SCIENTIFIC LETTER

Measurements of cardiac troponin T in patients with hypertrophic cardiomyopathy

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The serum concentration of cardiac troponin T (TnT) is a specific and highly sensitive marker of myocardial injury, and its diagnostic and prognostic values have been well established and widely reported in acute coronary syndromes.[1] We have recently found that patients with idiopathic dilated cardiomyopathy with particularly poor prognosis have increased serum concentrations of TnT in absence of significant coronary stenoses.[2 3] It is noteworthy that most patients with poor outcomes had persistently high TnT, including during periods of heart failure stabilised by conventional treatment, when they were free of dyspnoea, and of radiographic and auscultatory signs of pulmonary congestion. Therefore, an increase in serum TnT concentrations seems to be a reliable indicator of subclinical ongoing myocyte injury.

METHODS

To examine the relation between TnT concentrations (second generation assay kit) and echocardiographic findings in patients with hypertrophic cardiomyopathy (HCM), 30 consecutive patients with HCM were examined at the Hyogo Prefectural Amagasaki Hospital between 1995 and 2000. The mean age was 62.1 years (range 25–82 years). The diagnosis of HCM was based on the presence of left ventricular hypertrophy in the absence of any disorder causing chronic left ventricular pressure overload. In particular, no patient had a history of systemic hypertension, unstable angina or myocardial infarction.

Echocardiographic imaging was performed in the parasternal and in the apical two and four chamber views. Left ventricular fractional shortening (FS), left ventricular end diastolic diameter (LVEDd), ventricular septal thickness (VST), and left ventricular posterior wall thickness (PWT) were measured in the parasternal view by two experts who were unaware of the study protocol, and whose measurements were averaged. Among the 30 patients with HCM, 27 had asymmetric left ventricular hypertrophy, with a ventricular septal thickness ⩾ 13 mm, and three had apical disease, confirmed by a spade shaped deformity of the left ventricle on left ventriculography.

RESULTS

Fifteen patients (50%) with HCM had TnT concentrations < 0.02 ng/ml at initial measurement (group 1). The remaining 15 patients had initial serum concentrations of TnT ⩾ 0.02 ng/ml (mean (SD) 0.041 (0.031) ng/ml) (group 2). Eighteen patients (nine patients in group 2) underwent coronary angiography between 1995 and 2000 and there was no significant coronary stenosis. During a mean observation period of 19.5 (6.3) months, TnT concentrations in all group 1 patients remained < 0.02 ng/ml. In three of group 2 patients, TnT concentrations fell below 0.02 ng/ml, while in the remaining 12 patients TnT remained persistently increased over an observation period of 18.0 (9.6) months (0.053 (0.069) ng/ml).

The baseline and follow up echocardiographic findings in patients with non-dilated HCM are presented in table 1. FS was significantly lower ($p < 0.05$) and VST was significantly thicker ($p < 0.05$) in group 2 than in group 1 patients. In group 1, mean FS, LVEDd, VST, and PWT remained unchanged between baseline and the end of a mean follow up of 21.5 (9.2) months. In contrast, in group 2, FS and VST decreased significantly between baseline and the end of a mean follow up of 21.5 (11.7) months ($p < 0.001$ and $p < 0.01$, respectively). Eleven patients developed wall thinning in group 2. The score of wall thinning was calculated as [baseline VST – follow up VST]/follow up months. The mean wall thinning score was 0.18 mm/month (n = 11) and three patients had a score more than 0.2 mm/months.

