The Egyptian Journal of Hospital Medicine (July 2017) Vol.68 (3), Page 1405-1410

The Relationship of Complexity of Coronary Artery Disease and Complexity of Peripheral Arterial Disease

Sameh Saleh Sabet , Hany Mohammed Fakhry,
Khaled Aly Abdelkader , Alaa Ahmed Reyad Elkiey
Cardiology Department, Faculty of Medicine, Ain Shams University

ABSTRACT

Background: Atherosclerosis is a disease of the large and medium-sized arteries causing luminal narrowing (focal or diffuse). **Aim of the Work:** Measure the relationship between coronary artery disease complexity using SYNTAX score and peripheral arterial disease complexity using TASC II score. **Patients and Methods:** The study was designed as a prospective single center cross-sectional study conducted at Ain shams university hospitals. The study included 50 patients referred for elective coronary angiography in the time period from August 2016 till July 2017.

Results and conclusion: Patients with complex PAD had complex CAD. This finding suggested that PAD and CHD are different clinical manifestations of atherosclerosis and systemic pan vascular involvement is present in patients with complex lesions. (P-value 0.046).

Keywords: Peripheral Vascular Disease, Complexity, Coronary, Artery Disease, Complexity.

INTRODUCTION

Atherosclerosis is a disease of the large and medium-sized arteries causing luminal narrowing (focal or diffuse). This occurs as a result of the accumulation of lipid and fibrous material between the intimal and medial layers of the vessel[1].

Because atherosclerosis is a systemic disease, presence of PAD is considered a strong predictor of cardiovascular events which is 5-7% annually. In the AGATHA study, patients with PAD in one vascular bed had a 35% chance of having disease in at least one other territory, and 50% had cerebrovascular or coronary heart disease. There was a 2-3% nonfatal myocardial infarction rate, and a twofold to threefold increase in the occurrence of angina compared with age-matched controls. Risk of cardiovascular mortality increases with asymptomatic PAD and surprisingly the risk may not differ from symptomatic PAD [2].

Trans Atlantic Inter-Society Consensus II (TASC II) classification is an internationally derived definition that is dedicated for the assessment of peripheral artery disease according to anatomical distribution, number and nature of lesions (stenosis and occlusion) [3].

The SYNTAX score (SS) is a comprehensive scoring system dedicated for the assessment of complexity and severity of coronary artery anatomy and lesion characteristics. SYNTAX score is a valuable marker of major adverse cardiovascular events and cardiovascular mortality[4&5].

AIM OF THE WORK

The aim of this work is to measure the relationship between coronary artery disease complexity using SYNTAX score and peripheral arterial disease complexity using TASC II score.

PATIENTS AND METHODS

The study was designed as a prospective single center cross-sectional study conducted at Ain shams university hospitals. The study included 50 patients referred for elective coronary angiography in the time period from August 2016 till July 2017.

PATIENTS

Inclusion criteria

Patients with coronary artery disease undergoing diagnostic coronary angiography for coronary artery disease according to ESC 2014 revascularization guidelines.

Exclusion criteria

1) Patient's refusal.
2) Vasculitis.
3) Contraindication for CA e.g. (active bleeding, coagulopathy, active infection, etc.).
4) Non atherosclerotic stenosis.
5) Acute limp threatening ischemia.
6) Patients with known or suspected infectious or inflammatory conditions.
7) Patients with serum creatinine more than 1.3 mg/dL.

METHODS

A) History:

B) Complete physical examination:

C) Laboratory investigations:

D) Coronary angiography:

Received: 5 / 6 /2017
Accepted: 14 /6 /2017
DOI: 10.12816/0039682

It was performed using conventional techniques, and was analyzed by experienced interventional cardiologists.

E) Coronary scoring:

SYNTAX score was calculated using an online calculator (http://www.syntaxscore.com). A SYNTAX score of 0 indicates no measurable coronary disease, while a score 1 indicates the presence of CAD, with CAD complexity increasing as the SYNTAX score increases.

