

ORIGINAL ARTICLE

ATRIAL FIBRILLATION IN PATIENTS RECEIVING CONTINUOUS HEMODIALYSIS

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ABSTRACT

Objective: to describe the prevalence of atrial fibrillation, the epidemiological profile and the treatment used in patients undergoing continuous hemodialysis.

Method: Quantitative cross-sectional study conducted in 2017 with 110 patients admitted to an intensive care center of a large private hospital in Porto Alegre.

Results: The study found 36 (32.7%) episodes of atrial fibrillation during hemodialysis. Most patients were white males: 25 (69.4%) with a mean age of 75.2 ± 10 . Also, 22 (61.1%) experienced their first episode of atrial fibrillation. Systemic arterial hypertension and obesity were the most prevalent comorbidities. There was evidence of chemical cardioversion in 30 patients and electrical cardioversion in six patients.

Conclusion: There was a high prevalence of atrial fibrillation in patients receiving continuous hemodialysis. Thus, health professionals must have specific skills for the identification and management of heart disorders and accurate and complete records about the events.


DESCRIPTORS: Atrial fibrillation; Heart arrhythmias; Cardiovascular diseases; Kidney dialysis; Nursing.

HOW TO REFERENCE THIS ARTICLE:


Primon L da P, Riegel F, Russo D da S. Atrial fibrillation in patients receiving continuous hemodialysis. *Cogitare enferm.* [Internet]. 2019 [access "insert day, month and year"]; 24. Available at: <http://dx.doi.org/10.5380/ce.v24i0.60386>.



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FIBRILAÇÃO ATRIAL EM PACIENTES SUBMETIDOS À HEMODIÁLISE CONTÍNUA

RESUMO

Objetivo: descrever a prevalência de fibrilação atrial, o perfil epidemiológico e o tratamento utilizado em pacientes submetidos à hemodiálise contínua.

Método: estudo quantitativo, transversal, realizado em 2017, com 110 pacientes internados num Centro de Terapia Intensiva de hospital privado de grande porte de Porto Alegre.

Resultados: evidenciaram-se 36 (32,7%) ocorrências de fibrilação atrial durante a hemodiálise, com predominância da raça branca, sexo masculino em 25 (69,4%) e idade média de $75,2 \pm 10,5$. Verificou-se que 22 (61,1%) desencadearam o primeiro episódio de Fibrilação Atrial. A hipertensão arterial sistêmica e a obesidade foram as comorbidades de maior prevalência. Houve evidência maior de cardioversão química em 30 e elétrica em seis pacientes.

Conclusão: evidenciou-se alta prevalência de fibrilação atrial em pacientes submetidos à hemodiálise contínua, o que denota a necessidade de competências específicas dos profissionais para a identificação, manejo das intercorrências cardiológicas e registros de qualidade acerca dos eventos.

DESCRIPTORIOS: Fibrilação Atrial; Arritmias cardíacas; Doenças Cardiovasculares; Diálise renal; Enfermagem.

FIBRILACIÓN AURICULAR EN PACIENTES SOMETIDOS A LA HEMODIÁLISIS CONTINUA

RESUMEN

Objetivo: describir la prevalencia de fibrilación auricular, el perfil epidemiológico y el tratamiento que se utiliza en pacientes sometidos a la hemodiálisis constante.

Método: estudio cuantitativo, trasversal, que se realizó en 2017, con 110 pacientes ingresados en un Centro de Terapia Intensiva de un gran hospital particular en Porto Alegre.

Resultados: se evidenciaron 36 (32,7%) ocurrencias de fibrilación auricular durante la hemodiálisis, con predominancia de la raza blanca, sexo masculino en 25 (69,4%) y promedio de edad de $75,2 \pm 10,5$. Se verificó que 22 (61,1%) presentaron el primero episodio de Fibrilación Auricular. La hipertensión arterial sistémica y la obesidad fueron las comorbilidades de más prevalencia. Hubo evidencia mayor de cardioversión farmacológica en 30 y eléctrica en seis pacientes.

