Prevalence of Coronary Artery Disease in Adults Under 30 Presenting with Acute Chest Pain - A Retrospective Study

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Introduction

Coronary artery disease (CAD) is the number one cause of death worldwide with age being the most important non-modifiable risk factor. Prevalence of CAD in adults under 30 has been estimated to be very low (Fig. 1), however its true prevalence is unknown. Previous anatomical studies based on autopsy data suffer from either selection bias or lack of clinical correlation. Coronary computed tomography angiogram (CCTA) has demonstrated effectiveness in evaluating patients with low to intermediate risk for CAD that are unable to undergo stress testing, as well as symptomatic patients at intermediate risk after initial risk stratification. This retrospective study aims to evaluate the prevalence of clinically significant CAD in the young adult population who presented to the emergency department for chest pain as determined by findings on CCTA.

Fig. 1

Prevalence of coronary heart disease by age and sex

National Health and Nutrition Examination Survey: 2009–2012.

Mozaffarian D et al. Circulation. 2015;131:e29-e322
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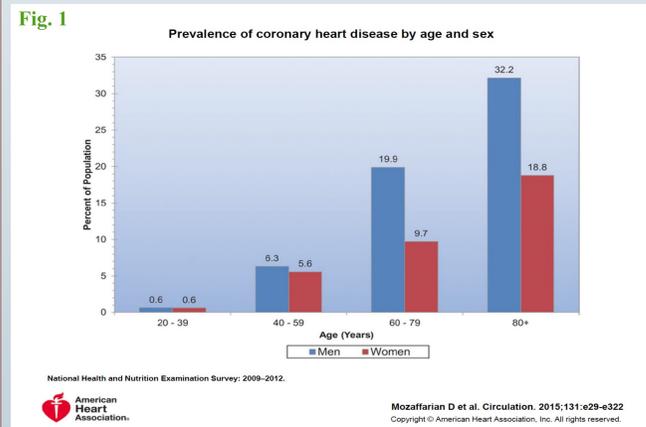
Methods

Fig. 2

| Degree of Maximal Stenosis (%)	Interpretation	Corresponding CAD-RADS*
<25%	Minimal Stenosis	CAD-RADS 0-1
25-49%	Mild Stenosis	CAD-RADS 2
>50%	Moderate – Severe Stenosis	CAD-RADS 3-5

*This study predates the publication of CAD-RADS, however our selected grading system coincided with the CAD-RADS classifications that may lead to further interventions.

A Montage® search was performed for CCTAs performed on young adults age 18-30 from January 1, 2013 to October 1, 2015, yielding 914 patients. Excluding 29 due to preexisting congenital heart disease, previous cardiac surgery or study performed for reason other than chest pain, the final study consisted of 885 patients (age range 18-30, average age 26). Each study was reviewed by 1 of 5 fellowship trained cardiac radiologists.

The study was deemed abnormal if presence of any of the following was identified:
- Atherosclerotic plaque – both calcified and non-calcified.
- Coronary artery stenosis – graded by % stenosis (see Fig.2)
- Coronary artery anomaly – classified into benign and malignant.

Examples

Fig. 3

Fig. 4
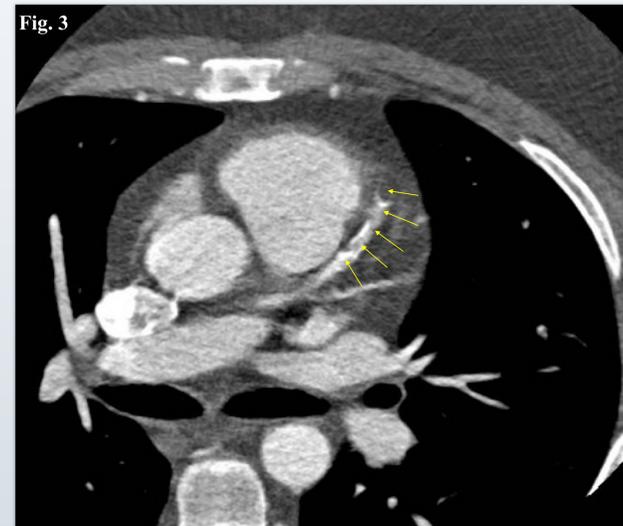
30 year old male. Axial coronary CTA image (Fig. 3) showing moderate-severe stenosis caused by atherosclerosis in the proximal left anterior descending artery (arrows). This patient had triple vessel disease with calcium score of 2036
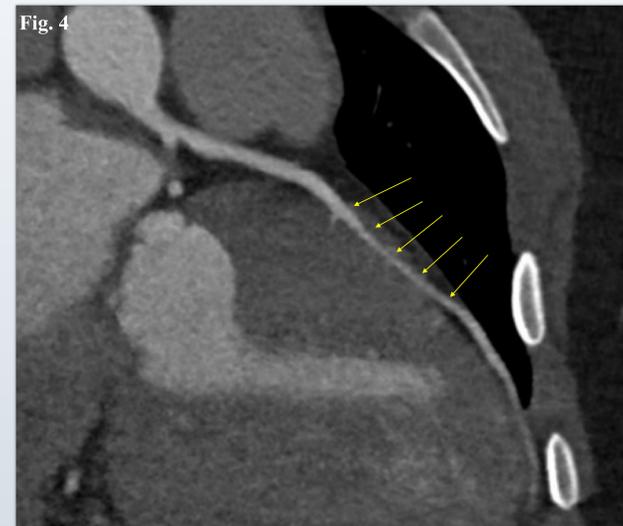
25 year old male. Single curviplanar reformatted coronary CTA image (Fig. 4) demonstrates a moderate-severe stenosis in the mid left anterior descending artery caused by myocardial bridging (arrows).

