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RESEARCH ARTICLE

Epicardial adipose tissue and right ventricular dysfunction in patients with acute pulmonary embolism

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KEY WORDS: epicardial adipose tissue, right ventricular dysfunction, pulmonary embolism.

ABSTRACT:

Epicardial adipose tissue has been linked with increased cardiovascular morbidity. Its correlation with right ventriclar morphology and physiology is a recent concept.

The aim of the study was to analyze severity of right ventricular dysfunction in the course of acute pulmonary embolism with the amount of epicardial adipose tissue.

Retrospective analsis of 192 computed tomography studies with confirmed pulmonary embolism was performed. Patients were divided into two groups with low and high amount of epicardial adipose tissue. Although no significant differences of BMI and severity of pulmonary embolism were observed between the groups, in patients with high amount of epicardial fat, right ventricular dysfunction was significantly more severe.

INTRODUCTION:

Right ventricular dysfunction (RVD) in the course of acute pulmonary embolism (PE) is an important risk factor of mortality. RVD is influenced by multiple factors, where severity of PE is only one of contributors [1].

Epicardial adipose tissue (EAT) has recognized metabolic features, related with release of adipocytokines and chemokines that may influence cardiac function and morphology [2]. Its significance has been widely researched in the coronary artery diseases. However, it it is under extensive research in other cardiovascular pathologies [3]. Therefore, the purpose of the study was to analyze the the distribution of EAT in patients with acute PE and analyze its amount in patietns with and without RVD.

MATERIAL AND METHODS:

Retrospective analysis of 192 consecutive computed tomography pulmonary angiography (CTPA) studies with confirmed PE was performed. Female to male ratio was = 88:104, mean age: 63,1+/-17 years, range: 21-95). In all cases, CTPA was performed with 64-

row VCT scanner (GE Medical Systems), with a standard protocol used at our institution, i.e. scanning of the full chest from lung apices to costodiaphragmatic recesses, 64×0.625 mm collimation, slice thickness 0.625 mm, with continous reconstruction. SmartPrep was used for adjustment of the initiation of injection of approximately 70 mL of iodinated contrast medium (Ultravist 370, Bayer Healthcare, Germany), at a flow rate of4–5 mL/sec by automatic injector, followed by 40 mL bolus of NaCl.

CTPA severity has been evaluated by measuring Qanadli score as described elsewhere [4]. RV/LV short axis ratio has been measured, as recommended by European Society of Cardiology guidelines [5]. Amount of EAT was measured by measurement of epicardial fat in the anterior interventricular groove [6]

By analysis of histogram of amount of EAT, patients were divided into group with low and high amount of EAT (Groups L and H, respectively). Comparison of data from both groups has been conducted with standard statistical tests.. The study protocol has been approved with a waiver of informed consent by local Bioethical Committee (KE-0254/41/2011).

RESULTS:

Study group consisted of 192 patients. Basic descriptive data, d-dimer test results are presented in Table 1. No siginificant differences of sex distribution, age, body mass, height, BMI, d-dimer result as well as PE severity measured with Qanadli score have been observed between groups. CTPA-derived measurements are presented in Table 2.

Detailed distribution of MPV in the study group is presented at Figure 1.

