7th Vascular Biomechanics Society

Does Arterial Stiffness Contribute to Coronary Artery Disease Risk Prediction Beyond the Traditional Risk Score ?

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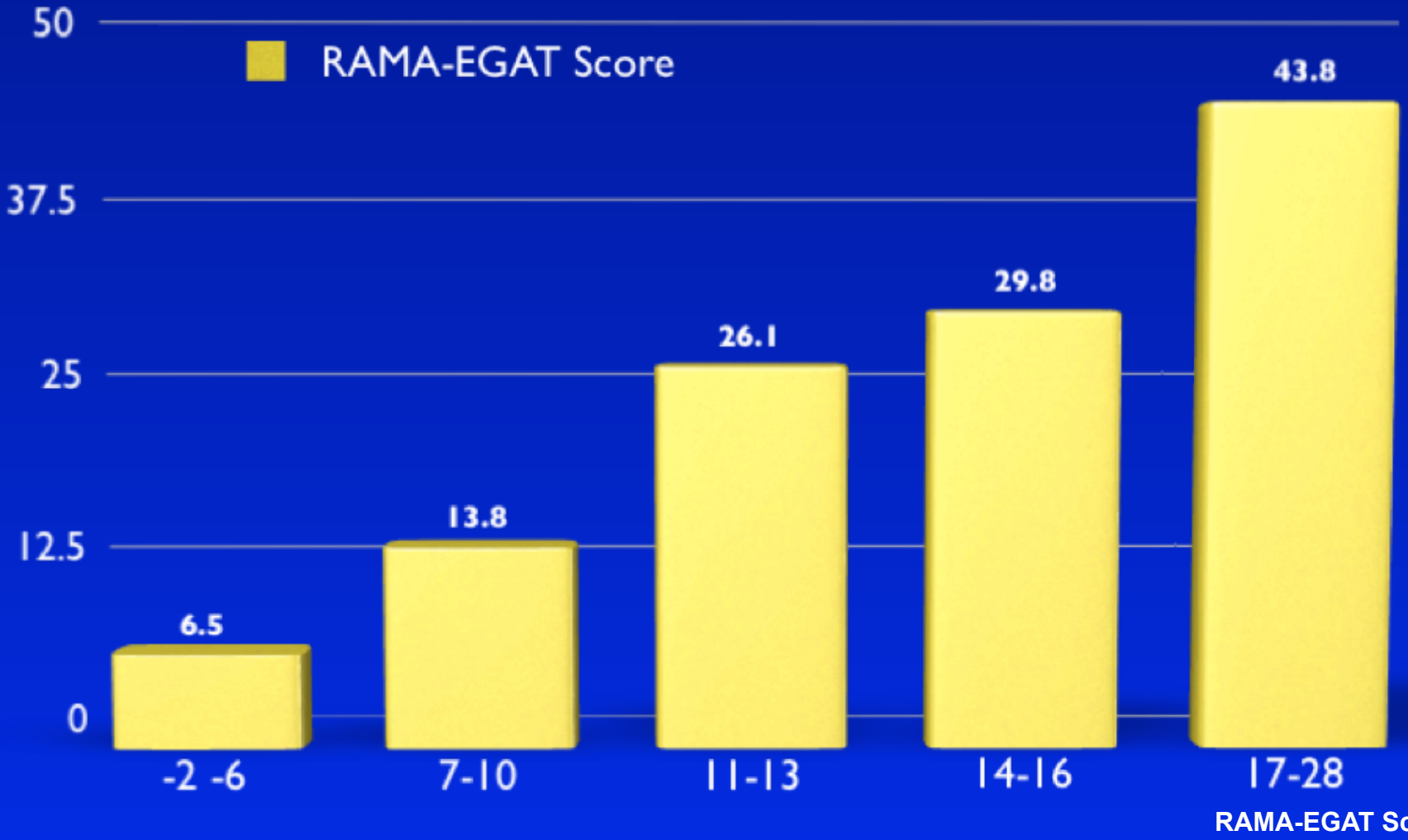
RAMA-EGAT Score

Score	-2	0	2	3	4	5	6	8	10
Age (year)	35-39	40-44	45-49		50-54		55-59	60-65	≥ 65
Gender		Female		Male					
Cholesterol (mg/dl)		<280				>280 or drug therapy			
Smoking		No	Yes						
Diabetes		No				Yes			
Hypertension		No		Yes					
Waist circumference*		Below		Above					

* Waist circumference: male ≥ 36 inches, female ≥ 32 inches

Int J Epidemiol 2003;32:461-8.

