

## Editorial Comment

# The Giant Negative T Wave Revisited . . . in Hypertrophic Cardiomyopathy\*

BARRY J. MARON, MD, FACC

Bethesda, Maryland

Deep T wave inversion on the 12 lead electrocardiogram (ECG) became of particular interest to cardiologists and students of hypertrophic cardiomyopathy more than 10 years ago with the reports from Japan of Sakamoto et al. (1,2) and Yamaguchi et al. (3). These investigators used the bizarre ECG pattern characterized by "giant" inversion of the T waves (usually defined as  $\geq 10$  mm deep) in the lateral precordial leads as a marker for patients with a morphologic form of hypertrophic cardiomyopathy in which hypertrophy was present primarily in the apical region of the left ventricle. In the ensuing years numerous reports have been published outside of Asia, mostly from centers in North America and Europe, describing patients who appear to represent (or closely resemble) this unique morphologic subgroup with nonobstructive hypertrophic cardiomyopathy (4-16). However, most patients with the apical form of hypertrophic cardiomyopathy studied outside of Asia have not shown the characteristic, striking T wave inversion described by the Japanese. This discrepancy in ECG pattern between the Japanese and Western versions of apical hypertrophic cardiomyopathy raises important questions regarding the potential clinical significance of the giant negative T waves.

**The current study.** It is in this context that Alfonso et al. (17) analyzed their patients with hypertrophic cardiomyopathy at St. George's Hospital. These investigators used giant negative T waves as a clinical marker and compared patients with and without this ECG pattern to assess whether its presence in patients with hypertrophic cardiomyopathy has any particular clinical or morphologic (echocardiographic) importance.

The authors found that patients with giant negative T

waves showed a more distal distribution of left ventricular hypertrophy, although they did not report the number of patients who met their criteria (or those of others) for apical hypertrophic cardiomyopathy. Indeed, many of their patients with giant negative T waves appear to have had more typical morphologic forms of hypertrophic cardiomyopathy in which the basal portion of the ventricular septum is substantially thickened (18) and obstruction to left ventricular outflow with mitral systolic anterior motion is present. This observation is consistent with previous reports that giant negative T waves are present in a small number of patients with morphologic forms of hypertrophic cardiomyopathy other than the apical variety (4).

**How significant are giant negative T waves in patients with hypertrophic cardiomyopathy?** Alfonso et al. (17) also show that the presence of giant negative T waves in patients with hypertrophic cardiomyopathy does not appear to have any particularly important clinical implications and does not identify those patients who may be at risk. Clinical outcome, prognosis and severity of symptoms did not differ among patients with or without giant negative T waves (about one half of both subgroups experienced functional limitation), and the overall patient population with hypertrophic cardiomyopathy remained relatively stable over an average follow-up period of about 5 years. Patients with giant negative T waves proved to be somewhat older than patients without these T waves and also showed other differences in ECG pattern, such as greater precordial voltages and a more vertical frontal plane axis. In addition, patients with giant negative T waves had a larger left ventricular cavity and less frequently demonstrated systolic anterior motion of the mitral valve, not unexpected findings in light of the more distal location of left ventricular hypertrophy in these patients (19).

The giant negative T wave is a striking ECG deformity that has intermittently aroused our interest by its occasional occurrence in patients with cardiovascular disease (20). In the context of hypertrophic cardiomyopathy, it has been described as a reliable marker for a nonobstructive form of the disease occurring primarily in Japanese patients and characterized by apical left ventricular hypertrophy. As defined in the report of Alfonso et al. (17) from the United Kingdom, the uncommon occurrence of giant negative T waves in non-Asian patients with hypertrophic cardiomyopathy is not, in itself, of major clinical import. Until future studies document its determinants and significance in patients with hypertrophic cardiomyopathy, marked inversion of the T waves should be considered to be a dramatic ECG pattern, of interest primarily because of its appearance.

\*Editorials published in *Journal of the American College of Cardiology* reflect the views of the authors and do not necessarily represent the views of JACC or the American College of Cardiology.

From the Echocardiography Laboratory, National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, Maryland.

Address for reprints: Barry Maron, MD, National Institutes of Health, Building 10, Room 7B15, Bethesda, Maryland 20892.

