

## PHLEBITIS ASSOCIATED WITH PERIPHERAL INTRAVENOUS CATHETER AMONG IN-PATIENTS OF A HOSPITAL IN VALE DO PARAÍBA

FLEBITE EM ACESSOS VENOSOS PERIFÉRICOS DE PACIENTES DE UM HOSPITAL DO VALE DO PARAÍBA

FLEBITIS EN EL ACCESO VENOSO PERIFÉRICO DE PACIENTES DE UN HOSPITAL DEL VALE DO PARAÍBA

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### ABSTRACT

Phlebitis is an acute inflammation of the vein that causes swelling, pain, discomfort, redness around the puncture and a palpable cord-like vein. The objective of the study was to identify the incidence or absence of phlebitis in patients in a general hospital, the complications associated with venipuncture and the length of time the catheters remained in situ. This is a prospective quantitative study with an exploratory and descriptive nature which analyzed 76 patients. Of these, 24 (31.6%) developed phlebitis; 10 (41.6%) were classified as Grade I phlebitis, 9 (37.5%) as Grade II, 4 (16.7%) as Grade III and 1 (4.2%) as Grade IV. The length of time the device remained in situ ranged from 3 to 120 hours with an average of 49 hours. Nursing has an important role in preventing complications associated with peripheral intravenous access. Furthermore, the risk of phlebitis should be carefully evaluated.

**Keywords:** Phlebitis; Peripheral Catheterization; Nursing Care; Nursing.

### RESUMO

A flebite caracteriza-se por uma inflamação aguda da veia, causando edema, dor, desconforto, eritema ao redor da punção e um "cordão" palpável ao longo do trajeto. Objetivou-se identificar a presença ou ausência de flebite em pacientes internados em um hospital geral, bem como os fatores que influenciam as complicações em punção venosa e o tempo de permanência dos cateteres intravenosos periféricos. Trata-se de um estudo prospectivo, quantitativo, do tipo descritivo-exploratório, que analisou 76 pacientes. Destes, 24 (31,6%) evoluíram com flebite, sendo que 10 (41,6%) foram classificados como flebite grau I, nove (37,5%) grau II, quatro (16,7%) grau III e apenas um (4,2%) como grau IV. O tempo de permanência do cateter variou entre três e 120 horas, com a média de 49 horas. A Enfermagem desenvolve importante papel na prevenção das complicações associadas à manutenção do acesso venoso periférico, devendo avaliar criteriosamente os riscos de flebite.

**Palavras-chave:** Flebite; Cateterismo Periférico; Cuidados de Enfermagem; Enfermagem.

### RESUMEN

La flebitis se caracteriza por una inflamación aguda de la vena, causando hinchazón, dolor, malestar, enrojecimiento alrededor de la punción, y una "cadena" palpable a lo largo del trayecto. El objetivo de este estudio fue identificar la presencia de flebitis en pacientes de un hospital general, así como los factores que influyen en las complicaciones de la punción venosa y el tiempo de permanencia de los catéteres venosos periféricos. Se trata de un estudio prospectivo, cuantitativo, descriptivo y exploratorio, que analizó 76 pacientes. De este total 24 (31,6%) tuvieron flebitis: 10 (41,6%) sujetos fueron clasificados como flebitis grado I, nueve (37,5%) grado II, cuatro (16,7%) Grado III y sólo uno (4,2%) como grado IV. El tiempo de uso de los catéteres varió de tres a 120 horas, con un promedio de 49 horas. Enfermería tiene un papel importante en la prevención de complicaciones asociadas con el acceso venoso periférico y debe evaluar cuidadosamente los riesgos de la flebitis.

