Journal of Clinical & Experimental Cardiology

Fei and Mazzoccoli, J Clin Exp Cardiolog 2013, 4:3
DOI: 10.4172/2155-9880.1000e121

Editorial Open Access

Epicardial Fat is an Important Visceral Adipose Depot Influencing Cardiovascular Disease and Metabolic Syndrome

Jia Fei[1]* and Gianluigi Mazzoccoli[2]

[1]*Department of Physiology and Pharmacology, University of Georgia, USA*
[2]*Department of Medical Sciences, Division of Internal Medicine and Chronobiology Unit, IRCCS Scientific Institute and Regional General Hospital, S. Giovanni Rotondo (FG), Italy*

Adipose tissue plays a key role in cardiovascular disease (CVD) and metabolic syndrome [1]. Epicardial fat (EF) is a special visceral fat depot covering the surface of heart and the adventitia of coronary artery [2]. Both EF and heart share the same coronary blood stream and influence each other [3].

Anatomical and physiological studies revealed different characteristics of EF compared to other fat depots. EF has relative smaller size of adipocytes but higher activity of lipid uptake and adipokines secretion than other fat depots [2]. Moreover, EF contains higher protein level [4] and has capacity of lipolysis [5], but weaker oxidative level [4] than other fat depots. Accordingly, EF can maintain a stable lipid level and supply energy for myocardium [2].

The advancing tomographic technology supplied a better and accurate tool to measure EF. The tomographic measurement of EF can be used as direct or indirect biomarker for the diagnosis of metabolic syndrome. For example, based on echocardiographic study, EF thickness is the independent predictive factor for obesity diagnosed by body mass index calculation. However, EF mass is not associated to other fat depots [3,6-8]. EF thickness is also positively associated with insulin resistance in obese patients [9] and elderly people [10]. Moreover, EF thickness is found to be independently related to hypertension [8], higher level of low-density lipoprotein cholesterol (LDL) [8] and fasting glucose levels [11].

EF also actively produces both inflammatory cyto/chemokines such as tumor necrosis factor–α, monocyte chemoattractant protein–1, interlukin-6, nerve growth factor, resistin, etc, [12] and anti-inflammatory adipokines such as adiponectin and adrenomedullin [12,13]. Adiponectin inhibits insulin resistance, atherosclerosis and inflammation [12]. Adrenomedullin is an angiogenic factor and is able to dilate vessels [13]. The reason for the secretion of both protective and harmful adipokines in EF is still unclear. However, it is well known that EF impacts the local myocardium and even the heart through this particular function. Interestingly, adipokine-secretion was observed to be influenced by aging in a sexually-dimorphic manner, which may explain why aged women usually have more severe CVD than aged men [14].

EF mass has also relationship to CVD, and is positively correlated to carotid intima-media thickness and arterial stiffness [15]. EF thickness is significantly associated with the extent and degree of coronary artery diseases (CAD) [16,17]. EF was found to become greater in the case of hypertrophic cardiomyopathy due to hypertension [3].

Although we have known many features of EF as shown above, its function and role in CVD is not clear up until now. The measurement of EF mass is a valuable tool to evaluate the treatment of some diseases. For example, EF mass decreased after weight-loss in obese patients [18]. However, we don't have more information about the role of EF in the treatment of CVD. More studies on this small tissue may explore a new area for a better understanding of CVD.