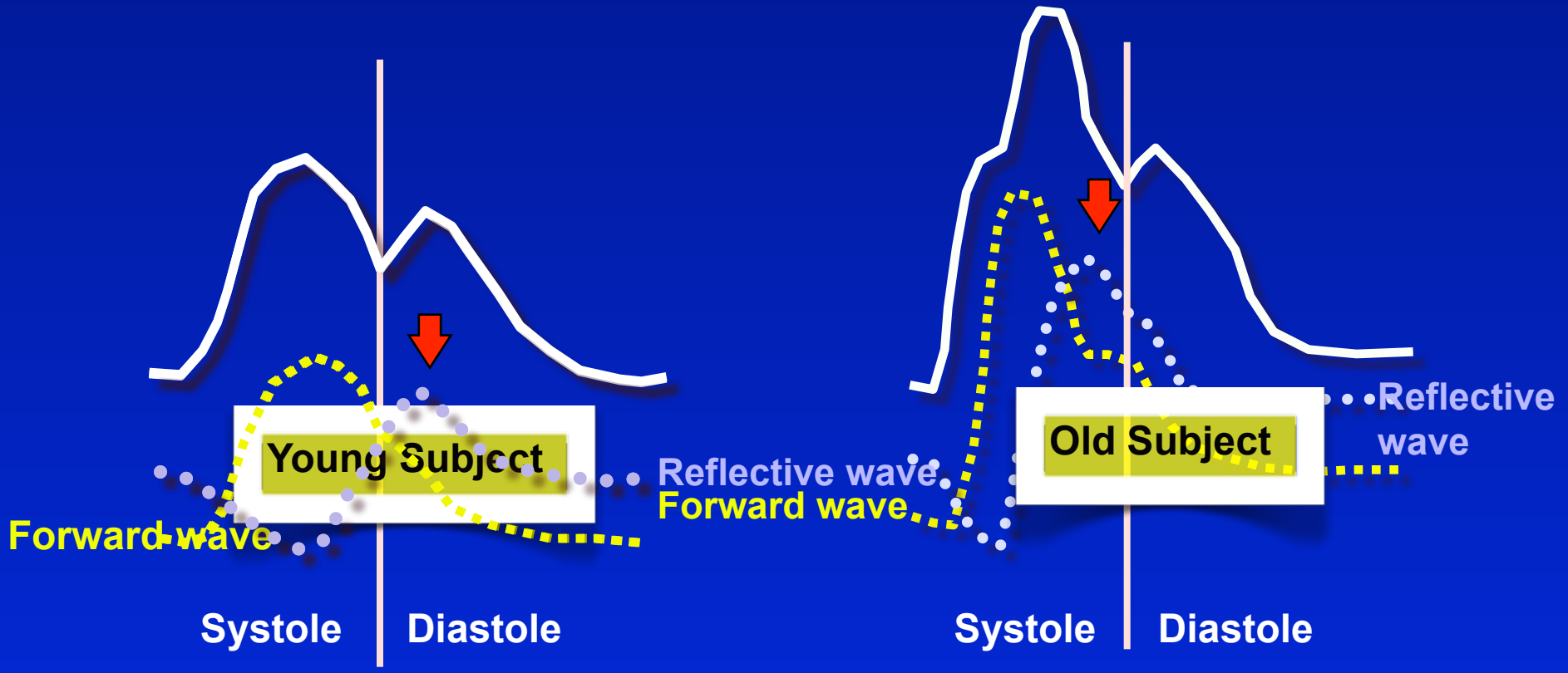
Prevalence of CAD by RAMA-EGAT Score and CAVI



Hypothesis

Are there any non-traditional risk factors to predict coronary atherosclerotic heart disease ?

