-

cers and even amputations of part of the affected limb,^(3,5) exposing her to local pain,⁽³⁾ risk of infection related to loss of tissue integrity,⁽⁶⁾ prolonged hospitalization time⁽⁷⁾ and morbidity,⁽⁸⁾ in addition to the need for further attempts at peripheral intravenous catheterization.

Thus, children and adolescents with cancer are more susceptible to the occurrence of this event due to the inherent characteristics of the solutions and drugs used peripherally and the need for multiple punctures during treatment, contributing to the deterioration of their peripheral venous network. Therefore, it was found that both nationally and internationally there are not many investigations related to risk factors for intravenous extravasation occurrence in children and adolescents with cancer, certifying the incipient production of knowledge on the subject.

When considering that the treatment of children and adolescents with cancer is long and the demand for drug infusions and intravenous solutions compromising the integrity of their peripheral veins, making them inaccessible for use, or potentiating local complications, it is essential to know the risk factors associated with extravasation occurrence from the beginning of the experience. Thus, the pediatric nurse will be able to plan and execute the best interventions for extravasation prevention and vascular health promotion in children with cancer.

Therefore, this study aimed to estimate extravasation incidence related to peripheral intravenous catheters in children and adolescents with cancer and its association with demographic, clinical, catheterization and previously used intravenous therapy characteristics.

Methods

This is a longitudinal and prospective study, carried out in the oncology unit of a pediatric hospital in Feira de Santana, Bahia, Brazil, between April 2015 and December 2016. The Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) guidelines were used.

The population of this study consisted of children and adolescents undergoing peripheral intravenous catheterization. The sample was initially estimated at 160 peripheral intravenous catheterization, according to the sample calculation performed in the Open-Epi program, expecting to find a maximum extravasation rate of 78%,⁽⁹⁾ confidence interval (CI) of 95%, error of 5 %, in the population of 400 children hospitalized for one month in the oncology unit. Considering 20% for losses, a sample of 192 peripheral intravenous catheterization was expected.

For the sample selection, the following inclusion criteria were used: age from 29 days to 16 years, considering that the research site assists people of this age group; need for drug administration through peripheral venous catheter short; intravenous therapy indication for more than 24 hours; stable clinical picture and present with a neurological alert state. The following were not included: children and adolescents in contact or respiratory precautions and concomitant peripheral intravenous catheter use and central venous catheter.

Participants who had peripheral venous catheter removal due to accidental loss, occlusion, phlebitis and infiltration were excluded from the research, given that these outcomes could have risk factors that confounded the researched association. Those with a change in health status were also excluded, when the clinical condition worsened and transferred to another care unit of the researched hospital, which would imply in the impossibility of monitoring the researched outcome.

Data were collected during the morning and afternoon from Monday to Friday, due to the institution's routine that does not allow students to enter to carry out data collection for research at night and on weekends. Collaborating researchers were trained by the main researcher.

Peripheral intravenous devices were monitored from the beginning of catheterization until the time they were removed due to hospital discharge, end of intravenous therapy or occurrence of complications, with daily assessment being performed twice a period by members of the data collection team.

During the assessment of the region around the intravenous device and its dressing, we sought to identify the skin conditions, verifying the presence or absence of signs suggestive of extravasation. At this moment, the scale of severity and signs and symptoms of infiltration/extravasation proposed by the Infusion Nurses Society⁽¹⁰⁾ was used due to the lack of translated and adapted scales for the Brazilian pediatric population at the time of this study. It is noteworthy that the scale used was translated and adapted to Portuguese for the adult audience.⁽¹¹⁾

Primary data obtained through observation of participants' intravenous device were used, and the medical records were used as a secondary source. From the data collected, the information was transcribed to the form, which contained demographic characteristics of the intravenous therapy previously used, data from the peripheral intravenous catheterization and intravenous therapy currently used, being considered as exposure. The outcome was the occurrence or not of extravasation, with the "no" group being the catheters removed due to the end of the intravenous therapy.

The collected data were double-entered into the Statistical Package for Social Sciences (SPSS), version 22.0. Descriptive analyzes were performed in this program, with categorical variables presented through absolute and relative frequencies, and the Shapiro-Wilk normality test was applied to numerical variables, considering them to be non-normal, using a measure of central tendency (median) and dispersion (quartiles and interquartile range).

