Oman Medical Journal (2013) Vol. 28, No. 5:373-374
DOI 10. 5001/omj.2013.106

Letter to Editor

Intraoperative Assessment of Coronary Artery Bypass Graft Patency

Received: 24 Jul 2013 / Accepted: 02 Aug 2013

To the Editor,

The patency of the anastomosis and the flow of the graft are the most important subjects for coronary artery bypass grafting (CABG). Graft patency verification is a high demanding procedure. The incidence of intraoperative graft failure has been estimated to be approximately 5% for internal mammary artery grafts and 11% for vein grafts.[1-3] These disappointing findings exceedingly require intraoperative assessment of graft patency to enable early detection and correction of technical problems. Early graft failures may occur due to poor quality and size of the distal coronary vascular bed, coagulation disorders, or surgical problems related to the graft conduits and anastomoses. To detect graft failure during CABG is difficult by the traditional methods such as inspection, palpation, electrocardiography, and echocardiography.[2] Expectedly, resolving intraoperative graft failure may improve early and longterm clinical outcomes.[1,3]

I read with interest the paper by Harahsheh.[4] The author underscores the importance of utilizing transit time flow measurement (TTFM), intraoperatively. He investigated 1394 grafts in 436 patients by TTFM to determine graft patency. The author is to be congratulated on his study on such an important subject. I would also like to add some comments on this topic.

Methods to assess graft patency during CABG should be easy, safe, and expeditious, so they may be routinely employable. Choosing the best available technology is a correct approach to ensure the best surgical outcomes. Currently, several techniques are available for intraoperative assesment of graft patency. They include coronary angiography, electromagnetic flowmetry, TTFM, thermal angiography, doppler velocity measurements, epicardial color Doppler scanning, and intraoperative fluorescence imaging (IFI).[1,5] Coronary angiography is the gold standard and still the most accurate technique for graft assessment. Nevertheless, it is not routinely employed because of logistical problems.[5]

Nowadays, IFI and TTFM are the most commonly used systems among the available techniques for graft quality assessment.[1] The IFI is a recent imaging method based on the fluorescence properties of indocyanine green dye, providing direct visual images to confirm graft patency.[1,2] It is a safe, simple and repeatable technique. It also has an advantage over TTFM in sensitivity. On the contrary, IFI allows a semiquantitative evaluation of graft flow, does not show exact anastomotic quality, and provides a suboptimal image of pedicled grafts and intramyocardial coronary arteries.[1,5]

At present, TTFM is the most widely used method for intraoperative assessment of graft patency during CABG.[2] It is an easy, quick, exact, and reproducible technique but less sensitive than IFI.[1] TTFM is a noninvasive method, independent of vessel size, shape, and Doppler angle. This assessment method may be useful especially during off-pump (or beating heart) CABG.[6] TTFM may accurately determine technical problems such as kinked, twisted, or stenotic grafts. Thus, the cardiovascular surgeon may promptly revise the graft before the patient leaves the operating table.[2,3] It does not provide a visual image of the graft and is more likely to both overestimate and underestimate the need for graft revision.[1,5]

TTFM reliably confirms graft patency in the majority of grafts with good flow.[1] The pulsatility index (PI) obtained by TTFM is a good indicator of the flow pattern and the quality of the anastomosis, as well as predicting outcomes.[1,3] PI should ideally be between 1 and 5 in the well-functioning graft. In my opinion, all grafts with a PI greater than 5 should be revised. Mean graft flow (MGF) value is not a good indicator of the quality of anastomosis. MGF is dependent on many variables including largely the quality of the native coronary artery. Mean flow of less than 15 mL/min is questionable.[1,3] An important drawback of TTFM is the lack of standard curves and flow values for different types of grafts and revascularized vessels.[3]

In Harahsheh's study,[4] MGFs ≥20 mL/min for right coronary artery (RCA) grafts and MGFs ≥15 mL/min for left-sided (LAD-left anterior descending and circumflex coronary artery) grafts were considered adequate. A diastolic filling above 50% with PI of <5 was also accepted as adequate. On the contrary, criteria for a poor functioning graft were low MGF, PI above 5, and a poor diastolic flow pattern. He also reported inadequate flow in 100 grafts including LAD system with 28 grafts (4%), for circumflex system 40 grafts (9%), and RCA system 32 grafts (9%) were suboptimal. Thus, in this study there was a 7% failure rate which is comparable to published data. Only 1% of grafts had been revised on the basis of flowmetry results.

Finally, I believe that a meticulous method to assess intraoperative graft patency increases the accuracy of diagnosing technical problems and improves surgical outcomes.

Sincerely,

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