Clinical determinants and prognostic impact of osteoporosis in patients with chronic heart failure

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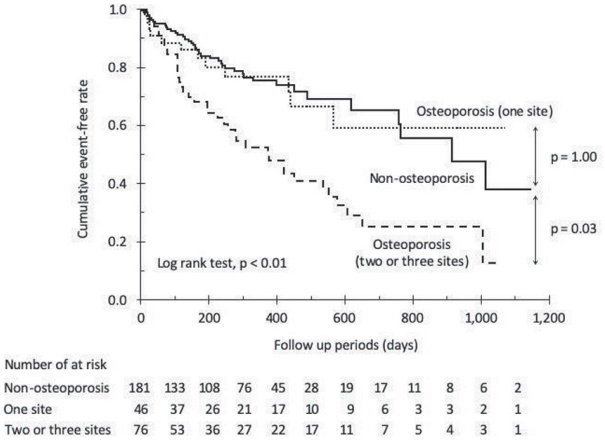
Background: Despite accumulating evidence of a close association between orthopedic fractures and chronic heart failure (CHF), the clinical risk factors of osteoporosis, defined as reduction in bone mineral densities (BMDs), in CHF patients have not been systematically analyzed. In addition, the impact of osteoporosis on prognosis of CHF remains unclear.
Aims: We aimed to clarify the prevalence, clinical risk factors, and prognostic impact of osteoporosis in CHF patients.
Methods: We retrospectively examined 303 CHF patients (75 years, [interquartile range (IQR), 66–82 years]; 41% female). BMDs at the lumber spine, femoral neck, and total femur were measured by dual-energy X-ray absorptiometry (DEXA), and osteoporosis was diagnosed when BMD at any of the three sites was less than 70% of Young Adult Mean.
Results: The prevalence of osteoporosis in the CHF patients was 40%. Patients with osteoporosis were older (79 [IQR, 74–86] vs. 72 [IQR, 62–80] years), included a large percentage of females, had slower gait speed and had lower body mass index (BMI). Loop diuretics and warfarin were used more frequently and direct oral anticoagulants (DOACs) were used less frequently in patients with osteoporosis than in patients without osteoporosis. Multivariate logistic regression analysis indicated that sex (odds ratio [OR] 5.07, 95% Confidence Interval [CI] 2.68–9.61, $p<0.01$), BMI (OR, 0.83; 95% CI, 0.75–0.91; $p<0.01$), gait speed (OR, 0.80; 95% CI, 0.70–0.92; $p<0.01$), loop diuretics use (OR, 2.52; 95% CI, 1.20–5.27; p=0.01) and no DOACs use (OR, 0.43; 95% CI, 0.19–0.96; p=0.04) were independently associated with osteoporosis. During the mean follow-up period of 290±254 days, 92 patients (30.4%) had adverse events. When patients with osteoporosis were divided into subgroups according to the number of sites with BMD of an osteoporosis level, Kaplan-Meier survival curves showed that the rate of adverse events (death and cardiovascular events) was higher in patients with osteoporotic BMD at two or more sites than in patients without osteoporosis (51% vs. 23%, p=0.03) (Figure). In multivariate Cox regression analyses, osteoporotic BMD at two or more sites was an independent predictor of adverse events after adjustment for age, sex, and NT-proBNP level (Hazard ratio, 1.74; 95% CI, 1.01–2.99; p=0.04).
Conclusion: The risk of osteoporosis may be increased in users of loop diuretics and may be decreased in users of DOACs in CHF patients. Extent of osteoporosis is a novel predictor of adverse events in CHF patients.



Number of at risk

Non-osteoporosis	181	133	108	76	45	28	19	17	11	8	6	2
One site	46	37	26	21	17	10	9	6	3	3	2	1
Two or three sites	76	53	36	27	22	17	11	7	5	4	3	1

Figure. Kaplan-Meier event-free survival curves in chronic heart failure patients with and those without osteoporosis
Patients who were diagnosed as having osteoporosis at two or more sites (dashed line), and patients who were diagnosed as having osteoporosis at one site (dotted line) vs. patients without osteoporosis (solid line).