Original Article

Relationship between Atrial fibrillation and plasma omentin-1 levels in patients with coronary artery disease

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Objective: To correlate the plasma omentin-1 with the presence of atrial fibrillation in patients with coronary artery disease (CAD).

Methodology: This cross-sectional study was performed at cardiac unit of Civil Hospital Karachi, Pakistan, from June 2016 to March 2017. A total of 195 patients of coronary artery disease, and 150 without atrial fibrillation (AF) were included in the study. Diagnosis of AF was made on the basis of electro-cardio-graph. Plasma omentin-1 levels were determined by enzyme linked immuno-sorbent assay. Data were analyzed by using SPSS version 16.

Results: Out of the 195 patients of AF (37 with permanent, 63 with persistent and 76 with paroxysmal AF), it was found that CAD patients with AF had reduced plasma omentin-1 levels (59.2±9.10 vs. 96.9±11.7, $p<0.01$). In addition, subgroup with permanent AF was found with significantly lessened omentin-1 as compared to other subgroups (37.4±8.10, 63.3±10.0, and 76.9±12.7, $p<0.01$). Both simple and multivariable regression analysis revealed momentous association of plasma omentin-1 with less chance of developing AF.

Conclusion: The risk of AF increases with lower plasma omentin-1 concentrations in coronary artery disease patients. (Rawal Med J 202;45:762-765).

Keywords: Atrial fibrillation, coronary artery disease, omentin-1.

INTRODUCTION

Atrial fibrillation (AF) is recognized as the most common supraventricular cardiac arrhythmia in clinical practice. In USA, about 2 million, whereas, in Europe more than 4 million people are living with AF.[1] Aging, obesity, hypertension, diabetes mellitus, congestive cardiac disease, coronary artery disease (CAD), valvular heart disease and inflammatory processes are causes of AF.[2] Atrial fibrosis, excessive extracellular matrix (ECM) production and accumulation in the atrium, is the key process in the development of atrial remodeling and AF. Cardiac fibroblasts (CFs) play an essential role in atrial fibrosis.[3] In healthy individuals, these cells remains inactive, however, under pro-inflammatory conditions, cardiac fibroblasts rapidly proliferate and differentiate into myoblasts, which then synthesize abundant ECM protein.[4]

Omentin-1 is a novel adipocytocytokine which is mostly released by visceral fat depots.[5] Omentin-1 can suppress the proliferation and migration of cardiac fibroblast thus suppresses ECM production via vascular smooth muscle cells through the inhibition of NF-κB signaling pathway.[6] CAD is usually due to atherosclerosis. The traditional risk factors associated with CAD are cholesterol, high hypertension, family history, diabetes, smoking, obesity, being post-menopausal for women and being older than 45 for men.[7] The high prevalence of CAD among patients with AF makes it one of its major risk factors.[8] Reduced serum levels of omentin-1 in CAD patients have been reported.[9] However, data concerning omentin-1 and AF relationship is inconsistent especially for Pakistani population. Therefore, the present study aimed to evaluate the association of plasma omentin-1 levels with the presence of AF in patients with CAD.

METHODOLOGY

This cross-sectional study was conducted in the

out-patient-department of Civil Hospital, Karachi, from June 2016 to March 2017. Sample size was calculated by open-Epi software. A total of 195 patients of CAD of either gender with AF were included in the study. Age and gender matched 150 CAD patients without AF were enrolled as controls. All participants were told about the protocol and significance of research. Diagnosis of AF was made on the basis of medical history and electrocardiogram (ECG) according to guidelines established by American Heart Association.[10]

AF patients were classified into permanent AF (n=37), persistent AF (n=63) and paroxysmal AF (n=97).[10] Serum omentin-1 levels were estimated by the enzyme linked immuno-sorband assay (Ray-Biotech USA). Study parameters concerning TC, TG, LDL-C, HDL-C and FBS were measured by standardized enzymatic methods. To evaluate left atrial diameter (LAD), transthoracic echocardiography was performed.

Statistical Analysis: Statistical analysis was performed using SPSS version 16. The unpaired t-test, and chi-square tests were used to decide the parametric contrasts between CAD patients with and without AF. One way ANOVA was applied to compare the characteristics of subgroups of AF. Pearson's correlation was done to correlate the omentin-1 with other investigated variables. Simple and multi variable logistic regression analysis performed to evaluate the association between risk of developing AF and omentin-1 plasma levels in CAD patients.

