Congestive Heart Failure With Preserved Systolic Function: Is It a Woman's Disease?

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Congestive heart failure with preserved systolic function is increased in prevalence with advancing age, especially in women, indicating the strong impact of gender on this common disease.

Congestive heart failure (CHF) is a major cause of morbidity and mortality. In recent years, congestive heart failure with preserved systolic function has gained increased recognition.[1–4] Studies have reported that the subset of patients with preserved systolic function comprises at least 40% of all cases of heart failure and that it is more common in older people.[1] The literature also suggests that the prevalence of CHF with preserved systolic function is higher in women than in men.[4–7] However, few studies have fully addressed this difference. We sought to characterize the association between gender and CHF with preserved systolic function, as influenced by age, in patients in an acute care hospital.

Retrospective data were obtained from the computer records of a tertiary teaching, acute care hospital. There were 3,753 admissions from January 1, 1986, to December 31, 1996, for patients with a diagnosis of CHF in whom echocardiograms and/or catheterizations were performed. We studied the last 695 of these, starting with the most recent admission prior to January 1, 1997, and working backward in time. CHF with preserved systolic function was defined as the presence of CHF symptoms with mildly reduced or preserved systolic function (ejection fraction $\geq$45%). Records were reviewed for the presence of coronary artery disease, aortic stenosis, mitral regurgitation,

Published by Elsevier Science Inc.
1049-3867/99/$20.00
PII S1049-3867(99)00008-0

hypertension, diabetes, and left ventricular hypertrophy. The diagnosis of CHF was accepted if at least three of the following were noted: dyspnea, jugular venous distention, presence of S3, basilar rales, and chest x-ray showing pulmonary venous congestion. Chi-square tests and logistic regression analysis (SAS, Version 6.12) were applied to assess for the association of CHF with preserved systolic function with age, gender, and the measures of cardiac disease.

A total of 695 patients were studied. Ages ranged from 16 to 96 years (mean 70.2 ± 13). There were 336 men and 359 women. Among all subjects of CHF, there was a significant association between gender and the prevalence of CHF with preserved systolic function: 59% in women as compared with 35% in men ($P < .001$). Moreover, the odds of having CHF with preserved systolic function were 2.7 [95% confidence interval (CI) 2.0–3.7] times larger in women than in men. There was also a significant association between age and preserved systolic function: 51% of patients who were 65 and older had CHF with preserved systolic function compared to 39% of the patients <65 years old ($P < .006$). Expressed differently, older patients (≥65 years) were 1.6 (95% CI 1.2–2.3) times more likely to have CHF with preserved systolic function than younger (<65 years) patients. The gender difference persisted even when controlling for age. As shown in Figure 1, the prevalence of CHF with preserved systolic function was significantly larger in younger and older women compared to their age-matched male cohorts. Furthermore, as seen in Figure 1, the increased prevalence in age was largely due to an increased prevalence among older women. The prevalence of CHF with preserved systolic function was significantly larger in older women compared to younger women ($P < .01$), but was similar in younger and older men ($P = .5$). Table 1 lists the prevalence of other cardiac disease in this cohort. Multiple logistic regression analysis (Table 2) showed that left ventricular hypertrophy, gender

The increased prevalence in age was largely due to an increased prevalence among older women.

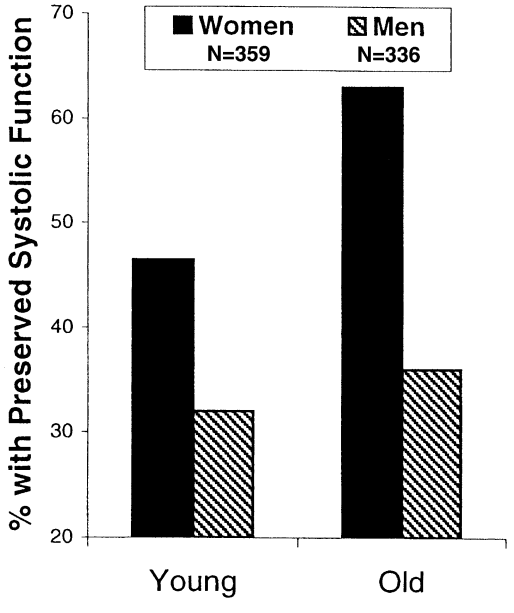

Figure 1. *Increased prevalence of congestive heart failure with preserved systolic function in women. Among both younger (<65 years old) and older (≥65 years old) adults, this type of heart failure was significantly more common in women than in men ($P < .05$ and $P < .001$, respectively). Note, too, that among women but not men, the prevalence of congestive heart failure with preserved systolic function increased significantly ($P < .01$) with age. These results are based on the study of 103 young and 233 older men and 86 young and 273 older women.*