## References

1. Sakamoto T, Tei C, Murayama M, Ichiyasu H, Hada Y. Giant T wave inversion as a manifestation of asymmetrical apical hypertrophy (AAH) of the left ventricle: echocardiographic and ultrasono-cardiotomographic study. *Jpn Heart J* 1976;17:611-29.
2. Sakamoto T, Amano K, Hada Y, et al. Asymmetric apical hypertrophy: ten years' experience. *Postgrad Med J* 1986;62:567-70.
3. Yamaguchi H, Ishimura T, Nishiyama S, et al. Hypertrophic nonobstructive cardiomyopathy with giant negative T waves (apical hypertrophy): ventriculographic and echocardiographic features in 30 patients. *Am J Cardiol* 1979;44:401-12.
4. Maron BJ, Bonow RO, Seshagiri TNR, Roberts WC, Epstein SE. Hypertrophic cardiomyopathy with ventricular septal hypertrophy localized to the apical region of the left ventricle (apical hypertrophic cardiomyopathy). *Am J Cardiol* 1982;49:1838-48.
5. Louie EK, Maron BJ. Apical hypertrophic cardiomyopathy: clinical and two-dimensional echocardiographic assessment. *Ann Intern Med* 1987;106:663-70.
6. Keren G, Belhassen B, Sherez J, et al. Apical hypertrophic cardiomyopathy: evaluation by noninvasive and invasive techniques in 23 patients. *Circulation* 1985;71:45-56.
7. Steingo L, Dansky R, Pocock WA, Barlow JB. Apical hypertrophic nonobstructive cardiomyopathy. *Am Heart J* 1982;104:635-7.
8. Abinader EG, Rauchfleisch S, Naschitz J. Hypertrophic apical cardiomyopathy: a subtype of hypertrophic cardiomyopathy. *Isr J Med Sci* 1982;18:1005-9.
9. Bertrand ME, Tilmant PY, Lablanche JM, Thieuleux FA. Apical hypertrophic cardiomyopathy: clinical and metabolic studies. *Eur Heart J* 1983;4(suppl F):F127-33.
10. McDonnell MA, Tsagaris TJ. Recognition and diagnosis of apical hypertrophic cardiomyopathy. *Chest* 1983;84:644-7.
11. Kereiakes D, Anderson DJ, Crouse L, Chatterjee K. Apical hypertrophic cardiomyopathy. *Am Heart J* 1983;105:855-6.
12. Vacek JL, Davis WR, Bellinger RL, McKierman TL. Apical hypertrophic cardiomyopathy in American patients. *Am Heart J* 1984;108:1501-6.
13. Panidis IP, Nestico P, Hakki AH, Mintz GS, Segal BL, Iskandrian AS. Systolic and diastolic left ventricular performance at rest and during exercise in apical hypertrophic cardiomyopathy. *Am J Cardiol* 1986;57:356-8.
14. Rovelli EG, Parenti F, Devizzi S. Apical hypertrophic cardiomyopathy of "Japanese type" in a Western European person. *Am J Cardiol* 1986;57:358-9.
15. Penas M, Fuster M, Fabregas R, Llorente C, Cosio FG. Familial apical hypertrophic cardiomyopathy. *Am J Cardiol* 1988;62:821-2.
16. Webb JG, Sasson Z, Rakowski H, Liu P, Wigle ED. Apical hypertrophic cardiomyopathy: clinical follow-up and diagnostic correlates. *J Am Coll Cardiol* 1990;15:83-90.
17. Alfonso F, Nihoyannopoulos P, Stewart J, Dickie S, Lemery R, McKenna WJ. Clinical significance of giant negative T waves in hypertrophic cardiomyopathy. *J Am Coll Cardiol* 1990;15:965-71.
18. Maron BJ, Gottdiener JS, Epstein SE. Patterns and significance of distribution of left ventricular hypertrophy in hypertrophic cardiomyopathy: a wide-angle, two-dimensional echocardiographic study of 125 patients. *Am J Cardiol* 1981;48:418-28.
19. Spirito P, Maron BJ. Significance of left ventricular outflow tract cross-sectional area in hypertrophic cardiomyopathy: a two-dimensional echocardiographic assessment. *Circulation* 1983;67:1100-8.
20. Jacobson D, Schrire V. Giant T wave inversion. *Br Heart J* 1966;28:768-75.