Conclusión: se evidenció alta prevalencia de fibrilación auricular en pacientes sometidos a la hemodiálisis constante, lo que apunta para la necesidad de competencias específicas de los profesionales para la identificación, la administración de las complicaciones cardiológicas y los registros de cualidad acerca de los eventos.

DESCRIPTORIOS: Fibrilación Auricular; Arritmias cardíacas; Enfermedades Cardiovasculares; Diálisis renal; Enfermería.

INTRODUCTION

The burden of cardiovascular diseases is rapidly increasing in Brazil and worldwide. This may be related to the higher complexity and changes in the epidemiological profile of the diseases, resulting in higher hospitalization rates and hospital costs.

According to data from the World Health Organization (WHO) in 2016 and the Brazilian Institute of Geography and Statistics (IBGE) in 2013, heart diseases are still the main causes of death in Brazil⁽¹⁻²⁾. In 2012, 17.5 million people died from cardiovascular diseases, accounting for 31% of global deaths. More than 3/4 of CVD deaths took place in low and middle-income countries. Moreover, the populations of these countries do not count on an integrated care network at the different healthcare levels capable of meeting all health needs of the individuals⁽²⁾.

Atrial Fibrillation (AF) is one of the most common type of cardiac arrhythmias. It is estimated that this condition accounts for one third of hospitalizations due to arrhythmia worldwide⁽³⁾. This fact is even more alarming given the prevalence of the disease, as it may affect more than 4.8 million Brazilians and more than 2 million Americans⁽⁴⁾.

In this context, it should be noted that atrial fibrillation (AF) is considered an important health problem, as it is a significant cause of increasing health care costs due to the considerable growth in the Brazilian population⁽⁵⁾. Even though the age-adjusted prevalence in men older than 75 years is higher, the prevalence in women is 60 %⁽³⁾. Developed countries reported an increase in the incidence and prevalence of AF associated to life expectancy and the increase in the elderly population. It is estimated that the prevalence of AF will more than double in the next decades^(3,6-7).

AF is the most common supraventricular arrhythmia in clinical practice, triggered by an electrophysiological disorder of the heart's electrical conduction system that leads to a fast and irregular heartbeat. Many different impulses begin at the same time and spread through the atria, competing for a chance to travel through the atrioventricular (AV) nodes. Abnormal impulse generation can occur in the sinus node or in ectopic foci, leading to irregular heartbeats, around 350 beats per minute. Then, the atria can no longer coordinate its contraction and begin to "fibrillate"^(6,8-11). The electrocardiographic records show fibrillatory "f" waves in the tracing, with various shapes and amplitudes⁽⁹⁾.

About 30% of the patients are asymptomatic, but may present the following clinical manifestations: palpitations, syncope, embolic complications, polyuria, irregular pulse and fatigue^(3,5). The disorders are accurately confirmed by means of an electrocardiogram (ECG), but other tests may assist in the investigation of AF, such as the use of 24-hour Holter, echocardiogram, chest X-ray and laboratory tests⁽³⁾.

Studies have demonstrated the influence of non-cardiovascular factors such as age and gender, diabetes mellitus (DM), hyperthyroidism, alcohol use, obesity, family history, excessive physical activity, and genetic factors with a significant predisposition to death for patients with renal failure (RF), cancer, chronic obstructive pulmonary disease (COPD), obstructive sleep apnea syndrome and sepsis^(5,7).

The treatment of AF may be clinical or surgical. Regarding the possibilities of clinical treatment, the first choice is chemical cardioversion through the use of antiarrhythmic agents for spontaneous reversal⁽⁵⁾. Another option is electrical cardioversion with the use of a defibrillator^(3,5). Regarding surgical treatment, the main indication is catheter ablation or cryoablation to disable these cells⁽³⁾.

Anticoagulants are mostly used to prevent the risk of thrombus formation, especially in case of arrhythmia for ≥ 48 h or indefinitely⁽³⁻⁵⁾. The risk of AF progressing to an ischemic stroke increases by 5-fold, because the atrium does not effectively contract, and blood stagnates in the atrial cavity favoring clot formation^(4,10).

