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# Diagnostic usefulness of multidetector computed tomography coronary angiography in assessment of patency of coronary artery bypass grafts

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Coronary artery bypass graft (CABG) surgery remains the standard of care in the treatment of advanced coronary artery disease. It is well recognized that the long term clinical outcome after myocardial revascularization is dependent on the patency of the bypass grafts. Conventionally, invasive coronary angiography has been used to assess graft status and evaluate for graft occlusion. Results provided by non-invasive techniques such as exercise testing, thallium scintigraphy, or exercise echo are often difficult to interpret in such patients, who may have chest pain unrelated to myocardial ischaemia, ischaemia unrelated to graft obstruction, or a pre-existing patchy infarction pattern. Multi-detector Computed tomography coronary angiography (MDCTA) has been considered as an attractive alternative to the gold standard invasive coronary angiography in the evaluation of coronary artery disease (CAD). The aim of this study is To evaluate the usefulness of multidetector (64-slice) computed tomography coronary angiography as a non invasive technique for assessment of patency of coronary artery bypass grafts (CABG). The study included a total number of thirty patients with history of CABG operation who were scheduled for elective conventional coronary angiography because of suspected progression of native coronary artery disease or graft malfunction (total occlusion or significant stenosis), and were enrolled for multi detector CT angiography of the coronary arteries between February 2008 and November 2009. All patients underwent both conventional and MDCT coronary angiography within one month of each other. The major inclusion criterion was history of prior CABG operation and scheduling for conventional coronary angiography. Patients enrolled in this study had to fulfill the following criteria: sinus heart rhythm, able to hold breath for accepted time (15-20 seconds) and normal serum creatinine. Exclusion criteria: 1. Patients with irregular heart rhythm (arrhythmias), especially AF. 2. Patients with known or suspected allergy to iodinated contrast material. 3. Renal insufficiency (serum creatinine more than 1.5 mg/dl). 4. Contra-indications to radiation exposure (e.g. pregnancy). 5. Patients who couldn't follow up breath holding instructions (i.e, those with respiratory impairment (inability to withhold breathing), and unstable clinical status or marked heart failure). 6. Patients with implanted pacemakers or valve prosthesis to avoid metal artifacts. All the thirty patients underwent the MDCT angiographic study according to standard protocol without complications. Selective coronary angiography was

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performed within one month before or after the multi-detector CT study. Findings of the multi-detector CT coronary angiography were compared to those of the corresponding conventional invasive coronary angiograms (ICA). In all cases; the two examinations were interpreted on a double-blinded basis. Evaluation was performed on a per graft basis. Cross tables were employed to calculate the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy of MDCT coronary angiography for each type of grafts (arterial or free) separately, and then the overall values for the total examined grafts were calculated as well. The results of the study were as follows: The total number of the examined grafts was 79 grafts, out of them fifty-two grafts were free grafts (65.8%) and (27) were arterial (IMA) grafts (34.2%). And the total number of functioning grafts was (50) grafts (63.3% of total grafts). Out of them (23) were arterial grafts (46%) and (27) were free grafts (54%), with the total number of malfunctioning grafts was (29) grafts (36.7% of total grafts). Out of them (4) were arterial grafts (13.8%) and (25) were free grafts (86.2%). Three out of the 79 examined grafts were not properly evaluable by MDCT coronary angiography due to motion artifacts (one arterial and two free grafts) which constitute (3.8%) of the total number of examined grafts. These unevaluable three grafts were not excluded during statistical analysis in our study. When considering these segments as malfunctioning (positive) grafts, this would result in: a sensitivity of (100%), specificity of (95.7%), negative predictive value of (100%), positive predictive value of (80%), and overall accuracy of (96.3%) for the arterial grafts. And a sensitivity of (100%), specificity of (92.6%), negative predictive value of (100%), positive predictive value of (92.6%), and overall accuracy of (96.2%) for the free grafts, with overall sensitivity of (100%), specificity of (94%), negative predictive value of (100%), positive predictive value of (90.6%), and overall accuracy of (96.2%) for all grafts. And when considering these segments as functioning (negative) grafts: This means that the results of MDCT angiography would be exactly matched to the results of ICA, and would result in: a sensitivity, specificity, negative predictive value, positive predictive value, and overall accuracy of (100%) for each. And these values would be applied when considering analysis of arterial grafts, free grafts and the total number of grafts as well. The results of our study indicates the high diagnostic accuracy of MDCT in evaluating the patency of coronary artery bypass grafts, and are supported by many other clinical trials and meta-analysis. The study is limited by: a Small number of study populations, the study didn't extend to include assessment of the native coronary arteries in the study populations and the cumulative dose of radiation exposure was not routinely calculated. In conclusion: Multi-Detector Computed tomography is a safe and reliable technique with high diagnostic accuracy in assessment of the patency of CABGs and high negative predictive value. However, some imaging artifacts may impair proper image interpretation and may affect the results of MDCT study. We recommend that: MDCT should be considered as a logical alternative to ICA in the evaluation of CABGs, especially in the absence of adequate information about the number, site or the orientation of the implanted grafts. However, the interpretation of the results of MDCT angiography should be carefully done, with special attention to imaging artifacts and the risk of radiation exposure should be evaluated when referring the

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patients to do MDCT angiography, we also recommend that further studies with a larger number of patients and examined grafts which extend to evaluate both CABGs and native coronary arteries will help in the evaluation of the role of MDCT in patients with CABG(s).