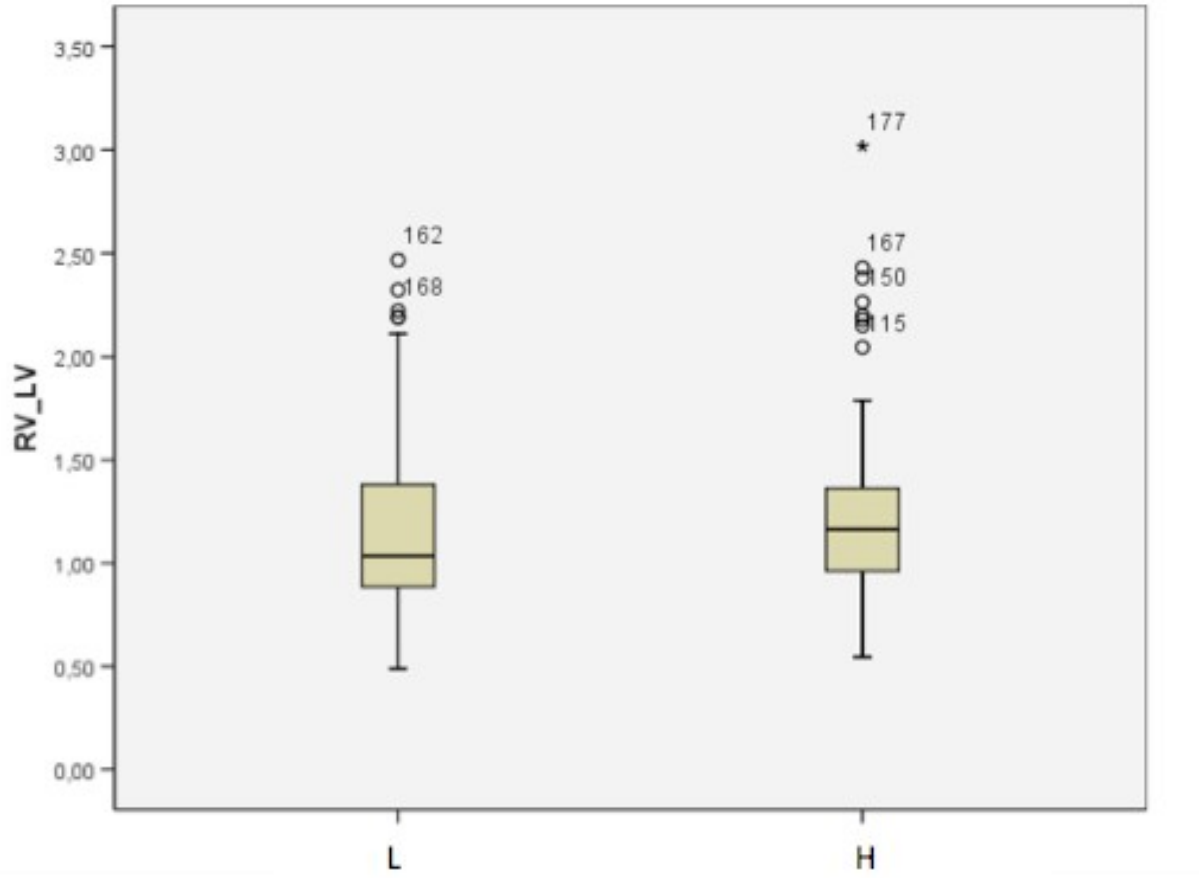
Table 1. *Basic characteristics of study groups. Numbers are medians, minimal and maximal value or pecetages whed indicated. Values given are means and standard deviations.*

	Group L (n=96)	Group H (n=96)	p
age [yrs]	61,0 (31,0)	65,5 (35,0)	NS
height [cm]	173,00 (8,329)	168,97 (7,399)	NS
weight [kg]	79,44 (14,31)	79,87 (18,71)	NS
BMI	26,89 (4,69)	27,68 (3,82)	NS
d-dimer [µg/L]	5312 (5510)	6431 (4932)	NS

Table 2. *Severity od PE, ventricular parameters and EAT distribution in the study groups. Values given are means and standard deviations.*

	Group L (n=96)	Group H (n=96)	p
Qanadli	16,12 (4,22)	17,78 (5,12)	NS
PA	30,89 (3,39)	31,68 (3,46)	NS
RV/LV	1,16 (0,23)	1,25 (0,11)	0,025
EAT	6,14 (2,66)	11,33 (3,94)	>0,001

Figure 1. *Boxplot graph of median RV/LV ratio values in groups L and H. Median value in group H significantly higher (p=0,025).*



DISCUSSION

Distribution of adipose tissue, in particular, differences in clinical significance of excess of subcutaneous and visceral fat, has been long recognized – excess of visceral fat is

related with a recognized higher cardiovascular risk [7]. Epicardial adipose tissue has been only recently recognized as an independent risk factor of coronary artery disease [8]. Furhtermore, multiple inflammatory markers and oxidative stress factores correlate with amount of pericardial and intrathoracic fat volumes [8].

In experimental studies of pulmonary embolism, right ventricular dysfunction was accompanied by severe inflamatory reaction with accumulation of neutrophils and monocyte/ macrophages as well as increased expression of proinflammatory chemokines[9]. Also, antiinflammatory therapy in expermiental PE has shown improved survival [10] in animal studies.

Moreover, recent study on relation of morphology of right ventricle and epicardial fat has shown that increaased amount of epicardial fat correlated with reduced RV mass, smaller end-diastolic and end-systolic volumes, as well as smaller stroke volume of right ventricle – which may be related with the observed rendency for right ventricular dysfunction observed in our study.

Observed tendency for more severe right ventricular dysfuncion in patients with increased amount of epicardial fat provides new area for research.

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