

METABOLIC SYNDROME IN PATIENTS WITH HEART FAILURE: A NEW PARADIGM?

CAMELIA CRISTINA DIACONU

UMF Carol Davila, Bucharest, Emergency Clinical Hospital Ilfov

Corresponding author: Camelia Diaconu, MD, PhD

Department of Internal Medicine, Emergency Clinical Hospital Ilfov, 49-51 Basarabia Blvd, Bucharest, Romania

e-mail: camiluciemi@yahoo.com

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Metabolic syndrome announces serious cardiovascular events, the impact on public health being alarming, due to associated cardiovascular risk. However, the prevalence and clinical significance of metabolic syndrome remain to be elucidated in patients with heart failure. The aim of the study was to evaluate the frequency of metabolic syndrome and clinical correlations in patients with chronic heart failure. The study was conducted on a sample of 132 patients diagnosed with chronic heart failure, hospitalized in Medical Clinic and referred for echocardiographic evaluation. In all patients 2-D transthoracic echocardiography was performed. Of the 132 patients, 81 were men and 51 women. In total, 52 patients (39.39%) were diagnosed with metabolic syndrome. The 52 patients with heart failure and metabolic syndrome had a younger age, a higher prevalence of smoking, ischemic heart disease, high blood pressure compared with those without metabolic syndrome. The prevalence of metabolic syndrome in patients with heart failure is high, suggesting that components of metabolic syndrome may have a substantial effect on heart failure development. Early diagnosis and treatment, as the control of metabolic risk factors, may improve cardiovascular prognosis of these patients.

Key words: Metabolic syndrome; heart failure.

INTRODUCTION

Metabolic syndrome announces serious cardiovascular events, the impact on public health being alarming, due to associated cardiovascular risk. However, the prevalence and clinical significance of metabolic syndrome remain to be elucidated in patients with heart failure. Heart failure is a complex clinical syndrome that results from any structural or functional cardiac anomaly, including coronary artery disease, hypertensive heart disease, myocardial disease and valvular heart disease¹. 50% of patients with heart failure have a low ejection fraction (systolic heart failure) and 50% have a preserved ejection fraction (diastolic heart failure or heart failure with

preserved ejection fraction)^{2,3}. Metabolic syndrome increases the risk of heart failure by a complex mechanism that probably involves arterial hypertension and diabetic cardiomyopathy. Individuals with type 2 diabetes mellitus have up to a five times higher-than-expected prevalence of chronic heart failure and are likely to present with heart failure at a younger age than those without diabetes^{4,5,6}.

THE AIM OF THE STUDY

The aim of the study was to evaluate the frequency of metabolic syndrome and clinical correlations in patients with chronic heart failure.

MATERIAL AND METHODS

Study conducted on a sample of 132 patients diagnosed with chronic heart failure, hospitalized in Medical Clinic between June 1st, 2010 and February 1st, 2011 and referred for echocardiographic evaluation. In all patients 2-D transthoracic echocardiography was performed. For each patient demographics were recorded including age, sex, height, weight, waist circumference, coronary risk factors (blood pressure, lipid profile, fasting glucose, smoking), drug therapy, comorbidities (stroke, myocardial infarction, atrial fibrillation, ischemic heart disease). Patients with valvular heart disease were excluded.

RESULTS

According to European Society of Cardiology guidelines, the patients were divided into two groups: a group with heart failure with preserved ejection fraction (EF \geq 50%) and a group with systolic heart failure (low ejection fraction $<$ 50%). Of the 132 patients, 81 were men and 51 women. In total, 52 patients (39.39%) were diagnosed with metabolic syndrome according to the International Diabetes Federation criteria. 30 (48.15%) of the 81 men with heart failure and 13 (25.49%) of the 51 women with heart failure have also metabolic syndrome.

The 52 patients with heart failure and metabolic syndrome had a younger age (67.6 *versus* 69.7 years), a higher prevalence of smoking (25.3% *versus* 18.1%), ischemic heart disease (55.3% *versus* 39%), high blood pressure (91.3% *versus* 67.8%) compared with those without metabolic syndrome.

