Coronary CT Angiography for Suspected Acute Coronary Syndrome in the Era of High-Sensitivity Troponins: Sex–associated Differences

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ABSTRACT

Background: The optimal diagnostic test in the work-up of suspected acute coronary syndrome (ACS) might differ between men and women. The aim of this study was to compare the clinical effectiveness of early coronary CT angiography (CCTA) in women and men.

Methods: 500 patients presenting with symptoms suggestive of an ACS at the emergency department (ED) were randomized between a diagnostic strategy supplemented by early CCTA or standard optimal care (SOC) with high-sensitivity troponins (hs-troponins) available in both groups. Interactions between sex and diagnostic group were assessed using regression analysis.

Results: ACS was diagnosed less often in women (5% versus 10%, p=0.03). No significant interaction was found for the number of hospital admissions, length of stay, repeat ED visits or outpatient testing between sexes and diagnostic groups (all p-interactions >0.05).

Conclusions: Women had a lower prevalence of CAD, were less often admitted and had a shorter length of stay. The results of our study suggest that CCTA provides no additional benefit for women compared to men who have normal hs-troponin levels.

Clinical Trial Registration - www.clinicaltrials.gov NCT01413282

SHORT REPORT

INTRODUCTION

The burden of coronary artery disease (CAD) in women may still be under-recognized [1]. This might be the result of distinct pathophysiological differences or disease perception by patients and physicians [2]. The optimal diagnostic test in the work-up of suspected acute coronary syndrome (ACS) might therefor differ between men and women [3]. In this pre-specified sub-analysis of the Better Evaluation of Acute Chest Pain with Coronary Computed Tomography Angiography (BEACON) trial, we compare the clinical effectiveness of early coronary CT angiography (CCTA) in women and men.

METHODS

The study design, criteria for enrolment, and primary results have been reported previously [4]. Briefly, in the BEACON-trial, we randomized 500 patients suspected of ACS (47% women) at the emergency departments (ED) of 7 hospitals to either a diagnostic strategy supplemented by early CCTA or standard optimal care (SOC) with high-sensitivity troponins (hs-troponins) available in both groups. Patients with the need for urgent cardiac catheterization were excluded. The results of the main study showed that CCTA, applied early in the work-up of suspected ACS, is safe and associated with less outpatient testing and lower costs. To assess interactions between sex and diagnostic group we used logistic regression analysis for binary outcomes and linear regression analysis for continuous outcomes.

RESULTS

In the BEACON-trial, women were generally older, i.e. 56 ± 10 versus 53 ± 10 years ($p<0.01$) and less often active smokers, i.e. 28% versus 40% men (Table 1, $p<0.01$). Type of chest pain at presentation was not different between sexes, with atypical chest pain as the most frequent type in both groups (52% of women and 51% of men, $p= 0.62$ for trend). Obstructive coronary artery disease (CAD) on CCTA (>50% luminal narrowing) was less frequent in women than in men (14% versus 29%, $p<0.01$). No significant difference was observed for results of exercise electrocardiography ($p=0.42$), which was the most frequently used diagnostic test in the SOC group. Regardless of randomization, women were admitted less often (33% versus 43%, $p=0.02$) and had a shorter length of stay than

Table 1. Baseline characteristics and study outcomes

	Women (n=236)	Men (n=264)	*p-value*	*p interaction*
Age, years ± SD†	56 ± 10	53 ± 10	<0.01	
Diabetes mellitus	25 (11)	39 (15)	0.16	
Hypertension	102 (43)	119 (45)	0.68	
Dyslipidemia	76 (32)	101 (38)	0.15	
Smoking	65 (28)	106 (40)	<0.01	
Family history	101 (43)	109 (41)	0.73	
Chest Pain			0.62	
Non-anginal	40 (17)	44 (17)		
Atypical	120 (51)	134 (51)		
Typical	76 (32)	84 (32)		
Diagnostic test				
Coronary CT angiography			<0.01	
<50% CAD	95 (86)	82 (71)		
≥50% CAD	15 (14)	33 (29)		
Exercise-ECG			0.42	
Normal	45 (40)	51 (38)		
Inconclusive	21 (19)	18 (13)		
Ischemic	5 (4)	4 (3)		
Coronary angiography	27 (11)	45 (17)	0.07	0.92
Coronary revascularization	15 (6)	24 (9)	0.25	0.94
ACS diagnosis at discharge	12 (5)	27 (10)	0.03	0.93
Hospital admission	77 (33)	113 (43)	0.02	0.81
Length of stay‡	6.1 (4.5-15)	7.0 (4.7-24.5)	0.04	0.80
Repeat ED visit	17 (7)	15 (6)	0.49	0.36
Outpatient testing	18 (8)	18 (7)	0.74	0.31

Table 1. Unless otherwise specified, data are numbers of patients, with percentages in parentheses. †Data are means ± standard deviations. ‡ Data are medians, with interquartile ranges in parentheses. Diabetes mellitus is defined as plasma glucose >11.0mmol/L or treated with either diet regulation or medication. Hypertension defines as >150mmHg systolic or >90mmHg diastolic or treated. Dyslipidemia defined as a total cholesterol level >5mmol/L, low-density lipoprotein level >3mmol/L, or on lipid-lowering medication. CAD, coronary artery disease; ACS, acute coronary syndrome; ED, emergency department

men (p=0.04). At discharge, ACS was diagnosed less often in women (5% versus 10%, p=0.03). The use of coronary angiography and the rate of coronary revascularization was not statistically different for women regardless of diagnostic strategy. Moreover, no significant interaction was found for the number of hospital admissions, length of stay, repeat ED visits or outpatient testing between sexes and diagnostic groups (all p-interactions >0.05).

DISCUSSION

Previously, it has been shown that early CCTA may be a more efficient work-up for suspected ACS, especially in women [5]. Women are thought to have a general lower risk of CAD and that they might benefit more than men from CCTA, which is known for its excellent negative predictive value. However, at the same time concerns exist about radiation associated cancer in young women resulting from increased exposure to radiation from medical testing [6]. Our results show indeed a lower incidence of obstructive CAD and ACS in women, however no additional benefit of CCTA could be demonstrated. We believe that there are two important reasons that can explain current findings. Novel to prior reports was the availability of hs-troponins for clinical decision making in both groups. The majority of patients in the current study (>90%) had normal hs-troponin levels (<99th percentile of the upper limit of normal). It has been shown that these patients have a very low risk of ACS [7]. Further advanced testing, in the form of CCTA, might therefor not be needed for them, and this is regardless of sex [8]. Secondly, it is believed that less classical causes of angina such as endothelial dysfunction and microvascular disease are more relevant in women, while epicardial CAD is more prevalent in men [9]. Consequently, it is likely that CCTA as a anatomic modality would provide less benefit in women following this pathophysiological hypothesis.

CONCLUSION

In conclusion, women had a lower prevalence of CAD, were less often admitted and had a shorter length of stay. Obstructive CAD on CCTA was more often found in men and they were more likely to undergo invasive angiography. The results of our study suggest that CCTA provides no additional benefit for women compared to men who have normal hs-troponin levels.

DISCLOSURES

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