Epicardial imaging improves surgical assessments, strategies and graft patency verification

Improved information for better outcomes
In planning and carrying out CABG procedures, major concerns include:
- Localization and extent of coronary stenoses
- Graft placement strategy – where to place grafts to provide optimal flow
- Graft and anastomotic quality – identifying possible sources of compromised blood flow

Transit Time Flow Measurement (TTFM) is a reliable and proven method, increasingly used to improve post-CABG outcomes, as recommended by guidelines issued jointly in 2010 by the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS).

Epicardial ultrasound for additional security
Haaverstad et al. found that epicardial imaging provided important information about coronary artery stenoses: site, degree and shape of the coronary lesions. In 17 (85%) of 20 LADs stenoses were easily and clearly identified. Epicardial imaging also allows adequate imaging and quantitative analysis of off-pump LIMA-to-LAD anastomoses. The surgeon may assess the morphology of an anastomosis independent of the phase of the cardiac cycle or the mode of ultrasound applied. Anastomotic dimensions and patency using intraoperative color Doppler ultrasound correlate with findings from selective coronary angiography at 8 months follow up.

In his 2011 review, Haaverstad showed that epicardial ultrasound imaging gives a simple, fast, safe and satisfactory imaging of coronary stenoses and graft anastomoses, providing intraoperative benefits for CABG surgery. Detection of a failed anastomosis by TTFM or ultrasound imaging enables the surgeon to perform a prompt revision of the graft. Technical problems of an anastomosis should immediately be corrected in the operating room.

Changing strategies intraoperatively
Stein et al. observed that the additional information easily obtained from scanning leads to changes in operating strategies that may improve graft patency. Ravulapalli et al. documented changes in the choice of anastomotic site in 6 of 15 patients, which they believe enhanced clinical outcomes.

In a study of 206 CABG operations where both TTFM and epicardial imaging were used, Di Giammarco found that epicardial imaging increased the specificity of the graft verification procedure, leading to revision of those grafts which were failing. Six of the seven surgeons were new to the technique, indicating that it was easy to learn.

What do imaging guidelines say?
- Epicardial imaging can be used to assess coronary quality, guide the strategy for graft placement and verify graft patency
- Epicardial echocardiographic examination can be performed efficiently and safely

Early post-operative graft failure following coronary artery bypass graft surgery leads to unnecessary morbidity and mortality. Surgeons are continually seeking better, faster and more reliable methods to assess coronary quality, select strategy for graft placement and verify graft patency intraoperatively. Transit time flow measurement (TTFM) is a reliable method which may be augmented by epicardial imaging (or epicardial ultrasonography). Graft verification contributes to reduced rates of major adverse cardiac and cerebrovascular events following surgery.
Additional assessment techniques
For the related technique of epiaortic imaging, multiple studies have shown it to be more sensitive than palpation or transesophageal echocardiography for detecting aortic plaque.14-18 In a study of 129 patients, Kamler et al. reported that imaging is safe, easy and fast to perform, and detects aortic plaque and wall thickening.19

Epiaortic imaging guidelines published in 2007 by the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists have been endorsed by the Society of Thoracic Surgeons.20

Combine TTFM and ultrasound imaging for enhanced insight into flow dynamics
The three techniques mentioned here – epicardial imaging, epiaortic imaging and flow measurement – are provided in the VeriQ C system from Medistim.

Epiaortic scanning can reduce the incidence of stroke. The combination of TTFM and epiaortic ultrasound can reduce the incidence of perioperative complications and improve long-term results.

References