The proportion of those with heart failure and preserved ejection fraction was higher among patients with metabolic syndrome than among those without metabolic syndrome (70.2% *versus* 65.6%). Compared with patients with low ejection fraction, those with preserved ejection fraction were characterized by a higher prevalence of obesity, female sex (35.7% *versus* 25.3%), old age (69.6 *versus* 67.7 years) and high blood pressure (31.9% *versus* 16.9%).

Men with chronic heart failure had a higher prevalence of increased BMI and diabetes mellitus (67.2% *versus* 62.5%). Women with chronic heart failure were characterized by a more advanced NYHA class and a higher prevalence of heart failure with preserved ejection fraction (81.2% *versus* 66.8%). From both men and women with heart failure, those with metabolic syndrome had a lower age, a higher prevalence of smoking, coronary artery disease and hypertensive

cardiopathy. Prevalence of heart failure with preserved ejection fraction was higher in metabolic syndrome group compared with the group without metabolic syndrome (73.2% *versus* 65.4%).

STUDY LIMITATIONS

Lacks an appropriate control group; small number of patients, without statistical significance.

DISCUSSION

Metabolic syndrome is a risk and prognostic factor for ischemic heart disease and stroke. Metabolic syndrome is highly associated with coronary artery disease in both men and women with heart failure, therefore prevention of coronary artery disease is extremely important for preventing the occurrence of heart failure, both by lifestyle changes and by use of drugs that stabilize atherosclerotic plaques. Furthermore, because hypertension is associated with obesity, it is important to treat obesity to gain control of hypertension and to prevent hypertensive cardiopathy.

Insulin resistance, independent of hyperglycaemia, predisposes to chronic heart failure, and in patients without overt heart failure is associated with echocardiographic signs of left ventricular dysfunction^{7,8,9}; 25% of asymptomatic subjects with type 2 diabetes have systolic left ventricular dysfunction. The reverse is also true: patients with heart failure have more frequently diabetes mellitus^{10,11}. Diabetes and metabolic syndrome are associated with increased left ventricle mass; left ventricular hypertrophy is associated with an increased risk of heart failure, but in the presence of diabetes the incidence increases to 2% per annum¹².

Coronary artery disease is the most frequent cause of LV systolic dysfunction and is common in diabetic patients. In addition, diabetics have also "diabetic cardiomyopathy", its etiology being independent of ischemia^{13,14}. The etiology of diabetic cardiomyopathy probably includes hyperglycaemia and insulin resistance, with specific alterations in endothelial function, cardiac ultrastructure, microangiopathy and cardiomyocyte metabolism.

In patients with chronic heart failure, in most studies, obesity is associated with reduced mortality, although hospitalisation rates are the same for obese and non-obese patients with chronic heart failure. Obesity, especially abdominal obesity, is an independent risk factor for heart

failure. In a study of more than 5800 patients, followed for 14 years, even those modestly overweight were at increased risk of development heart failure, with an attributable risk of heart failure due to obesity of 14% in women and 8.8% in men¹⁵. The risk of chronic heart failure in adults with a BMI > 30 was 1% per year for men and 0.7% per year for women.

Arterial hypertension is an independent risk factor for the development of heart failure, left ventricular hypertrophy being a predictive sign of morbidity and heart failure death¹⁶. However, once a diagnosis of heart failure has been made, arterial hypertension is associated with improved survival. In developed countries, between 6 and 10% of cases of heart failure are due to hypertension^{17,18}. Hypertension increases the risk of heart failure twofold in men and threefold in women¹⁹.

CONCLUSIONS

The prevalence of metabolic syndrome in patients with heart failure is high, suggesting that components of metabolic syndrome may have a substantial effect on heart failure development. Early diagnosis and treatment, as the control of metabolic risk factors, may improve cardiovascular prognosis of these patients.