Arterial Stiffness

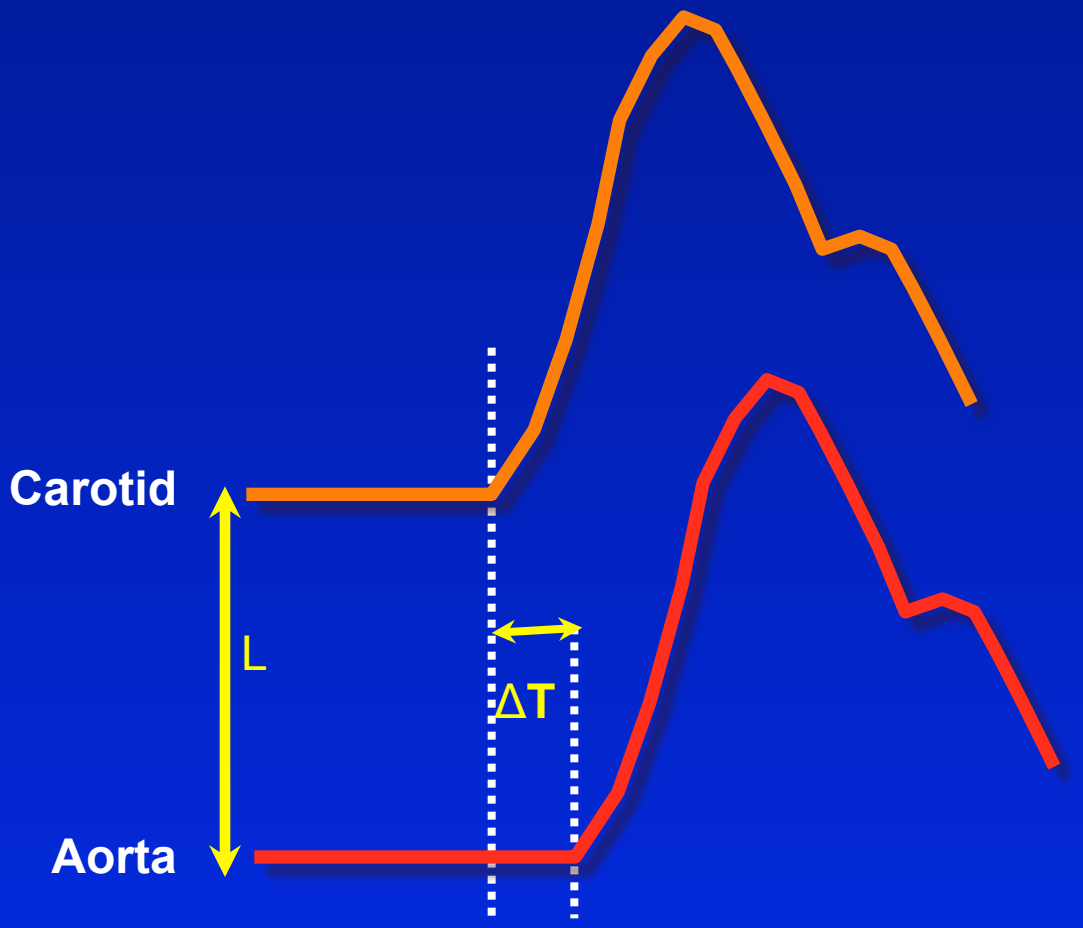


Borer JS(ed): Atherosclerosis, Large Arteries and Cardiovascular Risk, Advances in Cardiology Vol. 44.2007, pp 1-18.

Methods of Measuring Arterial Stiffness

- Aortic pulse wave velocity
- Brachial ankle pulse wave velocity
- Cardio-Ankle Vascular Index (CAVI)

The Concept of Arterial Stiffness Principle of Pulse Wave Velocity



PWV = L / T

Borer JS(ed): Atherosclerosis, Large Arteries and Cardiovascular Risk, Advances in Cardiology Vol. 44.2007, pp 1-18.

Measurement of CAVI

ID:4183682 DATE/TIME:2008/03/12 08:00:43

NAME :SOMSUK

HEIGHT:168cm WEIGHT: 87kg SEX :MALE AGE : 60Y.0.

AF : 507mm BMI :30.8kg/m² SYMP. : MED. :

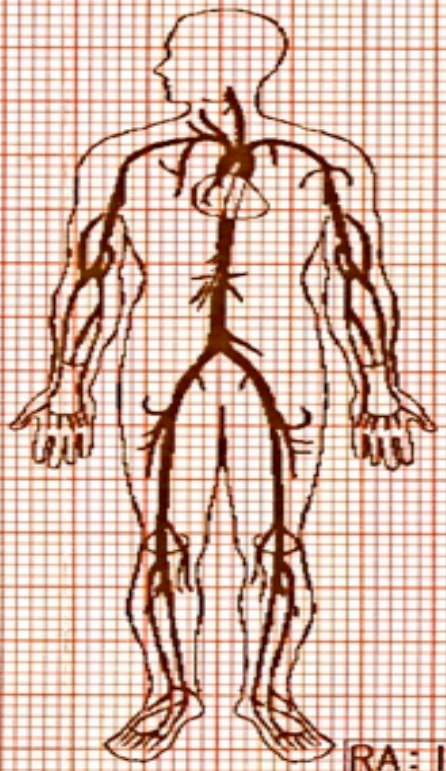
L 129cm = L1 66cm + L2 34cm + L3 29cm

TEST	ITEM	READING	STANDARD	COMMENTS
STIFFNESS OF ARTERY	R-*CAVI*	8.4	~ 9.0	Estimated age of artery is 60-64.
	L-*CAVI*	8.3	8.3±0.9	Estimated age of artery is 60-64.
BLOCKAGE OF ARTERY	R-ABI	1.04	0.9~1.3	In normal range.
	L-ABI	1.16		In normal range.

