Estimation the Importance of Serum Calcium Level Depending on The Effect Index in Coronary Artery Obstruction

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Abstract

Many researches relied on the importance of treating high cholesterol to prevent heart disease, and taking calcium and its level was not among the therapeutic considerations for the heart, this hypothesis gave an impetus to studying the serum level of calcium and lipid profile in patients who are at risk of atherosclerosis, and is calcium regulation of the same importance as treating lipids, or does the lipids clear of the atherosclerosis risk? One hindered and eighty individuals whose ages were from (40-70 years), they were divided into two groups according to their calcium score, in addition to the healthy group, the work was carried out between October 2022 and December 2022, diagnosis was made by a cardiac specialist in the Ghazi Al-Hariri Hospital for Surgical Specialties. To achieve the purpose of the study serum lipid profile, troponin, oxidized LDL, ionized calcium and atherogenic index were analyzed. Serum TG/HDL ratio in patients with high Ca-score show the highest level (with $p \leq 0.05$) when compared with patient have normal Ca-score and healthy subjects, Patient have high Ca-score have lowest serum Ca-ionized level in comparison with the two groups (with $p \leq 0.05$). those patients have the highest serum level of oxidized LDL and troponin when compared with the two other groups. The non-significant difference of the both ratio s. TG/HDL and LDL/HDL between patients have high calcium score and normal calcium score strongly suggests that cardiologists must take serum calcium inning in their treatment.

Numerous studies have demonstrated the role of the lipid profile in the progression of cardiovascular dieses (CVD). Increases in triglyceride (TG) and total cholesterol (TC) levels could affect the constriction and abstraction of vessels in the heart, which are significantly correlated with the risk of CVD (Zhao, etal,.2021 and Al-Alwany, A., 2021), Despite the well-documented role of calcium in cell metabolism, its role in the development of cardiovascular disease is still under heavy debate. Several studies suggest that calcium supplementation might be associated with an increased risk of coronary heart disease, whereas others underline a significant effect on lowering high blood pressure and hyperlipidemia

Evidence supports the idea that statin therapy not only reduces cholesterol levels but also changes existing plaques to make them less dangerous. As part of this process, the plaques may become more calcified—and thus, the calcium score goes up (Park JM, etal,.2022), A person can have a high cholesterol score and

a zero CAC score. When this occurs, doctors generally agree that a person's overall coronary heart disease risk is low and that the person does not require medical intervention.

The score reflects the total area of calcium deposits and the density of the calcium. A score of zero means no calcium is seen in the heart. It suggests a low chance of developing a heart attack in the future. When calcium is present, the higher the score, the higher your risk of heart disease (Greenland P, etal,.2018). Sixty patients were collected from Ghazi Al-Hariri Hospital for Surgical Specialties with a high calcium score level above zero Also, 60 patients with normal calcium score level were collected (calcium score = 0) and 60 healthy individuals' people were chosen, Inclusion criteria people who suffer from pain in the chest area, forcing them to see a doctor and exclusion criteria or/and whose pulse is high, the person who previously made arterial transplants and pregnant women.

Measurement of lipid profile using by Abbott, serum troponin, serum ionized calcium, serum oxidized LDL using by Elisa automation and serum atherogenic index.

It couldn't obtain a matching among the ages of the groups, individual due to the difficulty in obtaining patients with normal Ca-score mating in their age to the patients with high Ca-score, but the ages of patients with high Ca-score were chosen to be matched the age of healthy individual with (p>0.05) as table (1) show.

Serum TG/HDL ratio in patients with high Ca-score show the highest level (with p ≤ 0.05) when compared with patient have normal Ca-score and healthy subjects, this ratio shows non-significant differences between patient high and normal Ca-Score (with p≤ 0.05), but this ratio shows significant (with p≤ 0.05) differences between patient with healthy subjects. While the atherogenic index represented by serum LDL/HDL ratio show non-significant with (p≤ 0.05) differences among and between groups. Patient have high Ca-score have lowest serum Ca-ionized level in comparison with the two groups (with p≤ 0.05), also, patient have normal Ca-score show significant differences (with p≤ 0.05) when compared with two groups.

Patients with high Ca-score level have the highest serum level of oxidized LDL (21.94 ±

11.64 ng /ml) when compared with the two other groups with (p ≤ 0.05), while both groups' patients with normal Ca-Score and healthy individual show non-significant difference (p > 0.05) when compared with each other.

In the same line of significant dependency, patients with high Ca-score level have the highest level of serum troponin (106.67 ± 47.89 ng / L) when compared with the tow other groups with (p ≤ 0.05), while both groups' patients with normal Ca-score and healthy individual show non-significant differences (p > 0.05) when compared with each other show the table (2).