Bivariate analyzes were performed using the Statistical Package for Social Sciences (SPSS) version 22.0 and "Data Analysis and Statistical Software" (STATA), version 12.0. The Risk Ratio (RR) and their respective Confidence Intervals (CI) were estimated. Statistical significance levels were verified by Pearson's X and Fisher's exact test with a significance level of 5%. For testing in the multiple

model, unconditional logistic regression was used, with a statistically significant association being considered at the 5% level. Risk estimates were made using Poisson regression with robust variance.

The study presented was approved by the Research Ethics Committee of the *Universidade Estadual de Feira de Santana*, Brazil, under Opinion 841,612.

Results

The sample consisted of 299 peripheral intravenous catheterization, being performed in 73 children and 23 adolescents, mostly by children up to 6 years of age (median = 70.5 months; interquartile interval = 84 months; 1st quartile 39 months; 3rd quartile 122.7 months), non-white (64.6%), eutrophic (85.4%), hospitalized for up to 7 days (median = 1 day; interquartile interval = 1 day; 1st quartile 1 day; 3rd quartile 1 day), with a history of complications related to intravenous therapy (61.1%), mainly infiltration (79.3%), and lower percentage of history of difficulty for peripheral intravenous catheterization (60.4%). With regard to child-related variables, extravasation incidence was higher in non-eutrophic children who were hospitalized for 8 days or more (Table 1). Twenty-six (8.7%) cases of extravasation were identified.

Regarding the variables related to the intravenous therapy used previously, extravasation incidence was significant in children who used a peripheral intravenous catheter together with the central one, history of prolonged peripheral intravenous therapy, of complications and history of difficulty in peripheral intravenous catheterization, vesicant solution use, form of infusion and time of use of this therapy (Table 2).

It was observed that children with peripheral catheters inserted into non-visible and non-palpable veins had a higher incidence of extravasation (Table 3).

In the multiple analysis, prolonged peripheral intravenous therapy use (RR= 5.06; CI= 2.36-10.87; $p \leq 0.001$), history of complications (RR= 4.04; CI= 1.06 – 15.38; $p=0.040$), history of dif-

Table 1. Association between variables related to children and extravasation occurrence in a pediatric oncology unit

Variables	Extravasation				
	Yes (n=26) n(%)	No (n=273) n(%)	p-value ‡	RR †	CI†
Age					
≥ to 7 years	12(9.9)	109(90.1)	0.536§	1.26	0.604-2.631
Up to 6 years	14(7.9)	164(92.1)			
Sex					
Female	15(9.9)	136(90.1)	0.443§	1.34	0.635-2.813
Male	11(7.4)	137(92.6)			
Skin color					
White	9(9.7)	84(90.3)	0.686§	1.17	0.543-2.533
Non-white	17(8.3)	189(91.7)			
Nutritional condition					
Non-eutrophic	6(18.2%)	27 (81.8%)	0.051¶	2.41	1.047 – 5.58
Eutrophic	20(7.5)	246(92.5)			
Hospitalization time					
≥ to 8 days	4(50.0)	4(50.0)	0.003¶	6.61	2.969-14.734
Up to 7 days	22(7.6)	269(92.4)			

†RR - Relative Risk; †CI - Confidence Interval; ‡p-value - Significance level; §Pearson's chi-square; ¶Fisher's exact test.

ficulty in peripheral intravenous catheterization (RR= 2.62; CI= 1.18 – 5.80; $p=0.017$), having a non-visible (RR= 3.36; CI= 1.61 – 7.02; $p=0.001$) and not palpable vein (RR= 2.26; CI= 1.07 – 4.77; $p=0.032$) were factors associated with extravasation incidence.

Discussion

Some limitations can be pointed out for the present research: the absence of publications of prospective studies on extravasation in children with cancer, restricting the comparison of the research findings with those published in neonatal and adult areas. Moreover, catheter insertion site was not followed up after the removal of this intravenous device for the purpose of identifying possible injuries. Also, there was no data collection on weekends and at night, and this could contribute to the identification of more complications.