The SYNTAX score algorithm includes:

1) Dominance
2) Number of lesions
3) Segments involved per lesions with lesion characteristics
4) Total occlusions with subtotal occlusions:

a) Number of segments
b) Age of total occlusion
c) Blunt stump
d) Bridge collaterals
e) First segment beyond occlusion visible by anterograde or retrograde filling
f) Side branch involvement

5) Trifurcation, number of diseased segments
6) Bifurcation type and angulation
7) Aortic Osteal lesion
8) Severe tortuosity
9) Lesion length
10) Heavy calcification
11) Thrombus
12) Diffuse disease with numbers of segments

F) Peripheral angiography and TASC II score

The study was done after approval of ethical board of Ain Shams university and an informed written consent was taken from each participant in the study.

Statistical Analysis

Data were expressed as mean value ± SD for continuous variables, and as percentages for categorical variables. In this study, statistical significance was established as follows: $p>0.05$ insignificant, $p\leq0.05$ significant, $p\leq0.01$ highly significant.

RESULTS

This study included 50 patients who underwent coronary angiography at Ain Shams University hospitals in the time period from August 2016 till July 2017 and SYNTAX score was calculated. They also underwent peripheral angiography and TASC II score was calculated. The relationship between coronary artery disease complexity using SYNTAX score and peripheral arterial disease complexity using TASC II score, was measured.

Table (1): Socio-demographic data:

		No.=50
Sex	Female Male	10 (20.0%) 40 (80.0%)
Age	Mean ±SD Range	62.12 ± 5.71 53 – 77
DM	Negative Positive	0 (0.0%) 50 (100.0%)
HTN	Negative Positive	8 (16.0%) 42 (84.0%)
Smoking	Negative Positive	10 (20.0%) 40 (80.0%)

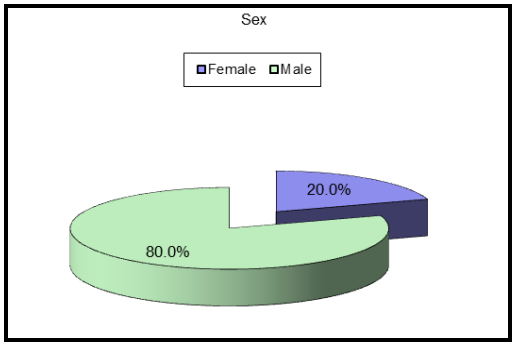

Figure (1): Socio-demographic data (sex).

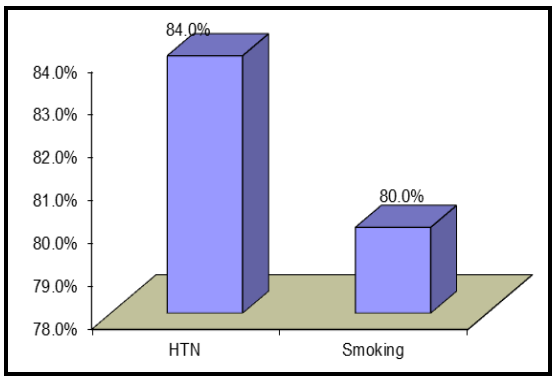

Figure (2): Risk factors studied.

Table (2): SYNTAX score, SYNTAX score categories and TASC II categories

		No.=50
SYNTAX score	Mean±SD Range	18.75 (11 - 26.5) 1 – 67
SYNTAX score categories	Mild Moderate Severe	30 (60.0%) 12 (24.0%) 8 (16.0%)
TASC II categories	A B C D	12 (24.0%) 14 (28.0%) 11 (22.0%) 13 (26.0%)

.