HR: 59 [BPM]

RB [mmHg]
BP(S/D): 152/ 93
PP: 59 MAP:111

LB [mmHg]
BP(S/D): 139/ 86
PP: 53 MAP:104



RA [mmHg]
BP(S/D): 158/ 95
PP: 63 MAP:116

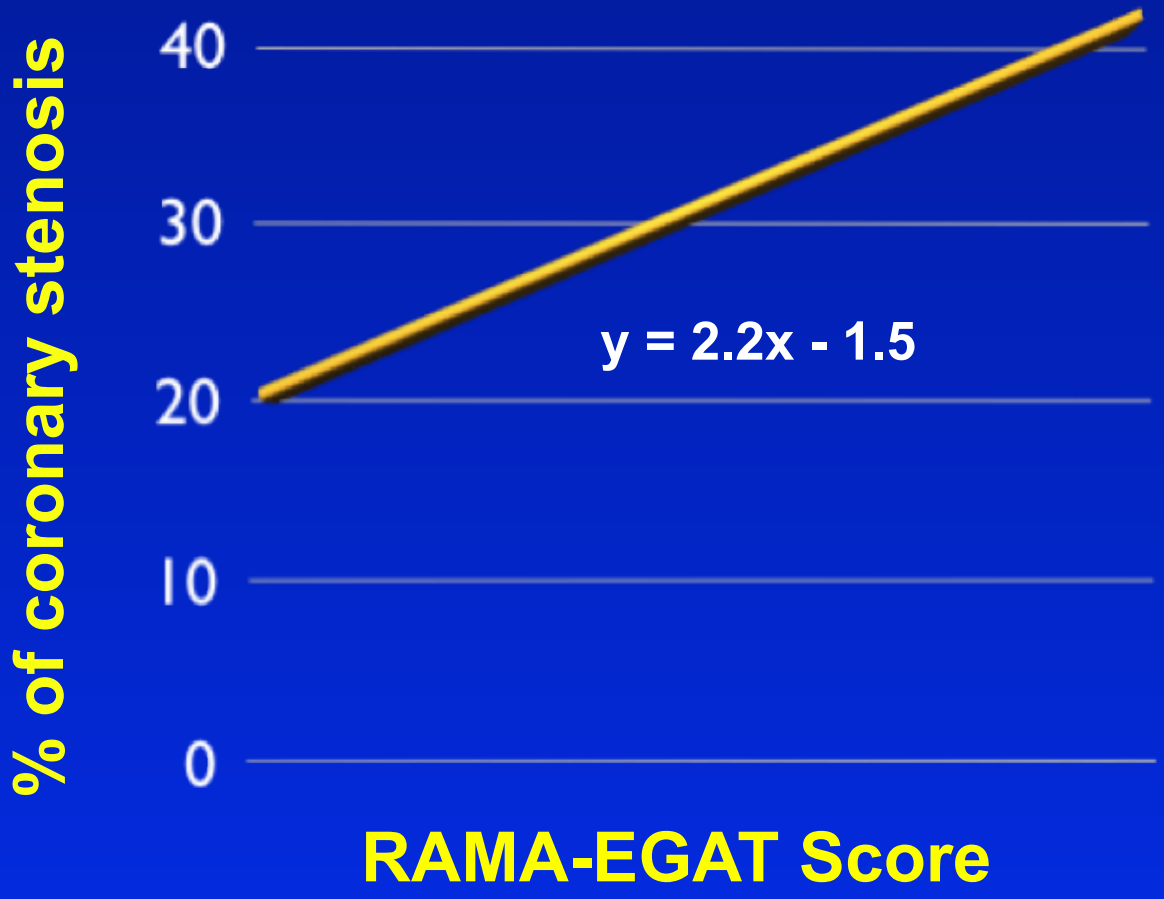
R-*CAVI*: 8.4
R-ABI: 1.04

LA [mmHg]
BP(S/D): 176/ 96
PP: 80 MAP:134

L-*CAVI*: 8.3
L-ABI: 1.16

RA: In normal range.
LA: In normal range.

Correlation between RAMA-EGAT Score and Significant Coronary Stenosis



Asean Heart J 2007;15(1): 18-22.

Study Objectives

Primary objective

- To demonstrate whether addition of CAVI to RAMA-EGAT score improves diagnostic yield of coronary atherosclerotic plaque burden

Secondary objective

- To find the appropriate cut-off value of CAVI for diagnosis of coronary heart disease in Thai population

Study Design and Studied Population

- Cross sectional study
- Studied population
  - Patients with suspected CAD who were referred for evaluation with 64-slice CT coronary angiography at Ramathibodi Hospital
  - The ethics committee of Ramathibodi hospital provided approval for the study and informed consent was obtained from all patients prior to participation.