Cardiovascular disease (CVD), associated with chronic kidney disease (CKD), increases the risk of death in dialysis patients, whose mortality is 10 to 20 times greater compared to the general population. It should be noted that 30% to 44% of patients undergoing hemodialysis for the first time have CVD⁽¹²⁾.

In hemodialysis patients' blood is filtered through a semipermeable membrane. Blood flows inside the tube (filter) in the opposite direction to the dialysate, which flows outside the tubes, in a counter current flow, providing osmotic changes. Continuous hemodialysis, in turn, is generally used in hemodynamically unstable patients who require greater control of uremia, acid-base balance and fluid removal. This technique is performed in intensive care units, lasting in average 24 hours, but may last for a few days without interruption. The blood and dialysate flows are low, thus providing a highly effective treatment and with less hemodynamic damage⁽¹³⁻¹⁴⁾.

Patients with CKD who undergo dialysis therapy have a high prevalence of disorders in the electrocardiographic tracing. AF is the most common arrhythmia in these hemodialysis patients, because of numerous factors, but also because of the low serum albumin levels⁽¹⁵⁾. However, there is an association between AF and renal failure, and whether or not dialysis is necessary. In this context, it was found that patients with such comorbidities are at a higher risk of progressing to ischemic stroke, myocardial infarction and thromboembolism⁽¹⁶⁾.

In view of the aforementioned, the purpose of this study was to describe the prevalence of atrial fibrillation, the epidemiological profile and the treatment administered to patients admitted to an intensive care center receiving continuous hemodialysis.

METHOD

Cross-sectional study with a quantitative design⁽¹⁷⁻¹⁹⁾, with patients hospitalized in a large private hospital in the city of Porto Alegre, Rio Grande do Sul, Brazil.

The sample consisted of 110 patients admitted to the Intensive Care Center, which has 31 beds and is divided into 3 areas. The participants were individuals aged 18 years and older, with no maximum age limit, of both genders and of any ethnic group, who received continuous hemodialysis. Patients who might have been diagnosed with atrial fibrillation and/or have undergone hemodialysis treatment during the same hospitalization period were also eligible to participate in the study. Patients whose information was incomplete or inaccurate in the medical records were excluded.

Patients admitted in the 01/01/2015 to 12/31/2016 period were included. The reason for choosing this period is that it corresponded to the two years prior to the study. The risk factors analyzed were heart failure, heart valve disease, systemic arterial hypertension, ischemic heart disease, sepsis, stroke, chronic obstructive pulmonary disease, sleep apnea, cancer, diabetes mellitus, hyperthyroidism, obesity and alcoholism.

Data was collected from September 28 to October 6, 2017. An instrument elaborated by the researchers was used. It contained the following information: patient record, age, ethnicity, gender, previous AF record, AF during and after hemodialysis, previous comorbidities, complications during hospitalization and type of anticoagulation.

Quantitative variables were described by mean and standard deviation, and categorical variables, by absolute and relative frequencies. To evaluate the association between variables, Pearson's chi-square test or Fisher's exact test were used. Adjusted residual test was used to complement these analyzes. The level of significance was set at 5% ($p \leq 0.05$). Statistical analysis was performed using the SPSS V.21.0 program.

Data collection began after the project's approval by the Research Ethics Committee under Protocol no 2.301.

RESULTS

The records of 110 patients receiving continuous hemodialysis in an intensive care unit (ICU) in the 2015-2016 period were evaluated, as follows: 65 (59.1%) patients in 2015 and 45 (40.9%) in 2016.

Of the 110 participants in the study, 29 (26.4%) had previously been diagnosed with atrial fibrillation; of these, 14 (48.3%) participants with previous atrial fibrillation also had episodes of AF at some time during hemodialysis therapy.

For the analysis of the data collected, the findings were divided into categories, as follows: sample characterization and epidemiological profile, prevalence of Atrial Fibrillation (AF), comorbidities and complications related to AF, treatment methods used in AF episodes and anticoagulation methods used in continuous hemodialysis. Table 1 shows the sample characterization data.

