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RESEARCH

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Risk Factors for Patients Showing Arteriovenous Fistula Recurrent Failure

Fatores de Risco para Pacientes com Falência Recorrente de Fístula Arteriovenosa

Factores de Riesgo para Pacientes con Falencia Recorrente de Fiesta Arteriovenosa

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ABSTRACT

Objective: The study's purpose has been to identify the risk/conditioning factors for Arteriovenous Fistula Failure (AVF), and also to analyze the care required for handling the arteriovenous fistula. **Methods:** It is a pilot study that was carried out with 10 participants showing a history of AVF. The data were collected through a form and analyzed by descriptive statistics. This research was accepted by the Research Ethics Committee from the Pedro Ernesto University Hospital, under the *Certificado de Apresentação para Apreciação Ética (CAAE)* [Certificate of Presentation for Ethical Appreciation] No. 64150117.2.0000.5259. **Results:** The average age was 57.3 years old. Arterial hypertension was the most common prior disease among the participants. Hypotension and repeated punctures were the most frequent risk/conditioning factors. **Conclusion:** A relevant percentage of the participants had little education and reported having had some complication in the AVF. Hypotension, as a conditioning factor for AVF failure, remained frequent among the participants. It was observed that a large part of the participants have undergone dialysis treatment previously.

Descriptors: Arteriovenous fistula, Renal dialysis, Chronic renal failure, Nursing care.

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RESUMO

Objetivo: Identificar os fatores de risco/condicionantes para a falência da fístula arteriovenosa e analisar os cuidados necessários para manutenção da fístula arteriovenosa. **Métodos:** Estudo piloto realizado com 10 participantes com histórico de falência de fístula arteriovenosa, com dados coletados por meio de formulário e analisados por estatística descritiva, aceito pelo Comitê de Ética em Pesquisa do Hospital Universitário Pedro Ernesto, com número do CAAE nº 64150117.2.0000.5259. **Resultados:** A idade média foi de 57,3 anos. A hipertensão arterial foi a doença prévia mais comum encontrada entre os participantes. A hipotensão e as punções repetidas foram os fatores de risco/condicionantes com maior ocorrência. **Conclusão:** a maioria dos participantes possuíam baixa escolaridade e informaram ter tido alguma complicação na FAV. A hipotensão como fator condicionante para falência das FAV, permaneceu de forma frequente entre os participantes. Observou-se que grande parte já realizava tratamento dialítico prévio.

Descritores: Fístula Arteriovenosa, Diálise Renal, Insuficiência Renal Crônica, Cuidados de Enfermagem.

RESUMEN

Objetivo: Identificar los factores de riesgo / condicionantes para la quiebra de la fístula arteriovenosa y analizar los cuidados necesarios para el mantenimiento de la fístula arteriovenosa. **Métodos:** Estudio piloto realizado con 10 participantes con historial de fallo de fístula arteriovenosa, con datos recogidos por medio de formulario y analizados por estadística descriptiva, aceptado por el Comité de Ética en Investigación del Hospital Universitario Pedro Ernesto, con número del CAAE nº 64150117.2.0000.5259. **Resultados:** La edad media fue de 57,3 años. La hipertensión arterial fue la enfermedad previa más común entre los participantes. La hipotensión y las punciones repetidas fueron los factores de riesgo / condicionantes con mayor ocurrencia. **Conclusión:** la mayoría de los participantes tenían baja escolaridad e informaron haber tenido alguna complicación en la FAV. La hipotensión como factor condicionante para la quiebra de las FAV, permaneció de forma frecuente entre los participantes. Se observó que gran parte ya realizaba tratamiento dialítico previo.

Descriptorios: Fístula Arteriovenosa, Diálisis Renal, Insuficiencia Renal Crónica, Atención de Enfermería.

INTRODUCTION

Renal failure is considered a systemic disease that occurs when the kidneys are unable either to remove the metabolic products that are produced by the body or to develop its regulatory function.¹ In this case, it is necessary to begin treatment that replaces those functions that were impaired.