**Palabras clave:** Flebitis; Cateterismo Periférico; Atención de Enfermería; Enfermería.

## INTRODUCTION

Phlebitis is one of the most common complications of peripheral venous catheters (PVC). It is characterized by an acute inflammation of the vein causing swelling, pain, discomfort, redness around the puncture and a palpable cord-like area along the vein. If not treated early, phlebitis may delay hospital discharge; it can cause septicemia and is often related to poor aseptic technique or catheter contamination during manufacture, storage or use.<sup>1</sup>

Inflammation may be influenced by the preparation of the puncture, the patient's clinical condition, the characteristics of the vein, drug incompatibility, diameter, catheter size, length of the line and material as well as insertion of PVC for prolonged periods.<sup>1</sup>

In clinical practice complications associated to venous punctures are often underestimated by the nursing staff. This is confirmed by a study which demonstrated that the incidence of phlebitis is around 10.5%, i.e. twice the 5% expected by the *Intravenous Nurses Society* (2000). In addition to that, the researchers uncovered another worrying factor: the length of time the venous access remains in situ is 2 to 216 hours against the 72 to 96 hours recommended by the *Centre for Disease Control and Prevention* (2005).<sup>2,3</sup>

Nursing care of a venous access can be classified as: satisfactory (grade 0), when the device is securely fastened, clean and the patient is not in pain; poor (grade 1), if the device moves in the vein when shifting the arm and/or there is blood inside the catheter or dressing; and very poor (grade 2), if the catheter moves in the vein and is secured by the dressing for more than five days.<sup>4</sup>

The prevention of complications depends on the choice of larger veins or the use of a central access for the administration of hypertonic solutions; the adoption of the smallest device for infusion; the rotation of the puncture site every 72 hours; an adequate fixation to prevent mechanical irritation; punctures should be performed by qualified professionals; proper hand washing technique; protocol on irritant medications and hypertonic solutions; replacement of solution bottles every 24 hours.<sup>1</sup>

Therefore, to avoid complications, nurses should bring their knowledge of anatomy, physiology, microbiology and pharmacology and promote continuing training activities aiming at the education of the nursing team.<sup>5</sup>

Venepuncture procedures are generally performed by nursing staffs. This study aimed at identifying the occurrence or absence of phlebitis in patients admitted to a general hospital, the complicating factors and the length of time the peripheral intravenous catheters remained in-situ.

## METHODOLOGY

This is a prospective quantitative study with an exploratory and descriptive nature that used convenience samples of patients at a hospital in Vale do Paraíba – Brazil.

The researchers used data collection tools containing patient information – such as lifestyle (alcohol and tobacco consumption), peripheral venous infusion, type of dressing, reasons for catheter removal and assessment of the incidence and classification of phlebitis.

Data was collected from January to March 2010. Interviews were scheduled in advance by telephone at time and date arranged by the institution. All research subjects signed an Informed Consent Statement after being informed about the objectives of the study.

Data was collected through direct observation of venous punctures and analysis of the patients' record.

Inclusion criteria were: patients over 18 years of age, conscious or accompanied by a responsible adult, with peripheral venepuncture who agreed to participate in the research. Patients that appeared confused, sedated or presented psychiatric disorders as well as those who had not signed the Informed Consent Statement were excluded.

The results were tabulated electronically, quantitatively analysed and presented in tables.

The research was approved under protocol no. H230/CEP2009 by the Ethics in Research Committee of the University of Vale do Paraíba in March 2010.

## RESULTS

### SOCIODEMOGRAPHIC AND PERIPHERAL VENIPUNCTURE CHARACTERISTICS OF THE SAMPLE

The research sample included 76 patients, 33 (43.4%) were female and 43 (56.6%) male; the prevalent age group was between 20 to 30 years (19.7%) and over 70 years of age (19.7%); 42 (55.3%) patients were white, 12 (15.8%) brown and 22 (28.9%) black (Table 1).

According to Table 1 the patients' lifestyle habits were as follows: 7 (9.2%) reported alcohol consumption; 5 (6.6%) were smokers; 10 (13.2%) combined alcohol and tobacco and 54 (71%) denied the consumption of alcoholic beverages and tobacco.

Regarding chronic diseases, 19 (25%) patients had hypertension; 10 (13.2%) had diabetes mellitus; 7 (9.2%) had diabetes mellitus and hypertension; 8 (10.5%) had heart disease; 6 (7.9%) reported other diseases; 26 (34.2%) did not report any chronic disease (Table 1).

The length of stay in hospital varied from 1 to 22 days, with an average of 9 days.

According to Table 2, as per the venous punctures, 49 (64.5%) of the catheters were salinized and 27 (35.5%) were used for saline infusion; 31 punctures (40.8%) were performed with 22G catheter, 2 (2.6%) with 18G, 18 (23.7%) with 20G, 7 (9.2%) with 24G. In 18 (23.7%) cases it was not possible to reg-

ister the diameter of the catheter due to the bandaging of the upper limb and the lack of record in the patient's report.

