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Body composition changes in patients with systolic heart failure treated with beta blockers: A pilot study

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Abstract

Background: Cachexia is an independent risk factor for mortality in chronic heart failure (CHF). Beta blockers can reduce body energy expenditure and improve efficiency of substrate utilization.
Aim: To assess the changes in body composition in non-cachectic patients with CHF treated with beta blockers.
Methods: We prospectively followed 41 non-cachectic ambulatory CHF patients (mean age 67 ± 10 years, ejection fraction 37 ± 4%) treated with beta blockers for at least 6 months. Body composition was measured by bioimpedance.
Results: At baseline 16/41 patients were treated with beta blockers while at the end of follow-up all patients received beta blockers (31/41 at full recommended dose). During follow up of 263 ± 106 days body weight (83.1 ± 16.7 vs. 83.0 ± 16.9 kg), body mass index (29.3 ± 5.5 vs. 29.3 ± 5.6) and total body water did not change (51.2 ± 6.4% vs. 51.0 ± 6.4%), while total body fat mass (27.4 ± 9.6 to 28.3 ± 10.2 kg, median change +0.89 kg, $p=0.01$) and percent of total body fat increased (32.3 ± 7.4% to 33.4 ± 7.5%, median change +0.7%, $p<0.001$). New York Heart Association class and Minnesota Living with Heart Failure Questionnaire improved from 2.9 ± 0.4 and 48 ± 15 to 2.3 ± 0.6 and 32 ± 16, respectively ($p<0.001$ for both).
Conclusion: In patients with CHF, treatment with beta blockers can increase total body fat mass and total body fat content.

Keywords: Heart failure; Beta blockers; Body fat mass; Bioimpedance

1. Background

Chronic heart failure (CHF) is a serious, prevalent, and deadly condition [1]. Patients with CHF have increased resting energy production rate [2], which correlates with the severity of their condition [3]. Impaired body metabolism can lead to cardiac cachexia, which is an independent risk factor for mortality [4]. Controlled clinical trials undoubtedly proved the beneficial effect of beta blockers in patients with CHF, irrespective to the severity of the condition [5,6]. Recently, it has been shown that CHF patients with higher body mass index [7,8], higher total cholesterol [9,10] or higher body fat mass [11] have better clinical outcomes.

To our knowledge, there are no studies assessing the effect of treatment with beta blockers on body composition, determined by bioimpedance. Therefore, in our observational study we aimed to investigate changes of body composition in patients with CHF during treatment with beta blockers.

2. Methods

In this pilot prospective observational study starting in March 2002, we followed 41 non-cachectic CHF patients

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Table 1
Baseline patient characteristics ($N=41$)

Age [years]	67 ± 10
Men	68%
Left ventricular ejection fraction	37 ± 4%
Arterial hypertension	63%
Ischemic heart disease	41%
Diabetes mellitus	29%
Atrial fibrillation	49%
Dyslipidemia	37%
ACE inhibitors	93%
Beta blockers	37%
Spironolactone	68%
Furosemide	64%
Digoxin	39%

Data are presented as mean ± standard deviation or percent of patients.
ACE—angiotensin converting enzyme.

(NYHA class II–IV, left ventricular ejection fraction ≤40%) for at least 6 months. At baseline 16 of 41 patients were already receiving beta blocker therapy at low doses (8 patients carvedilol—mean daily dose 10.5 ± 6.9 mg, 7 patients bisoprolol −3.7 ± 1.6 mg, 1 patient metoprolol tartrate −100 mg). None of these 16 patients received maximum guideline recommended doses of beta blocker therapy. The remaining patients were started on beta blockers in our heart failure clinic. Beta blockers were titrated to the target daily dose or to the maximal tolerated dose in individual patient. At follow-up, 31 patients were receiving carvedilol (mean daily dose 41.6 ± 14.0 mg), 9 patients bisoprolol (9.2 ± 2.5 mg), and 1 metoprolol tartrate (200 mg); in 31 of the 41 patients the dose of beta blocker therapy was at the highest recommended dose while the remaining patients received the maximal tolerated dose.