Table 1. PREVALENCE (% OF GROUP) OF CARDIAC COMORBIDITIES IN PATIENTS WITH CHF

	Women (n = 359)		*Men (n = 336)*	
Comorbidity	*Young (<65 y) (n = 86)*	*Old (≥65 y) (n = 273)*	*Young (<65 y) (n = 103)*	*Old (≥65 y) (n = 233)*
Left ventricular hypertrophy	19	40*†	27	30
Hypertension	36	49*†	34	39
Coronary artery disease	40	57*†	57	67
Mitral regurgitation	40	53*	41	57*
Aortic stenosis	6	11	2	8*
Diabetes	28	26	18	28

*Significant ($P < .05$) age-related effect.
†Significant gender-related effect (within age group).

(women), hypertension, and older age contributed independently to the likelihood of having CHF with preserved systolic function. In contrast, the presence of diabetes, mitral regurgitation, and coronary artery disease decreased the likelihood.

In a previous, smaller study of 99 patients, Wong et al.[2] found that the prevalence of CHF with normal systolic function increased with age and there was a tendency toward female predominance. More recently, Aronow et al.[3] showed that female gender and age were independent risk factors for CHF with normal systolic function among 572 older (>60 years) patients living in a long-term care facility. The present study shows that in patients admitted to an acute care hospital, the increase in prevalence of preserved systolic function in older patients is in fact largely due to the increased rate in women.

This age-associated increase in prevalence of CHF with preserved systolic function in women is likely to be multifactorial. One important consideration is that, in general, men have more prior myocardial infarctions than women. In patients <65 years of age, men are three times more likely to have a prior myocardial infarction. A second factor is that for any given increase in systolic blood pressure or for aortic stenosis of similar degree, women have more left ventricular hypertrophy compared to men.[4,8] Moreover, left ventricular hypertrophy, regardless of how it is indexed, has a more profound association with cardiac disease in women than in men.[9] Third, women are still undertreated for cardiac disease compared to men.[10,11] These factors, along with the loss in older women of estrogen-mediated protective effects such as coronary reserve and vasodilation with menopause,[11] probably contribute to the reduced left

Table 2. ADJUSTED ODD RATIOS (OR) FOR CHF WITH PRESERVED SYSTOLIC FUNCTION

Independent Risk Factor	*Adjusted OR*	*95% CI*	*P Value*
Left ventricular hypertrophy	2.6	1.8–3.8	.001
Gender (women)	2.5	1.8–3.6	.001
Hypertension	1.6	1.1–2.3	.010
Age (10 y)*	1.2	1.1–1.4	.003
Diabetes	0.6	0.4–0.9	.024
Mitral regurgitation	0.4	0.3–0.5	.001
CAD	0.3	0.2–0.5	.001

*The odds ratio for age is determined for a 1 decade (10 year) increment in age, e.g., a 70-year-old is 20% more likely to have CHF with preserved systolic function compared with a 60-year-old after adjusting for other factors.

ventricular compliance and consequent increased prevalence of CHF with preserved systolic function in older women as compared to men.[12–14] We note, however, that the present study was a retrospective data analysis, and hence is subject to the limitations that are associated with such a design.

A recent editorial by Lindenfeld et al.[5] suggested that an increased prevalence of CHF with preserved systolic function in women may explain the difficulty that has been encountered in finding equal numbers of men and women with systolic dysfunction even though there is an equal prevalence of CHF. Our study strongly supports this view. Prospective controlled trials will need to be conducted to definitely confirm the findings of this study. The mechanisms and pathophysiology underlying this age-associated gender difference should be investigated so that appropriate preventive measures and treatment can be provided to this large and ever-increasing segment of the population.

In summary, CHF with preserved systolic function is increased in prevalence with advancing age, especially in women. In fact, the increase with age in women apparently accounts for a large part of the age-associated increase. It therefore appears that CHF with preserved systolic function is largely a disease of older women.

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