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THE ROLE OF TRANSESOPHAGEAL ECHOCARDIOGRAPHY FOR ENDOVASCULAR REPAIR OF THORACIC AORTIC ANEURYSMS

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Introduction: Endovascular stent grafting is a promising alternative to open repair of descending thoracic aortic aneurysms (TAA). The adequacy of endovascular stent positioning is usually guided by intraoperative angiographic imaging. The proximity of the esophagus to the aorta make transesophageal echocardiography (TEE) an ideal aortic imaging tool to aid in stent deployment. We report our experience with TEE as an adjunct to fluoroscopy for the endovascular repair of TAAs.

Methods: From May 2002 to October 2002, six patients underwent endovascular stent grafting of descending TAAs with IRB approval. After induction of general anesthesia, a comprehensive TEE examination was performed for all patients according to prescribed guidelines(1) using a multiplane TEE probe. Digital images were obtained on a Phillips Sonos 5500 Ultrasound machine (Phillips Medical Systems, Andover, MA) and interpreted by anesthesiologists certified in perioperative TEE (MS, JPM). Bradycardia (to a rate of 50 beats per minute) and hypotension (to a mean arterial pressure of 50 mm Hg) were transiently induced to enable accurate stent deployment. Angiography was also performed for all cases and TEE images were used to identify the extent of the aneurysm and placement of the stent. Doppler color flow mapping by TEE was used to supplement angiography to confirm the absence of flow within the aneurysmal sac. Cardiac performance before, during and after stent deployment was also assessed using TEE.

Results: The thoracic aortic pathology was identified by TEE in all six patients. Three patients had saccular TAAs (example in figure 1), two had dissecting aneurysms and one had a fusiform TAA. One patient died due to postoperative complications related to extensive aortic dissection. TEE was accurate in identifying the adequacy of stent positioning and exclusion of flow within the aneurysmal sac in three patients. Abnormal flow within the sac after stent deployment (endoleak) was identified by TEE and angiography in one patient requiring stent repositioning. In another patient, only TEE detected abnormal flow in the aneurysmal sac, with angiography showing no flow. On the basis of the TEE findings, the stent was reinforced with a proximal cuff. In one patient with

Type B aortic dissection, the true lumen was found to be extensively compressed by the false lumen throughout the descending thoracic aorta. Based on these TEE findings, the endovascular procedure was abandoned in favor of open surgical repair. Diastolic dysfunction after stent deployment was detected in one patient, who had elevated postoperative troponin levels. TEE was the only intraoperative modality to suggest myocardial injury in this patient

Discussion: We found TEE to be an invaluable intraoperative tool for (a) identifying aortic pathology, (b) aiding in accurate stent graft positioning (see Figure 1), (c) supplementing angiography for detecting endoleaks within the aneurysmal sac, and (d) monitoring cardiac performance during the hemodynamic stress of stent deployment. Although the usefulness of TEE in endovascular repair of TAAs has been described, there are no reports of TEE experience in these cases in the anesthesia literature. The usefulness of TEE lies in its specificity in diagnosing aortic pathology and sensitivity in detecting even small amounts of flow within the aneurysmal sac. Whether small endoleaks that are detected by TEE but not angiography need to be corrected or will spontaneously resolve over time is so far unknown. As experience with TEE evolves, anesthesiologists can play a vital role in enabling successful outcomes in this patient population.

References

1. Shanewise JS, et al. *Anesth Analg* 1999;89:870-84.
2. Fattori R, et al. *J Thorac Cardiovasc Surg* 2000;120:490-5

Figure 1. Transesophageal long axis view of the descending thoracic aorta showing the saccular aneurysm and the endovascular stent system (sheath and graft) used to position the stent graft within the aortic lumen.