Serum ratio of TG/HDL in the patients with high Ca-score show non-significant (with p> 0.05) correlation with each of serum Ca-ionized, s. troponin, oxidizes LDL and level of Ca-score in these patients with (r=0.14, r=-0.15, r=-0.11, r=-0.11), while the serum ratio LDL/HDL in these patients show non-significant (with p> 0.05) correlation with each of serum Ca-ionized, s. Troponin, s. oxidized LDL and level of Ca-score in these patients with (r=0.02, r=-0.05, r=-0.02, r=-0.14) show the table (2), But serum of TG/HDL ratio in the patients with normal Ca-score show non-significant (with p> 0.05) correlation with each of serum oxidized LDL and s. troponin with (r=0.14, r=0.1), while this ratio shows significant with (p ≤ 0.05) correlation with each of serum Ca-ionized (r=0.26), also the serum of LDL/HDL ratio in these patients show non-significant (with p> 0.05) correlation with each of serum Ca-ionized (but this are negative direction), s. troponin and oxidized LDL with (r=-0.01, r=0.00, r=0.03). show the table 2 and the figure 1.

coronary artery calcification (CAC) is a specific feature for coronary atherosclerosis (Noor N. Nafie, etal,.2014), using different modalities and techniques of Echocardiography for early (Al Alwany, A.A.,2022) coronary angiography, or an in vivo contrast analysis of the coronary artery tree and lumen, is a standard procedure for determining the anatomy of the coronary arteries and determining the number, location, and severity of coronary stenoses. The coronary tree is observed, its branching pattern is delineated, and the inner diameter of a coronary artery is outlined by injecting 5−12 mL of radiographic contrast solution containing

iodine, which is plainly visible on X-ray images of the artery (Saleh, S.A. and Al-Alwany, etal,.2022), the research didn't find a significant changes in their blood lipid profile even in their serum LDL/HDL ratio but the only significant results was found with serum TG/HDL ratio and serum HDL, which leads to a difference of thinking about the idea of dyslipidemia with atherosclerosis, that many studies (Kumar, etal,.2018 and James Beckerman, etal,.2020), well documented that high serum lipid levels, especially the elevated level of low-density lipoprotein (LDL), have been shown to be strongly related to the development of atherosclerosis. It is generally accepted that atherosclerotic lesions are initiated via an enhancement of LDL uptake by monocytes and macrophages, by this way low-density lipoproteins cause atherosclerotic cardiovascular disease (Vuorio, etal,.2020), and this doesn't agree with apparent picture of the study.

Oxidized low-density lipoprotein (OxLDL) contributes to the atherosclerotic plaque formation and progression by several mechanisms, including the induction of endothelial cell activation and dysfunction, macrophage foam cell formation, and smooth muscle cell migration and proliferation (Ahmadi, etal,.2021). Oxidized LDL triggers inflammation leading to the formation of plaque in the arteries, also known as atherosclerosis. Oxidized LDL may also play a role in increasing the amount of triglycerides the body produces, as well as increasing the amount of fat deposited by the body (Khatana, etal,.2020). this is what the study found that it was the patients who had high calcium score had the highest level of serum oxidized LDL, while patients with normal calcium score and healthy individual didn't difference significantly patient with high calcium score have the highest level of troponin, elevated troponin is diagnostic for myocardial

injury (Martinez, etal,.2020). the elevation of serum troponin usually associated with coronary artery disease (CAD) decreased myocardial blood flow (myocardial infraction), artery solidifies promotes by the calcium mineralization of the lumen leading to narrowing of the blood vessel (Sternberg M, etal,.2019 and Kalampogias A, etal,.2016).

Ionized calcium binds to negative charged sites on protein molecules, competing with hydrogen ions for the same binding sites on albumin and other calcium-binding proteins. This binding is pH dependent and alters the level of ionized calcium in the blood. An increased in pH, alkalosis, promotes increased protein binding which decreases free calcium levels (Abbas, etal,.2018). Acidosis, on the other hand, decreases protein binding, resulting increased free calcium levels (Aydin, etal,.2019). individual home have a zero calcium score asymptomatic and no associated risk factor are unlikely to have obstruction or pluck and low risk for any cardiovascular events with the next years (Shreya D, etal,.2021). A lack of calcium can hide cholesterol from this body. If lose calcium, synthetic machinery thinks there's no cholesterol and it starts making more even if there is already enough." High blood cholesterol is a known risk factor for developing heart disease (Jialal I, etal,.2019).

Based on the obtained results, there is no significant difference between patients who have a high calcium score with patients who have a normal calcium score in the level of the atherogenic index(serum TG/HDL ratio &LDL/HDL ratio) while there is a significant increase in the level of serum calcium ions and LDL oxidase with a significant increase in the serum level of troponin, which strongly suggests that doctors take targeting the level of serum calcium In the blood during treatment in addition to the level of lipids in the blood.

Table (1): General Charter Patients of age of the study individual

parameters	Groups	No.	Mean ± SD	P-value	LSD
Age (years)	Healthy individual (a)	60	57.56 ± 6.64	0.000 Sig.	(a) ∨ (b) 0.00 Sig.
	Patients with normal Ca. score level (b)	60	49.80 ± 9.73		(a) ∨ (c) 0.24 non. sig.
	Patients with high Ca-score level (c)	60	59.93 ± 7.44		(b) ∨ (c) 0.00 Sig.

sig. = significant P≤0.05, non. Sig. = non-significant P>0.05, LSD = fisher least significant difference.

