Revista Portuguesa de
Cardiologia
Portuguese Journal of Cardiology

www.revportcardiol.org

ORIGINAL ARTICLE

Diagnostic yield of current referral strategies for elective coronary angiography in suspected coronary artery disease— An analysis of the ACROSS registry

Miguel Borges Santos*, **António Miguel Ferreira, Pedro de Araújo Gonçalves, Luís Raposo, Rui Campante Teles, Manuel Almeida, Miguel Mendes**

Departamento de Cardiologia, Hospital de Santa Cruz, Lisboa, Portugal

Abstract
Introduction and Objectives: The purpose of this study was to assess the diagnostic yield of current referral strategies for elective invasive coronary angiography (ICA).
Methods: We performed a cross-sectional observational study of consecutive patients without known coronary artery disease (CAD) undergoing elective ICA due to chest pain symptoms. The proportion of patients with obstructive CAD (defined as the presence of at least one $\geq$50% stenosis on ICA) was determined according to the use of noninvasive testing.
Results: The study population consisted of 1892 individuals (60% male, mean age 64$\pm$11 years), of whom 1548 (82%) had a positive noninvasive test: exercise stress test (41%), stress myocardial perfusion imaging (36%), stress echocardiogram (3%) or coronary computed tomography angiography (3%). Referral without testing occurred in 18% of patients. The overall prevalence of obstructive CAD was 57%, higher among those with previous testing (58% vs. 51% without previous testing, p=0.026) and when anatomic rather than functional tests were used (81.3% vs. 57.1%, p=0.001). A positive test and conventional risk factors were all independent predictors of obstructive CAD, with adjusted odds ratios (95% confidence interval) of 1.34 (1.03–1.74) for noninvasive testing, 1.05 (1.04–1.06) for age, 3.48 (2.81–4.29) for male gender, 1.86 (1.32–2.62) for current smoking, 1.74 (1.38–2.20) for diabetes, 1.30 (1.04–1.62) for hypercholesterolemia, and 1.39 (1.08–1.80) for hypertension.
Conclusions: More than 40% of patients without known CAD undergoing elective ICA did not have obstructive lesions, even though four out of five had a positive noninvasive test. These exams were relatively weak gatekeepers; functional tests were more often used but appeared to be outperformed by the anatomic test.

* Corresponding author.
  E-mail address: c.miguel.santos@gmail.com (M. Borges Santos).

PALAVRAS-CHAVE

Angiografia coronária;
Dor
torácica/diagnóstico;
Angina estável;
Isquémia miocárdica

Rendimento das atuais estratégias de referenciação para coronariografia eletiva por suspeita de doença coronária—análise do registo ACROSS

Resumo

Introdução e objetivos: O objetivo do estudo foi avaliar o rendimento das atuais estratégias de referenciação eletiva para coronariografia invasiva.

Métodos: Estudo transversal de indivíduos consecutivos sem doença coronária conhecida submetidos a coronariografia por dor torácica. Determinação da prevalência de doença coronária obstrutiva (definida pela presença de pelo menos uma estenose ≥ 50%) de acordo com a utilização de testes não-invasivos para despiste de cardiopatia isquémica.

Resultados: Foram avaliados 1892 indivíduos (60% homens, idade média 64 ± 11 anos), dos quais 1548 (82%) tinham um teste não-invasivo positivo: prova de esforço (41%), cintigrafia de perfusão miocárdica (36%), ecocardiograma de *stress* (3%) e angiografia coronária por tomografia computorizada (3%). Ocorreu referenciação sem teste prévio em 18% dos doentes. A prevalência global de doença obstrutiva foi 57%, sendo mais elevada nos doentes submetidos a testes não-invasivos (58% *versus* 51% nos doentes sem testes prévios, p = 0,026) e naqueles em que o teste era anatómico *versus* funcional (81,3% *versus* 57,1%, p = 0,001). Um teste não-invasivo positivo e fatores de risco convencionais foram preditores independentes de doença obstrutiva, com *odds-ratio* ajustado (intervalo confiança 95%) de: teste não-invasivo 1,34 (1,03-1,74), idade 1,05 (1,04-1,06), sexo masculino 3,48 (2,81-4,29), tabagismo ativo 1,86 (1,32-2,62), diabetes 1,74 (1,38-2,20), hipercolesterolemia 1,30 (1,04-1,62) e hipertensão 1,39 (1,08-1,80).

Conclusões: Mais de 40% dos doentes sem doença coronária conhecida que realizam coronariografia eletiva não têm doença obstrutiva, apesar de quatro em cada cinco ter um teste não-invasivo positivo. Estes testes são *gatekeepers* relativamente fracos; os funcionais foram utilizados mais frequentemente mas o anatómico pareceu ter melhor desempenho.

© 2012 Sociedade Portuguesa de Cardiologia. Publicado por Elsevier España, S.L. Todos os direitos reservados.

List of abbreviations

CAD	coronary artery disease
CCTA	coronary computed tomography angiography
ECG	electrocardiogram
ICA	invasive coronary angiography
SPECT	single-photon emission computed tomography

Introduction

The evaluation of patients with suspected coronary artery disease (CAD) is based on clinical assessment, often supplemented by noninvasive tests which serve as gatekeepers for invasive coronary angiography (ICA).[1–3] ICA is the diagnostic gold standard for CAD but is costly, has limited availability and carries a risk of complications related to its invasive nature.[4] The aims of performing noninvasive testing in this setting include minimizing unnecessary risks and costs, and identifying patients who will benefit from revascularization. However, despite the frequent use of noninvasive testing, a significant proportion of patients undergoing ICA do not have obstructive CAD or are not eligible for revascularization.[5,6] The purpose of this study was to assess current patterns of noninvasive testing and to appraise their diagnostic yield among symptomatic patients undergoing ICA for suspected CAD.

Methods

Population

This was an observational, cross-sectional study performed at a single hospital center serving an urban population of 900 000 inhabitants in Lisbon, Portugal. The study population consisted of all patients referred for elective ICA for evaluation of chest pain symptoms between January 2006 and November 2010. Patients' referral for ICA and the decision to perform previous noninvasive testing, including the testing modality, were left to the discretion of attending physicians. Noninvasive testing was performed mostly at private practice facilities.

The modalities of noninvasive testing were exercise electrocardiogram (ECG) stress testing, stress myocardial single-photon emission computed tomography (SPECT), stress echocardiography and coronary computed tomography angiography (CCTA). 'Ischemic changes' on the resting ECG were not considered noninvasive testing. The following exclusion criteria were applied sequentially: non-elective setting (acute coronary syndrome), previously known CAD (defined as previous acute coronary syndrome, revascularization procedure or documented coronary stenosis ≥50% on previous ICA), preoperative evaluation, presenting symptom other than chest pain, negative noninvasive test result and incomplete information on patients' clinical characteristics or ICA result.