RESULTS

Baseline characteristics of the study population are portrayed in Table 1. Patients with AF were found with high SBP and DBP, though found with diminished plasma omentin-1 levels (59.2±9.10 vs. 96.9±11.7; p<0.01). The basic properties of AF subgroups are shown in Table 2. The participants with permanent AF had lower plasma omentin-1 concentrations (37.4±8.10, 63.3 ± 10.0, 76.9 ± 12.7; p< 0.01) as compared to persistent and paroxysmal AF respectively.

Table 1. Demographic, clinical and biochemical characteristics of CAD patients with and without AF.

Study parameter	CAD Patients with AF (n = 195)	CAD Patients without AF (n = 150)	P-value
Age, years	55.18 ±6.54	54.71± 4.49	0.12
BMI, kg/m^2	34.76= 4.71	32.19± 5.98	0.22
SBP mm Hg	152.0±12.78	128 ± 7.09	0.01*
DBP mm Hg	111.66±8.90	94 ± 4.89	0.01*
FBS, mg/dl	100 ±10.03	99 ± 13.8	0.11
TC, mg/dl	236.3±14.98	230± 21.8	0.23
TG, mg/dl	157.6±16.87	154 ± 12.32	0.43
HDL, mg/dl	43.63±15.76	42.3 ± 10	0.34
LDL, mg/dl	157±7.43	133 ± 6.78	0.09
LAD	59.2.7653±3.9	39.24±3.20	0.01*
EF (%)	45.3± 6.54	65.1±9.43	0.01*
Smoking %	80	79	0.045
Omentin-1 (ng/dl)	59.2 ±9.10	96.9 ± 11.7	0.01*

Values expressed in mean standard± deviation and percentage. BMI; body mass index, FBS; fasting blood sugar, TG; triglycerides, TC; total cholesterol, HDL-C; high density lipoprotein, LADL-C; low.

Table 2. Demographic, clinical and biochemical characteristics of AF sub-groups.

BMI, kg/m^2	33.76= 4.71	30.05± 4.80	32.19± 5.98	0.22
SBP mm Hg	150±12.78	145 ± 13.60	150 ± 10.09	0.21
DBP mm Hg	110±8.90	100 ± 10.09	115 ± 6.89	0.01*
FBS, mg/dl	98±10.03	104 ± 4.9	99 ± 13.8	0.11
TC, mg/dl	240±14.98	239 ± 25	230± 21.8	0.23
TG, mg/dl	154±16.87	158.3 ± 9.40	161 ± 12.32	0.43
HDL, mg/dl	43±15.76	45.9 ± 6.2	42.3 ± 10	0.34
LDL, mg/dl	145±7.76	153 ±7. 85	173 ± 6.78	0.02*
LAD	43.24±3.39	38.80±2.86	35.85±3.77	0.01*
Omentin-1 (ng/dl)	37.4±8.10	63.3 ± 10.0	76.9 ± 12.7	0.01*

Table 3. Pearson´s correlation between omentin-1 and study parameters.

	Pearson´s correlation r	p	Uni-variate regression OR (95% CI)	p	Multivariate regression OR (95% CI)	p value
Age (years)	0.248	0.291	0.999 (0.097- 1.043)	Ns		
BMI (kg/m)	–0.467	0.038	1.008 (0.943-1.090)	Ns		
SBP (mm Hg)	–0.450	0.014	1.081 (1.063-1.114)	>0.01	1.095 (1.005-1.033)	0.02
DBP(mm Hg)	–0.877	0.007	1.084 (1.053-1.117)	>0.01	0.994 (0.095-1.029)	0.07
FBS (mg/dl)	0.999	0.012	0.671 (0.781-1.444)	Ns		
TC (mg/dl)	–0.560	0.010	0.292 (0.235-1.181)	Ns		
TG (mg/dl)	0.983	0.032	0.911 (0.843-1.000)	Ns		
HDL-C (mg/dl)	0.568	0.009	0.781 (0.932- 1.090)	Ns		
LDL-C (mg/dl)	–0.590	0.001	0.980 (0.897- 0.921)	Ns		
LAD	–0.789	0.001	1.529 (1.341-1.470)	0.001	1.664 (1.25-1.71)	0.001
Omentin-1 (ng/dl)			1.031 (1.022-1.040)	0.001	1.043 (1.024-1.041)	0.001

r = Correlation coefficient; OR=odd ratio; CI= Confidence interval; Ns =not significant