Among the available treatments, hemodialysis (89.4%)² is the most used, which cleans and filters the blood that the kidney in injury is incompetent to perform. Through the capillary of the machine it is possible to eliminate the slag and balance the serum electrolytes helping to maintain the stabilization of the systemic arterial pressure. For replacement therapy to occur, temporary or permanent venous access is necessary through the catheter and an Arteriovenous Fistula (AVF), respectively.³ The AVF is a permanent access made in the surgical center with to attach an artery to a vein. The produced anastomosis allows the performance of punctures, where a connection of the

patient's circulation is created to the external hemodialysis circuit.⁴

The use of AVF in relation to the use of long-stay venous catheters is considered, considering its advantages in patients with Chronic Renal Failure (CRF).⁵ They are also recommended even before the patient needs hemodialysis, since AVF have a period of 30 days for maturation, which is considered the time for the vein to acquire flow, diameter and path necessary to support the dialysis. Among the benefits, the AVF are the ones that most resemble an ideal access, and can be considered an access capable of providing a satisfactory flow, easy to obtain and with a reduced amount of complications such as thrombosis and infection.⁵

It is necessary to start the care with the AVF before its construction in addition, to continue during its accomplishment, period of maturation and use in the treatment of hemodialysis. The contribution of the nurse to the patients is fundamental in the pre, post-construction period and in the complications associated with the AVF, being considered of extreme importance in the conservation of the access quality.⁶

Guidance and education can be used as a basis for establishing a care relationship in an effective and effective way. It is necessary to stimulate the clear communication between client and nursing team to encourage their action in the self-care, besides contributing to the reduction of possible damages to the patient.⁷ In this case, damages are understood as situations that can lead to a dysfunction of the AVF, and can be identified, avoided or solved from the development of competences, created after the development of self-care behaviors has been stimulated.⁶

Complications of AVF, in addition to being costly, sometimes generate hospitalizations and catheter passages for hemodialysis in a short time. AVFs are essential for prolonging and stabilizing the life of patients with end-stage renal failure.⁸ Hemodynamic changes, hydroelectrolytic disorders and renal dysfunction become incompatible to maintain life, requiring hemodialysis to be adjusted in order to meet the mentioned needs.

It is important the presence of the nurse who holds scientific knowledge, use his educator's competence to sensitize his patients regarding restrictions and recommendations in the treatment, instigating changes that will lead to the prevention of possible complications.¹

The nurse should explain doubts about the manipulation of AVF, where the patient should always be instructed on the daily exercise of rubber ball compression; changes that must be observed at the site of the fistula, such as heat, pain, erythema, and edema; palpation and perception of the tremor; in addition to alerting them to avoid venous punctures and checking the blood pressure in the fistula arm.⁹

This study is able to contribute to the identification of

factors that are influencing AVF failure, so that it is possible to formulate and implement measures to reduce possible complications and damages.

Given the aforementioned and considering that patients bearing AVF are a population under risk of complications, it becomes important to investigate the reasons that may prevent the failure of the first AVF of chronic kidney disease bearing patients.

Hence, this study aimed to identify the risk/conditioning factors for AVF, and to analyze the care required for handling the arteriovenous fistula as well.

METHODS

It is a pilot study that was carried out in a vascular surgery ward of a University Hospital, belonging to the Sentinel Network, and located in *Rio de Janeiro* city, State of *Rio de Janeiro*, Brazil.

The sampling was intentional, consisting of 10 hospitalized patients for the creation of new AVF. Inclusion criteria were individuals of all ages, of both genders, showing a history of AVF failure. Individuals who were unable to answer questions due to cognitive deficit and disorientation who did not have companions were excluded from the study.

Data collection was performed during the four-month period of 2017, through a form constructed with primary data, structured from a theoretical reference of the information that involved risk criteria for AVF failure. The first part of the instrument is related to socio-demographic information (age, gender, and schooling) and the second part investigated issues involving vascular access failure (AVF maturation time, hemodialysis time, complications, self-care and specific care guidelines received from the moment of the decision of the creation of the AVF to the post-production of the AVF).

The obtained data were organized in spreadsheets in Microsoft Excel® version 2010 and, later, analysis through descriptive statistics.

It is important to point out that the data collection took place after the evaluation and approval by the Research Ethics Committee from the Pedro Ernesto University Hospital, under the *Certificado de Apresentação para Apreciação Ética (CAAE)* [Certificate of Presentation for Ethical Appreciation] No. 64150117.2.0000.5259 of 05/04/2017, being in accordance with the Resolution No. 466/2012, which regulates researches involving human beings.

RESULTS AND DISCUSSION

Ten patients participated in the study. The characterization of the subjects in terms of gender, age and schooling (Table 1), as well as the time of dialysis and other chronic diseases

allowed a better understanding of the admitted clientele showing a history of AVF failure.

Table 1: Socio-demographic profile of patients bearing arteriovenous fistula failure who were attended at a University Hospital, State of *Rio de Janeiro*, 2017.

Variable	n = 10
Gender	
Female	5
Male	5
Age group	
18 - 40 years old	2
41 - 60 years old	3
More than 60 years old	5
Schooling	
Illiterate	2
Incomplete elementary school	5
Complete high school	2
Complete college	1

The participants' age ranged from 37 to 81 years old, with an average of 57.3 years old. Regarding the educational level, 7 patients were illiterate or had incomplete elementary education, followed by 2 with complete secondary education and only 1 patient had completed higher education.