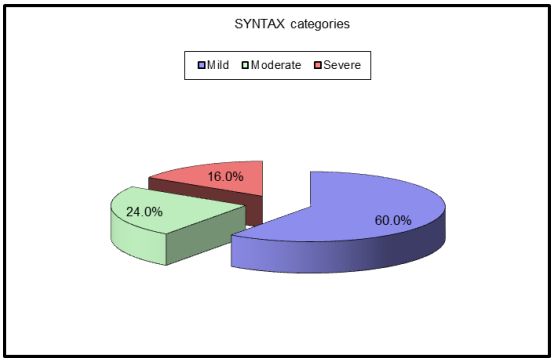

Figure (3): SYNTAX score categories.

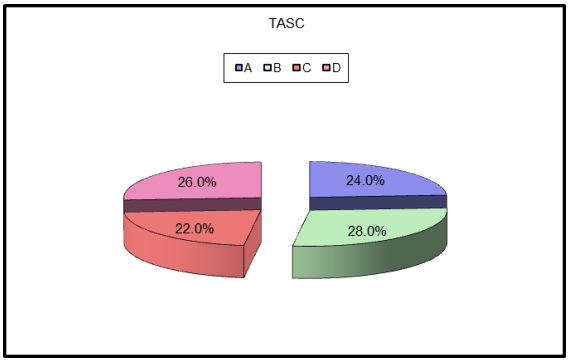

Figure (4): TASC II score categories.

Table (3): Relation between SYNTAX score categories with demographic and risk factors of the studied patients:

		Mild No.=30	Moderate No.=12	Severe No.=8	Test Value	P-value	Sig.
HBA1c	Mean±SD Range	8.06 ± 1.24 6.8 – 12	8.13 ± 1.30 6.7 – 10.6	10.50 ± 0.69 9.5 – 11.3	13.992	0.001	HS
Post hoc analysis by LSD							
Mild vs Moderate		**Mild vs Severe**		**Moderate vs Severe**			
0.851		0.001		0.001			

Table (4): Relation between SYNTAX score categories with TASC II score categories of the studied patients:

TASC	Mild		Moderate		Severe		Test Value*	P-value	Sig.
	No.	%	No.	%	No.	%			
	11	36.7%	1	8.3%	0	0.0%	12.768	0.046	S
	10	33.3%	3	25.0%	1	12.5%			
	3	10.0%	4	33.3%	4	50.0%			
	6	20.0%	4	33.3%	3	37.5%			

NS: Non significant; S: Significant; HS: Highly significant, *:Chi-square test

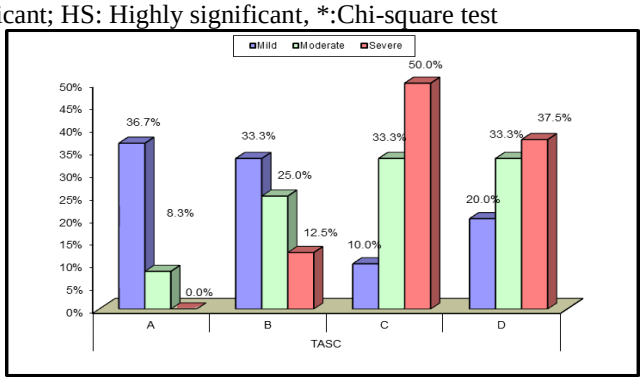

Figure (5): Relation between SYNTAX score categories with TASC II score categories of the studied patients.

Table (5): Relation between SYNTAX groups with TASC II groups of the studied patients:

		A	B	C	D	Test Value	P-value	Sig.
		No.=12	No.=14	No.=11	No.=13			
Syntax groups	Mild	11(91.7%)	10 (71.4%)	3 (27.3%)	6 (46.2%)	12.768*	0.046	S
	Moderate	1 (8.3%)	3 (21.4%)	4 (36.4%)	4 (30.8%)			
	Severe	0 (0.0%)	1 (7.1%)	4 (36.4%)	3 (23.1%)			
Syntax score	Median (IQR)	10.00 (2.5-16)	13.50 (10 - 22.5)	26.50 (19 - 36)	19.50 (13 - 27)	11.777‡	0.008	HS
	Range	1 – 37	5 –38.5	11 – 54	8 – 67			