REFERENCES

- Hunt SA, Abraham WT, Chin MH, Feldman AM, Francis GS, Ganiats TG, *et al.*, 2009 focused update incorporated into the ACC/AHA 2005 Guidelines for the Diagnosis and Management of Heart Failure in Adults: A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines: Developed in collaboration with the International Society for Heart and Lung Transplantation. *Circulation* 2009;119:e391–e479.
- Cleland JG, Cohen-Solal A, Aguilar JC, Dietz R, Eastaugh J, Follath F, *et al.*, Management of heart failure in primary care (the IMPROVEMENT of Heart Failure Programme): An international survey. *Lancet* 2002;360:1631–1639.
- Bhatia RS, Tu JV, Lee DS, Austin PC, Fang J, Haouzi A, *et al.*, Outcome of heart failure with preserved ejection fraction in a population-based study. *N Engl J Med* 2006;355:260–269.
- Kannel, WB, McGee, DL., Diabetes and Cardiovascular disease: the Framingham study. *JAMA* 1979;241:2035–38.
- Gottdeiner, JS, Arnold, AM, Aurigemma, GP, *et al.*, Predictors of congestive heart failure in the elderly; the Cardiovascular Health Study. *J Am Coll Cardiol* 2000;35:1628–37.
- Nichols, GA, Guillon, CM, Koro, CE, Ephross, SA, Brown, JB., The incidence of congestive heart failure in type diabetes: an update. *Diabetes Care* 2004;27:1879–84.
- Ingelsson, E, Sundström, J, Årnlöv, J, Zethelius, B, Lindt, L., Insulin resistance and risk of congestive heart failure. *JAMA* 2005;294:334–40.
- Ingelsson, E, Arnlov, J, Sundstrom, J, Zethelius, B, Vessby, B, Lind, L., Novel metabolic risk factors for heart failure. *J Am Coll Cardiol* 2005;46:2054–60.
- Rutter, MK, Parise, H, Benjamin, EJ, *et al.*, Impact of glucose intolerance and insulin resistance on cardiac structure and function: sex-related differences in the Framingham Heart Study. *Circulation* 2003;107:448–54.
- Bertoni, AG, Tsai, A, Kasper, EK, Brancati, FL., Diabetes and Idiopathic Cardiomyopathy: A nationwide casecontrol study. *Diabetes Care* 2003;26:2791–95.
- Adams, KF Jr., Fonarow, GC, Emerman, CL, *et al.*, Characteristics and outcomes of patients hospitalised for heart failure in the United States: rationale, design and preliminary observations from the first 100,000 cases in the Acute Decompensated Heart Failure National Registry (ADHERE). *Am Heart J* 2005;149:209–16.
- Ingelsson, E, Sundstrom, J, Lind, L, *et al.*, Low-grade albuminuria and the incidence of heart failure in a community-based cohort of elderly men. *Eur Heart J* 2007; 28:1739–45.
- Bell, DS., Diabetic cardiomyopathy. *Diabetes Care* 2003;26:2949–51.
- Hayat, SA, Patel, B, Khattar, RS, Malik, RA., Diabetic cardiomyopathy: mechanisms, diagnosis and treatment. *Clinical Science* 2004;107:539–57.
- Bozkurt, B, Deswal, A., Obesity as a prognostic factor in chronic symptomatic heart failure. *Am Heart J* 2005; 150:1233–39.
- Kannel, WB., Prevalence and natural history of electrocardiographic left ventricular hypertrophy. *Am J Med* 1983;75:4–11.
- Parameshwar, J, Shackell, MM, Richardson, A, Poole-Wilson, P.A., Sutton, G.C., Prevalence of heart failure in three general practices in north west London. *Br J Gen Pract* 1992;42:287–89.
- Ho, KK, Pinsky, JL, Kannel, WB, Levy, D., (1993) The epidemiology of heart failure: the Framingham Study. *J Am Coll Cardiol* 22(4 suppl A): 6A–13A.
- Levy, D, Larson, MG, Vasan, RS, Kannel, WB, Ho, KK., (1996) The progression from hypertension to congestive heart failure. *JAMA* 275: 1557–62.