Considering all the study participants, 7 patients had been undergoing dialysis for more than 5 years, although the maximum time between participants was 16 years. Systemic Arterial Hypertension (SAH) was the most common comorbidity, in which 6 patients had only SAH, and 3 had both SAH and *Diabetes Mellitus* (DM).

At some time of AVF use, 9 patients had one or more complications of these fistulas. Thus, the risk/conditioning factors were studied in these patients who presented AVF failure (Table 2).

Table 2: Risk/conditioning factors in patients bearing arteriovenous fistula failure who were attended at a University Hospital, State of *Rio de Janeiro*, 2017.

Risk/conditioning factors	n = 10*
Hypotension during the AVF use	9
Previous dialysis treatment	8
Repeated puncture in the AVF	6
Trauma in the AVF site	1
Infection	1

*Considering that the same patient had more than one factor, the risk/conditioning factors found do not total 10.

Concerning the risk/conditioning factors for AVF failure, 8 participants were already undergoing dialysis treatment before the first AVF was made. However, it was possible to identify that the occurrence of hypotension (8 cases) and repeated punctures in the AVF (6 cases) are factors that the health professionals have a direct association, since they are assisting patients at the time of hemodialysis. The trauma

factors at the site of AVF and infection may be related to health care, but they may also be linked to aspects of self-care.

Two participants had the first AVF made in the dominant upper limb. There was no bleeding and early puncture in the AVF, in any case reported, in other words, during the maturation period. Nonetheless, 2 participants lost AVF during this period because they did not reach maturation.

Considering all the study participants, 8 patients were already undergoing dialysis, where 2 of them had four histories of AVF failure. Therefore, the distribution of self-care performed by all AVF patients was listed here (Table 3).

Table 3: Distribution of the self-care performed by patients bearing arteriovenous fistula failure who were attended at a University Hospital, State of Rio de Janeiro, 2017.

Self-care performed during the maturation	n = 10*
Exercising with malleable object	10
Do not allow the administration of medicines on the AVF member	10
Reducing sodium intake	10
Do not do housework	9
Avoiding excess weight	9
Do not allow the collection of blood samples on the AVF member	9
Do not allow the blood pressure measurement in the AVF member	8
Loose dressing during use	8
Checking the quiver	7
Do not sleep over your arm	3

*Considering that the same patient had more than one factor, the distributions found do not total 10.

It was observed that the participants of the study performed self-care actions, since they observed a high number of activities developed, as listed in Table 3. Observing these aspects, 8 patients responded that they received guidance by the multiprofessional team where, as follows: 3 patients were medically oriented, a nurses and social workers, 4 exclusively by registered nurses and 1 only by physicians. Considering all the participants investigated, 5 reported having either received some informative material or written guidelines by the health professional.

There was a prevalence of clients over 60 years old and the average age did not differ from other studies.^{5,10-11} Age progression makes people more susceptible to pathological processes, thus increasing the possibility of some disease arising with aging.

The educational level was predominant in the participants with low education, evidenced by 7 patients who were illiterate or had an incomplete elementary education. A study developed in the Nephrology sector of a Hospital in Pernambuco State that aimed to identify the knowledge, attitude, and practice of patients with chronic renal failure on arteriovenous fistula found that 56.6% of the individuals had incomplete primary education.¹²

As for comorbidities, there was a prominence, especially for SAH, which was present in 9 patients of this study. Similar

findings were found in other studies.^{5,13,14} A research performed in João Pessoa city (Brazil) found DM as the most common underlying disease.¹³ Patients with chronic kidney disease were diagnosed with hypertension (33.8%) and DM (28.5%) as major underlying diseases in the last 11 years.¹⁵

SAH and DM cause slow and progressive lesions in the organs, which are developed when treatment is neglected or unaware of its existence, since they are silent diseases and lead to chronic renal failure.⁷ Hypertensive and/or diabetic individuals participate in the group of patients risk for developing chronic kidney disease, which shows a Brazilian problem,¹⁶ and it was also observed here.

