

WORLD-LEADING CARDIOLOGY

European Journal of Heart Failure

eurjh.oxfordjournals.org

Eur J Heart Fail (2011) 13 (5): 482-488. doi: 10.1093/eurjhf/hfr007

First published online: February 20, 2011

## Low free testosterone is associated with heart failure mortality in older men referred for coronary angiography

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Received October 11, 2010.

Revision received November 29, 2010.

Accepted December 3, 2011.

### Abstract

**Aims** Accumulating evidence suggests that androgen deficiency is associated with cardiovascular disease. We aimed at evaluating whether total testosterone (TT) and free testosterone (FT) are associated with specific cardiovascular events.

**Methods and results** We measured TT and sex-hormone-binding globulin levels in 2078 men who were routinely referred for coronary angiography between 1997 and 2000. Free testosterone was calculated according to Vermeulen. Main outcome measures were Cox proportional hazard ratios (HRs) for sudden cardiac death, fatal myocardial infarction, death from congestive heart failure (CHF), as well as other cardiac deaths according to quartiles of TT and FT. The median follow-up time was 7.7 years. Multivariable adjusted HRs (with 95% confidence intervals) in the fourth compared with the first FT quartile and per 1 SD increase in FT for CHF mortality were 0.38 (0.17-0.87) and 0.37 (0.15-0.89), respectively. We observed no independent significant association of FT with sudden cardiac death, fatal myocardial infarction, or other cardiac death. There was no independent association of TT levels with cardiovascular events or cardiac disease.

**Conclusion** Low levels of FT are independently associated with increased CHF mortality.

**Key words** Free testosterone Congestive heart failure

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