Post hoc analysis						
	A vs B	A vs C	A vs D	B vs C	B vs D	C vs D
Syntax groups	0.386	0.006	0.044	0.066	0.348	0.612
Syntax score	0.318	0.002	0.02	0.022	0.149	0.343

NS: Non significant; S: Significant; HS: Highly significant
*:Chi-square test; ‡: Kruskall Wallis test

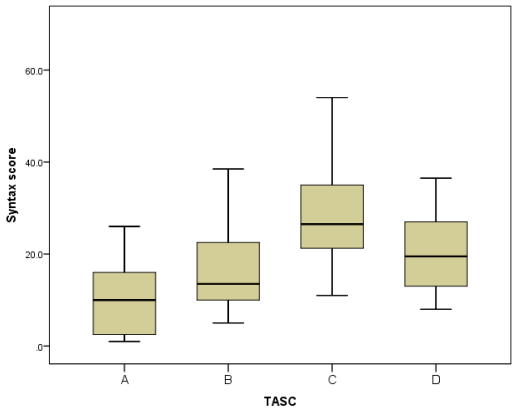

Figure (6): Relation between TASC II score and SYNTAX score.

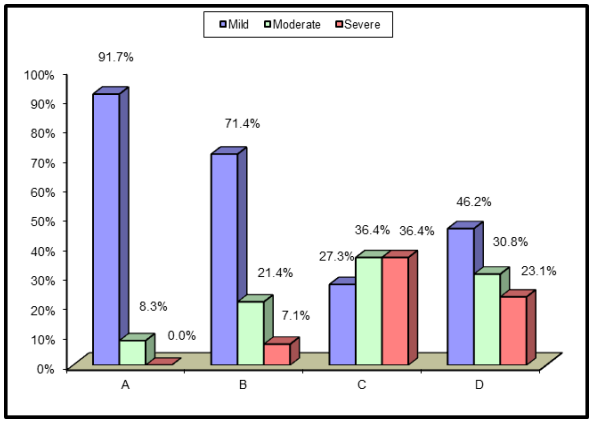

Figure (7): Relation between TASC II score categories and SYNTAX score categories.

Table (6): Relation between TASC II score categories with ABI categories of the studied patients:

		A	B	C	D	Test Value•	P-value	Sig.
		No.=12	No.=14	No.=11	No.=13			
ABI	Mean ±SD	1.03 ± 0.05	0.92 ± 0.05	0.83 ± 0.06	0.81 ± 0.07	38.087	0.001	HS
	Range	1 – 1.1	0.85 – 1.08	0.73 – 0.93	0.7 – 0.87			
	Normal	12 (100.0%)	1 (7.1%)	0 (0.0%)	0 (0.0%)	61.393	0.001	HS
	Borderline	0 (0.0%)	7 (50.0%)	1 (9.1%)	0 (0.0%)			
	Low	0 (0.0%)	6 (42.9%)	10 (90.9%)	13 (100.0%)			

Post hoc analysis						
	A vs B	A vs C	A vs D	B vs C	B vs D	C vs D
ABI score	0.001	0.001	0.001	0.001	0.001	0.291
ABI groups	0.001	0.001	0.001	0.044	0.018	0.573

NS: Non significant; S: Significant; HS: Highly significant
•:Independent t-test

Table (7): Correlation between SYNTAX score and other study parameters

	SYNTAX score	
	r	**p-value**
Age	-0.080	0.582
LDL	0.052	0.721
HDL	0.009	0.948
EF	-0.081	0.578
Creat	-0.042	0.772
HBA1c	0.405**	0.004
Ankle BP	-0.124	0.389
Brachial	0.122	0.398
ABI	-0.457**	0.001
INR	0.146	0.312