Table 1 - Distribution of categorical variables of the 76 patients studied – São José dos Campos, 2010

Variable	No.	%
<b>Sex</b>		
Female	33	43,4
Male	43	56,6
<b>Age group</b>		
20 – 30	15	19,7
31 – 40	6	7,9
41 – 50	13	17,1
51 – 60	14	18,5
61 – 70	13	17,1
> 71 years old	15	19,7
<b>Race</b>		
White	42	55,3
Brown	12	15,8
Black	22	28,9
<b>Substance use</b>		
Alcohol	7	9,2
Tobacco	5	6,6
Alcohol + Tobacco	10	13,2
None	54	71,0
<b>Chronic diseases</b>		
HTN	19	25,0
DM	10	13,2
HTN + DM	7	9,2
Cardiac disorders	8	10,5
Others	6	7,9
None	26	34,2

Sites used for the insertion of PVC were in 24 cases (31.6%) the back of the hand, in 8 (10.5%) the fist, in 26 (34.2%) in the forearm, and in 18 (23.7%) the cubital fossa (Table 2).

Among the 76 patients analysed, the catheter remained in situ from 2 to 120 hours, with an average of 53 hours.

Dressing of the venous puncture was performed in 31 (40.8%) patients with surgical tape and in 45 (59.2%) with hypoallergenic tape. Of these, 41 (54%) were blood-stained, 8 (10.5%) were wet and 27 were dry (35.5%). (Table 2)

Infiltration occurred in 27 (35.5%) of the analysed cases and was the most frequent reason for the removal of the device. It follows, obstruction in 21 cases (27.6%), hospital discharge in 18 (23.7%), bending in 6 (7.9%) and accidental removal in 4 (5.3%) cases (Table 2).

Table 2 - Distribution of the variables related to catheter use - São José dos Campos, 2010

Variable	No.	%
<b>Type of use</b>		
Salinized	49	64,5
Saline infusion	27	35,5
<b>Teflon catheter</b>		
18 Gauge	2	2,6
20 Gauge	18	23,7
22 Gauge	31	40,8
24 Gauge	7	9,2
No record	18	23,7
<b>Puncture site</b>		
Back of hand	24	31,6
Fist	8	10,5
Forearm	26	34,2
Cubital tunnel	18	23,7
<b>Duration of catheter in situ</b>		
< 72 hours	55	72,4
≥ 72 hours	21	27,6
<b>Dressing condition</b>		
Dry	27	35,5
Wet	8	10,5
Soiled	41	54,0
<b>Type of dressing</b>		
Surgical tape	31	40,8
Hypoallergenic Tape	45	59,2
<b>Reasons for catheter removal</b>		
Bending	6	7,9
Obstruction	21	27,6
Infiltration	27	35,5
Accidental	4	5,3
Discharge	18	23,7

Venous punctures were performed in 19 (25%) cases by nursing assistants, in 52 cases (68.4%) by practical nurses and in 5 (6.6%) cases by registered nurses.

As for the quality of nursing notes, 58 (76.3%) were complete (including date, time, puncture site and description and diameter of the device), and 18 (23.7%) were incomplete.

## DESCRIPTION OF CASES WITH PHLEBITIS

Of the 76 patients interviewed, 24 (31.6%) developed phlebitis. Of these, 11 (45.8%) occurred in women and 13 (54.2%) in men; in 14 (58.4%) cases individuals were white, 5 (20.8%) were brown, and 5 (20.8%) were black.

Signs of phlebitis appeared among 15 (62.5%) patients aged less than 60 years and in 9 (37.5%) over 60 years.

Venous punctures were performed with 18G devices in 2 (8.3%) cases, with 20G in 6 (25%) cases, 22G in 8 (33.3%), 24G in 5 (20.9%); 3 (12.5%) patients could not be evaluated as there was no information available in the patient record.

The average length of time of the catheter in situ was 49 hours, ranging from 3 to 120 hours.

As for the degree of phlebitis, 10 (41.6%) cases were classified as grade I, 9 (37.5%) as grade II, 4 (16.7%) as grade III and 1 (4.2%) as grade IV (Table 3).