Table (2): Mean ± SD of atherogenic index represented by serum TG/HDL ratio, LDL/HDL ratio, serum Ca-ionized, serum troponin and oxidized LDL in patient with high, normal Ca-Score levels and healthy induvial.

parameters	Groups	No.	Mean ± SD	P-value	LSD
S. Ratio of TG / HDL	Healthy individual. (a)	60	2.3226 ± 0.2245	0.00 sig.	(a) ∨ (b) 0.00 sig.
	Patients with normal Ca-score level. (b)	60	3.876 ± 2.276		(a) ∨ (c) 0.00 sig.
	Patients with high Ca-score level. (c)	60	3.896 ± 1.924		(b) ∨ (c) 0.95 non. sig.
S. Ratio of LDL / HDL	Healthy individual. (a)	60	2.0739 ± 0.2270	0.07 non. sig.	(a) ∨ (b) 0.08 non. sig.
	Patients with normal Ca-score level (b)	60	2.319 ± 0.877		(a) ∨ (c) 0.15 non. sig.
	Patients with high Ca-score level (c)	60	2.348 ± 1.052		(b) ∨ (c) 0.95 non. sig.
S. Ca. Ionized (mg/dl)	Healthy individual. (a)	60	4.89 ± 0.27	0.00 Sig.	(a) ∨ (b) 0.00 sig.
	Patients with normal Ca-score (b)	60	5.31 ± 0.33		(a) ∨ (c) 0.00 sig.
	Patients with high Ca-score level (c)	60	4.12 ± 0.42		(b) ∨ (c) 0.00 sig.
S. OXLDL (ng /ml)	Healthy individual. (a)	60	18.606 ± 1.155	0.01 sig.	(a) ∨ (b) 0.99 non. sig.
	Patients with normal Ca-score level (b)	60	18.662 ± 1.438		(a) ∨ (c) 0.02 sig.
	Patients with high Ca-score level (c)	60	21.94 ± 11.64		(b) ∨ (c) 0.03 sig.
S. Troponin (ng /L)	Healthy individual. (a)	60	88.88 ± 11.82	0.00 sig.	(a) ∨ (b) 0.56 non. sig.
	Patients with normal Ca-score level (b)	60	94.02 ± 11.13		(a) ∨ (c) 0.00 sig.
	Patients with high Ca-score level (c)	60	106.67 ± 47.89		(b) ∨ (c) 0.049 sig.`

Table 3: Person's correlations between: (a) serum TG/HDL ratio, (b) serum LDL/HDL ratio and each of groups of high Ca-score level.

(a)

Parameters	s. TG / HDL ratio r =	P-value
s. Ca. Ionized (mg/dl)	0.14	0.28 non. sig
S. Troponin (ng /L)	-0.15	0.25 non. sig.
S. oxidized LDL (ng /ml)	-0.12	0.38 non. sig.
Ca-score level	-0.11	0.39 non. sig.

(b)

Parameters	s. LDL / HDL ratio r =	P-value
s. Ca. Ionized	0.02	0.89 non. sig
s. Troponin (ng /L)	-0.05	0.71 non. sig.
s. oxidized LDL (ng /ml)	-0.02	0.85 non. sig.
Ca-Score level	-0.14	0.28 non. sig.

Table 4: Person's correlations between: (a) serum TG/HDL ratio, (b) serum LDL/HDL ratio and each of groups of normal Ca-score level.

(a)

Parameters	TG / HDL ratio r =	P-value
s. Ca. Ionized (mg/dl)	0.26	0.045 sig
S. troponin (ng /L)	0.10	0.43 non. sig.
S. oxidized LDL (ng /ml)	0.14	0.30 non. sig.

(b)

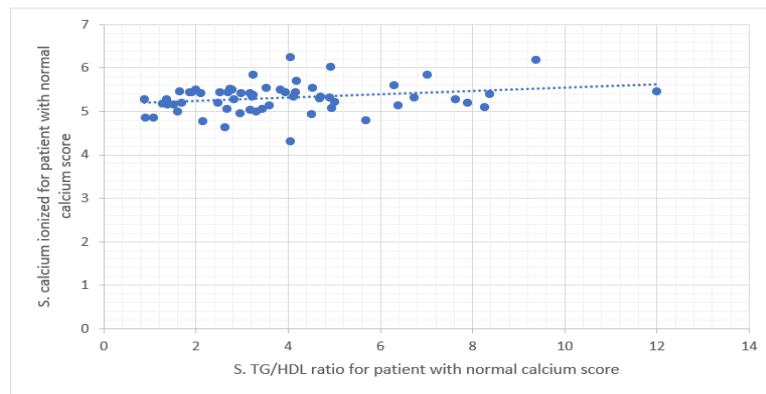| Parameters	LDL / HDL ratio r =	P-value
s. Ca. Ionized (mg/dl)	-0.01	0.93 non. sig
s. troponin (ng /L)	0.00	0.99 non. sig.
s. oxidized LDL (ng /ml)	0.03	0.84 non. sig.

Figure 1: Correlation between serum TG/HDL ratio and s. Calcium ionized in the patient with normal calcium score level.

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