Trakia Journal of Sciences, Vol. 12, Suppl. 1, pp 255-258, 2014

Available online at:
http://www.uni-sz.bg

ISSN 1313-7050 (print)
ISSN 1313-3551 (online)

ADDITIVE PROGNOSTIC VALUE OF CT ANGIOGRAPHY AS COMPARED TO EXERCISE ECG IN PATIENTS WITH LOW AND INTERMEDIATE RISK OF CAD

Zh. Stoykova[1], K. Karamfiloff[1], P. Georeva[2], D. Zlatareva[3], V. Groudeva[1], D. Trendafilova[1], J. Jorgova[1]

[1]University Hospital "St. Ekaterina"
[2]Trudova medicina OOD
[3]Department of Diagnostic Imaging, Medical University, Sofia

ABSTRACT
PURPOSE: Our aim was to compare the prognostic performance of computed tomography coronary angiography (CTA) and exercise electrocardiography (ex-ECG) in patients with suspected coronary artery disease (CAD). METHODS: We enrolled 60 patients (age 61.3 ± 10.4 years, 40 men) with angina and no history of CAD. All underwent ex-ECG and CTA and were followed for 12 months. The endpoints were cardiac events - nonfatal myocardial infarction, cardiac death, and revascularization. RESULTS: ex-ECG and CTA were positive in 36 (60%) and 24 (40%) of 60 patients, respectively. Both ex-ECG and CTA were predictors of cardiac events (hazard ratio [HR]: 2, $p < 0.0001$ and HR: 20, 95% $p < 0.0001$, respectively) and hard cardiac events (HR: 1.9, 95% ,$p = 0.02$ and HR: 6.8; $p < 0.0001$, respectively), in a multivariate analysis, CAD with ≥50% stenoses detected by CTA was the only independent predictor of hard cardiac events. Ex-ECG provides a further risk stratification in the subset of patients with positive findings on CTA and a low to intermediate likelihood of CAD. Positive findings on CTA identify a shorter event-free period. CONCLUSION: CTA has a higher prognostic value compared with ex-ECG in patients with low to intermediate pre-test likelihood of CAD.

Key words: CT angiography, exercise stress – test, risk, coronary artery disease.

INTRODUCTION

Coronary artery disease (CAD) is one of the major causes of mortality and morbidity nowadays. Its management consumes a large portion of the health care budget. Therefore, identification of patients at high risk of adverse events is crucial.There are varous diagnostic tests but the Exercise electrocardiography (ex-ECG) remains the most commonly, unfortunately with proor sensitivity and specifity.

Computed tomography coronary angiography (CTA) was recently introduced as an anatomic imaging method for the evaluation of CAD. Several studies support the use of CTA to rule out the presence of CAD with high accuracy (1) and also improving diagnostic assessment above baseline risk factor evaluation. (2, 3, 4, 5, 6, 7). However only a few studies have been conducted to compare the prognostic value of CTA and ex- ECG for detecting significant CAD. (11)

According to accurancy trial ct angiography can be used as a rule – out method for coronary atherosclerosis with sensitivity close to 100%

Objectives

Our aim was to compare the prognostic performance of computed tomography coronary angiography (CTA)and exercise electro cardiography (ex-ECG) in patients with suspected coronary artery disease (CAD).

METHODS

We enrolled 60 patients (age 61.3 ± 10.4 years,40 men) with angina. We excluded from the present analysis patients with known CAD or known non- ischemic cardiac disease, pre – existing electrocardiographic changes r inability to perform ex- ECG with conseùent inability to reach target heart rate, contraindications to contrast agents. Impaired renal function, defined as creatinite clearance <60ml/min, inability to sustain a 15s breath hold, pregnanxy and resting heart rate >75/min, despite beta – blocker treatment or cardiac arrhythmias. All underwent ex-ECG and CTA within 6 months – both tests were performed in addition to a standart clinical workup that was based on clinical evaluation .
Clinical history regarding hypertension, smoking, hyperlipidemiq, diabetes mellitus,family history of CAD and home use of antianginal drugs was obtained from medical records.

Each patient performed a cycle ergometer-graded exercise test.The stress test response was considered positive in case of: horizontal or downsloping ST-segment depression >0.1 mV measured at 80 or 60 ms after the J-point during exercise or recovery; upsloping ST-segment depression of 0.15 mV at 80 ms after the J-point; ST-segment elevation >0.1 mV measured at 80 or 60 ms after the J-point during exercise or recovery.

