Original Article

Anxiety and clinical outcomes in coronary patients undergoing unplanned catheterization

Ansiedade e desfechos clínicos em pacientes coronariopatas submetidos ao cateterismo não programado

Ansiedad y resultados clínicos en pacientes con coronariopatías sometidos a cateterismo no programado

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Abstract

Objectives: To describe the state and trait anxiety level in patients with acute coronary syndrome undergoing unplanned catheterization; to assess the influence of trait anxiety on state anxiety before and after catheterization, and check if anxiety (state and trait) is predictive of non-fatal arrhythmias, of patients' clinical severity measured by the Killip score and the Charlson Comorbidity Index (CCI), and of length of hospital stay.

Methods: An observational, correlational and longitudinal study in which were evaluated participants with acute coronary syndrome waiting for unplanned cardiac catheterization. At the initial meeting (Ti), were collected sociodemographic and clinical data, and were applied the State and Trait Anxiety Inventory (STAI) and Beck Depression Inventory (BDI). At the final meeting (Tf), was applied the STAI-state. Participants were followed up until hospital discharge or death regarding the occurrence of non-fatal arrhythmias and length of hospital stay.

Results: A total of 100 participants were included (62.2±11.4 years; 61% male sex). The STAI-trait score was 42.2±10.4 and it influenced the STAI-state score at Ti and Tf (p<0.005). The STAI-state decreased significantly between Ti and Tf (40.2±10.4 *vs* 37.2±11.2, respectively, p=0.002). There was no association of STAI-trait or STAI-state with severity indexes, length of hospital stay or arrhythmia occurrence. However, the depression score increased the chance of occurrence of arrhythmias by 9.5% (OR=1.009, 95% CI=0.913-1.115).

Conclusion: The level of anxiety reduced significantly after catheterization, and was not a predictor of short-term clinical outcomes.

Resumo

Objetivos: Descrever o nível de ansiedade traço e estado em pacientes com síndrome coronariana aguda submetidos a cateterismo não programado; verificar a influência da ansiedade traço na ansiedade estado antes e após o cateterismo e verificar se a ansiedade (traço e estado) é preditiva da ocorrência de arritmias não fatais, da gravidade dos pacientes medida pela classificação Killip e pelo índice de comorbidade de Charlson, e do tempo de permanência hospitalar.

Métodos: Estudo observacional, correlacional e longitudinal, no qual foram avaliados participantes com síndrome coronariana aguda aguardando cateterismo cardíaco não programado. No encontro inicial (Ti) foram coletados dados sociodemográficos e clínicos, aplicados inventários de ansiedade traço e estado (IDATE) e de depressão de Beck. No encontro final (Tf), aplicou-se o IDATE-estado. Os participantes foram acompanhados até alta hospitalar ou óbito quanto a ocorrência de arritmias não fatais e tempo de permanência hospitalar.

Resultados: Foram incluídos 100 participantes (62,2±11,4 anos; 61% do sexo masculino). O escore do IDATE-traço foi 42,2±10,4 e influenciou o escore do IDATE-estado em Ti e Tf (p<0,005). O IDATE-estado diminuiu significativamente de Ti para Tf (40,2±10,4 vs 37,2±11,2, respectivamente, p=0,002). Não se observou associação do IDATE-traço ou do IDATE-estado com os índices de gravidade, tempo de permanência hospitalar ou ocorrência de arritmias. Entretanto, o escore de depressão aumentou 9,5% a chance de ocorrência de arritmias (OR=1,009; IC95%=0,913-1,115).

Conclusão: O nível de ansiedade reduziu de forma significativa após a realização do cateterismo, e não foi um preditor de desfechos clínicos em curto prazo.

Resumen

Objetivos: Describir el nivel de ansiedad rasgo y estado en pacientes con síndrome coronario agudo sometidos a cateterismo no programado, verificar la influencia de la ansiedad rasgo en la ansiedad estado antes y después del cateterismo, y verificar si la ansiedad (rasgo y estado) es predictiva de la ocurrencia de arritmias no fatales, de la gravedad de los pacientes medida por clasificación Killip e índice de comorbilidad de Charlson, y del tiempo de permanencia hospitalaria.

Métodos: Estudio observacional, correlacional y longitudinal. Fueron evaluados participantes con síndrome coronario agudo esperando cateterismo cardíaco no programado. En el encuentro inicial (Ti) fueron recolectados datos sociodemográficos y clínicos, aplicando inventarios de ansiedad rasgo y estado (IDATE) y de depresión de Beck. En el encuentro final (Tf), se aplicó IDATE-estado. Los participantes recibieron seguimiento hasta el alta o el deceso, respecto de la ocurrencia de arritmias no fatales y tiempo de permanencia hospitalaria.

