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CAN WE MEASURE EARLY CARDIAC DYSFUNCTION IN PATIENTS WITH TSH SUPPRESSION?

Taillard V, Sardinoux M, Oudot C, Fesler P, Rugale C, Raingeard I, Renard E, Ribstein J, du Cailar G. **Early detection of Isolated Left Ventricular Diastolic Dysfunction in High-Risk Differentiated Thyroid Carcinoma Patients on TSH-Suppressive Therapy.** Clin Endocrinol (Oxf) 2011;75:709-14.

SUMMARY

BACKGROUND

Much has been written about possible cardiac side effects and bone loss during suppressive thyroxine treatment. An abundant literature points to possible left ventricular hypertrophy, but there is controversy about the functional consequences of this finding, since the commonly used two-dimensional echocardiography has its limitations in correctly evaluating left ventricular function. Speckle tracking echocardiography (STE) is a new noninvasive development of cardiac echocardiography that provides important additional information about cardiac deformation during contraction and relaxation. STE allows better appreciation of thickening, shortening, and twisting of the ventricular wall during the cardiac cycle. In patients with borderline cardiac function, TSH suppression may represent a precipitating factor, and objective signs of early cardiac dysfunction may be clinically useful. The present study used STE to provide information on the long-term cardiac effects of borderline hyperthyroidism. Previously, such information could only be obtained by means of cardiac magnetic resonance imaging (MRI).

METHODS AND RESULTS

As compared with classical echocardiography, STE visualizes and quantifies left ventricular deformation and rotation during the cardiac cycle, a phenomenon named in technical terms "two-dimensional strain" (meaning cardiac torsion). STE is also called "strain rate imaging." In other words, STE is able to simultaneously evaluate radial, longitudinal, and circumferential cardiac planes. This allows calculation of sophisticated and useful parameters such as the (mean) velocity of the circumferential fiber shortening, transmitral inflow, and early and late atrial filling.

The study was performed in 24 patients. Thyroxine treatment lasted for approximately 36 months. Twenty patients with additional disorders such as diabetes, hypertension, or preexisting cardiac insufficiency were excluded. The 24 remaining patients formed a very homogeneous group with similar histories of progressive thyroid cancer. The main suppressive dose was 2.3 μg/kg/24 hr (160 μg for a 70-kg patient). Serum thyrotropin (TSH) was <0.1 mU/L but, free thyroxine (T_4) and free triiodothyronine (T_3) were in the upper normal range. The control group consisted of 20 age- and sex-matched euthyroid subjects.

The results of two-dimensional echocardiography did not reveal any differences in left ventricular mass, relative wall thickness, ejection fraction, and cardiac output between patients and control subjects. However, with STE, early diastolic velocity and longitudinal proto-diastolic strain were shown to be impaired. This difference was an independent correlate of longitudinal diastolic strain. Thus, with STE, left ventricular mass was found to be increased in T_4-treated subjects.

CONCLUSIONS

The patients did not suffer from clinically overt hyperthyroidism and did not present with clinical evidence of worsening of their cardiac function. Classical two-dimensional echocardiography did not reveal any abnormalities, contrasting with the findings with STE that indicated an impairment of left ventricular longitudinal elongation.

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ANALYSIS AND COMMENTARY

The authors stress the point that this rather small group of patients was relatively homogeneous in terms of thyroxine treatment and stability of the underlying thyroid cancer. During the observation period, no patient had recurrence of the disease. Patients with major interfering disorders were excluded.

Following the landmark articles by Sawin et al. (1) and later Osman et al. (2, 3) pointing to the increased risk for atrial fibrillation in patients with TSH suppression, many studies have been published indicating some minor but nevertheless possibly deleterious effects on cardiac function. Other authors did not confirm these findings. STE may end this controversy by demonstrating that both phases of the early diastolic period were impaired, thus indicating left ventricular diastolic dysfunction. This correlated with changes in left ventricular mass. STE has the advantage of being noninvasive. Moreover, it avoids irradiation and is not expensive. Thus, it compares favorably with cardiac MRI in several aspects.

For thyroidologists, it would be interesting to know whether these cardiac changes occur only after many months of treatment or in its early phase. In an individual patient, it will be particularly interesting to perform STE studies before, during, and after treatment. Depending on the results, the cardiac and thyroidal surveillance of a patient at risk may need to be changed. It is reassuring that the cardiac abnormalities are most often reversible (4, 5). Yet, long-term studies are not available, and this new technique may add valuable new information about this point (6).

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