Table 1 – Sample characterization. Porto Alegre, RS, Brazil, 2017

Variables	N=110 (n %)
Age (years) – Mean \pm SD [min-max.]	74.8 \pm 14.2 [23-99]
Age range	
<60	15 (13.6)
60 – 69	18 (16.4)
70 – 79	24 (21.8)
80 years or older	53 (48.2)
Gender	
Male	70 (63.6)
Female	40 (36.4)
Color	
White	109 (99.1)
Yellow	1 (0.9)
Black	0

The previous comorbidities shown in the general sample of selected patients include Systemic Arterial Hypertension in 73 (66.4%), Cancer in 39 (35.5%), Diabetes Mellitus in 34 (30.9%), Ischemic Heart Disease in 30 (27.3%), Chronic Renal Disease in 29 (26.4%), Heart Failure in 18 (16.4%), Chronic Obstructive Pulmonary Disease in 16 (14.5%), Stroke in 16 (14.5%), of which 15 were ischemic. Thirteen (11.8%) participants were in the postoperative stage of myocardial revascularization surgery (CABG), eight (7.3%) in the postoperative stage of Peripheral Arterial Disease surgery, and six (5.5%) in the postoperative stage of Heart Valve Surgery.

The most prevalent risk factors were smoking, with 27 participants (24.5%) being active smokers or ex-smokers; alcoholism, with (5.5%) participants reporting using alcohol, and Obesity, with five (4.5%) obese patients in the study.

Nine patients (8.2%) had some sort of arrhythmia, but the type of arrhythmia was

not clarified in the medical record, and finally none of the patients had sleep apnea, nor hyperthyroidism, only hypothyroidism 18 (16.4%). Figure 1 shows the prevalence of comorbidities identified in the sample (n = 110).

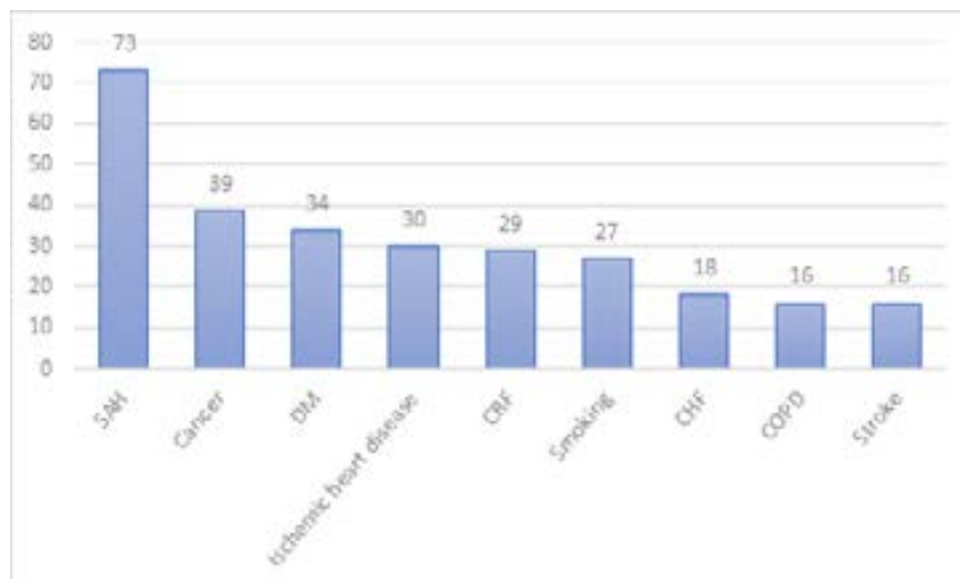


Figure 1 – Prevalence of comorbidities (n=110). Porto Alegre, RS, Brazil, 2017

It was found that 29 (26.4%) participants had been diagnosed with atrial fibrillation; of these, 14 (48.3%) participants diagnosed with atrial fibrillation also had episodes of AF at some time during hemodialysis therapy.