Resultados: Fueron incluidos 100 participantes (62,2+11,4 años; 61% de sexo masculino). El puntaje de IDATE-rasgo fue 42,2±10,4, influyendo en el puntaje del IDATE-estado en Ti y Tf (p<0,005). El IDATE-estado disminuyó significativamente entre Ti y Tf (40,2±10,4 vs 37,2±11,02 respectivamente; p=0,002). No se observó asociación del IDATE-rasgo ni del IDATE-estado con los índices de gravedad, tiempo de permanencia hospitalaria u ocurrencia de arritmias (OR=1,099; IC%=0,913-1,115).

Conclusión: El nivel de ansiedad se redujo significativamente luego de realizarse el cateterismo, y no constituyó un predictor de resultados clínicos en el corto plazo.

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Introduction

Acute Coronary Syndrome (ACS) is a group of clinical symptoms of myocardial ischemia, and its clinical spectrum includes unstable angina (UA) and acute myocardial infarction (AMI) with and without ST segment elevation.[1] It is the most serious manifestation of coronary artery disease (CAD), which is recognized as the leading cause of death in developed and emerging countries, including Brazil.[2] The impact of classic risk factors on the onset and progression of myocardial ischemia is well established[1], but the influence of psychosocial factors on the morbidity and mortality of patients with ACS is also known.[3]

Depression and anxiety may occur in patients following an episode of ACS. Although the adverse effects of depression on short- and long-term outcomes have been well studied, the effects of anxiety still require further investigation.[3] Anxiety is an emotional state characterized by feelings of concern and apprehension. The literature suggests that 20% to 30% of patients experience high levels of anxiety after an episode of ACS, and in half of them the symptom may persist for up to a year after the coronary event.[3]

There are different theoretical models available for anxiety analysis. In the present research, was adopted the Spielberger's anxiety model, in which two constructs are generated in the evaluation, namely the trait and the state.[4] The trait refers to the anxious profile, that is, more or less stable individual characteristics of personality with respect to the propensity to be anxious. The state refers to a transient emotional state characterized by unpleasant feelings of tension and apprehension.[4]

The state and trait of anxiety have been observed in different clinical conditions, including patients with ACS.[5] Both constructs are targets in nursing research with the aim to recognize their manifestations, predictive factors, and test interventions.[6-8] However, the relationship between the level of anxiety and the severity of heart disease is not established.[9]

Furthermore, studies have documented the adverse outcomes of anxiety in cardiovascular health in patients with ACS, in the short and long term. Researchers found that after an episode of ACS, patients with anxiety had a higher rate and higher risk of developing in-hospital complications compared to those without anxiety.[10] In another study, it was demonstrated that the high level of anxiety increased the relative risk of cardiac event recurrence 12 months after percutaneous coronary intervention.[11]

Studies on analysis of the relationship of anxiety with short-term outcomes in patients with ACS undergoing unplanned catheterization are scarce. In this study, the term unplanned catheterization was used to generically designate percutaneous coronary interventions that had not been scheduled prior to the patient's visit to the emergency department. In the face of a life-threatening situation (ACS) and the imminence of an unscheduled invasive examination, the trait anxiety determines the increase in state anxiety, is related to disease severity, and influences short-term clinical outcomes. Furthermore, clinical experience shows that patients with ACS and undergoing unplanned catheterization experience shorter hospital stay compared to those undergoing surgery, which can be a challenge for the diagnosis, planning and implementation of care for anxiety management.

The aims of this study were to describe the level of state and trait anxiety in patients with ACS, to prove if there is influence of the level of anxiety trait in the level of anxiety state before and after catheterization, and to confirm if anxiety (state and trait) is predictive of the occurrence of non-fatal arrhythmias, of the clinical severity of patients measured by the Killip classification and by the Charlson Comorbidity Index (CCI), and of length of hospital stay.

Methods

Observational, correlational, longitudinal study performed in a public reference hospital in cardiopneumology. The data collection period was from July to October 2017.

The sample size was calculated in 99 participants, and the following were considered: the prev-

alence of anxiety of 50% in coronary patients undergoing percutaneous procedures, the number of catheterizations performed in the hospital (field of study) in patients admitted with ACS in the emergency department, and a type error I of 5%.

