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Original Research

Prevalence of coronary artery disease evaluated by computed tomography coronary angiography in preoperative assessment of cardiac valvular surgery

Prevalencia de enfermedad arterial coronaria evaluada por angiotomografía coronaria en la evaluación preoperatoria de cirugía cardiaca valvular

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ABSTRACT. Introduction: Rheumatic valvular disease is predominant in developing countries. The prevalence of coexisting coronary artery disease (CAD) is based on other populations, and could be lower than reported, so that the indication of pre-operative invasive coronary angiography (ICA) could be over evaluated. The aim of the study is to demonstrate the prevalence of CAD diagnosed by Computed Tomography Coronary Angiography (CTCA) in a population of severe valvular heart disease (VHD) that requires surgery. **Material and methods:** Observational study that included subjects with severe VHD with surgical indication who underwent pre-operative CTCA. **Results:** We included 487 patients, 37% men and average age of 53 years. The prevalence of CAD was 4.1%. The independent predictors of CAD are age older than 60 years and male sex. **Conclusion:** In patients of our institution with severe VHD, the prevalence of CAD was low and CTCA could be the pre-operative tool of choice.
Keywords: Heart valve disease, prevalence, coronary artery disease, computed tomography coronary angiography, preoperative care.

RESUMEN. Introducción: *La enfermedad valvular reumática es la predominante en países en vías de desarrollo. La prevalencia de enfermedad arterial coronaria coexistente está basada en otras poblaciones, y podría ser menor a la reportada, por lo que la indicación de coronariografía preoperatoria podría ser supravalorada. El objetivo del estudio es demostrar la prevalencia de enfermedad arterial coronaria obstructiva diagnosticada por angiotomografía en una población con valvulopatías severas que requieren cirugía de cambio valvular quirúrgico.* ***Material y métodos:*** *Estudio observacional que incluye sujetos con enfermedad valvular severa con indicación quirúrgica a los que se les realizó angiotomografía de coronarias preoperatoria.* ***Resultados:*** *Se incluyeron 487 pacientes, 37% hombres y promedio de edad de 53 años. La prevalencia de enfermedad arterial coronaria fue 4.1%. Los predictores independientes de enfermedad arterial coronaria son edad mayor de 60 años y sexo masculino.* ***Conclusión:*** *En pacientes de nuestra institución con enfermedad valvular severa, la prevalencia de enfermedad arterial coronaria fue baja, por lo que la angiotomografía podría ser la herramienta de elección preoperatoria.*
Palabras clave: *Enfermedad valvular cardiaca, prevalencia, enfermedad arterial coronaria, angiotomografía coronaria, evaluación preoperatoria.*

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INTRODUCTION

In industrialized countries, valvular heart disease (VHD) affects 2.5% (95% CI 2.2-2.7%) of adults and degenerative is the main cause. These patients are older than 65 years and with multiple cardiovascular risk factors.[1] The coexistence with coronary artery disease (CAD) was previously reported at 22%.[2] In developing countries, rheumatic VHD is predominant and could affect up to 20-30 per 1,000 subjects.[3] However, rheumatic patients are younger and with low prevalence of CAD. European and U.S. guidelines recommendation is to perform preoperative invasive coronary angiography (ICA) previous surgery in men over 40 years, postmenopausal women or with at least one cardiovascular risk factor.[4,5] Recently, computed tomography coronary angiography (CTCA) is an option in low to intermediate pre-test probability of CAD. Current guidelines only recommend CTCA when ICA is a risk. In populations with mainly rheumatic VHD this could be the tool of choice, because the low prevalence of CAD. The aim of the study is to demonstrate the prevalence of obstructive CAD diagnosed by CTCA in a population of severe VHD in the preoperative assessment of cardiac valvular surgery.