Pearson´s correlation revealed the statistically negative correlation between plasma omentin-1 and left atrial diameter in AF patients. Simple and multi variable regression analysis revealed the momentous association of plasma omentin-1 with less chance of establishing AF. Plasma omentin-1 levels (OR 1.043; 95% CI: 1.024-1.041; p<0.001) and LAD (OR: 1.664; 95% CI: 1.25-1.71; p<0.001) were discovered the only independent indicators of AF (Table 3).

DISCUSSION

The current study has concluded that CAD patients with AF had decreased plasma omentin-1 levels contrasted with the other study group without having AF. We also found negative correlation between Plasma omentin-1 concentration and left atrial diameter in AF patients. This is the first study in Pakistan that has demonstrated the association of omentin-1 and AF in Pakistani population. Various studies have shown the significant job of adipocytokines in development and progress of AF. Some adipocytokines like adiponectin resisting and apelin have been accounted for to be related with progress of AF.[11,12] Our results also indicated a worth-noticing connection between the novel anti-inflammatory adipokine,omentin-1and development of AF. This point a significant job for fat tissue and adipokines in the pathophysiology of AF.

Several biomarkers are utilized in finding and anticipating of cardio-vasculardisorders.[13,14] Serumomentin-1 might be used as useful biomarker to evaluate the danger of AF. Obesity has been accounted for to be related with the progress of AF. Increase body size and weight gain from age twenty to middle age are considered to have been connected with AF independently.[15] Obesity is recognized as short term risk factor for developing AF.[16] Omentin-1 adipocytokine is linked with obesity and energy metabolism. Decreased plasma omentin-1 levels along with its gene expression is essentially diminished in obese individualsi.[17]

The significant increase in plasmaomentin-1 levels was observed after weight reduction and oxygen consuming aerobics.[18] This point to the significant job of omentin-1 in obesity and its associated comorbidities. Metabolic disorders and CAD are also considered as well-known causes of AF. Diabetic patients were most likely found with reduced serum concentrations of omentin-1.[19] Omentin-1 prevents migration of vascular smooth muscle cell by lessening oxidative stress. This phenomenon shows that omentin-1 might be involve in preventing hypertension by repressing vascular re-designing.[20,21] Diminished circulating omentin-1 levels found in CAD patients.[22]

CONCLUSION

There was inverse connection between plasma omentin-1 and developments of AF. Thus, decreased levels of plasma omentin-1 may be a potential risk factor for the development and advancement of AF in CAD patients.

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Analysis and interpretation of data: Shazia Nazar, Sitwat Zehra
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REFERENCES

1. Ullah I, Ahmad F, Ahmad S, Hayat Y. Atrial fibrillation and stroke prevention practices in patients with candidacy for anticoagulation therapy. J Ayub Med Coll Abbottabad 2015;27:669-72.
2. Menezes AR, Lavie CJ, DiNicolantonio JJ, O'Keefe J, Morin DP, Khatib S, et al. Cardiometabolic risk factors and atrial fibrillation. Rev Cardiovasc Med 2019;14:73-81.
3. Dzeshka MS, Lip GY, Snezhitskiy V, Shantsila E. Cardiac fibrosis in patients with atrial fibrillation: mechanisms and clinical implications. J Am Coll Cardiol 2015;66:943-59.
4. Nattel S, Harada M. Atrial remodeling and atrial fibrillation: recent advances and translational perspectives. J Am Coll Cardiol 2014;63:2335-45.
5. Biscetti F, Nardella E, Bonadia N, Angelini F, Pitocco D, Santoliquido A, et al. Association between plasma omentin-1 levels in type 2 diabetic patients and peripheral artery disease. Cardiovasc. Diabetology 2019;18:74-79.
6. Rao SS, Hu Y, Xie PL, Cao J, Wang ZX, Liu JH, et al. Omentin-1 prevents inflammation-induced osteoporosis