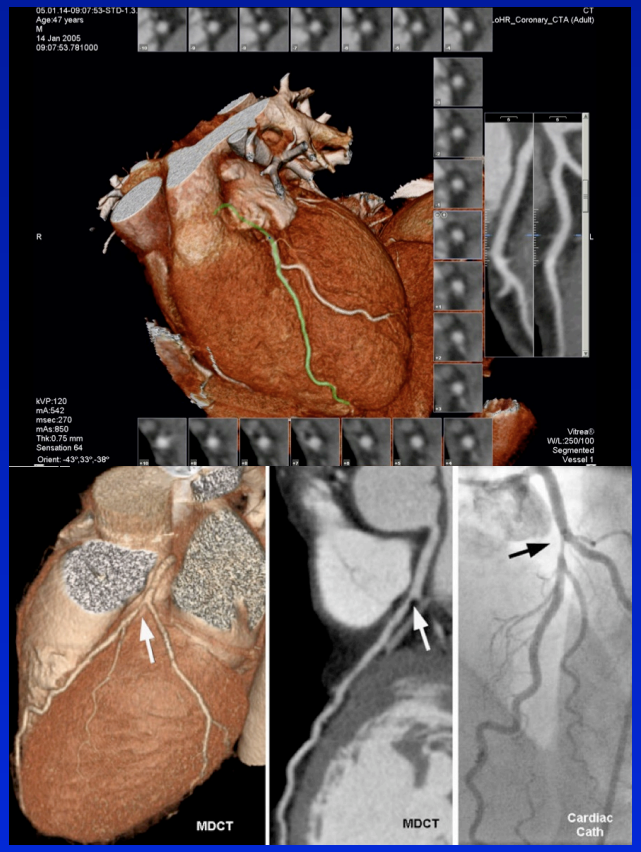
Exclusion Criteria

1. Atrial fibrillation
2. Decline injection of contrast media
3. Contraindicate to contrast media (previous allergy to contrast media, severe renal insufficiency)
4. Unable to hold their breath for long enough time for the CT scan
5. Peripheral arterial disease (ABI $\leq$ 0.9)
6. LVEF < 40%
7. Valvular heart disease

Outcome Measurement

64 Slice CT Scan

- Modified 17-segment AHA model
- Degree of stenosis
  - ≥ 50% : Significant CAD
  - 50-75% : Moderate CAD
  - ≥ 75% : Severe CAD
- Total CAC scores graded according to the Agatston method

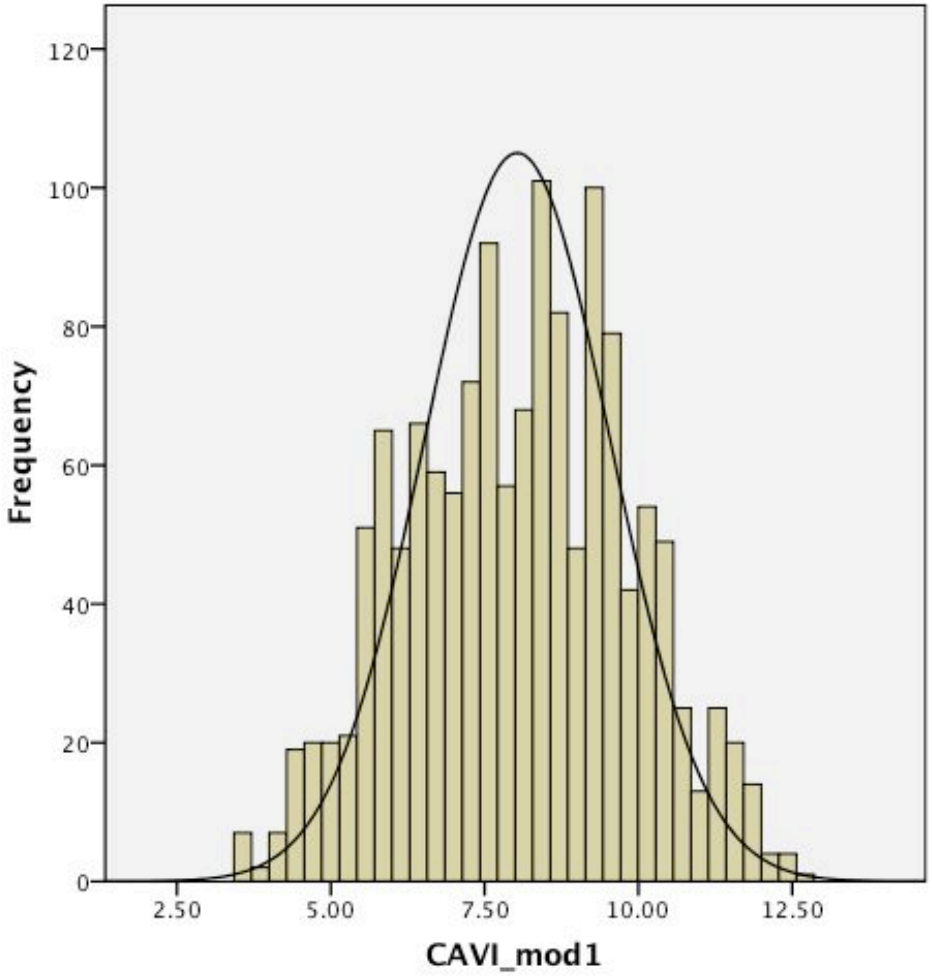


Results

Baseline Characteristics (N=1391)