Participants included in the study were aged 18 years or older, with confirmed diagnosis of UA and non-ST-segment elevation acute myocardial infarction (NSTEMI), who underwent unplanned catheterization and were hemodynamically stable. Participants with ST-segment elevation AMI were not included because they were quickly referred to catheterization hence, making data collection impossible. The following were excluded: those with ischemic pain at the time of data collection; whose conduct was modified after the initial planning of catheterization; with documented diagnosis of anxiety or depression and using mood modulators.

Participants were recruited prior to cardiac catheterization. At the initial meeting (Ti), sociodemographic data (age, sex and educational level) and clinical data (medical diagnosis, cardiovascular risk factors, comorbidities and Killip classification) were collected by consulting the medical records or through the interview, and were applied the State-Trait Anxiety Inventory (STAI), the Beck Depression Inventory (BDI), and the Charlson Comorbidity Index (CCI).[12-14] The final meeting (Tf) occurred six to 12 hours after catheterization, when the main researcher applied the STAI-state.

The STAI has scales that were translated and validated into Brazilian Portuguese.[12] Each construct is evaluated by means of 20 items followed by a 4-point Likert scale. In order to avoid response bias, some items are presented in reverse order and individual scores must be inverted for the calculation of the score. The total score ranges from 20 to 80 for each scale, and the higher the score the higher the level of anxiety.

Considering that anxiety and depression often overlap, the BDI was chosen for evaluation of the depression score. The scale has been translated and validated for Portuguese, and has 21 items classified in a 4-point Likert scale. The total score ranges from 0 to 63 points.[13]

Clinical severity was assessed using the CCI and the Killip classification system.[14,15] The CCI assesses clinical severity according to weight attributed to comorbidities. It consists of 19 clinical conditions, and a 1-6 score is assigned for each condition. The higher the total score, the greater the severity.[14] The Killip classification evaluates the patient's severity after probable AMI based on data from the physical examination indicative of cardiac dysfunction. Patients can be classified as Killip I (without pulmonary congestion), Killip II (pulmonary rales, jugular stasis or third heart), Killip III (pulmonary edema) and Killip IV (cardiogenic shock).[15]

Participants evaluated at Tf were monitored through their medical records until hospital discharge or death for monitoring the following outcomes: non-fatal arrhythmias and length of hospital stay.

For analysis of the continuous variables, were calculated mean and standard deviation. Categorical variables were analyzed by means of absolute and relative frequency calculations. A paired T-test was used to compare means. The influence of the STAI-trait score on the change of the STAI-state score before and after the catheterization and the associations between the STAI-trait score with the STAI-state score at Ti and Tf, and between the score of STAI-state/trait with the CCI and hospital length of stay was determined by linear regression model. The model adjustment was verified through R^2. In turn, logistic regression models were used to determine the association between the score of the STAI-state/trait with the Killip classification and arrhythmia. The predictive capacity of these models was assessed through the area under the ROC (Receiver Operating Characteristic Curve) curve. The significance level was set at 5%.

The study was approved by the Ethics Committee of the proposing institution (process number 2.087.449) and of the coparticipant institution (process number 2.126.485).

Results

A total of 116 participants were included in the study, of whom 16 were excluded because of change

of conduct after the initial planning of catheterization, hospital discharge before Tf, diagnosis of anxiety or depression, and use of mood modulators. In the final sample, 100 participants were followed up from admission to the emergency department until discharge from the hospital (discharge or death). They had a mean age of 62.2±11.4 years, 61% were male, 60% were married, 39% had incomplete primary education, 47% had diagnosis of NSTEMI, and 54% underwent angioplasty. Furthermore, 53% reported a sedentary lifestyle, 22% were smokers, 43% were overweight or obese, 53% had previous diagnosis of unstable angina, 82% of hypertension, 41% had diabetes, 40% had dyslipidemia, 8% had heart failure, 6% had cerebrovascular accident, 18% had undergone previous angioplasty, and 24% underwent surgery.

Regarding severity, the CCI was 2.1±1.7, 12.8% of participants with NSTEMI were classified as Killip II and 10% presented non-fatal arrhythmias. The mean length of hospital stay was 6.4±7.3 days. The mean BDI score was 12.8±9.2.

The mean score of STAI-trait at Ti was 42.2±10.4. The STAI-state score before catheterization was significantly higher than after the procedure (40.2±10.4 vs 37.2±11.2, respectively, p=0.002).

There was an association between the STAI-trait score and the STAI-state score at both measurement moments. At the Ti, the STAI-state score increased by 0.406 (95% CI 0.222-0.589, p<0.001) for each point of the STAI-trait. At Tf, the STAI-state score increased 0.357 (95% CI 0.155-0.559, p=0.001) for each point of the STAI-trait. However, the STAI-trait score did not influence the difference in the STAI-state score before and after catheterization (p=0.602).