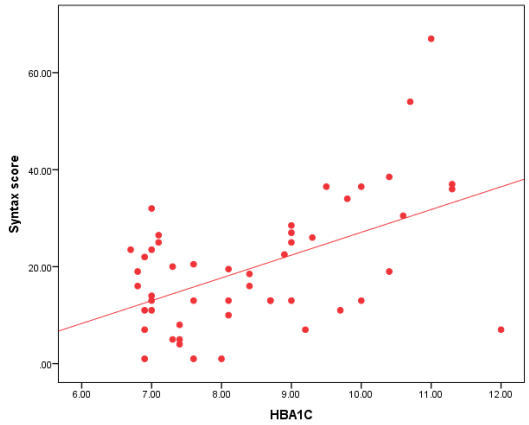

Figure (8): Correlation between SYNTAX score and HBA1c.

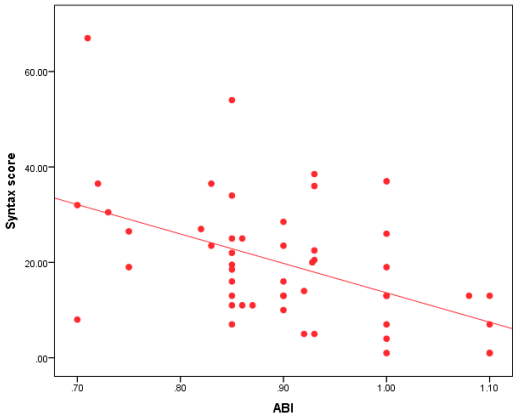

Figure (9): Correlation between SYNTAX score and ABI.

In Our study there was a statistically significant difference between TASC II score categories and SYNTAX score categories concluding that patients with complex PAD had complex CAD. This finding suggested that PAD and CHD are different clinical manifestations of atherosclerosis and systemic pan vascular involvement is present in patients with complex lesions. (P-value 0.046).

Also, there was a statistically significant difference between SYNTAX score and TASC II score (P-value 0.008).

Moreover, there was a statistically significant difference between SYNTAX score and HBA1c (P-value 0.0001).

Also, there was a statistically significant difference between SYNTAX score and mean ABI (P – value 0.015). Moreover, statistical significant difference was found between TASC II score and the age (P-value 0.01).

In addition, there was a statistically significant difference among the four categories of TASC II score and mean ABI of the studied patients with (P-value 0.0001).

Also, there was a highly significant difference between ABI categories and TASC II score categories with (P-value 0.0001).

DISCUSSION

The aim of our study was to find out the relationship between CAD complexity and PAD complexity. So, CA was done for 50 patients and their SYNTAX score was calculated following CA. Also, peripheral angiography was done for those patients and their TASC II score was calculated following peripheral angiography.

In this study, we have demonstrated a significant association between coronary and peripheral artery disease complexity using SYNTAX score and TASC II classifications. This may suggest that complex arterial disease in a region should be regarded as a sign of complex pan vascular disease. Peripheral arterial disease is a marker of systemic atherosclerosis.

The ankle brachial index (ABI) is a noninvasive marker of presence and severity of PAD. ABI is a statistically significant independent predictor for

lesion site, complex stenotic lesions and lesion morphology in patients with angina pectoris suspected for CAD. The presence of an abnormal ABI (≤ 0.9) was associated with an increased risk of multi vessel disease. There was a significant association between degree of PAD and higher prevalence of 3- or 4-vessel CAD. There was a statistically significant difference between SYNTAX score and HBA1c (P-. value 0.0001) which means that the more increase in severity of SYNTX score, the more increase in HBA1c which reveals uncontrolled D.M. Elevated HbA1c levels are associated with an increased risk for further micro vascular and macro vascular disease.

These results goes hand by hand with ***Aykan et al*** [6] who investigated the relationship between peripheral artery disease complexity and coronary artery disease complexity in patients with peripheral artery disease. A total of 449 patients were enrolled. SYNTAX score, a marker of coronary artery disease complexity, was assessed by dedicated computer software and complexity of peripheral artery disease was determined by Trans Atlantic Inter-Society Consensus II classification.

