

VIEWPOINT

HFNEF, HFpEF, HF-PEF, or DHF

What Is in an Acronym?

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It is well recognized that many patients presenting with heart failure have a normal left ventricular ejection fraction. There has been debate about the correct name for this condition including originally Diastolic Heart Failure (DHF), Heart Failure with a Normal Ejection Fraction (HFNEF), and more recently Heart Failure with a Preserved Ejection Fraction, usually abbreviated to HFpEF. In this viewpoint it is argued that 'Preserved' is the least appropriate word to use, as ejection fraction declines over time and furthermore it is never explained why the 'p' is small. The most honest acronym is HFNEF. (J Am Coll Cardiol HF 2014;2:93-4) © 2014 by the American College of Cardiology Foundation

It has been recognized for a long time that there is a group of patients who present with symptoms suggestive of heart failure (HF) but whose left ventricular ejection fraction (LVEF) is normal. Many of these patients are elderly, have long-standing hypertension, may have diabetes, and usually have some degree of LV hypertrophy (1). Early on it was assumed that, because systolic function was normal, the disorder was due to impaired filling, and the condition was initially labeled *diastolic heart failure*, or DHF. Thus, there was a rather neat distinction between systolic HF and DHF. However, several studies began to emerge using newer measurements of LV mechanics demonstrating that systolic function was not entirely normal despite appearances. Reduced long-axis function was shown first, followed by evidence of more extensive, subtle defects, especially on exercise, with reduced augmentation of long-axis function, impaired systolic twist, reduced strain, torsional dyssynchrony, and reduced myocardial systolic reserve (2,3). In addition, atrial function is often impaired, especially on exercise. Because fibrosis is a prominent feature of LV hypertrophy, it would be expected that this will impair systolic as well as diastolic function and increase passive ventricular stiffness in both systole and diastole. In fact, there is evidence of widespread vascular stiffening involving the heart, arteries, and probably also the veins. Clearly the label *DHF* is inadequate. Thus when the European Society of Cardiology Working Group produced new guidelines (4), the acronym *HFNEF* (i.e., heart failure with a normal ejection fraction) was used, as this appears to precisely describe the clinical situation—a patient presents with clinical symptoms

of heart failure (HF) and echocardiography shows a normal ejection fraction (EF), and hence HFNEF can be diagnosed. Also, this term provided another neat contradistinction of heart failure with reduced ejection fraction (HFREF). However, for some inexplicable reason, another term—*heart failure with preserved ejection fraction* (HFpEF)—has emerged and has been used more and more widely, especially in North America and more recently in Europe. What is the logic here? Why *preserved*, and why a small *p*? No one has ever explained the reason for the small *p*—is it because there

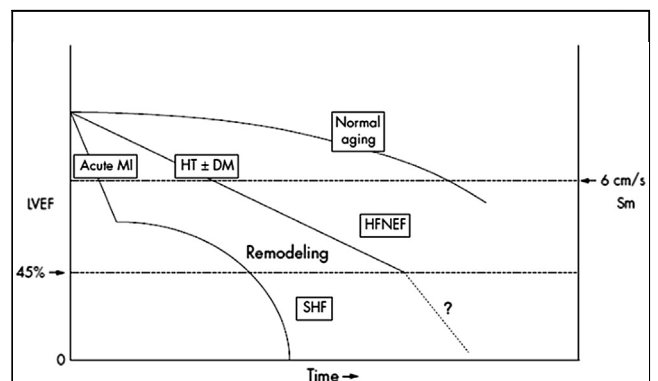


Figure 1 Time Course and Development Pattern of HF

Time course and pattern of development of heart failure (HF) primarily caused by myocardial infarction (MI), with pronounced remodeling and shape change leading to systolic heart failure (SHF), and of HF primarily caused by hypertension (HT), with or without diabetes mellitus (DM), leading to heart failure with a normal ejection fraction (HFNEF). Lower normal limits of left ventricular ejection fraction (LVEF) and peak annular systolic velocity (Sm) are indicated on the axes. Patients with a history of MI and patients with HT may experience periods of HFNEF and finally SHF/heart failure with a reduced ejection fraction (HFREF). The **question mark** can now be removed as it is now proved that this path occurs (see text). Reproduced from *Heart*, Sanderson JE. vol. 93, pp. 155-158, Sanderson JE. Heart failure with a normal ejection fraction. *Heart* 2007;93:155-8. © 2007, with permission from BMJ Publishing Group Ltd. (1).

