Editorial

Computed Tomography Angiography and Cardiac Catheterization: Allies in the Treatment of Chronic Coronary Obstruction

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In the first years after the advent and popularization of coronary computed tomography angiography (CT angiography), part of the medical community began to design it as a substitute test for catheterization for diagnostic purposes, relegating the latter only for therapeutic purposes. Over time, the diverse and robust evidences that, every day, consolidate clinical recommendations for CT angiography show that these methods are not necessarily competitive. Both have distinct recommendations and may actually be complementary and synergistic. This is seen both in the clinical management of chronic coronary artery disease (CAD), in which CT angiography can better select patients that should or should not undergo catheterization, and in situations where computed tomography angiography provides information that are essential for the planning of percutaneous procedures, such as Transcatheter Aortic Valve Implant (TAVI).[1]

Another situation in which computed tomography angiography attracts special interest as an ally in interventional procedures is the treatment of chronic coronary artery occlusion. Defined as total obstruction of coronary artery lumen, with zero thrombolysis in myocardial infarction (TIMI) flow in the occluded segment and estimated duration of ≥3 months,[2] chronic arterial occlusion is frequently found in patients with CAD, with an estimated prevalence of 10 to 25% of cases managed with diagnostic angiography.[3] Chronic coronary occlusions are known to be associated with worse prognosis, and their recanalization leads to relief of symptoms, improved ejection fraction, reduced arrhythmias and decreased need for coronary artery bypass grafting.[4] Although some observational studies point out to a potential reduction in mortality rates, evidence in this respect is conflicting and, to date, not proven by well-designed randomized trials.

Treatment of chronic coronary occlusion should be considered in the presence of symptoms or objective evidence of viability/ischemia at the site of the occluded artery and follows the general recommendations of coronary artery bypass grafting in CAD.[2] Its recommendation also depends on the chances of success of the procedure and appropriate patient selection. However, percutaneous treatment of this clinical situation is extremely challenging and highly complex from a technical perspective. It is also of long duration and high rates of failure and complications, especially in centers of lower expertise.[3]

The main technical obstacle is the difficulty of passing the guidewire through the occluded arterial segment. Many scores have been developed with the purpose of estimating the chances of success of the procedure. J-CTO Score and PROGESS-CTO[3] are the most used ones. In general, with the development of new apparatuses, devices and techniques for catheter coronary artery bypass grafting, the main angiographic predictors of recanalization failure of the occluded artery are the degree of calcification, extension of the occluded arterial segment, tortuosity and unfavorable morphology of the blunt stamp.[6]

Coronary computed tomography angiography with recognized diagnostic accuracy for the detection of significant luminal reduction, also reveals occluded arterial segments, and allows the analysis of the degree of arterial tortuosity, identification of the distal bed to the occlusion and presence of collateral branches. Its role in patient evaluation and planning of recanalization procedures has been previously studied.[7] Some authors have tested scores using tomography-derived parameters similar to those obtained by conventional angiography, with quite similar performance. In particular, Fujino et al. developed a J-CTO Score based on the computed tomography angiography findings and compared with the traditional J-CTO Score, where the former was superior in the prediction of success of percutaneous recanalization.[8] In general, the main predictors of failure of the procedure obtained by computed tomography angiography are the extension of the occluded arterial segment >15 mm, moderate to severe calcification (taking >50% of the luminal cross-sectional area) and unfavorable morphology of the blunt stamp.

Computed tomography angiography can also be used to help choose the interventionist approach strategy. By analyzing the precise site of calcifications, their degree and extent, and the presence or absence of collateral vessels distal to occlusion, the method can be used to decide which approach to use (antegrade or retrograde), to choose guidewires, devices, stents and specific catheters (rotablator), and to predict the best projections and angulations for the procedure, saving time, radiation and volume of contrast medium.[9] Some centers even use hybrid imaging, by combining tomography with fluoroscopy images, and virtual reality.[10]

Despite this, computed tomography angiography is still underused in patient selection and assistance in chronic obstruction approach strategy. This interventional procedure is less used in Brazil than it should, due to limitations to the access of new technologies in the area. The current hemodynamics guidelines have not yet incorporated routine

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recommendation of computed tomography angiography in these cases, mainly because there are no longer any major randomized trials evaluating the importance of the method for decision making and the real benefit of using their information prior to interventional procedures. However, current evidence is encouraging and, with the impressive progress of interventional techniques, tomography equipment and analysis software, it is expected that the use of computed tomography angiography, combined with conventional invasive angiography, will become standard practice, leading to better patient selection and safer and more successful procedures for recanalization of chronically occluded arteries.

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