Bioimpedance was measured by Maltron BF-907 (Maltron International Ltd., UK). Patients were resting on a non-conductive surface in supine position for at least 10 min. They were instructed to relax completely, not to cross or bend the legs and arms, and to remain still during the measurement. Four electrodes, two on the right hand (directly below the third knuckle of the middle finger and on the crease of the wrist) and two on the right foot (centrally above the meeting of the second and third toe and at the crease of the ankle in line with shin bone), were attached. Bioimpedance measurements were repeated and the average of the two measurements was calculated. Reproducibility of the measurements was excellent (within 0.1%).

Body mass index (BMI) was calculated from body weight and height. Quality of life was assessed using New York Heart Association (NYHA) functional class and Minnesota Living with Heart Failure Questionnaire (MLHFQ).

We compared data at baseline and at last visit in heart failure clinic. Results are expressed as mean ± standard deviation or proportion of patients. In figures we also used 95% confidence intervals. For comparison of data we used the paired samples t-test and t-test for independent samples. A p-value <0.05 was considered statistically significant. All calculations were made using SPSS 11.0 (Statistical Package for Social Sciences, SPSS Inc., 2001, USA).

3. Results

The 41 non-cachectic CHF patients (age 67 ± 10 years, 68% males) were followed for 263 ± 106 days and were seen in heart failure clinic for 5.7 ± 1.7 times. Their baseline characteristics are presented in Table 1.

During follow up, body weight, body mass index, and total body water did not change significantly (Table 2). Both NYHA class and MLHFQ improved significantly ($p<0.001$). Total body fat mass increased in 28 of 41 patients (Fig. 1a). The median increase in total body fat mass was +0.89 kg with a range of −2.81 kg to +8.50 kg. The change in total body fat mass (mean change in the whole group +0.92 ± 2.29 kg) was similar in patients with or without beta blocker therapy at baseline (+0.74 ± 2.62 vs. +1.02 ± 2.13 kg, $p=0.56$). Percent of total body fat increased in 33 of 41 patients (mean change +1.06 ± 1.46%, median increase +0.7%, range −1.8% to +4.7%; Fig. 1b). The increase in percent of total body fat was significant irrespective to beta blockers treatment at baseline (both $p<0.05$).

4. Discussion

There are no data on the time course of body composition changes in patients with CHF. Recent analyses of the SOLVD treatment database demonstrated weight loss of ≥6% to occur in 35% of these patients over a period of 3–4 years [12]. Spontaneous reversal of weight loss was noted only in 2% of cases with prior weight loss. Treatment with enalapril was associated to lower risk of weight loss, which became apparent after 12 months of treatment [12].

The increase of total body fat content was present in 33 of 41 patients (85%) in our cohort, and ranged from 0.5% to

Table 2
Bioimpedance parameters, body weight, body mass index, and quality of life parameters

	Baseline	Follow up	p
Body weight [kg]	83.1 ± 16.7	83.0 ± 16.9	ns
Body mass index	29.3 ± 5.5	29.3 ± 5.6	ns
Total body water [%]	51.2 ± 6.4	51.0 ± 6.4	ns
Total body fat mass [kg]	27.4 ± 9.6	28.3 ± 10.2	0.01
Total body fat [%]	32.3 ± 7.4	33.4 ± 7.5	<0.001
NYHA class	2.9 ± 0.4	2.4 ± 0.6	<0.001
NYHA I/II [No. of patients]	6	23	
NYHA III/IV [No. of patients]	35	18	
Minnesota Living with Heart Failure Questionnaire	48 ± 15	32 ± 16	<0.001

Data are presented as mean ± standard deviation.
NYHA—New York Heart Association.