DISCUSSION

In this study, a population of consecutive patients with HCM was distinctly separable into two groups on the basis of their serum concentrations of TnT. Patients with increased serum

Abbreviations: FS, fractional shortening; HCM, hypertrophic cardiomyopathy; LVEDd, left ventricular end diastolic diameter; VST, ventricular septal thickness; PWT, posterior wall thickness; TnT, troponin T

Table 1 Changes in echocardiographic measurements in group 1 versus group 2 patients (non-dilated hypertrophic cardiomyopathy)

	Group 1 (n=15)		Group 2 (n=15)	
	Baseline	Follow up	Baseline	Follow up
FS (%)	43.0 (6.5)	42.1 (7.3)	36.7 (8.8)*	30.8 (8.4)***
LVEDd (mm)	44.8 (5.7)	44.1 (6.5)	46.0 (5.4)	45.8 (5.4)
VST (mm)	15.6 (4.5)	15.2 (3.2)	18.6 (3.4)*	16.8 (3.9)**
PWT (mm)	10.5 (1.7)	11.2 (2.3)	10.3 (2.4)	10.7 (2.2)

Data are mean (SD).
*p<0.05 *v* group 1; **p<0.01, ***p<0.001, *v* baseline.
FS, fractional shortening; LVEDd, left ventricular end diastolic diameter; VST, ventricular septal thickness; PWT, posterior wall thickness.

TnT concentrations had a decrease in FS and VST on echocardiogram during follow up. An increase in TnT serum concentrations in HCM pointed to subclinical myocyte injury. Though all patients in this study were in the non-dilated phase of HCM, we experienced four cases of end stage dilated HCM. These patients had raised TnT (mean 0.045 ng/ml), significantly decreased FS (from 23.7 (3.4)% to 14.0 (2.7)%, $p < 0.05$) and VST (from 13.2 (1.5) mm to 7.5 (1.0) mm, $p < 0.001$), and significantly increased LDEDd (54.2 (5.7) mm to 66.7 (7.6) mm, $p < 0.05$) during a mean time interval of 102.5 months.

Although we had already suspected ongoing myocyte injury in patients with HCM by undertaking indium^{111} antimyosin antibody imaging,[4] that technique involves radioisotopes and cannot be used serially to follow patients in the long term. TnT is easy to measure, does not need complicated laboratory methods, and can be used serially to follow patients, without interobserver variability.

The mechanisms of myocyte injury in HCM are not fully understood. It may be caused by relative myocardial ischaemia resulting from an imbalance between inappropriate hypertrophy of the myocardium and insufficient coronary arterial supply, as well as by myocyte abnormalities determined by gene mutation causing myocyte injury.[5] A limitation of this work is the small sample size of the population. A large study of the relation between serum concentrations of TnT and these factors is warranted. Moreover, this study was not designed to examine the effects of drug treatment on the evolution of TnT serum concentrations. Larger clinical drug trials including the monitoring of TnT concentrations should be planned. In group 2, three patients developed decompensated heart failure requiring rehospitalisation, and two patients were rehospitalised for non-sustained ventricular tachycardia. In contrast, all patients in group 1 remained clinically stable throughout the observation period. A relation between TnT and disease progression also requires further study.

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REFERENCES

1 **Donnelly R**, Millar-Craig MW. Cardiac troponins: IT upgrade for the heart. *Lancet* 1998;**351**:537–9.
2 **Sato Y**, Kataoka K, Matsumori A, *et al*. Measuring serum aminoterminal type III procollagen peptide, 7S domain of type IV collagen, and cardiac troponin T in patients with idiopathic dilated cardiomyopathy and secondary cardiomyopathy. *Heart* 1997;**78**:505–8.
3 **Sato Y**, Yamada T, Taniguchi R, *et al*. Persistently increased serum concentrations of cardiac troponin T in patients with idiopathic dilated cardiomyopathy are predictive of adverse outcomes. *Circulation* 2001;**103**:369–74.
4 **Matsumori A**, Kawai C, Yamada T, *et al*. Mechanism and significance of myocardial uptake of antimyosin antibody in myocarditis and cardiomyopathy: clinical and experimental studies. *Clin Immunol Immunopathol* 1993;**68**:215–19.
5 **Spirito P**, Seidman CE, McKenna WJ, *et al*. The management of hypertrophic cardiomyopathy. *N Engl J Med* 1997;**336**:775–85.