Table 3 - Distribution of phlebitis incidence according to Phlebitis Scale - São José dos Campos, 2010

Classification	No.	%
Grade I	10	41,6
Grade II	9	37,5
Grade III	4	16,7
Grade IV	1	4,2
Total	24	100

Regarding the insertion site, 8 (33.3%) punctures were at the back of the hand, 3 (12.5%) in the fist, 9 (37.5%) in the forearm and 4 (16.7%) in the cubital fossa.

Among the punctures that resulted in phlebitis, 2 (8.3%) had wet dressings; 16 (66.7%) were blood-stained; 6 (25%) were clean and dry. Among these, 9 (37.5%) were removed because of obstruction, 14 (58.3%) due to infiltration and one (4.2%) to bending of the catheter.

Among the professionals who performed the venepuncture, 14 (58.3%) were practical nurses and 10 (41.7%) nursing assistants. No punctures were performed by registered nurses.

Regarding the nursing notes, 15 (62.5%) were complete and 9 (37.5%) incomplete.

Among the infused medications, we highlight serum electrolyte and analgesics in 13 (54.1%) cases; antibiotics in 6 (25%) cases; antiemetic in 3 (12.5%) and anticonvulsant and bronchodilator one case each (4.2%).

## DISCUSSION

The percentage of phlebitis occurrence in the sample was 31.6%, which is high if compared to the 5% expected by the Intravenous Nurses Society<sup>2</sup>. Rates obtained in other studies were similar to those found in the present investigation: a rate of 26% among 300 patients analysed with no statistically significant relationship between the occurrence of complications and the variables age, diameter of the catheter and trauma.<sup>6</sup>

The relationship between sex, skin colour and phlebitis is controversial, being approached differently among the available scientific studies.<sup>7-9</sup>

In the present study, white male patients presented the highest rates of phlebitis.

Being older than 65 years of age is considered a predisposing factor for the incidence of phlebitis.<sup>4,10</sup>

Other aspects to be observed in the aetiology of phlebitis are the diameter, size, length, material and long-term use of a peripheral venous catheter<sup>1</sup>, as well as the quality of its maintenance.<sup>8,11</sup>

A previous research demonstrated that the 20 gauge catheter is the most used and that most professionals do not wear gloves during intravenous puncture, with classification of nursing care as grade 1 (unsatisfactory) and grade 2 (very unsatisfactory)<sup>4</sup>.

Catheters containing metallic needles, Teflon and polyurethane catheters are currently available on the market.<sup>3</sup> According to the literature incidence of phlebitis with Teflon catheters is higher than with polyurethane catheters. These have a radiopaque material added for better radiographic visualization. Metallic catheters are used in short-term therapies and present low levels of inflammation and phlebitis; Teflon catheters are long-term catheters and allow more mobility to the patient.<sup>1</sup>

Among subjects who developed phlebitis, the average length of time that a catheter was left in-situ was 49 hours, ranging from 3 to 120 hours. This is partially against the recommendation of the Centre for Disease Control and Prevention, whose ideal period ranges from 72 to 96 hours.<sup>3</sup>

However, systematic review on the subject revealed that scientific literature does not seem to be conclusive as to the benefits of catheter replacement between 72 and 96 hours as recommended.<sup>12</sup> This comes against recent randomized clinical trial that evaluated 362 patients allocated in two groups. In the first group, catheter replacement occurred after 72 hours (n = 177), and, in the second, when clinically indicated (n = 185). There were no differences in the rates of infiltration, phlebitis or accidental removal between the groups. In the clinically-indicated replacement the catheter was used for five or six days without complications. Thus, the authors conclude that, although more studies are needed, routine replacement of intravenous catheters increases patient discomfort as well as costs associated with care and do not reduce the incidence of complications.<sup>13</sup>

Previous research found infiltration as the main reason for the removal of the intravenous device<sup>4</sup>, which corroborates the data of the present investigation.

The signs of phlebitis can be graded on a scale from one to four, according to the signs and symptoms presented by the patient.<sup>2</sup> In paediatric literature, there is prevalence of grade I cases, i.e. those in which patients have erythema, with or without local pain or swelling, no induration, and no palpa-

ble fibrous cord; grade II has the same symptoms of phlebitis grade I plus induration.<sup>11</sup> In the present study phlebitis grade I and II predominate.