As for contributions in the theoretical field, the results of this study may encourage future investigations on the subject, due to the scarcity of publications in national and international literature on risk

Table 2. Association between variables related to previous and current intravenous therapy and extravasation occurrence in a pediatric unit

Variables	Extravasamento				
	Yes (n=26) n(%)	No (n=273) n(%)	p-value [‡]	RR [*]	CI [†]
Prior intravenous therapy					
Yes	26(8.8)	270(91.2)	1.000 [§]	-	-
No	-	3(100.0)			
Type of previously used catheter [¶]					
Peripheral + central catheter	19 (11.8)	142 (88.2)	0.040 [§]	2.33	1.008 – 5.369
Peripheral catheter	7 (5.1)	131 (94.9)			
Prolonged peripheral intravenous therapy					
Yes	5(45.5)	6(54.5)	0.001 [§]	6.23	2.894-13.426
No	21(7.3)	267(92.7)			
History of complications [¶]					
Yes	24(11.5)	184(88.5)	0.009 [¶]	5.19	1.254-21.506
No	2(2.2)	88(97.8)			
History of infiltration ^{¶¶}					
Yes	21(12.7)	144(87.3)	0.423 [§]	1.82	0.571-5.832
No	3(7.0)	40(93.0)			
History of extravasation ^{¶¶}					
Yes	2(8.0)	23(92.0)	0.746 [¶]	0.66	0.166-2.661
No	22(12.0)	161(88.0)			
History of difficulty for peripheral intravenous catheterization					
Yes	18(15.7)	97(84.3)	0.001 [¶]	3.60	1.618-8.009
No	8(4.3)	176(95.7)			
Irritant medication use ^{¶¶}					
Yes	23(10.9)	188(89.1)	0.058 [¶]	3.12	0.963-10.136
No	3(3.5)	83(96.5)			
Vesicant solution use					
Yes	22(25.0)	66(75.0)	<0.001 [¶]	13.1	4.636-36.803
No	4(1.9)	205(98.1)			
Intravenous therapy infusion form					
Intermittent	5(4.1)	117(95.9)			
Continuous	3(11.1)	24(88.9)	0.316 [§]	0.36	0.093-1.45
Intermittent and continuous	18(12.0)	132(88.0)	0.034 [¶]	0.34	0.130-0.893
Intravenous therapy use time (days) ^{§§}					
Greater than or equal to 8 days	1(50.0)	1(50.0)	0.168 [§]	5.90	1.404-4.796
Up to 7 days	25(8.5)	270(91.5)			

RR - Relative Risk; CI - Confidence Interval; †p-value - Significance level; ‡Fisher's exact test; ¶In 3 peripheral intravenous catheterization, it was not possible to visualize this variable; ¶¶In 1 peripheral intravenous catheterization, it was not possible to visualize this variable; ¶¶¶Pearson's chi-square test; ¶¶¶¶In 91 peripheral intravenous catheterization, it was not possible to visualize this variable; ¶¶¶¶¶In 2 peripheral intravenous catheterization, it was not possible to visualize this variable; ¶¶¶¶¶¶In 6 peripheral intravenous catheterization, it was not possible to visualize this variable.

factors for extravasation occurrence in children and adolescents with cancer. With regard to practice, this study may contribute to nursing professionals by providing information on some risk factors for a greater extravasation occurrence and prevention of this complication. For children and adolescents,

Table 3. Association between variables related to current peripheral intravenous catheterization and the venous network conditions to extravasation occurrence

Variáveis	Extravasamento				
	Yes (n=26) n(%)	No (n=273) n(%)	p-value [‡]	RR [*]	CI [†]
Peripheral intravenous catheterization site [§]					
UL [¶]	6(8.8)	270(91.2)	> 0.999 [¶]	-	-
LL [¶]	-	2(100.0)			
Vein visibility					
Not visible	9(21.4)	33(78.6)	0.005 [¶]	3.24	1.547-6.784
Visible	17(6.6)	240(93.4)			
Vein palpability					
Not palpable	9(15.3)	50(84.7)	0.046 ^{¶¶}	2.15	1.011-4.587
Palpable	17(7.1)	223(92.9)			
Vein route					
Tortuous	9(10.6)	76(89.4)	0.464 ^{¶¶}	1.33	0.618-2.873
Straight	17(7.9)	197(92.1)			
Vein mobility					
Mobile	7(8.5)	75(91.5)	0.952 ^{¶¶}	0.97	0.426-2.233
Fixed	19(8.8)	198(91.2)			
Vein depth					
Deep	6(13.3)	39(86.7)	0.250 [¶]	1.69	0.720-3.984
Shallow	20(7.9)	234(92.1)			
Catheter type					
Teflon	7(5.1)	131(94.9)	0.040 ^{¶¶}	0.43	0.186-1.00
Polyurethane	19(11.8)	142(88.2)			
Catheter gauge					
20 Gauges	1(20.0)	4(80.0)			
22 Gauges	12(9.8)	110(90.2)	0.845 [¶]	2.03	0.325-12.72
24 Gauges	13(7.6)	159(92.4)	0.681 [¶]	2.64	0.424-16.48
Puncture method					
Direct	24(9.2)	238(90.8)	0.754 [¶]	1.69	0.418-6.878
Indirect	2(5.4)	35(94.6)			
Dressing used on the catheter					
Non-sterile dressing	6 (14.3%)	36 (85.7%)	0.9380 [¶]	1.857	0.2455 – 14.05
Sterile + non-sterile dressing	19 (7.8%)	225 (92.2%)	>0.9999 [¶]	1.012	0.1467 – 6.987
Sterile dressing	1 (7.7%)	12 (92.3%)			
Catheter stabilization					
No	6(12.8)	41(87.2)	0.267 [¶]	1.61	0.682-3.792
Yes	20(7.9)	232(92.1)			
Catheter use time					
Greater than or equal to 72 hours	24(8.5)	260(91.5)	0.628 [¶]	0.63	0.165-2.435
Less than 72 hours	2(13.3)	13(86.7)			