Regarding the 36 (32.7%) participants who had AF during continuous hemodialysis, when evaluated, it was found that 22 (61.1%) had experienced the first episode of AF. As for fibrillation after hemodialysis, this occurred in 13 (11.8%) individuals, since nine (69.2%) participants also had atrial fibrillation during the hemodialysis session, and eight (61.5%) had previous AF episodes. Only one (7.7%) participant had the first episode of AF after the end of continuous hemodialysis (Figure 2).

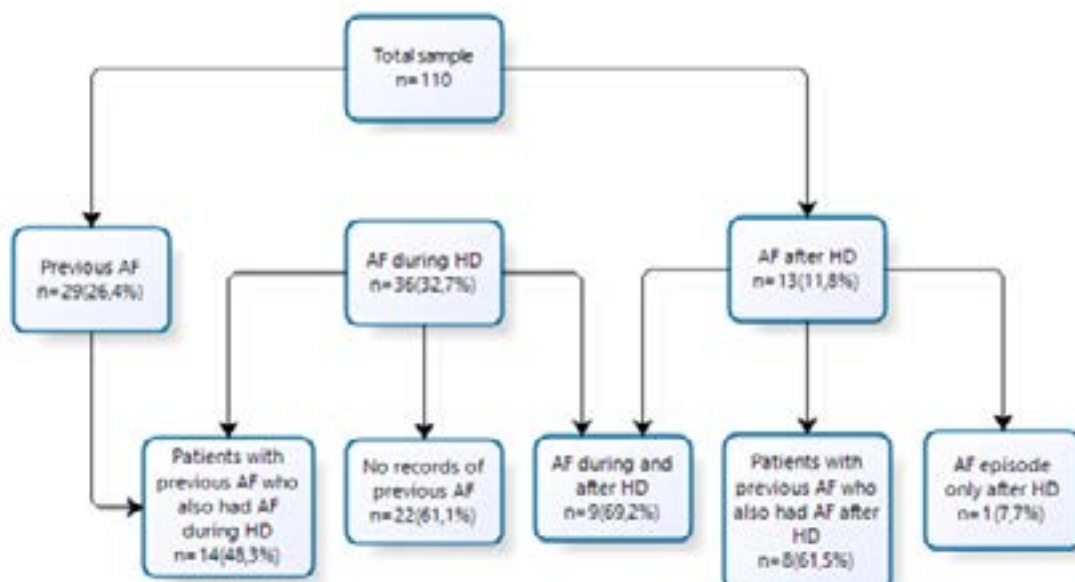


Figure 2 – Prevalence of Atrial Fibrillation (FA). Porto Alegre, RS, Brazil, 2017

Comorbidities and complications related to atrial fibrillation were obtained based on the number of participants who had AF during hemodialysis (HD), that is, 36 (32.7%); This figure was then compared to the number of participants who did not have episodes of AF during HD, which was 74 (67.3%).

Comparison of the participants who had AF during continuous HD: 36 (32.7%) with those who did not have AF episodes: 74 (67.3%), led to the following results: there was a higher prevalence of AF in continuous HD in male individuals, with 25 (69.4%) of the cases. The mean age was 75.2 ± 10.5 years. Regarding female participants, there were 11 (30.6%) cases, and the mean age was 80.5 ± 9.6 years.

Among the relevant comorbidities for this study, systemic arterial hypertension (SAH) was statistically significant and occurred among participants who had AF during continuous HD, with 30 cases (83.3%); On the other hand, 43 (58.1%) participants did not have AF, $p = 0.016$.

There was a prevalence of hypertension in women: 10 (90.9%). In turn, 20 (80%) of the participants were men. Regarding risk factors, obesity in four (11.1%) cases showed statistical significance, $p = 0.039$. Other comorbidities such as ischemic heart disease, HF, COPD, stroke, valve insufficiency and cancer were not statistically significant in this study.

Other complications were less recurrent, such a deep venous thrombosis (DVT) in two (9.1%) cases and acute myocardial infarction (AMI) in one (4.5%) case.

