Technical Note

Epiaortic Scanning (EAS) in Cardiac Surgery

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DECLINING CABG SURGERY STROKE RISKS
US stroke risk data and incidence in patients undergoing CABG surgery is both accessible and impressive. A huge prospective Cleveland Clinic study of 45,432 consecutive CABG patients showed a steady decline in stroke rate from 1985 to 2010. From 2005 to 2010, the yearly rate for stroke was only 0.91%, less than one percent. Although these numbers cannot be generalized across all US practices, stroke rates, in general, have been declining even as disease severity has been on the rise.¹

MEDISTIM STUDY FAILS TO SHOW EAS BENEFIT
A 2010 observational study by Dr. Markus Kamler (University Hospital, Essen, Germany) examined outcomes of patients that had epiaortic doppler imaging compared with palpation of the aorta alone.

- Study included 129 cardiac surgery patients who either had CABG alone, aortic valve surgery, or CABG with valve surgery.
- In 27 patients (>20%), operative strategy (cross-clamp location, site of cannulation, etc.) was changed based on scanning results.
- Study showed a 2.6% mortality rate; 2 patients needed ECMO, and 5 neurologic events occurred (4%).⁷
- Although Medistim was hopeful that this study would show that EAS would decrease cardiac surgery stroke rates, the study failed to conclude that EAS decreased stroke incidence.

CONFLICTING EVIDENCE FOR STROKE-RELATED OUTCOMES WITH EAS
Studies have compared outcomes of patients who had EAS compared to manual palpation/inspection of the aorta.

- While a 2008 study by Djaiani, et al, in the Journal of Anesthesia and Analgesia showed that “the use of EAS led to modifications in intraoperative surgical management in almost 1/3 of patients undergoing CABG surgery, the use of EAS did not lead to a reduced number of cerebral emboli before or during CPB.”³
- A 2004 Best Evidence topic paper, published in Interactive Cardiovascular and Thoracic Surgery, sought to answer the question whether changing operative technique based on EAS reduced the incidence of intraoperative stroke during cardiac surgery. In the study, 179 papers were reviewed, of which eight presented the best evidence to answer the clinical question. Results were mixed as to whether stroke rate can be reduced as a result of EAS examination. Five of the eight studies showed a reduction in the stroke rate as a result of modification to surgical technique after EAS. The degree of modification to the surgeon’s operative technique when atherosclerosis is detected is the determining factor in these papers as to whether a reduction in stroke rate can be achieved, with a no-touch technique being of most benefit in the highest risk patients.⁴

TRANSESOPHAGEAL ECHOCARDIOGRAPHY (TEE)
The standard of care in the United States for CABG patients (plus or minus valve work) is for transesophageal echocardiography (TEE) to assess aortic and valvular anatomy.

While a number of studies have looked at the EAS’s ability to assess atheroma in the aorta and its picture clearly identifies the degree and location of the atherosclerosis present much more clearly than TEE, there appear to be no head-to-head comparisons between EAS to TEE with respect to outcomes.
Epiaortic Scanning (EAS) in Cardiac Surgery Cont.

EAS PUBLISHED GUIDELINES
Guidelines exist for “The Performance of a Comprehensive Intraoperative Epiqercic Ultrasoundographic Examination. Recommendations of the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists and endorsed by the Society of Thoracic Surgeons,” and were published in JASE, November 2007. These guidelines suggest routine epiqercic scanning, but only on patients with an increased risk for embolic stroke and those who have evidence of aortic atherosclerosis or calcification by other imaging modalities.

STROKE MECHANISMS VARY
Many mechanisms can be involved in the incidence of stroke so it is virtually impossible to identify the specific mechanism of stroke in a CABG patient. Stroke can result from embolization from atheromatous plaque, fat embolism, air embolism, thrombus, atrial fibrillation, hypoperfusion, and intraoperative hypotension. In addition, there are well documented predictors of post-CABG stroke. The right surgical technique for the right patient appears to make a difference in stroke rate. In one study, CABG without CPB had a 0.14% stroke rate.

PERCEIVED EAS BENEFIT
With the use of epiqercic scanning, the surgeon may feel better about his choice of location for cross-clamping, cannulation, or partial occlusion. Whether the patient has a neurologic event or not, he can feel confident that he has chosen the optimal site, and can document same. However, for as often as the surgeon feels that EAS is necessary, he/she can also use existing ultrasound equipment, readily available in the operating room.

CONCLUSION
It is clear that epiqercic ultrasound scanning provides a more sensitive assessment of intra-aortic atheroma than intraoperative TEE or palpation alone. However, whether EAS adds clinical benefit beyond that afforded by intraoperative TEE alone for prevention of stroke remains as yet unanswered. In the subset of patients who are at high risk of stroke, the surgeon may perform an epiqercic scan, using equipment already available in the operating room.

Several probe options are available from imaging companies such as Phillips, GE, Siemens, and Terumo. A high quality probe that is compatible with a currently owned console will provide better results at a low cost. Therefore, there is no clear advantage in having this ultrasound capability incorporated into the flow measurement system.

References:

Reviewed by Robert Jasmer, and Dorothy Caputo,

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