RR - Relative Risk; CI - Confidence Interval; †p-value - Significance level; ‡This variable excluded 1 peripheral intravenous catheterization that was performed in the jugular because there was no extravasation; ¶UL = upper limbs; ¶¶LL = lower limbs; ¶¶¶Fisher's exact test; ¶¶¶¶Pearson's chi-square test.

the data may enhance the use of interventions that promote their safety when using intravenous therapy, reducing damage resulting from associated complications.

It may also encourage using technologies that facilitate visualization, clinical assessment and selection of the venous network, as well as dressings that

contribute to longer permanence of the intravenous catheter in situ and removal at the end of intravenous therapy.

Extravasation occurrence in peripheral intravenous catheterization performed in children and adolescents reached a rate of 8.7%, being in the range observed in national and international literature in the pediatric area, which varies from 1.79% to 78%.^(9,12-15) Although the extravasation rate in children is in agreement with national and international literature, it is believed in the need to establish clinical care based on scientific evidence to promote a safe practice, and that measures to prevent this complication in children are taken, thus promoting patient safety. In this sense, carrying out safe practices guarantees quality in health care reduces adverse event occurrence and hospitalization time.⁽¹⁶⁾

In the present study, prolonged peripheral intravenous therapy use was a risk factor for extravasation occurrence in children and adolescents with cancer. Thus, being hospitalized for more than seven days increased the risk of the complication by five times when compared to children and adolescents who were hospitalized for a shorter period of time (CI=[2.36 – 10.87]).

This data is in agreement with a study carried out at a Neonatal Intensive Care Unit in Rio de Janeiro, Brazil, in which 76% of newborns who received peripheral intravenous therapy for up to 20 days had complications, such as infiltration (79.2%), phlebitis (16.7%) and extravasation (4.2%).⁽¹⁴⁾ Intravenous catheter use time was a risk factor for extravasation ($p < 0.001$)⁽¹⁷⁾ and catheter removal due to complications, including infiltration or extravasation, occlusion, thrombophlebitis, suspected infection and wound at the catheter insertion site, in the average period of use of 4 days ($p < 0.001$) in neonates.⁽¹⁸⁾

Other studies carried out with children showed that previous intravenous therapy use for more than five days is a factor that predisposes infiltration occurrence,⁽¹⁹⁾ as well as peripheral intravenous catheter use time (on average 11 days).⁽²⁰⁾ Research carried out with children that analyzed the cumulative risk for infiltration occurrence according to

the time of peripheral intravenous device use, it was found that in 24 hours of catheter use the risk increases by 1.5%, to 9.6% at 72 hours and 32% at 120 hours.⁽²¹⁾

However, a study carried out with adults using non-cytotoxic drugs showed that the time of peripheral intravenous catheter use (≥ 72 hours) was not an associated factor for extravasation occurrence ($p = 0.054$).⁽²²⁾

A randomized controlled clinical trial carried out with adults in need of peripheral intravenous therapy, which analyzed the difference between the use of two types of catheters complication occurrence, observed that, for infiltration occurrence, the control group, which used the short and flexible catheter showed lower survival after the third day, while the experimental group, which used the catheter with complete safety, showed a longer permanence time (maximum of 7 days), despite not showing statistical significance between the groups ($p = 0.1650$).⁽²³⁾

