Commentary: Measure twice, cut as directed— Transit-time flow measurement and high-frequency ultrasound-guided surgical revision

John Bozinovski, MD, MSc

From the Division of Cardiac Surgery, Department of Surgery, The Ohio State University Wexner Medical Center, Columbus, Ohio.

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Address for reprints: John Bozinovski, MD, MSc, 816A Doan Hall, 410 West 10th Ave, Columbus, OH 43210 (E-mail: john.bozinovski@osumc.edu).

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Objective assessment of the quality of conduit, cannulation sites, anastomoses, and target vessels in coronary artery bypass grafting surgery is a worthy goal, but it is adopted incompletely. Transit-time flow measurement (TTFM) and high-frequency ultrasound (HFUS) are tools purported to assess such, and proponents argue that their use is of value^{1,2}; however, the definitive study to evaluate whether their use improves outcomes is neither available nor imminent. Nonadopters have various reservations, and they can always justify them with this lack of empirical evidence. Determination of whether the use of TTFM and HFUS lowers either mortality or major adverse cardiac and cardiovascular events might require very large numbers of patients, suggesting that any effect on outcome, if present, would be small. Trying to tease out that effect from the multitude of other elements that may affect cardiac outcomes makes it more problematic. These realities should not dissuade us from measuring the utility of these tools. Acknowledging these limitations, the REQUEST (Registry for Quality Assessment with Ultrasound Imaging and TTFM in Cardiac Bypass Surgery) investigators measured procedural changes guided by TTFM and HFUS during coronary artery bypass grafting surgery.³

Some of the strengths of the REQUEST study reported by Taggart and colleagues³ in this issue of the *Journal* are that it involved more than 1000 contemporary patients from 7 high-volume coronary bypass centers and that the reasons for surgical changes were categorized by changes to sites of cannulation, crossclamping, anastomoses, or arterial targets, and to graft revisions and conversions between use or avoidance of the pump.

It is initially surprising that changes to the surgical procedure occurred in 25.2% of patients. Of these changes, however, at least 1 in 8 were, and as many as 1 in 4 could have been, based on visual inspection alone without the

John Bozinovski, MD, MSc

Central Message

Transit-time flow measurement and high-frequency ultrasound identify problems and induce changes relatively frequently during coronary artery surgery; however, endorsement of their use should be qualified.

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use of TTFM or HFUS, because the protocol did not exclude changes that were based on visualization alone. This still leaves about 19% of patients undergoing TTFM- or HFUS-guided changes to their surgery. Most changes were alterations to planned cannulation sites or target vessels, but a significant proportion (7.8%) of the changes were to the grafts themselves. That this much change is considered necessary by experienced coronary surgeons is a salient point and a valuable message from this study. Not everyone would suspect that 1 in 13 of their patients undergoing coronary artery bypass grafting warrant revision to their initial work.

Notwithstanding the value of the study, it may be that the enthusiastic advocacy by Taggart and colleagues³ for the routine use of these tools in coronary surgery is premature and speculative. This study did not assess whether the use of TTFM and HFUS improves outcome or whether it adds risk, because there was no comparison group. Rather, it assessed how often this use triggers alteration to surgery. The possibilities remain that, although done with a low rate of adverse events, the alterations that TTFM and HFUS induced were in some way detrimental, or at least were unable to confer substantive benefit. It is reasonable to suspect, however, that the hazard with TTFM or HFUS is extremely low and that the potential benefit of objectively assessing

ones work in real time is sufficient to warrant restrained consideration for use.

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