Comparison of this sample with the sample of participants who did not have AF during continuous HD showed that 52 (70.3%) died and 44 (59.5%) had sepsis as the most recurrent complication, and there was no statistical significance in the comparison with the participants who had AF, $p = 0.314$.

Figure 3, below, shows the comorbidities related to participants who had AF during continuous HD and distinguishes them from the comorbidities of the participants who did not have AF episodes.



Figure 3 – Atrial fibrillation during hemodialysis “versus” no fibrillation episodes. Porto Alegre, RS, Brazil, 2017

The treatments adopted were electrical cardioversion, chemical cardioversion, and the concomitant use of both methods. Chemical cardioversion was prevalent: it was used in 30 (83.3%) patients with AF. The drugs administered were, as follows: Amiodarone (50mg/ml) 3ml in 27 (90%); Deslanoside (0.2mg/ml) 2ml in 13 (43.3); and Metoprolol Tartrate (1mg/ml) 5ml in 11 (36.7), all boluses and intravenously.

In some cases, more than one of the drugs mentioned above had been administered. However, amiodarone was the preferred drug. The dosage of amiodarone during AF was two 3ml ampoules (50mg/ml) diluted in 100ml of 5% glycosated serum, administered in thirty minutes; and the maintenance therapy consisted of six blisters of 3 ml (50 mg/ ml) were diluted in 232 ml of 5% glycosated serum in a continuous flow, according to medical prescription.

Six (16.7%) participants underwent electrical cardioversion. All patients in the sample were also previously treated with antiarrhythmic agents and, when there was no reversal, synchronized shocks were delivered. However, records in electronic medical charts did not specify the defibrillation dose (in joules), nor did they indicate if there were repetitions.

All patients were monitored with a Dräger® multi-parameter monitor, and patients undergoing electrical cardioversion were also monitored with the CRA (cardiorespiratory arrest) monitor.

The anticoagulation methods used by the institution for the patients included in the sample were heparin 5000 IU "Hepamax®" and sodium citrate 4% solution 3000 ml. Sodium citrate 4% anticoagulant solution was the prevalent method. It was used in 100 (90.9%) of the 110 participants in hemodialysis therapy.

In the institution where the study was conducted, the heparin solution was composed of 1 ml of heparin and 19 ml of saline solution 0.9%, adapted to the continuous hemodialysis machine (Prismaflex®), in a flow prescribed by the nephrologist physician.

Regarding the outcome, 29 (80.6%) of the participants who had AF during continuous hemodialysis progressed toward death and seven (19.4%) were discharged to the hospitalization unit.

DISCUSSION

Compared to a study conducted in Porto Alegre⁽¹⁴⁾ and to a study conducted in the state of Paraná, which evaluated 168 participants in conventional hemodialysis, of which 4.2% had AF during the hemodialysis session, the present study had more evidence of AF, and the justification may be related to the type of hemodialytic therapy used and the need for treatment with emphasis on the reduction of physiological changes⁽⁸⁾.

The present study demonstrated that aging is a factor that predisposes to the onset of AF, and the higher prevalence of AF in males, corroborating the findings in the scientific literature^(3,6-8,20).

Of the patients who had AF during HD in an adult ICU, 17 (47.2%) progressed toward sepsis and/or septic shock. In a study conducted in Portugal, AF was frequently observed in patients with sepsis. Among the several possible physiological disorders, we can mention systemic inflammatory response and increase in the levels of C-reactive protein⁽⁷⁾, which was evident in the study conducted in Porto Alegre.

A cohort study conducted in a hospital in São Paulo evaluated 3010 patients after undergoing coronary artery bypass grafting. These patients had a similar epidemiological profile, that is, 82.2% were hypertensive and 69.9% were males, of which 36.6% had DM. The most common complication was cardiac arrhythmias with 18.7%, and of these 14.3% were identified as AF and 4.4% of the subjects had renal failure requiring hemodialysis,

which was similar to a study conducted in Porto Alegre⁽²¹⁾. The latter found that 70 (63.6%) of the participants were male and had arterial hypertension, corroborating the findings of the study conducted in São Paulo that evaluated more than 3,000 patients after coronary artery bypass grafting. In short, the findings of the referred study are consistent with those of this study confirming that hypertension as the most frequent comorbidity, old age, and male gender as a highly prevalent risk factor for AF.