MATERIAL AND METHODS

This is an observational cross-sectional study. The study was carried out at the *Instituto Nacional de Cardiología «Ignacio Chávez»* in Mexico City from 2014 to 2017. Patients of both sexes, older than 18 years, with severe VHD diagnosed by echocardiography, were included. All patients underwent CTCA in 256-slice Siemens equipment. Prior to the study, they were premedicated with beta-blockers and/or nitrates. Iodinated contrast dye with a concentration of 350 mEq/L was injected with a caudal rate of infusion of at least 5 mL/sec. All CTCA studies were interpreted in a workstation with software for axial, curvilinear, MPR and MIP analysis. All subjects signed informed consent prior the CTCA. Obstructive CAD was defined as a coronary stenosis >50%. Statistical analysis was performed with Student's t test for quantitative variables, χ^2/Fisher's test for qualitative variables. The independent risk factors of CAD were determined by logistic regression. A two tails $p<0.05$ value is considered as statistical significance. All the calculations were made using SPSS software version 22. The present study is part of a prognostic study, previously endorsed by local ethics and research committees.

RESULTS

A total of 487 patients were included. Baseline characteristics are presented in *table 1*. Average age is 53 ± 10 years, predominance of the female sex (women:men 1.6:1), with low prevalence of cardiovascular risk factors, the most frequent was hypertension (29%). Only 20 patients had obstructive CAD (4.1%), and were older (63±11 vs 53±10, $p<0.0001$), predominance of males and with high prevalence of hypertension and smoking. No differences were observed in the rest of risk factors. Sub-analysis by aortic or mitral valve disease showed differences in male sex (49 vs 22%, $p<0.0001$) and dyslipidemia (16 vs 9%, $p=0.02$), and no differences in CAD. Bicuspid aortic valve patients showed very low prevalence of CAD (1 of 51 patients, 45±9 years, 66% men, 33% hypertension).

Table 1: Baseline characteristics.

Variable	Value n=487 (%)
Age (years)	53.5±10.8
Male sex	182 (37.4)
Body mass index (kg/m^2)	26.87±4.2
Obesity	98 (20.1)
Diabetes	116 (23.8)
Hypertension	142 (29.2)
Dyslipidemia	60 (12.3)
Smoking	38 (7.8)
Valve diagnosis:	
• Aortic stenosis	202 (41.5)
• Aortic regurgitation	42 (8.6)
• Mitral stenosis	39 (8)
• Mitral regurgitation	204 (41.9)
Bicuspid aortic valve	51 (10.5)
Calcium score (UA)	0 (0, 0.9)
CAD (>50% stenosis)	20 (4.1)

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ROC curve calculate 60.5 years as a cutoff point to predict CAD (sensitivity=70% and specificity=77%). Only seven female patients had CAD (2%), and these were older (68±14 vs 54±9 years, p<0.0001), without any other differences. Adjusted predictors of CAD are age older than 60 years (OR: 8.33, 95% CI: 2.95-23.4, p<0.001) and male sex (OR: 4.14, CI 95%: 1.5-11.4, p=0.006).

DISCUSSION

The evaluation of CAD evolved with the advent of CTCA, which is a lower-cost, non-invasive and safe method. Previous studies demonstrated the diagnostic performance in preoperative assessment of VHD, showing sensitivity of 100% and specificity of 78-80% when compared with ICA.[6,7] Our study shows a very low prevalence of CAD, which does not justify the performance of invasive studies as the first choice. Historical and more recent studies show very different prevalences of CAD,[2,3] based on smaller and older populations, and these are the basis of guidelines. Previously in a study of our institution, a prevalence of 12.5% was reported in a small group of subjects.[8] Our study suggests that CAD predictors are age and male sex, so ICA would be reserved for the following populations: (i) men over 60 years old, (ii) women older than 65 years, (iii) ischemic heart disease known; (iv) aortic stenosis with angina. The use of these new criteria reduces ICA indications recommended in current guidelines. The study presents some limitations: (a) the unicentric nature may represent an inclusion bias that must be taken into account when generalizing the data; (b) there is a selection bias, since the decision to perform CTCA rests on the clinical judgment of physicians involved in the medical care of patients, so we could underestimate the prevalence in patients with multiple risk factors or the history of angina.

CONCLUSIONS

In patients with severe VHD the prevalence of obstructive CAD diagnosed by CTCA is 4.1%, and predictor of CAD are age >60 years and the male sex. In countries with predominance rheumatic VHD, CTCA is the method of choice for preoperative assessment.

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