	Significant Coronary Stenosis (N=346)	No Significant Coronary Stenosis (N = 1045)	*p* value
Age (year)	62.1±8.4	56.9±9.1	<0.001
Male (%)	63	39.9	<0.001
BMI (kg/m2)	25.9±7.2	24.7±3.8	<0.001
RAMA-EGAT Score	15.8±5.7	11.1±5.98	<0.001
CAC	315.2±470.6	39.7±149.33	<0.001
Smoking (%)	9.7	6.4	0.046
HT (%)	58.5	36.5	<0.001
DM(%)	22.6	9.9	<0.001
HDL (mg/dL)	43.7±11.7	48.5±13.9	<0.001
CAVI	9.7±1.36	7.4±1.54	<0.001

Cardio-Ankle Vascular Index

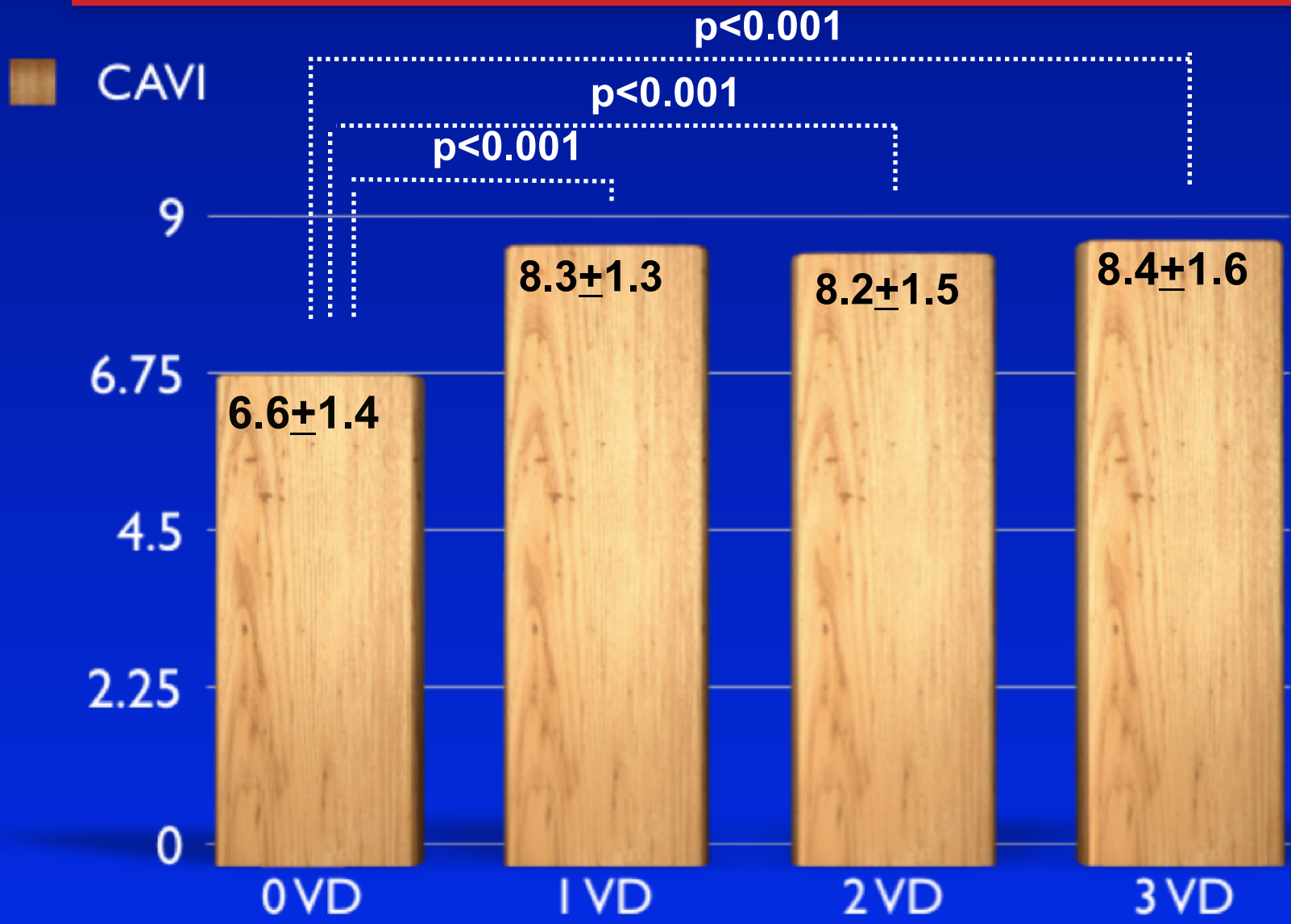


Minimum 3.45
Maximum 12.8
Mean = 8.04
Median = 8.15
SD = 1.80

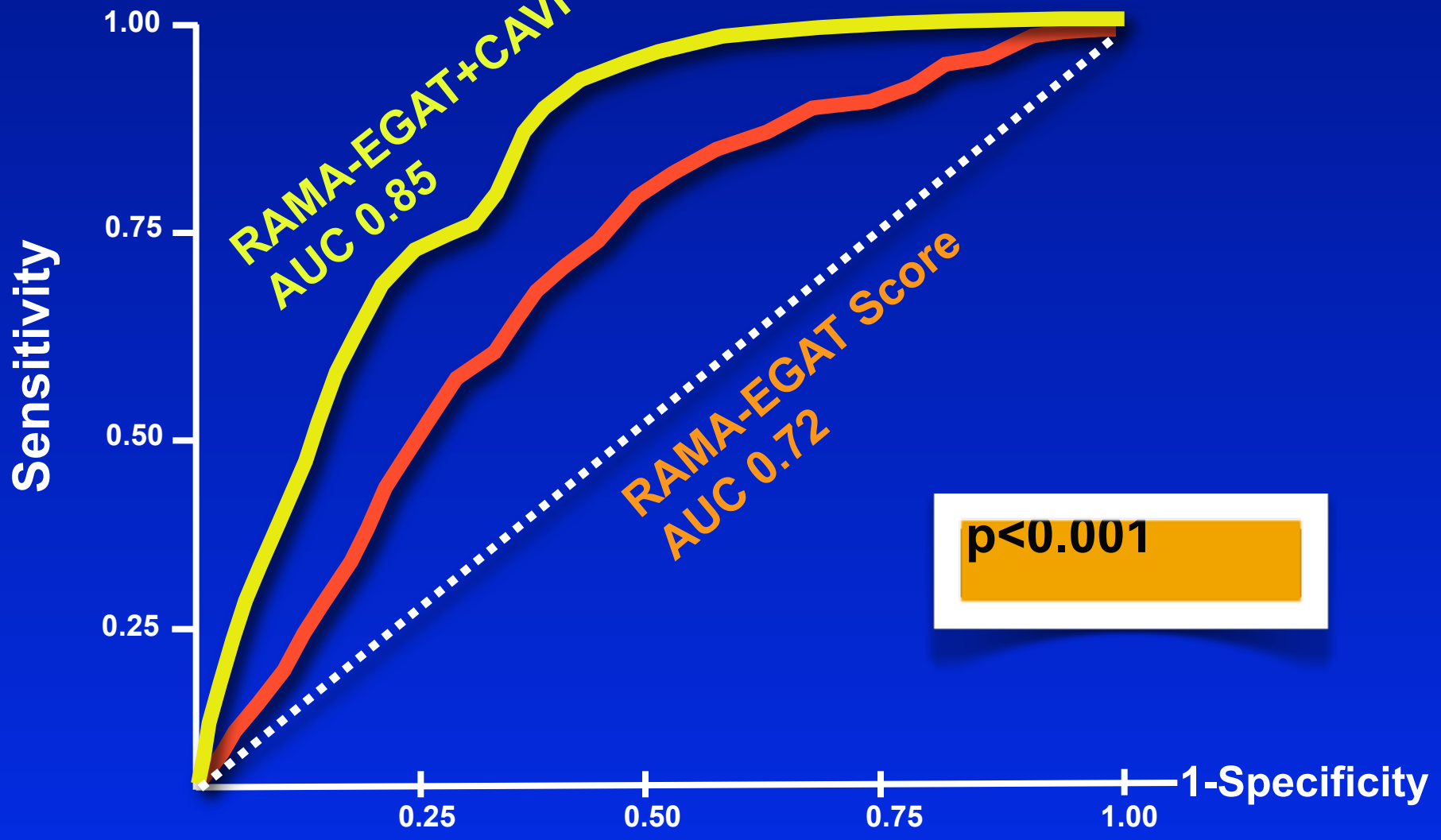
Stepwise Multiple Regression Analysis of Variables Associated with CAD

Variables	Odd Ratio	*p* value
Age	1.034	0.023
Male Gender	1.774	0.011
CAC	1.004	<0.001
HDL	0.983	0.039
CAVI	3.297	<0.001

