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WAYS TO REDUCE THE SEVERITY OF BENDOPNEA AS A PROGNOSTIC SIGN OF DECOMPENSATION OF CHRONIC HEART FAILURE

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Abstract:

We have frequently found that patients with heart disappointment had shortness of breath when bowing forward. The frequency of bendopnea in patients with decompensated heart disappointment (DHF), its repercussions on quality of life (QoL), and its prognosis have not however been considered. This think about was carried out to assess the characteristics, degree of limitation, and short-term guess of patients with bendopnea and DHF.

Keywords Bendopne, decompensated heart disappointment, quality of life, mortality.

Introduction

In clinical practice, the doctor in most cases pays attention to the frequent and typical manifestations of chronic heart failure (CHF), such as edema and shortness of breath, often without differentiating the type of respiratory disorder: orthopnea, nocturnal paroxysmal dyspnea, etc. Recognition of a specific type of respiratory disorder or other symptom of fluid retention allows you to obtain additional information about both the department of the heart most involved in the pathological process and intracardiac hemodynamics. For example, it has been proven that orthopnea indicates a greater lesion of the left heart [1], whereas bendopnea indicates involvement of the right atrium in the pathological process. Bendopnea is a new symptom of heart failure, which was described for the first time in a long time in 2014 by J. Thibodeau [2]. Bendopnoe (from the English word "slope" and Greek. "lack of breathing") – the appearance of shortness of breath when the trunk is tilted forward. The presence of this symptom reflects changes in indicators such as the cardiac index (SI) and pulmonary capillary jamming pressure (DLC), which are difficult to measure during routine examination. To date, the relationship between the presence of bendopnea and the risk of CHF decompensation is not fully understood.

The purpose of the study

The aim of the study was to study the risk of CHF decompensation in patients with preserved left ventricular ejection fraction (LV) and bendopnea and the dependence of this symptom on the level of salt intake.

Research materials and methods

On the basis of the NIITPM branch of the ICiG SB RAS, an interventional single—center open randomized controlled trial "Efficacy and safety of prolonged-release metformin in patients with prediabetes, CHF and AO" is being conducted, including 4 consecutive periods: screening, an introductory period (for 4 weeks. prior to randomization, when all patients will take the original prolonged—acting metformin at a dose of 1000-1500 mg/day with an assessment of its tolerability), randomization (the metformin group and the comparison group) and the main period - observation, clinical, laboratory and instrumental studies in patients of the two specified groups against the background of basic therapy of CHF (52 weeks, or 12 months). Currently, the stage of recruitment and initial examination of patients has been completed.

The results of the study

Characteristics of patients. It was possible to establish contact with 156 of the 254 patients who met the selection criteria. 115 of them agreed to participate in the study. In these patients, the presence of shortness of breath, nocturnal paroxysmal dyspnea, orthopnea, as well as shortness of breath that occurs when tying shoelaces or putting on socks (bendopnea) was assessed. 49 patients did not have these symptoms, so they were excluded from the study. The remaining 66 patients were asked to complete a questionnaire to assess their salt intake ("Charlton: SaltScreener"). 53 patients completed a test visit to determine the presence of bendopnea.

The average age of the patients included in the study was 73.0±11.7 years (Table 1). Women predominated among them. Most patients were overweight or obese, as well as arterial hypertension, but the average levels of systolic and diastolic blood pressure (BP) corresponded to the target values. All patients had preserved PV, which averaged 49.0±12.8%. All patients received diuretic and hypotensive therapy, mainly with ACE inhibitors/angiotensin II receptor antagonists and beta-blockers. Only 20 patients took Spironolactone, including 13 at a dose of 25 mg and 7 at a dose of 50 mg.

Assessment of CHF symptoms. Dyspnea was observed in 51 (96.2%) of 53 surveyed patients, nocturnal paroxysmal dyspnea – in 14 (26.4%), orthopnea – in 40 (75.5%), bendopnea (according to patients) – in 42 (79.2%), edema – in 36 (67.9%). In almost all patients, bendopnea was combined with dyspnea (95.0%), nocturnal paroxysmal dyspnea (27.5%), orthopnea (80.0%) or all three of the listed symptoms (20.7%). Only in 2 (3.8%) patients, bendopnea was not accompanied by other symptoms of CHF. Liver enlargement and ascites were significantly less common, which were detected in 7 (13.2%) and 2 (3.8%) patients, respectively.