by down regulating the pro-inflammatory cytokines. Bone Res 2018;6:10-18.
7. Steensig K, Olesen KK, Thim T, Nielsen JC, Jensen SE, Jensen LO, et al. CAD is an independent risk factor for stroke among patients with atrial fibrillation. J Am Coll Cardiol 2018;72:2540-2.
8. Jamshidi J, Ghanbari M, Asnaashari A, Jafari N, Valizadeh GA. Omentin Val 109 Asp polymorphism and risk of coronary artery disease. Asian Cardiovasc Thorac Ann 2017;25:199-203.
9. Motawi TM, Mahdy SG, El-Sawalhi MM, Ali EN, El-Telbany RF. Serum levels of chemerin, apelin, vaspin, and omentin-1 in obese type 2 diabetic Egyptian patients with coronary artery stenosis. Can J Physiol Pharmacol 2018;96:38-44.
10. Fuster V, Rydén LE, Asinger RW, Cannom DS, Crijns HJ, Frye RL, et al. ACC/AHA/ESC guidelines for the management of patients with atrial fibrillation: executive summary: J Am Coll Cardiol 2001;38:1231-65.
11. Yamaguchi N, Okumura Y, Watanabe I, Nagashima K, Takahashi K, Iso K, et al. Clinical implications of serum adiponectin on progression of atrial fibrillation. Int J Arrhythm 2017;33(6):608-12.
12. Ermakov S, Azarbal F, Stefanick ML, LaMonte MJ, Li W, Tharp KM, et al. The associations of leptin, adiponectin and resisting with incident atrial fibrillation in women. Heart J 2016;102:1354-62.
13. Han Y, Zhao S, Gong Y, Hou G, Li X, Li L. Serum cyclin-dependent kinase 9 is a potential biomarker of atherosclerotic inflammation. Oncotarget 2016;7:1854-60.
14. Rahim S, Abdullah HM, Ali Y, Khan UI, Ullah W, Shahzad MA, et al. Serum Apo A-1 and its role as a biomarker of coronary artery disease. Cureus 2016;8:124-130.
15. Lavie CJ, Pandey A, Lau DH, Alpert MA, Sanders P. Obesity and atrial fibrillation prevalence, pathogenesis, and prognosis: effects of weight loss and exercise. J Am Coll Cardiol 2017;70:2022-35.
16. Tedrow UB, Conen D, Ridker PM, Cook NR, Koplan BA, Manson JE, et al. The long-and short-term impact of elevated body mass index on the risk of new atrial fibrillation: the WHS (Women's Health Study). J Am Coll Cardiol 2010;55:2319-27.
17. Alissa EM, Maisa'a M, Alama NA, Ferns GA. Role of omentin-1 and C-reactive protein in obese subjects with subclinical inflammation. J Clin 2016;3:7-11.
18. Nasrabadi M, Mogharnasi M. Effect of rhythmic aerobic exercise on serum concentration of omentin-1 and same anthropometric markers in obese women. J Diabetes Metab Disord 2017;15:192-200.
19. Escoté X, Gómez-Zorita S, López-Yoldi M, Milton-Laskibar I, Fernández-Quintela A, Martínez JA, Moreno-Aliaga MJ, Portillo MP. Role of omentin, vaspin, cardiotrophin-1, TWEAK and NOV/CCN3 in obesity and diabetes development. Int J Mol Sci 2017;18:1770-76.
20. Bilovol OM, Knyazkova II, Al-Travneh OV, Bogun MV, Berezin AE. Altered adipocytokine profile predicts early stage of left ventricular remodeling in hypertensive patients with type 2 diabetes mellitus. Diabetes Metab Syndr 2020;14:109-16.
21. Kazama K, Okada M, Yamawaki H. A novel adipocytokine, omentin, inhibits monocrotaline-induced pulmonary arterial hypertension in rats. Biochem Biophys Res Commun 2014;452:142-46.
22. Du Y, Ji Q, Cai L, Huang F, Lai Y, Liu Y, et al. Association between omentin-1 expression in human epicardial adipose tissue and coronary atherosclerosis. Cardiovasc Diabetology 2016;15(1):90-98.