CTA was performed within 6 months after ex-ECG on a 64 slice scanner. In all patients with resting heart rate >70 beats/min before CTA, beta –blocker or ivabradine was administered to achieve a target heart rate ≤70 beats/min. Image CTA datasets were transferred to a dedicated workstation and analyzed with cardiac software.

FOLLOW UP AND RESULTS

Patients were followed for 12 months. The endpoints were cardiac events - nonfatal myocardial infarction, cardiac death, and revascularization. Hard cardiac events – non-fatal myocardial infarction and cardiac death are analyzed separately.

Table 1. *Characteristics of study population*

	ALL PATIENTS	Group CTA -/ECG -	Group CTA -/ ECG +	Group CTA + /ECG -	Group CTA + / ECG +
N	60	16	20	7	17
Age, yrs	61	59.4	58.7	63.9	65.0
Male	41	10	11	6	14
Hypertension	40	8	8	5	12
Smoker	17	4	5	2	6
Dyslipidemia	26	6	6	4	9
Diabetes	5	1	1	1	2
Family history of CAD	20	5	6	3	5

Hazard ratio was high for both all and hard cardiac events in patients with CT data for ischemic heart disease with the highest hazard ration in LM >50 subgroup.

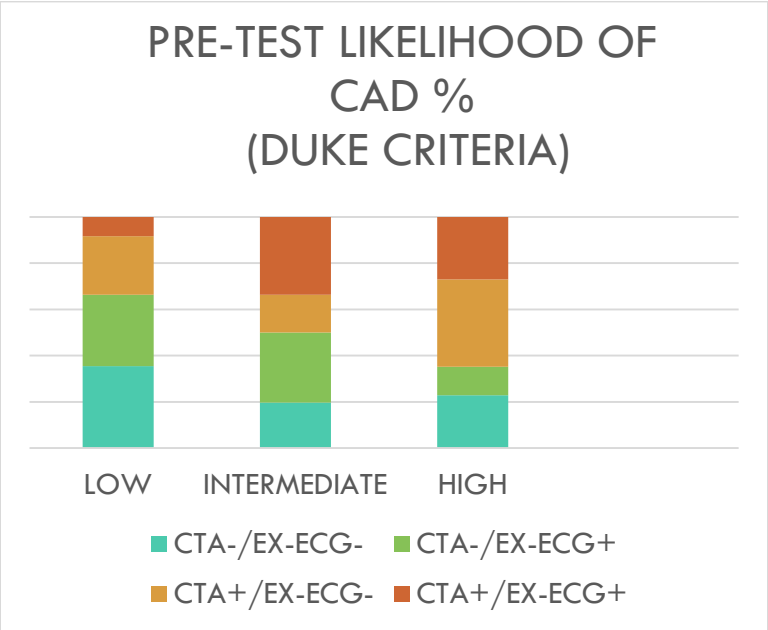

Figure 1. Pre – test likelihood of CAD % , based on DUKE criteria-the majority of the patients in the intermediate and high risk groups are with positive CTA, but many of them are with negative EX-ECG. In the low risk subgroup the highest percent of patients are with negative CT angiogram

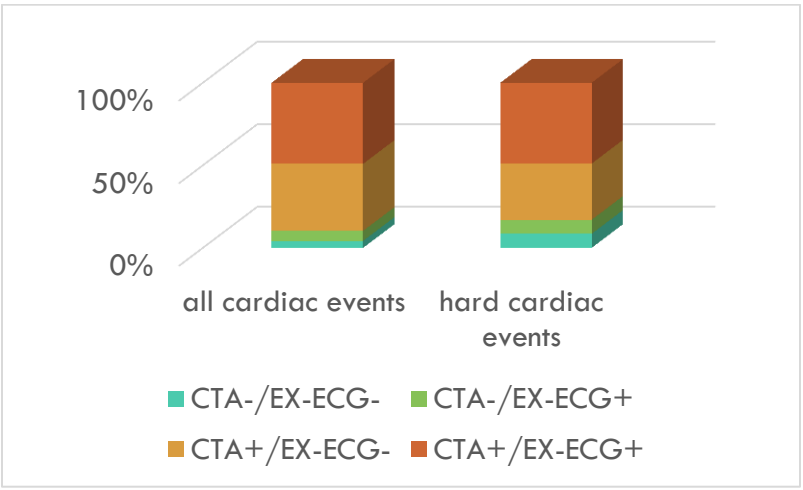

Figure 2. Follow up – all cardiac events and hard cardiac events. In the group of all cardiac events the majority of patients are with CTA positive results, but with ex – ECG + or -. The same can be outlined for the hard cardiac events group.