The antiarrhythmic drug amiodarone is the preferred treatment, corroborating a study published by the Brazilian Society of Cardiology, in 2015, which identified the use of amiodarone in isolated episodes of AF before and after ablation procedures, such as in the prevention of arrhythmias, and also administered as pills as maintenance therapy after hospital discharge in chronic patients who had AF, according to medical prescription⁽²²⁾. The II Brazilian Guidelines for Atrial Fibrillation confirms the efficacy of amiodarone, which is a first-choice drug for antiarrhythmic treatment⁽⁵⁾.

A study on electrical cardioversion as a treatment of AF conducted in Cuba found that the use of electrical cardioversion was successful in 81.2% of the cases. The author of the study also reported the early administration of amiodarone as an adjuvant therapy in the treatment of AF, since amiodarone contributes to a more successful defibrillation shock, which is consistent with the findings of the present study⁽²³⁾.

The choice of the anticoagulant used in hemodialysis therapy involves a more comprehensive analysis: heparin has a systemic action, which can trigger hemorrhagic events. On the other hand, sodium citrate 4% is used because it only produces effects on the dialysis system, preventing the clotting of the circuit⁽²¹⁾.

The therapy must be considered on a case-by-case basis, because the described factors predispose to stroke, since patients who had AF need anticoagulants, which may lead to other complications such as stroke. On the other hand, in the cases of sepsis, AF also prolongs hospital stay⁽⁷⁾.

A study conducted in a hospital in São Paulo evaluated the efficacy of sodium citrate 4% in the continuous HD system. In all the evaluated parameters, citrate was an effective anticoagulant. None of the patients had problems with blood clots during hemodialysis⁽²⁴⁾.

The participants who were given heparin: six (5.5%), and even those who were given heparin intercalated with sodium citrate 4%: four (3.6%) in the hemodialysis system did not have any complications related to hemorrhagic events. These methods of anticoagulation had no significant relationship with patients who had AF.

One limitation of this study was the lack of information in the analyzed patients' charts, which made it difficult to collect and analyze the data.

CONCLUSION

The present study showed a high prevalence of subjects who had atrial fibrillation during continuous hemodialysis. Systemic arterial hypertension was found to be a statistically significant comorbidity in hemodialysis participants, and obesity was the most recurrent extrinsic factor. Regarding the treatment for AF, as set forth in the II Brazilian Guidelines for Atrial Fibrillation, this study confirmed that amiodarone is the first-choice drug in the immediate and long-term treatment of episodes of fibrillation.

This study drew attention to the importance of standardized records in patients' records. Incomplete information and use of abbreviations that made it difficult to understand the data recorded are reasons for suggesting the use of the Continuous HD Control Sheet.

Further studies that use results of laboratory tests, such as serum potassium, sodium, magnesium and calcium analysis, albumin, INR (International Normalized Ratio),

TP (Prothrombin Time) and KTTT (Activated Partial Thromboplastin Time) to complement data analysis are suggested.

We stress the need for studies focused on nursing care and monitoring of patients with AF receiving hemodialysis, to contribute to the training of multidisciplinary teams in intensive care in the identification and early treatment of AF, in order to avoid unnecessary prolongation of hospital stay, heart lesions and thromboembolic complications in patients admitted to intensive care centers.

The findings of this study highlight the importance of nurses in the care of patients receiving continuous hemodialysis, as well as in the identification of complications related to this therapy, such as atrial fibrillation. They also stress that work organization, direct patient care, identification of the signs of cardiac arrhythmias and training of health teams in care related to episodes of arrhythmias contribute to diagnosis, monitoring and treatment, since events such as atrial fibrillation can cause complications and permanent sequelae for patients undergoing continuous hemodialysis.

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Received: 07/07/2018

Finalized: 25/04/2019

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Final approval of the version to be published - FR