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is uncertainty about whether *preserved* is the right word? The definition of *preserve* (*Oxford English Dictionary*) is “maintain (something) in its original or existing state” (5). What evidence is there that the EF is unchanging, especially because there are usually no measurements taken before the onset of symptoms? In fact, the opposite typically occurs: Recent work by Dunlay et al. (6) showed that in HFNEF patients, on average, EF decreased by 5.8% over 5 years ($p < 0.001$), with greater declines in older individuals, and that 39% of HFNEF patients had an EF $< 50\%$ after 5 years (i.e., they had developed HFREF). Paradoxically, over the same period, EF increased in patients with HFREF (possibly because of effective therapy that induced reverse remodeling that will have a greater impact on the EF measurement). The progressive but slow decline in EF in HFNEF confirms a scheme I have suggested in the past to explain that all forms of HFREF will pass through an HFNEF phase, but at differing rates (1). HFREF is mainly due to myocardial infarction or dilated cardiomyopathy that rapidly damages the myocardium, whereas in HFNEF, the effects of hypertension, diabetes, and aging are slower and would explain why long-axis function, which is a more sensitive measure, can be reduced while EF remains “normal” (Fig. 1; the question mark can now be removed in view of these latest data) (1). Indeed, cardiologists working in Africa, East Asia, and India often see patients with HFREF who have only hypertension as a risk factor, and presumably these patients passed through an HFNEF phase (other risk factors may interact, and one is alcohol intake, which has experimentally-induced HFREF with a typical dilated LV with low EF in spontaneously hypertensive rats with pre-existing LV hypertrophy and a normal or supranormal EF [7]).

Therefore, *preserved* is the least appropriate word to describe the EF in these patients, with or without a small p . In any case, the word *preserved* seems rather ostentatious in this context and can appeal only to those who prefer to use a more pretentious word when a simple one like *normal* will do the job.

Of course, the most sensible path would be to drop any classification of HF based on a poor measurement like the EF and just label HF according to the etiology and physiological disturbances if possible (1,2). In the meantime, I

would like to make a plea for the rehabilitation of the acronym *HFNEF*, which is the most accurate and honest description of the problem given our current state of knowledge of this variegated disease. Accuracy of a diagnostic label is important, for in science these often imply an underlying conceptual framework that can have a powerful influence on future research and the type of therapies we might consider to be effective (e.g., using the label *DHF* might lead to more efforts on drugs for myocardial relaxation, thereby ignoring the systolic problems that actually cause the delayed relaxation). Finally, another good reason is that *HFNEF* is much easier to pronounce and more melodious than is *HFpEF*. Try it.

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REFERENCES

1. Sanderson JE. Heart failure with a normal ejection fraction. *Heart* 2007; 93:155–8.
2. Tan YT, Wenzelburger F, Lee E, et al. The pathophysiology of heart failure with normal ejection fraction: exercise echocardiography reveals complex abnormalities of both systolic and diastolic ventricular function involving torsion, untwist, and longitudinal motion. *J Am Coll Cardiol* 2009;54:36–46.
3. Borlaug BA, Olson TP, Lam CS, et al. Global cardiovascular reserve dysfunction in heart failure with preserved ejection fraction. *J Am Coll Cardiol* 2010;56:845–54.
4. Paulus WJ, Tschope C, Sanderson JE, et al. How to diagnose diastolic heart failure: a consensus statement on the diagnosis of heart failure with normal left ventricular ejection fraction by the Heart Failure and Echocardiography Association of the European Society of Cardiology. *Eur Heart J* 2007;28:2539–50.
5. Oxford Dictionaries. Definition of preserve in English. Available at: http://www.oxforddictionaries.com/us/definition/american_english/preserve. Accessed December 17, 2013.
6. Dunlay SM, Roger VL, Weston SA, Jiang R, Redfield MM. Longitudinal changes in ejection fraction in heart failure patients with preserved and reduced ejection fraction. *Circ Heart Fail* 2012;5:720–6.
7. Sanderson JE, Jones JV, Graham DI. The effect of chronic alcohol ingestion on the heart and blood pressure of spontaneously hypertensive rats. *Clin Exp Hypertens A* 1983;5:673–89.

Key Words: diastole ■ ejection fraction ■ heart failure.