Table 2. *Hazard ratio for all and hard cardiac events analyzed in the one/two/ three vessel disease and LM subgroups by CTA.*

CTA	All cardiac events (HR)	Hard cardiac events (HR)
1vessel>50%	16	4.9
2vessels>50%	26,8	8,1
3vessels>50%	25,8	9,9
LM>50%	40,7	11,4

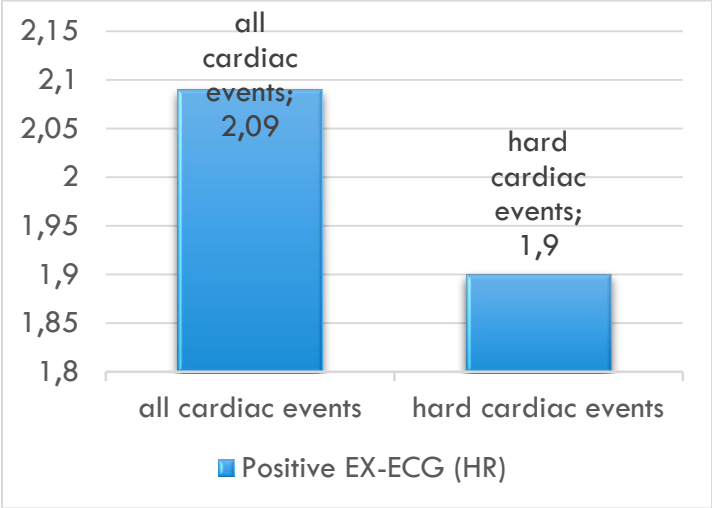

Figure 3. Hazard ratio for ex-ECG positive population.

With positive ex – ECG, HR is >1 but was far less than that observed in the CTA positive group.

Ex-ECG and CTA were positive in 36 (60%) and 24 (40%) of 60 patients, respectively. Both ex-ECG and CTA were predictors of cardiac events (hazard ratio [HR]: 2, $p < 0.0001$ and HR: 20, 95% $p < 0.0001$, respectively) and hard cardiac events (HR: 1.9, 95% ,$p = 0.02$ and HR: 6.8; $p < 0.0001$, respectively).

CONCLUSION

The main findings of this study are that CTA shows a better prognostic performance compared with ex – ECG, evaluation of coronary anatomy with CTA may be the first diagnostic tool needed for prognostic stratification in patients with a low to intermediate pre – test likelihood of CAD, whereas ex- ECG may be more appropriate for further prognostic stratifications in the subset of patients with CAD >50% on CTA; positive CTA findings identify a shorter event- free survival time , regardless of the presence of ischemia at ex- ECG.

REFERENCES

1. Budoff M.J., Dowe D., Jollis J.G., Diagnostic performance of 64 multidetector row coronary computed tomographic angiography for evaluation of coronary artery stenosis in individuals without known coronary artery disease: results from prospective multicenter ACCURACY (Assesment by Coronary Computed Tomographic Angiography in Individuals Undergoing Invasive Coronary Angiography) trial. *J Am Coll Cardiol.*2008; 52: 1724-32
2. Carrigan T.P., Nair D., Scoenhagen P., Prognotic utility of 64 – slice computed tomography in patients with suspected but no documented coronary artery disease. *Eur Heart J.* 2009; 30:362-371.
3. Chow B.J., Welis G.A., Chen L., Prognostic value of 64 – slice cardiac computed tomography severity of coronary artery disease, coronary atherosclerosis, and left ventricular ejection fraction. *J Am Coll Cardiol* 2010; 55:1017-28.
4. Gaemperli O., Valenta I., Schepis T., Coronary 64 – slice CT angiography predicts outcome in patients with known or suspected coronary artery disease. *Eur Radiol.* 2008; 18: 1162-73.
5. Min J.K., Shall L.J., Devereux R.B., Prognostic value of multidetector coronary computed tomographic angiography for prediction of all – cause mortality. *J Am Coll Cardiol.* 2007; 50: 1161-1170.
6. Sozii F.B., Civala F., Rossi P., Long – term follow – up of patients with first – time chest pain having 64 – slice computed tomography. *Am J Cardiol.* 2011; 107: 516-21
7. Van Werkhoven J.M., Schuijf J.D., Gaemperli o., Prognostic value of multislice computed tomography and gated single – photon emission computed tomography in patients with suspected coronary artery disease. *J Am Coll Cardiol.* 009; 53: 623-632.