References

1. Fox CS, Massaro JM, Hoffmann U, Pou KM, Maurovich-Horvat P, et al. (2007) Abdominal visceral and subcutaneous adipose tissue compartments: association with metabolic risk factors in the Framingham Heart Study. Circulation 116: 39-48.
2. Marchington JM, Pond CM (1990) Site-specific properties of pericardial and epicardial adipose tissue: the effects of insulin and high-fat feeding on lipogenesis and the incorporation of fatty acids in vitro. Int J Obes 14: 1013-1022.
3. Corradi D, Maestri R, Callegari S, Pastori P, Goldoni M, et al. (2004) The ventricular epicardial fat is related to the myocardial mass in normal, ischemic and hypertrophic hearts. Cardiovasc Pathol 13: 313-316.
4. Marchington JM, Mattacks CA, Pond CM (1989) Adipose tissue in the mammalian heart and pericardium: structure, foetal development and biochemical properties. Comp Biochem Physiol B 94: 225-232.
5. Mattacks CA, Pond CM (1988) Site-specific and sex differences in the rates of fatty acid/triacylglycerol substrate cycling in adipose, tissue and muscle of sedentary and exercised dwarf hamsters (Phodopus sungorus). Int J Obes 12: 585-597.
6. Iacobellis G, Assael F, Ribaudo MC, Zappaterreno A, Alessi G, et al. (2003) Epicardial fat from echocardiography: a new method for visceral adipose tissue prediction. Obes Res 11: 304-310.
7. Iacobellis G, Leonetti F, Di Mario U (2003) Images in cardiology: Massive epicardial adipose tissue indicating severe visceral obesity. Clin Cardiol 26: 237.
8. Iacobellis G, Ribaudo MC, Assael F, Vecci E, Tiberti C, et al. (2003) Echocardiographic epicardial adipose tissue is related to anthropometric and clinical parameters of metabolic syndrome: a new indicator of cardiovascular risk. J Clin Endocrinol Metab 88: 5163-5168.
9. Iacobellis G, Willens HJ, Barbaro G, Sharma AM (2008) Threshold values of high-risk echocardiographic epicardial fat thickness. Obesity (Silver Spring) 16: 887-892.
10. Mazzoccoli G, Dagostino MP, Fontana A, Grandone E, Favuzzi G, et al. (2012) Influence of the Gly1057Asp variant of the insulin receptor substrate 2 (IRS2) on insulin resistance and relationship with epicardial fat thickness in the elderly. Exp Gerontol 47: 988-993.
11. Iacobellis G, Barbaro G, Gerstein HC (2008) Relationship of epicardial fat thickness and fasting glucose. Int J Cardiol 128: 424-426.
12. Cheng KH, Chu CS, Lee KT, Lin TH, Hsieh CC, et al. (2008) Adipocytokines and proinflammatory mediators from abdominal and epicardial adipose tissue in patients with coronary artery disease. Int J Obes (Lond) 32: 268-274.

***Corresponding author:** Jia Fei, Department of Physiology and Pharmacology, University of Georgia, USA, Tel: 706-340-9618; E-mail: feijia@uga.edu

Received January 25, 2013; **Accepted** January 28, 2013; **Published** January 29, 2013

Citation: Fei J, Mazzoccoli G (2013) Epicardial Fat is an Important Visceral Adipose Depot Influencing Cardiovascular Disease and Metabolic Syndrome. J Clin Exp Cardiolog 4: e121. doi:10.4172/2155-9880.1000e121

13. Silaghi A, Achard V, Paulmyer-Lacroix O, Scridon T, Tassistro V, et al. (2007) Expression of adrenomedullin in human epicardial adipose tissue: role of coronary status. Am J Physiol Endocrinol Metab 293: E1443-1450.

14. Fei J, Cook C, Blough E, Santanam N (2010) Age and sex mediated changes in epicardial fat adipokines. Atherosclerosis 212: 488-494.

15. Natale F, Tedesco MA, Mocerino R, de Simone V, Di Marco GM, et al. (2009) Visceral adiposity and arterial stiffness: echocardiographic epicardial fat thickness reflects, better than waist circumference, carotid arterial stiffness in a large population of hypertensives. Eur J Echocardiogr 10: 549-555.

16. Ahn SG, Lim HS, Joe DY, Kang SJ, Choi BJ, et al. (2008) Relationship of epicardial adipose tissue by echocardiography to coronary artery disease. Heart 94: e7.

17. Eroglu S, Sade LE, Yildirir A, Bal U, Ozbicer S, et al. (2009) Epicardial adipose tissue thickness by echocardiography is a marker for the presence and severity of coronary artery disease. Nutr Metab Cardiovasc Dis 19: 211-217.

18. Iacobellis G, Singh N, Wharton S, Sharma AM (2008) Substantial changes in epicardial fat thickness after weight loss in severely obese subjects. Obesity (Silver Spring) 16: 1693-1697.

Citation: Fei J, Mazzoccoli G (2013) Epicardial Fat is an Important Visceral Adipose Depot Influencing Cardiovascular Disease and Metabolic Syndrome. J Clin Exp Cardiolog 4: e121. doi:10.4172/2155-9880.1000e121