A global study with a secondary analysis of 4,206 peripheral intravenous catheterization in hospitalized children found in a multivariate analysis that predictors for complication occurrence were age younger than two years (odds ratio - OR > 1.58 ; CI=[1.2–2.1]) and use time (OR > 1.9 ; CI=[1.3–2.6]).⁽²⁴⁾ Data from a meta-analysis⁽²⁵⁾ of 9 clinical, randomized and controlled trials involving 7,412 participants, without specifying the age group and type of treatment used, showed that there is moderate certainty evidence that infiltration and perhaps extravasation is less when the peripheral intravenous catheter is routinely withdrawn; and moderate certainty evidence that clinically indicated removal is likely to reduce device-related costs. However, it is not recommended to change peripheral intravenous catheters in children routinely.⁽²⁶⁾

Another variable that showed a statistical association for extravasation occurrence in children and adolescents with cancer was history of difficulty in obtaining peripheral intravenous catheterization, and the risk among the exposed group was 2.62 times greater (CI=[1.18 – 5, 80]). This statistical significance related to history of difficulty for peripheral intravenous catheterization found in the study

may be related to the fact that children need several catheterizations for cancer treatment follow-up, and the medications and fluids with extreme pH and osmolarity used cause greater venous fragility and consequently difficulty in obtaining venous access.

Thus, the difficulty in venous catheterization is directly related to prolonged intravenous therapy use, since the time of therapy contributes to the depletion of the venous network and leads to the occurrence of multiple punctures.⁽²⁷⁾ The literature highlights four characteristics related to extravasation occurrence, such as extreme pH, osmolarity, cytotoxicity, and vasoactivity. These extravasation risk facilitators take into account the fluid infused in the catheters, which may change as a result of the concentration of the drug and the diluent used in intravenous therapy.⁽²⁸⁾

In a study carried out in China with children, a multivariate analysis found that using fluids with high osmolarity ($p=0.011$), poor condition of the venous network ($p=0.013$) and excessive infusion of fluids per day greater than 1,000 ml ($p=0.043$) were risk factors for extravasation.⁽¹³⁾

It was also observed that children who had already had an episode of intravenous therapy complication had four times greater risk for extravasation occurrence, when compared to children who had no complications ($CI=[1.06 - 15.38]$).⁽¹³⁾

A Brazilian study, carried out with 388 children and adolescents in a hospital in São Paulo, showed a statistical association between having a history of infiltration and phlebitis with infiltration occurrence ($p=0.001$). Previous occurrence of phlebitis and infiltration accounted for 5.6% and 22.2%, respectively, in children who developed infiltration in this study.⁽¹⁹⁾

Association between history of complications and extravasation can also be explained by the various peripheral intravenous catheterization attempts and the fragility of the venous network during cancer treatment, when using the peripheral intravenous route in children and adolescents.

It was verified that vein visibility and palpability continued to present a statistical association for extravasation occurrence in children who presented these characteristics. Considering that children and

adolescents who did not have visible veins had a 3.36 times greater risk for complication occurrence ($CI=[1.61 - 7.02]$), while those who did not have palpable veins had a risk of 2.26 times greater for developing the outcome ($CI=[1.07 - 4.77]$).

In a study carried out with women who had uterine cancer, the characteristics of the vascular network at the beginning and at the end of treatment were verified, with all participants having visible veins at the beginning and at the end; 80% of them remained visible; 80% were palpable at the beginning of treatment, being reduced to 70% at the end.⁽²⁹⁾ Another survey carried out with women with breast cancer undergoing chemotherapy observed that 60% had visible veins and 100% had palpable veins.⁽³⁰⁾

Conclusion

A high incidence of extravasation was observed in the studied sample, associated with previous intravenous therapy use, history of complications, history of difficulty in peripheral intravenous catheterization, lack of vein visibility and palpability. It is proposed that further studies be carried out on risk factors for extravasation occurrence in children and adolescents with cancer so that it is possible to compare with the results found in this research.

Collaborations

Santos LM, Cerqueira LF, Almeida AHV, Silva BSM, Gomes and Silva CS, Avelar AFM contributed to study design, data interpretation and analysis, article writing, relevant critical review and final approval of the version to be published.

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