Analysis of the sample to detect bendopnea. During the test, bendopnea was detected in 40 (75.5%) of 53 patients. Shortness of breath appeared on average 22.5± 9.3 seconds after leaning

forward (at least 5 seconds). It should be noted that the test was positive in 17.5% of patients who did not have bendopnea according to the survey, and negative in 23.0% of patients who noted the presence of bendopnea during the survey. In 5 (12.5%) of 40 patients with bendopnea, CHF I FC was diagnosed, in 22 (55.0%) – II FC, in 13 (32.5%) – III FC.

Patients were divided into groups according to the time of occurrence of bendopnea: group 1 (n=10) – up to 14 s (10.4±2.33 s) after incline; group 2 (n=15) – from 15 to 20 s (17.7±2.9 s); group 3 (n = 15) – after 21 seconds or more (25.6 ± 2.5 seconds).

Analysis of the Charlton: SaltScreener questionnaire. The average salt intake in scores in 53 patients was 35.4±9.6, which indicated a high-salt diet (daily salt intake of more than 6 g) in all included patients. Converting the scores into grams of salt consumed allowed us to conclude that 36 (67.9%) patients consumed from 6 to 10 g of salt per day, and 17 (32.1%) – more than 10 g per day. The results of the analysis of salt intake in patients with various symptoms of CHF are shown in (Table 2).

Consumption of more than 10 g of salt per day was associated with a significant increase in the risk of shortness of breath (relative risk [HR] 1.5, 95% confidence interval [CI] 1.2; 1.8, $p<0.05$), orthopnea (HR 1.3, 95% CI 1.05; 1.7, $p<0.05$) and bendopnea (HR 1.3, 95% CI 1.1; 1.7, $p<0.05$) and an unreliable increase in the risk of nocturnal paroxysmal dyspnea (HR 1.2, 95% CI 0.5; 3.1, $p>0.05$).

Analysis of the risk of CHF decompensation. During the year, CHF decompensation was noted in 32 (60.4%) of 53 patients, including 23 (57.5%) of 40 patients with bendopnea. The presence of bendopnea was associated with an unreliable increase in the risk of CHF decompensation during the year (HR 2.9, 95% CI 0.8; 10.3, $p>0.05$). In patients with CHF decompensation during the tilt test, bendopnea occurred later than in patients who had no CHF decompensation (Fig. 2). CHF decompensation was registered in 8 (80.0%) of 10 patients of group 1, in 12 (80.0%) of 15 patients of group 2 and in 3 (20.0%) of 15 patients of group 3.

It should be noted that an increase in the risk of CHF decompensation was statistically significant in patients of groups 1 and 2 who had bendopnea during the first 14 seconds (HR 4.7, 95% CI 0.99; 22.5, $p<0.05$) and 15-20 seconds (HR 7.1, 95% CI 1.6; 32.1, $p<0.05$) after the slope, respectively. At the same time, there was no significant increase in the risk of CHF decompensation in patients of group 3 (HR 0.4, 95% CI 0.1; 2.0, $p>0.05$).

Among patients with bendopnea, CHF decompensation was not registered in any patients with CHF I FC and was noted in 12 (54.5%) of 22 patients with CHF II FC and in 12 (92.3%) of 13 patients with CHF III FC. In patients with CHF III FC, the risk of decompensation was significantly higher than in patients with CHF I and II FC (HR 4.8, 95% CI 1.5; 15.1).

The presence of dyspnea (HR 1.02, 95% CI 0.24; 4.1), nocturnal paroxysmal dyspnea (HR 1.39, 95% CI 0.8; 2.3) and orthopnea (HR 1.8, 95% CI 0.8; 4.4) was not accompanied by a significant increase in the risk of CHF decompensation. However, when consuming more than 10 g of salt per day, orthopnea (HR 1.3, 95% CI 1.0; 1.7, $p<0.05$) and to a greater extent bendopnea (HR 1.5, 95% CI 1.0; 2.3, $p<0.05$) were associated with a significant increase in the risk of CHF decompensation.