Number of Coronary Arterial Stenotic Lesions and CAVI



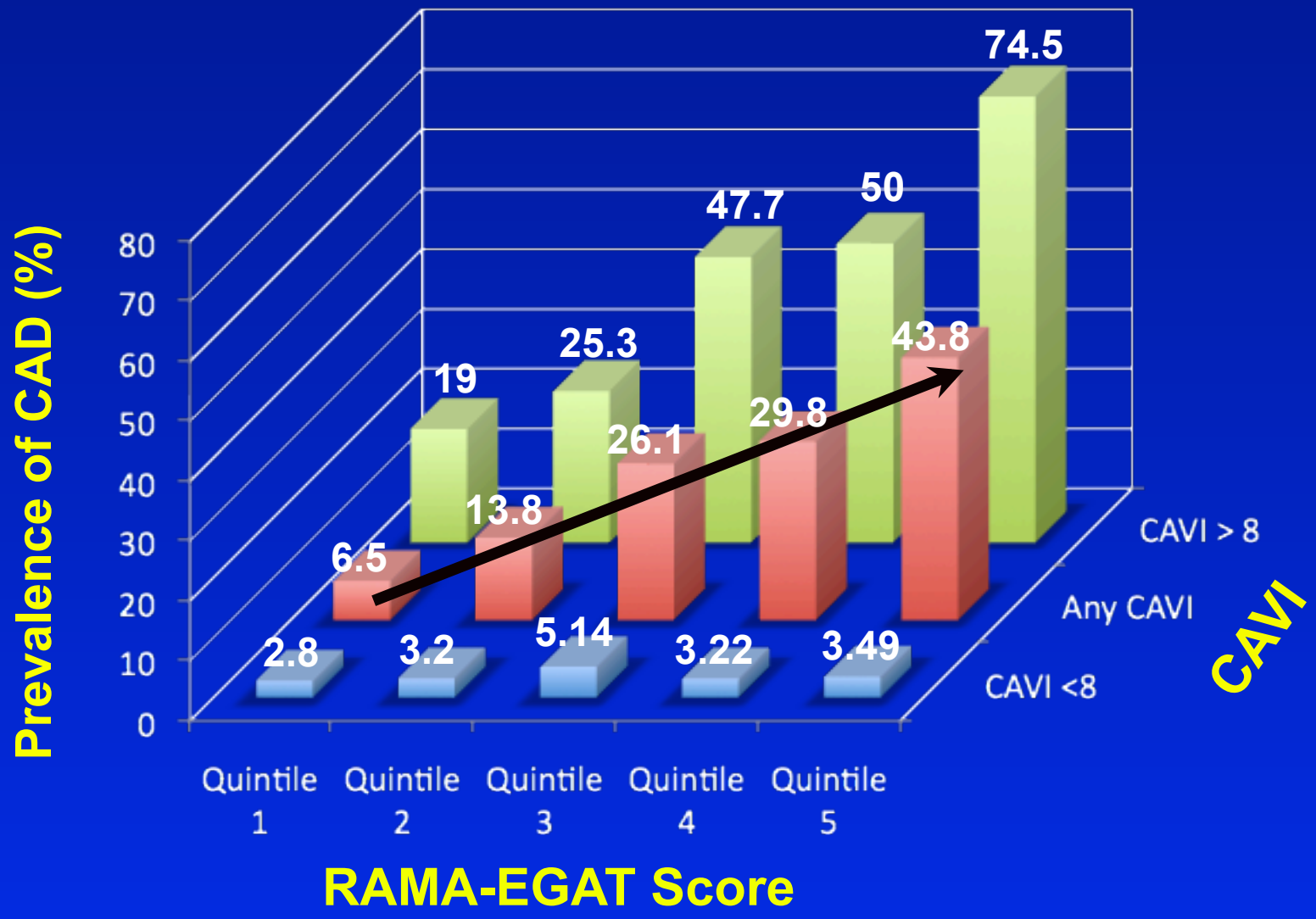
ROC Analysis of RAMA-EGAT Score Versus Modified RAMA-EGAT Score in Predicting CAD



Cut-off Value of CAVI

CAVI	Sensitivity	Specificity	Accuracy
7	95	40	53.75
8	92	63	70.25
9	79	84	82.7
10	42	96	82.5

Prevalence of CAD by RAMA-EGAT Score and CAVI



Discussion

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- CAVI is an independent predictor of existing CAD in Thai population after adjusted for age, traditional risk factors and RAMA-EGAT Score
- CAVI significantly improves the prediction of CAD beyond traditional risk factors (RAMA-EGAT Score)

Discussion : Strength

- Largest study in this topic
- First study in Thailand
- Study population were in moderate risk group for CAD, CAVI may play role as a good screening tool and minimize CTA use

Discussion : Limitation

- Cross-sectional study design
- Limit the conclusion of the causal effect between CAVI and CAD

Future Consideration

CAVI

CAD

Detect the existing

High sensitivity
High Negative Predictive value
Simple
Non-invasive
Widely available
Inexpensive

Conclusion

Conclusion

Arterial stiffness as assessed by CAVI is associated with CAD in Thai population and improve the prediction of CAD beyond the traditional risk score

Thank you for your attention