Erkan et al. [7] , also studied the relationship between SYNTAX score and TASC II score in 72 to whom were elective coronary angiography for was done for the assessment of CAD. At the same session, peripheral angiography was performed in cases of suspected PAD.

Rapolti et al[8] ,also studied the association between severity of peripheral Artery Disease Angio CT-derived Coronary Syntax Score in Patients with Critical Limb Ischemia. The study included 24 patients, who were admitted at the Cardio Med Medical and Research Center with peripheral artery disease between August 1st, 2015 and December 31, 2015. They found a significant correlation between the Syntax Score and TASC classification.

Vuruskan et al. [9] , also studied the Prediction of coronary artery disease severity in lower extremity artery disease patients: A correlation study of TASC II classification, Syntax and Syntax II scores. The study population consisted of 178 patients who underwent lower limb and coronary diagnostic angiography for assessment of LEAD and CAD at the same session. Syntax and Syntax II scores were calculated. TASC II classifications of the lower limb arteries were done. The study showed after an analysis of the correlation and regression, the findings indicated a moderately positive correlation between the TPS and Syntax (Pearson correlation = 0.467, $p < 0.001$).

CONCLUSION

We had shown a significant association between coronary and peripheral artery disease complexity using SYNTAX score and Trans-Atlantic Inter-Society Consensus II classifications.

Patients with complex PAD had complex CAD. This finding suggest that PAD and CHD are different clinical manifestations of atherosclerosis and systemic pan vascular involvement is present in patients with complex lesions.

REFERENCES

1) **Creager MA, Belkin M, Bluth EI *et al.* (2012):**ACCF/AHA/ACR/SCAI/SIR/STS/SVM/SVN/ SVS Key data elements and definitions for peripheral atherosclerotic vascular disease: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Clinical Data Standards (Writing Committee to develop Clinical Data Standards for peripheral atherosclerotic vascular disease). J Am CollCardiol.,59:294.

2) **Fowkes FG, Low LP, Tuta S *et al.* (2006):**Ankle-brachial index and extent of atherothrombosis in 8891 patients with or at risk of vascular disease: results of the international AGATHA study. European Heart Journal, 27 (15): 1861-1867.

3) **Norgren L, Hiatt WR, Dormandy JA *et al.* (2007):** Inter-society consensus for the management of peripheral arterial disease (TASC II). Eur J Vasc Endovasc Surg.,33(1): 1–75.

4) **Sianos G, Morel MA, Kappetein AP *et al.* (2005):** The SYNTAX score: an angiographic tool grading the complexity of coronary artery disease. Eurointervention, 1: 219–227.

5) **Serruys P, Onuma Y, Garg S *et al.* (2009):** Assessment of the SYNTAX score in the Syntax study. Eurointervention, 5: 50–56.

6) **Ahmet Çagri Aykan, Engin Hatem, Can Yücel Karabay *et al.* (2014):**Complexity of lower extremity peripheral artery disease reflects the complexity of coronary artery disease . Heart Lung Circ., 23(8):764 - 71 http://journals.sagepub.com/doi/full/ 10.1177/1708538114550738.

7) **Erkan H, Vatan B, Ağaç MT *et al.* (2013):**Relationship between SYNTAX score and Trans-Atlantic Inter-Society Consensus II classification in patients undergoing diagnostic angiography. Postep Kardiol Inter., 4(34): 344–347.

8) **Rapolti E, Benedek T, Kovács I *et al.* (2016):** Association between Severity of Peripheral Artery Disease Angio CT- derived Coronary Syntax Score in Patients with Critical Limb Ischemia. Journal of Interdisciplinary Medicine,1(1):42-45.

9) **Vuruskan E, Saracoglu E, Polat M *et al.* (2017):**Prediction of coronary artery disease severity in lower extremity artery disease patients: A correlation study of TASC II classification, Syntax and Syntax II scores. Cardiol J.**,34:33-35.**