Access of forearm veins, which have a larger diameter, may contribute to lower rates of phlebitis in the region.<sup>1</sup> Accordingly, a review of the literature found that cubital veins are associated with reduced rates of phlebitis when compared to hand veins.<sup>9</sup>

Painkillers are second only to antibiotics among risk factors leading to phlebitis<sup>8</sup>. Study conducted in São Paulo demonstrated that incorrect dilutions of medications interfere with inflammatory processes such as phlebitis.<sup>10</sup>

Regarding the nursing notes, the present study observed that 37.5% were inadequate. Nursing notes are extremely important as a means of communication among nursing staff, although professionals do not often appreciate the importance of the process.<sup>14</sup> Poor quality of nursing records was also observed in a previous study in which the authors sought to identify factors that facilitate or hinder the learning of such important tool. Although the subject is addressed at different stages of the nursing course, there is a dichotomy between theory and practice. Furthermore, difficulties arising from primary and secondary education deficiencies reflect on the poor quality of written communication among these professionals.<sup>15</sup>

It is important to highlight the influential role of the registered nurse as leader of the nursing team in the organization of nursing care quality and as the professional responsible for continuing education of assistants and technicians. As demonstrated in this study, the latter were responsible for 93.4% of the venepunctures analysed and, unfortunately, for all those culminating in phlebitis.

Of the 6.6% of venous punctures performed by registered nurses none developed phlebitis. Thus, the importance of the organization of the nursing team must be redeemed. Standardization of the technique combined with the performer's skill may reduce complications and increase customer satisfaction.

Regarding nursing interventions, this research observed that prevention and detection of phlebitis was inadequate. This aspect indicates poor nursing performance, since registered nurses delegate venous puncture to auxiliary and technical nursing team members and apparently do not supervise the process or venous access care and maintenance.

A previous study classified nursing care related to catheter maintenance as 60% unsatisfactory<sup>4</sup>. This fact points to the need for constant attention of the nursing staff regarding venepuncture technique and catheter maintenance, as to avoid possible complications.

The authors demonstrated that procedures like hand washing before and after care, observation of the patient complaints and reactions and patient orientation on post puncture care are generally unsatisfactory.<sup>5</sup>

Venous puncture dressing was performed with surgical tape in 31 (40.8%) patients and with hypoallergenic tape in 45 (59.2%) ones.

The surgical dressing procedure can sometimes unwittingly lead to removal of the peripheral venous device, but it has not yet been linked to the occurrence of phlebitis.<sup>11</sup>

Regarding the kind of dressing, the main advantage of polyurethane dressings (transparent) seems to be that such dressings need less changes compared to hypoallergenic or surgical tape ones, which require changes every 24 hours.<sup>16</sup> Besides, polyurethane dressings bring security to the nursing team, for they provide direct visualization of peripheral access. A major disadvantage is their higher cost.

Nursing teams evolved from their empirical knowledge, seeking support on theoretical progress based on health care experience, teaching, management and research, which help to deliver a safer care. They should act to prevent and reduce infection related to PVC.<sup>1,17</sup>

## CONCLUSION

The present research concluded that:

- phlebitis occurred in 24 (31.6%) of the 76 patients investigated; 37.5% of them were grade I;
- blood was found in dressings of the 16 (66.7%) patients who developed phlebitis;
- among patients with phlebitis, 8 (33.3%) venous punctures were performed with 22G catheter and in 6 (25%) cases with 20G catheters;
- the length of time the device remained in-situ in the subjects who developed phlebitis ranged from 3 to 120 hours, with an average of 49 hours.

## FINAL CONSIDERATIONS

It is the nurse's responsibility to carefully assess the risks of phlebitis, to inform and protect patients, as well as to inform the whole nursing team about possible complications and propose a care plan. Therefore, nurses should combine theoretical knowledge with technical skills.

Right now, it is important to highlight the need of nursing teams able to perform venous punctures, take care and daily assess patients undergoing punctures and intravenous therapies. Nurses must have a prominent role in combining required skills to provide quality care based on the best scientific evidence.

Further scientific studies are necessary to broaden knowledge on prevention and care of intravenous complications such as phlebitis.

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