Discussion

In recent years, the only new symptom of CHF has been bendopnea. This symptom was described in 2014, but was included in the recommendations of the European Society of Cardiology for the treatment and diagnosis of CHF only in 2017 [4]. Unlike shortness of breath during exercise or orthopnea, the presence of bendopnea with high accuracy indicates a change in intracardiac hemodynamics. So, in a study by J. Thibodeau et al. [2] in patients with bendopnea, the median pressure in the right atrium was 11 [7; 15] mmHg, and in patients without bendopnea – 5 [3; 10] mmHg. DLC was also higher in patients with bendopnea (23 [20; 26] and 19 [8; 23] mmHg, respectively, p=0.0004). At the same time, SI did not increase in the group of patients with bendopnea. In accordance with the classification of J. Forrester in the modification of A. Nohria et al. [5] the following clinical types of patients with CHF are distinguished: type A – "warm and dry" (SI>2.2 l/min/m2; TLC<22 mmHg); type B – "warm and moist" (SI>2.2 l/min/m2; TLC≥22 mm Hg); type C – "cold and wet" (SI≤2.2 l/min/m2; TLC≥22 mmHg); type L – "cold and dry" (SI≤2.2 l/min/m2; TLC<22 mmHg). In the study of J. Thibodeau et al. patients with bendopnea were most often classified as type C, while patients without bendopnea were classified as types A and L [2]. This indicates that the appearance of bendo pnoe is more associated with an increase in DLC. Type C hemodynamic changes are considered unfavorable and are associated with a high risk of death and decompensation in the near term. In the ORACLE study, patients with this type of hemodynamics showed a significant increase in the risk of death (HR 2.9, 95% CI 2.4; 3.6]) [6]. Similar data were obtained in the ESCAPE study, in which the risk of death and re-hospitalization for CHF decompensation in such patients was 50% higher [1].

We have previously shown that excessive salt intake and changes in natriuresis are also independent and highly significant predictors of decompensation and mortality in patients with CHF [7,8]. In the present study, the consumption of more than 10 g of salt per day increased the risk of decompensation of CHF during the year in patients with orthopnea and bendopnea.

In a major study by D. Martínez Segop et al. [9] when studying the symptoms of CHF in 633 patients aged 45 to 99 years, it was shown that bendopnea and nocturnal paroxysmal dyspnea were of the greatest diagnostic importance. In our study, bendopnea was observed in 75.5% of patients with CHF and in most cases was combined with shortness of breath during exercise (95%) or orthopnea (80%), while nocturnal paroxysmal dyspnea was observed less frequently (28%).

The most relevant is the study of the relationship between bendopnea and the risk of CHF decompensation. So, in the study of R. Baeza-Trinidad et al. 250 patients aged an average of 81.8±8.3 years with CHF were included, 122 (48.8%) of whom had bendopnea [10]. The presence of this symptom was associated with higher levels of NT-proBNP. In the presence of other CHF symptoms, especially oliguria, bendopnea occurred faster than in their absence. The most significant increase in the risk of death in the presence of bendopnea was found in patients with CHF III-IV FC (HR 2.3, 95% CI 1.05; 5.14). In our study, in patients with CHF III FC and bendopnea, the risk of CHF decompensation increased 4.8 times.

Conclusion

Adverse outcomes in patients with bendopnea were also studied by the discoverer of this symptom, J. Thibodeau et al., in 179 outpatient patients with CHF, who were observed during the year [11]. Bendopnea was detected in 18% of them. In this group of patients, there was an increase in the risk of a combined endpoint, including death, implantation of an artificial left ventricle and decompensation of CHF, by 1.9 times ($p<0.05$) and the risk of decompensation of CHF during the first 3 months of follow-up by 3.1 times ($p<0.004$). We did not find a reliable association between the risk of decompensation of CHF and the presence of bendopnea, although the increase in risk reached statistical significance when consuming more than 10 g of salt per day. In addition, the risk of CHF decompensation depended on the time of onset of bendopnea after leaning forward: it significantly increased in patients who had this symptom during the first 14 hours and 15-20 seconds (HR values were 4.7 and 7.1, respectively). Thus, the greatest risk of CHF decompensation was observed in patients with bendopnea occurring during the first 20 seconds after incline, as well as when consuming more than 10 g of salt per day, regardless of the time of onset of the symptom.

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