In relation to outcomes of interest, in the univariate analysis, there was a significant correlation of the CCI with the STAI-trait score (r=0.329, p=0.001), but not with the STAI-state score (r=0.109, p=0.282). On the other hand, there was no association between the Killip score with trait anxiety scores (p=0.742) or state anxiety scores (p=0.550), nor correlation between the length of hospital stay with those scores (r=-0.017, p=0.870 and r=0.061, p=0.547, respectively). There was no

association between the occurrence of arrhythmias with trait anxiety scores (p=0.960) or state anxiety scores (p=0.250), but the regression model (Table 1) shows the relationship between the occurrence of non-fatal arrhythmias and the depression score influenced by anxiety-state.

Table 1. Regression model of predictive variables of the occurrence of non-fatal arrhythmias in patients with acute coronary syndrome undergoing catheterization

Variables	Odds ratio	Standard error	Wald	95% confidence interval	p-value
Arrhythmia					
STAI-state	0.930	0.047	2.370	0.848-1.020	0.124
Age	0.999	0.033	0.001	0.937-1.065	0.979
Male sex	5.340	0.969	2.990	0.800-35656	0.084
Educational level	0.917	0.195	0.196	0.626-1.344	0.658
Smoking	0.370	1.143	0.756	0.039-3.477	0.385
Sedentary lifestyle	0.918	0.788	0.012	0.196-4.306	0.914
Overweight/Obesity	1.156	0.779	0.035	0.251-5.319	0.852
BDI score	1.095	0.046	3.870	1.000-1.199	0.049
CCI score	0.746	0.291	1.012	0.422-1.320	0.314
Constant	0.382	2.810	1.117		0.382

BDI – Beck Depression Inventory; CCI – Charlson Comorbidity Index

In table 1, the STAI-state score was not a predictor of the occurrence of non-fatal arrhythmias. The predictive capacity of the model is shown in figure 1.
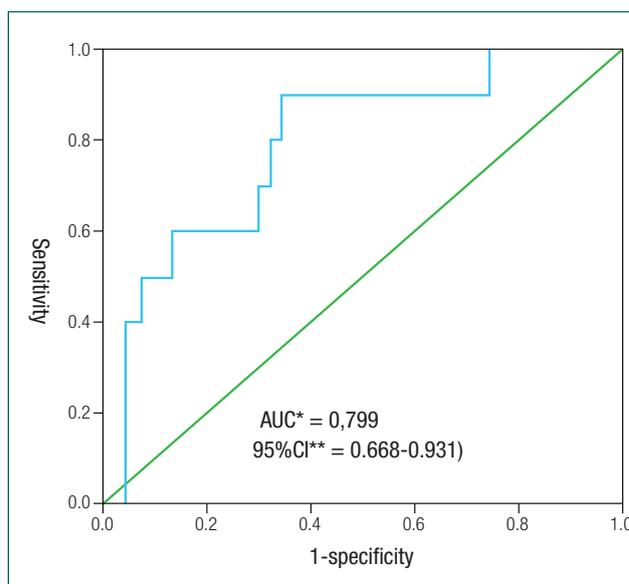
AUC - Area under the curve; CI – Confidence interval 95%

Figure 1. Predictive capacity of the regression model of predictive variables of the occurrence of non-fatal arrhythmias in patients with acute coronary syndrome undergoing unplanned catheterization

The state and trait anxiety scores were not predictors of participants' clinical severity, as measured by the Killip classification (OR=0.904, 95% CI=0.747-1.095; AUC = 0.814 and OR=0.994, 95% CI=0.889-1.112; AUC=0.799, respectively). These were neither predictors of length of hospital stay (B=0.115, 95% CI=0.123-0.284; R2=0.090 and B=-0.025; 95% CI=0.165-0.130, R^2=0.095) in regression models corrected for confounding variables (age, male gender, educational level, risk factors, BDI and CCI score).

Discussion

Anxiety has been associated with the onset and progression of cardiovascular diseases, as well as with adverse cardiovascular outcomes, including mortality.[16] This study analyzed the relationship of anxiety scores assessed by the STAI-state and STAI-trait with short-term outcomes in patients with ACS undergoing unplanned catheterization. The results of this study may contribute to improve the understanding of the influence of this phenomenon mediated by intervening factors (age, sex, educational level, cardiovascular risk factors, comorbidities and depression) in these patients' health.

