

<sup>1</sup> Instituto do Coração Edson Saad,  
Universidade Federal do Rio de Janeiro,  
Rio de Janeiro, RJ, Brazil.

## Optimizing coronary angiography in Brazil: a legacy from the COVID-19 era

Otimizando a realização de coronariografias no Brasil:  
um legado da era COVID-19

Roberto Muniz Ferreira<sup>1ID</sup>

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At the time this editorial is written, a new reality is under construction in medicine all over the world. The pandemic associated with the severe acute respiratory syndrome (SARS-CoV-2) coronavirus 2 continues to advance, imposing an unprecedented burden on several health systems around the world.<sup>1</sup> In Brazil, the scarcity of resources and the risk of contamination are daily concerns for health managers and professionals, placing the rational use of diagnostic tests and therapeutic interventions as priority measures in all medical specialties in the public and private sectors. In this context, it is essential that the indications for invasive procedures, which could expose both the professional and the patient to the risk of contamination by SARS-CoV-2, are accurate. Containing the pandemic and preventing the collapse of the Unified Health System (SUS) are paramount.

Although coronary angiography is an exam with known and potentially severe complications, the current scenario requires an even more rigorous selection of patients.<sup>2,3</sup> World-renowned cardiology societies have developed guidelines aimed to reduce the potential risk of transmission during the procedure, but undoubtedly prevention already begins in its indication.<sup>4</sup> Knowing the predictors of absence of obstructive coronary artery disease (CAD) on the exam is essential for the implementation of this strategy, and may also leave a valuable legacy for the post-pandemic era. Currently, the American College of Cardiology (ACC) recognizes the prevalence of normal exams found in the literature to be large, because it depends on a series of clinical variables. Nevertheless, the best results remain in the 20% range – a figure far from ideal in the context of the current pandemic.<sup>5</sup>

Considering this basic scenario, the article published by Sant'Anna et al. has great relevance, for it shows national data on the prevalence of elective coronary angiography with absence of obstructive lesions.<sup>6</sup> In the study, 503 consecutive patients with no anatomically known CAD underwent elective diagnostic coronary angiography in a private organization in Cabo Frio, in the state of Rio de Janeiro. Almost 90% of patients were from SUS units, stratified into two groups, according to presence or absence of significant obstructive CAD on coronary angiography. The degree of obstruction was assessed by quantitative coronary angiography (QCA) and considered relevant when  $\geq 40\%$  in, at least, one vessel with a diameter  $\geq 2.0$ mm. Patients with valve diseases, previously revascularized, known to have obstructive CAD or who underwent percutaneous coronary intervention at the study organization, were excluded.

Although the majority of patients included were male, the percentage of women was high (45%) considering that the mean age was under 65 years. Arterial hypertension, diabetes and family history of CAD were the most frequent risk factors, whereas dyslipidemia was reported in only 20% of participants. Chest pain was described in more than 60% of cases, although typical angina was present in about 40%. Taking into account this profile of evaluated patients, the prevalence of exams showing absence of CAD was high (45%), surpassing other national and international studies, although it was below the prevalence found by Patel et al., in a study carried out in the United States.<sup>7-9</sup> Age, diabetes and smoking habit were predictive variables of obstructive

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### Corresponding author:

Roberto Muniz Ferreira  
Rua Rodolpho Paulo Rocco, 255 –  
Ilha do Fundão  
Zip code: 21941-913 – Rio de Janeiro,  
RJ, Brazil  
E-mail: betomf@terra.com.br

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lesions, whereas only female sex was associated with normal exams, even in the multivariate analysis.

These findings are important to guide the implementation of more strict criteria for requesting coronary angiography in Brazil, albeit some observations are pertinent. The analysis excluded 167 patients who were referred with a previous request for percutaneous intervention, which may have contributed to reducing the prevalence of CAD among the cases evaluated in the study. In addition, the association of females with normal exams has already been described in the literature, and can be up to 80% in patients aged under 50 years, according to national data.<sup>7,8</sup>

Considering that most participants did not have typical symptoms, the high prevalence of normal exams could be anticipated. According to recent data, even in women over 70 years of age who have typical chest pain, the probability of obstructive CAD is less than 30%, even though it may increase according to the presence of risk factors. This observation only reinforces the need to improve the process of clinical indication of the procedure, since there is a tendency to overestimate the diagnostic probability, according to clinical criteria developed in previous decades.<sup>10</sup>

The use of QCA is a tool that helps standardize the assessment of severity of coronary lesions, minimizing the bias associated with the operator. It is a reproducible and objective method, with important applicability in research. However, previous studies, such as one by Shah et al., suggested that QCA tends to underestimate the diagnosis of obstructive CAD when compared to visual estimation.<sup>11</sup> This may have been one of the factors that contributed to the higher percentage of normal exams found by Sant'Anna et al.<sup>6</sup> The prevalence of CAD found in previous studies, such as Ferreira et al. and Levitti et al., were determined by visual estimation of the lesions, hindering direct comparison of findings.<sup>7,8</sup>

In addition, previous studies have not shown a predictable correlation of severity of the obstruction estimated by QCA with the functional impact of the lesion measured by fractional flow reserve (FFR). Furthermore, according to data published by Adedji et al., a visual estimation of the obstruction may be more accurate than QCA when both are compared with the FFR.<sup>12</sup> This observation could explain, at least partially, the low correlation of the functional tests performed before coronary angiography with the presence of obstructive CAD, in the study by Sant'Anna et al.<sup>6</sup> The use of functional tests in patients with a low pretest probability of disease is another pertinent reflection in this case. Information on the presence of clinical heart failure, ventricular dysfunction, medications in use and the extent of CAD found in coronariography could provide more clearly the profile of the patients selected for invasive exam in the study at issue.

Science and medicine are constantly evolving. When facing new challenges, the development of new technologies and innovative solutions is essential. Although the SARS-CoV-2 pandemic will eventually reach a downward

phase, the knowledge learned with it will remain in all medical specialties. Scientific concepts need to be constantly reviewed to ensure the progress of knowledge and humanity, and this will be an important legacy left by the current scenario. In cardiology, the finding of a normal coronary angiography does not imply an inadequate indication, and often is an essential information for the management of the patient. However, the questions that should always be asked in this context are: could the outcome have been predicted? Could the examination have been avoided? The study by Sant'Anna et al. helps to answer both questions, and in current times, these are the answers all physicians should search for in their specialties.<sup>6</sup> Cardiology, medicine, SUS and, especially, patients will be grateful.

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