Hypotension is an important risk factor for early AVF failure, which can be considered as a probable cause for fistula failure. Hemodialysis may cause hypotension, coagulation disorders and lead to early AVF occlusion, significantly increasing the chance of failure of access within 30 days.⁵ Hypotension, as well as repeated AVF punctures, have been reported frequently by participants in this study. Blood pressure should be closely monitored by the nurse and staff during hemodialysis sessions, preventing a marked fall characterized by hypotension and identifying the unique needs of each patient.¹⁷

It was identified that 8 patients already underwent hemodialysis prior to the formation of AVF, which is an unfavorable element related to definitive vascular access for hemodialysis, since surgery is recommended in advance of hemodialysis, since they require a period for the maturation in order to avoid the use of catheters and their complications.^{5,11}

After the preparation of the AVF it is necessary to wait an interval of 4 to 6 weeks for a satisfactory venous dilation to occur, in order to allow an adequate flow of blood to the dialyzer, and thus to be able to initiate the punctures.¹¹

In the maturation period of the access, the fistula tremor should be checked, the dressing should be kept clean, dry and loose.¹⁰ A study carried out with 30 patients recorded that only 3.3% of these patients verified the presence of tremor in the access site.¹² Thrombosis in venous access may occur due to disruption of blood flow when sleeping on the arm and is an important risk factor that should be prevented.¹⁸ Herein, participants performed adequate self-care and had no listed these factors as an issue.

Failures may occur in the AVF maturation period leading to excessive calcification due to the lack of mediators that lead to vasodilation of the artery, easily perceived in diabetic and/or uremic individuals. A skilled and under-qualified team can determine if a fistula has matured.¹⁹ No puncture was performed in any of the participants during the maturation period.

It is preferable to choose the non-dominant arm to make the AVF and thus avoid any effort, such as carrying weight. There should be some other care such as not sleeping over the arm, which may interfere with blood flow in the AVF area; as well as attention to blood pressure values, since one of the causes for the fistula to stop working is the alteration

of this parameter.²⁰ It was verified in the study that only 3 patients reported not having slept over the arm with the AVF, that this action did not seem to be highly valued or followed.

Also regarding self-care with AVF, procedures such as blood pressure measurement, obtaining blood samples, compressive dressings, restraints or use of jewelry on vascular access are contraindicated. When blood flow is reduced through access for any reason such as hypotension, blood pressure cuff or tourniquet application, access may coagulate or become infected.²¹ It was confirmed that most of the patients in the study follow this care.

The reduction in sodium intake in the diet is considered a positive attitude about self-care and was verified in all the participants of the research. Investigators reported that only 3.3% of respondents reported knowledge about this care.¹⁰ The same study identified that only 6.6% of the patients had access to materials that dealt with AVF care.¹⁰ These results differ from the research performed since 5 patients reported receiving informational material or written guidance, which justifies a greater adherence to AVF care, we believe that this value could be even higher.

Researchers conducted a study in the State of *São Paulo*, where the findings were similar to those identified in this study regarding the participation of health professionals in the orientation process.¹¹ It is understood that just as the patient plays a fundamental role on related issues the maintenance of the AVF through self-care, the professionals that participate in this process are also important, since they can guide and enable this patient, so that care can be carried out in an appropriate way, being necessary always the search for a greater participation and interaction of the multiprofessional team.

The only possibility of a cure for CRF is the transplant. The percentage of patients who achieve this type of treatment is very low, requiring that patients with chronic kidney disease need to continue in a dialysis program, most of the time for many years.²² Thus, we can underline hemodialysis as well as maintenance of AVF as essential for the survival of the CRF bearing person.

A study performed in *Fortaleza* city (Brazil) found the reduction of social impact with the creation of AVF in patients with renal disease, where the patients' preference for the permanence of AVF in relation to previously used catheters was verified. They reported that, although it was necessary to puncture each session of hemodialysis, it provided greater comfort and safety in the hemodialysis treatment, different from the catheter, which was considered uncomfortable and aesthetically unpleasant.²³

Although the manufacture of the AVF is more advantageous in relation to the catheters, proper maintenance is necessary, avoiding complications and possible loss of access. Complications of vascular access lead to a high number of hospitalizations and due to the bankruptcy of these accesses, the interval between hospitalizations decreases, significantly increasing the final expenditure.²⁴ This was verified in this

study, where two participants showed four incidents of AVF failure, then requiring hospitalizations more frequently and undergoing new procedures, as well as putting their lives at risk.

CONCLUSIONS

A relevant percentage of the participants had little education and reported having had some complication in the AVF. Hypotension, as a conditioning factor for AVF failure, remained frequent among the participants. It was observed that a large part of the participants have undergone dialysis treatment previously.

It is necessary to get the entire multiprofessional team involved, targeting to preserve the AVF through self-care guidelines, but not disregarding the patients' participation as protagonists. The communication becomes a great differential in the relationship between nursing and the surgical client, aiming at orientations towards the care and conservation of the definitive accesses.

Hence, it is concluded that although we find as a limitation of the study the low number of participants, it can be seen that the patients have demonstrated being aware of the necessary care for the AVF preservation. It was not reported the existence of continuing information so that they could take care adequately from their AVF, something considered important since they predominantly were elderly people and had little education.

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