The sociodemographic profile of participants of this study, the risk factors presented, and their comorbidities are similar to those observed in the literature.[16,17] The state anxiety level was significantly higher prior to catheterization than after. This was expected because the state anxiety level increases in threatening situations and tends to decrease when the threat is controlled or no longer exits. The decrease in anxiety level after an invasive procedure was also found in a longitudinal study in which was evaluated the anxiety in patients undergoing elective percutaneous coronary treatment at different stages (one day before the procedure, and one day, one month, three months, six months and one year after the procedure).[18]

However, the usual level (trait) of anxiety did not influence the difference in the level of state anxiety before and after catheterization. A hypothesis to explain such observation is that the influence of contextual factors, for example, staying in a strange environment as the emergency department, or of individual factors beyond the anxious profile, such as understanding about the purpose of catheterization, has determined the response of decreased anxiety-state.

Although not influencing the level of state anxiety reduction, the association of anxiety-trait with anxiety-state before and after catheterization suggests the relationship between habitual level of anxiety and the level of anxiety of moment (state), which, in this case, is influenced by the performance of an invasive procedure in the presence of ACS. This association was also observed in other studies both in patients with heart disease and in other groups.[19-21]

Regarding the short-term outcomes analyzed, it could not be demonstrated that anxiety is a predictor of the occurrence of non-fatal arrhythmias. Although our initial hypothesis has not been confirmed, there is underlying pathophysiological foundation. Anxiety is associated with changes in heart rate variability, sympathetic nervous system hyperactivity, and autonomic dysregulation.[22] Such effects on the cardiovascular system potentiate the occurrence of arrhythmias and may even lead to higher mortality in these patients.[22] Possibly, the standard pharmacological treatment of ACS patients, which includes the use of antiarrhythmics may have influenced the relationship between anxiety and arrhythmias observed in this study.[23]

The clinical severity of participants was determined by the Killip classification and the CCI. While the aim of the first one is to estimate the severity of patients after AMI and showed a relevant prognostic performance at a five-year follow-up in patients with ACS, the CCI considers the impact of chronic comorbidities on the chance of survival.[14,24,25]

For some participants in this study, the Killip classification II may suggest poor clinical prognosis, even though the CCI was low.[26] In the literature, Killip classification is an independent predictor of in-hospital complications in patients with ACS, whose risk is five times greater in those with anxiety.[10] In another study was investigated a similar population, and a similar CCI value

was found.[27] In any case, CCI is known as an adequate prognostic indicator to assess the risk of in-hospital mortality in patients with ACS after one year of the event.[25]

Together, these data show the clinical severity profile of participants, whether based on the occurrence of complications after AMI or by the impact of comorbidities. Differently from expected, trait and state anxiety were not predictors of the severity of participants as assessed by the Killip classification, which can be explained by the low number of participants who presented such condition.

Considering that clinical severity after AMI can also be expressed by the occurrence of other cardiac events or by the mortality rate, its relation with anxiety remains unclear. In another study, anxiety symptoms were not associated with the occurrence of fatal and non-fatal cardiac events at a 10-year follow-up.[28] However, other authors have found different results regarding the association of short- and long-term outcomes with anxiety.[10,11] Further investigations are needed to assess the influence of anxiety on short-term outcomes in patients with ACS.

There was no association between length of hospital stay and level of anxiety, and neither were the trait and state anxiety scores predictive of length of hospital stay. In the literature, there is no consensus about the relationship between anxiety and length of hospital stay.[29,30] However, it has been shown that the average length of hospital stay for this group of patients has been decreasing over the last 20 years.[31] This fact is a challenge for proposing strategies aimed at reducing anxiety levels in these patients.

This study has limitations. Data collection in a single center and in a highly specialized service, as well as not including AMI patients with ST-segment elevation may compromise the generalization of results. In addition, collecting clinical data from patients' medical records depends on the accuracy and completeness of the documented information. In spite of the potential influence of the time between hospitalization and catheterization on anxiety levels, this information was not analyzed in the present study. Thus, other studies that assessing anxiety in patients with ACS undergoing unplanned catheterization should be conducted in order to enable

greater understanding of the phenomenon and its association with short-term outcomes.

Conclusion

The level of anxiety in patients with ACS undergoing unplanned catheterization decreased significantly after the procedure. Moreover, although the usual level of anxiety (trait) is associated with the level of anxiety of the moment (state), the difference in state anxiety score before and after catheterization was not influenced by the level of trait anxiety. Trait and state anxiety scores were not predictive of short-term outcomes (non-fatal arrhythmia, clinical severity, and length of hospital stay).

Collaborations

Batista LC, Calache ALSC and Butcher RCGS declare they have contributed to the design of the study, analysis and interpretation of data, relevant critical review of the intellectual content and approval of the final version to be published.

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