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The relationship between left atrial fibrosis and left ventricular diastolic dysfunction in paroxysmal atrial fibrillation

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Topic(s):
Disease Modeling in Atrial Fibrillation

Citation:
Background: Whether left atrial fibrosis in patients with atrial fibrillation (AF) is a primary form of atrial pathology or consequence of left ventricular diastolic dysfunction continues to be a debatable issue. Electroanatomical mapping (EAM) allows to image and to define the atrial fibrosis as a substrate of AF.

Purpose: To assess the relationship between the severity of left atrial fibrosis and signs of diastolic impairments in patients with paroxysmal AF.

Methods: 32 patients with paroxysmal AF (mean age 57.3±8.9 years, 16 males) were enrolled in the study, including 16 patients with arterial hypertension (AH), 12 – with coronary artery disease and AH. In all patients the level of NT-proBNP in the blood was determined. To assess the diastolic function there was carried out comprehensive echocardiography with the calculation of generally accepted parameters in accordance with the Recommendations for the Evaluation of Left Ventricular Diastolic Function by Echocardiography, endorsed by ASE and EACVI (2016). EAM before ablation was done in sinus rhythm. The bipolar low voltage areas of fibrosis in left atrium were identified with the cut-off <0.5 mV (Fig.1). For the quantification of atrial fibrosis, the following indicators were calculated: total square of fibrosis (Sf), % of fibrosis in relation to the total square of the left atrium (%Sf), number of fibrosis zones (Nf). The degree of atrial fibrosis estimated as an analog of the UTAH staging system: UTAH I: <5% fibrosis; II: 5% to 19% fibrosis; III: 20% to 35% fibrosis; and IV: >35%.

Results. The level of NT-proBNP was divided into degrees: <125 pg/ml, 125-600 pg/ml and >600 pg/ml. There was a positive significant correlation between the degree of NT-proBNP increase with Sf (R=0.37, p<.05), %Sf (R=0.38, p<.05), as well as the degree of fibrosis on UTAH (R=0.39, p<.05). All patients had preserved systolic left ventricular function. Decrease of septal e<7 cm/s was correlated with the increase of Sf, %Sf and Nf: R=0.41, R=0.42 and R=0.40, respectively (p<.05). Decrease of lateral e<10 cm/s was associated with the increase of Nf: R=0.40 (p<.05). A significant negative correlation between %Sf and pulmonary vein diastolic velocity (PVD) was detected: R=0.39 (p<.05), and positive correlation with S/D ratio (pulmonary vein systolic velocity to PVD ratio): R=0.39 (p<.05). At the same time, PVD significantly correlated with the thickness of interventricular septum (R=0.36, p<.05), septal e<7 cm/s (R=0.31, p<.05) and DT of mitral E velocity (R=0.57, p<.05).

There was revealed a positive correlation between Sf, %Sf and the presence of tricuspid regurgitation: R=0.43 and R=0.45, respectively (p<.05).

Conclusion: The data obtained confirm the relationship of left atrial fibrosis with early signs of diastolic dysfunction of the left ventricle in the form of abnormal relaxation, expressed in disorders of early diastolic left ventricular filling.
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