Results

Fig. 5

885 patients

857 (96.8%) normal

28 (3.2%) abnormal

9 (1.0%)* with stenosis induced by myocardial bridging

9 (1.0%) with coronary anomalies

11 (1.2%)* with stenosis induced by atherosclerosis
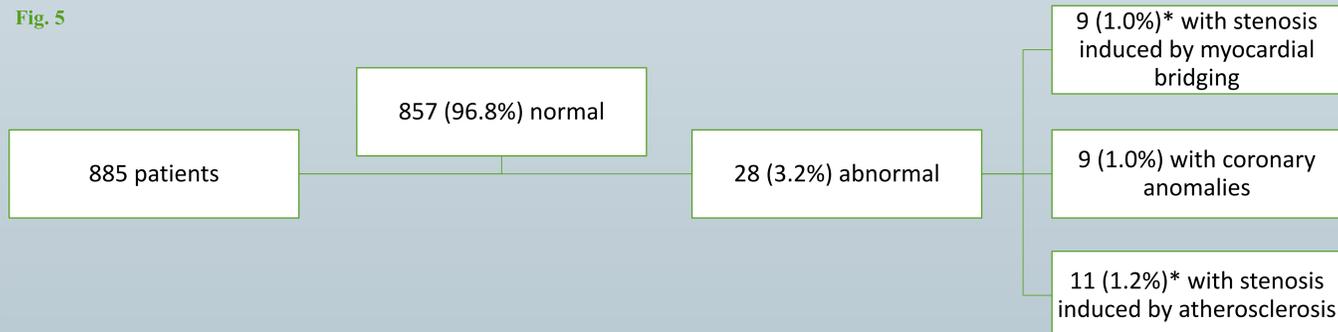
Fig. 6

Patient Demographics	
Total exams retrieved	914
Excluded exams - known congenital heart disease, history of cardiac surgery, and study performed for reason other than chest pain (E.g. mass).	29
Total exams included	885
Age range	18 - 30
Average age	26
Male patient	529 (59.8%)
Female patient	356 (40.2%)

Of the 885 patients, 857 (96.8%) were found to be normal while 28 (3.2%) were found to be abnormal due to the presence of stenosis induced by myocardial bridging in 9 patients (1%), coronary anomalies in 9 patients(1%), and stenosis induced by atherosclerosis in 11 patients (1.2%). These results are summarized in Fig. 5. Using moderate to severe stenosis or malignant coronary artery anomaly as a criteria for clinical significance, which may lead to short-term diagnostic or therapeutic intervention, there were a total of 6 (0.7%) clinically significant findings. Using moderate to severe stenosis alone as the criteria for clinical significance, which may lead to short-term diagnostic or therapeutic intervention, there were a total of 3 (0.3%) clinically significant findings.

The demographics of the patients that participated in the study are depicted in Fig. 6.

Results (Cont.)

Abnormal Exams	Sub-categorization
9 patients with stenosis induced by myocardial bridging	• 2 (0.2%) had moderate to severe stenosis • 7 (0.8%) had minimal to mild stenosis
9 patients with coronary artery anomalies	• 3 (0.3%) were malignant • 6 (0.7%) were benign
11 patients with stenosis induced by atherosclerosis	• 1* (0.1%) had moderate to severe stenosis • 10 (0.1%) had minimal to mild stenosis

*Of note, this single patient had additional risk factors for CAD including hypertension and hyperlipidemia.

Of the 28 abnormal studies, further sub-categorization was performed to identify the portion that may lead to short term diagnostic or therapeutic intervention – the "clinically significant fraction".

Discussion

This study is the first non-invasive anatomic study aimed at evaluating the prevalence of CAD in young adults. It expands our understanding of prevalence of CAD in this population by using retrospective data with increased clinical relevance, as opposed to previous survey based estimates. We found evidence supporting a low prevalence of CAD in young adults aged 18-30. Only 1 out of 885 (0.1%) patients were identified with clinically significant CAD due to atherosclerosis. In addition, we identified 5 (0.6%) patients with moderate to severe stenosis induced by myocardial bridging or malignant coronary artery anomaly.

Conclusion

This study provides evidence for more restricted use of CCTAs in young adults age 18-30 presenting with acute chest pain. The cost-versus-benefit ratio of CCTA for evaluation of chest pain in this young adult population requires further research but is likely to be low.

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