EDITORIAL

Expanding the Boundaries of Multislice Computed Tomography Coronary Angiography

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Multislice computed tomography coronary angiography (MCTCA) has been positioned as the non-invasive diagnostic method with the highest sensitivity and specificity to detect coronary artery disease in selected patients. Recently, two multicenter trials (CORE-64 and ACCURACY) proved that, for patients with intermediate prevalence of coronary artery disease, a non-invasive method like the MCTCA is highly accurate in detecting patients with obstructive coronary stenosis (area under the ROC curve 0.93) and presents a similar performance to the conventional coronary angiography to predict revascularization at 30 days (area under the ROC curve 0.84 versus 0.82; p = 0.36); sensitivity is between 85-95%, and specificity is between 83-90%. (1, 2) These diagnostic performance values are higher than those showed in the graduated ergometric test (52% and 71%, respectively), the rest-stress myocardial perfusion (87% and 73%, respectively), the echo stress (85% and 77%, respectively), and the calcium score by EBCT (85% and 75%, respectively). (3-5) However, although its accuracy is high in all the spectrum of the coronary artery disease, the MCTCA does not provide relevant additional information in patients who are likely to develop coronary artery disease.

In this issue of the *Revista*, Carrascosa et al. (6) report the prevalence and characteristics of myocardial bridging in MCTCA studies. Discordance about the prevalence of myocardial bridging provided by conventional angiography (0.5-2.5%) and MCTCA (17-35%) is due to the fact that only the deep septal bridges cause systolic compression or 'milking effect', which can be detected by conventional angiography. (7) It is important to point out that, while it has been rarely found in association with ischemic events, this type of benign coronary anomaly (8) is highly frequent, and the proportion of patients with symptoms attributed to myocardial bridging is minimum, with typically benign clinical course.

Authors' classification of myocardial bridging (complete or incomplete) differs from the one previously reported (deep septal, superficial, and right ventricle type). (7, 9) While some myocardial bridging with systolic and even diastolic compression may cause ischemia, paradoxically they lack atherosclerotic substrate. In a series of 577 consecutive patients assessed with MCTCA, 109 myocardial bridges in 100 patients were detected, but none of them had atherosclerosis in the bridged segment, despite 65% of the patients had proximal and/or distal atherosclerosis to the myocardial bridging. (7) This could be attributed to an intrabridge laminar flow, with increased 'shear stress' and consequent anti-atherosclerotic protection. (7, 10)

In another article, (11) the authors demonstrate the feasibility of prospective electrocardiogram-gated multidetector row computed tomography coronary angiography (PMDCTCA), with a substantial reduction of effective radiation dose (ERD) and a quality image comparable to those obtained conventionally (retrospective gating). In this technique, patient is selectively irradiated at end-diastole, whereas in the conventional acquisition, patient is irradiated throughout the cardiac cycle. This is an important contribution about an issue that has not been reported in our sphere, and the data provided –though preliminar– should encourage the utilization of the prospective gating technique for the acquisition of MCTCA in selected patients.

The ERD is a limitation of the acquired MCTCA with no radiation modulation, and recently a study has suggested a potential risk of cancer associated with MCTCA performance. (12) Using standard protocols for MCTCA, this study reported an increase of lifetime cancer risk of 1 in 143 for a 20-year-old woman, and of 1 in 3,261 for an 80-year-old man, as well as an increase of the risk of 1 in 219 for a 20-year-old woman, and of 1 in 1,911 for a 60-year-old man, by the use of tube current modulation (radiation at 100% only at end-diastole). However, these findings should be carefully interpreted. Since the study does not include patients, but its outcomes are the result of computarized simulation methods, cause-effect is not demonstrated. (12) Nevertheless, over and above its outcomes, MCTCA should definitely not be recommended for young women.

The risk for developing lifetime fatal cancer –0.5 per 1,000 individuals– is similar to that of performing a conventional MCTCA, a computed tomography of chest and/or abdomen, and a rest/stress SPECT. (13) This risk is lower than the chance of dying of choking (0.9 per 1,000 individuals), of arsenic in running water (1 per 1,000 individuals), or of light passive smoking (4 per 1,000 individuals) in the United States. (13)

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In addition, a normal MCTCA is related to a lowest event rate; therefore, performing additional studies for a long period of time would not be required. (14)

Performing MCTCA with prospective acquisition techniques as the one described by Carrascosa et al. is highly potential, mainly for patients who require follow-up and for those with low chances of coronary artery disease. However, despite a substantial reduction of the ERD, with a quality image similar to the one obtained by conventional acquisition, it is important to highlight that patients should be carefully selected. The studies must be performed at stable heart rate < 60 bpm throughout the acquisiton, and patients must be preferably slim. Stents would also represent a difficulty, because the technique required must be optimal. Therefore, since the outcomes of conventional acquisition are more accurate, (15) I would recommend prospective gating acquisition for a very selected population, such as young patients with low likelihood of developing coronary artery disease, even though it could be argued that coronary calcium score could be used in those patients, since it does not require contrast, and the ERD is minimum (1 mSv).

At the same time, it is worth mentioning that, since the prospective gating acquisition described by Carrascosa et al. is an axial technique, it does not include functional evaluation of the left ventricle. Instead, while radiation of the tube current modulation is reduced by 80% in the remainder of the cardiac cycle –except for an optimal image quality during a diastolic 'window'–, and simultaneously evaluates the left ventricular function, it significantly reduces ERD –even to conventional coronary angiography levels (5.4-9.4 mSv)– (16) altough the ERD in the gating technique is lower (3.5 mSv).

Given the rapid evolution of non-invasive diagnostic methods, it is important to bear in mind the concept of radiation in cardiology, and studies like this one by Carrascosa et al. are a significant contribution to improve the risk-benefit equation of a highly accurate study. However, it should be noted that the MCTCA –if correctly indicated– does not entail greater risk than that of other studies performed more frequently. (13)

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