

Anesthesiology
73:777-778, 1990

Mallory-Weiss Tear Complicating Intraoperative Transesophageal Echocardiography in a Patient Undergoing Aortic Valve Replacement

WILLIAM E. DEWHIRST, M.D.,* JAMES J. STRAGAND, M.D.,† BARBARA M. FLEMING, M.D.‡

During its brief history, the safety of intraoperative transesophageal echocardiography (TEE) has been attested to by the paucity of reported complications attributed to its use. However, blind positioning and manipulation of the ultrasound probe in the distal esophagus and stomach would seem to pose special risks to the cardiac surgical patient being subjected to the low perfusion pressure and anticoagulation associated with cardiopulmonary bypass (CPB). We present a previously unreported case of a Mallory-Weiss type, distal esophageal tear occurring secondary to TEE monitoring in a patient undergoing aortic valve replacement and coronary artery bypass graft surgery.

CASE REPORT

A 77-yr-old woman underwent elective aortic valve replacement and coronary artery bypass grafting (CABG) for progressive syncopal episodes and angina. Past medical history was remarkable for hypertension, hypercholesterolemia, glaucoma, benign positional vertigo, and a history of gastritis treated 3-5 yr previously with no evidence of esophagitis, hiatal hernia, or active gastrointestinal disease. She specifically denied symptoms of esophageal reflux or stricture on review of systems. There was no personal or family history of coagulopathy. Preoperative laboratory studies showed a hemoglobin concentration of 118 g/l, and serum chemistries and plasma coagulation tests were all within normal limits. Chest x-ray revealed only mild cardiomegaly and a tortuous aorta with no evidence of a hiatal hernia or pulmonary pathology. The ECG showed sinus rhythm with a left bundle branch block pattern. Cardiac catheterization demonstrated an aortic valve area of 0.4 cm² with 90% and 50% occlusive lesions of the circumflex and proximal left anterior descending coronary arteries, respectively, and well-preserved ventricular function.

After receiving cimetidine, morphine, and scopolamine premedicants, venous and arterial vascular access was secured and pulmonary artery catheterization was accomplished prior to uncomplicated induction of anesthesia with fentanyl, midazolam, and vecuronium. After tracheal intubation, a Hewlett-Packard Model 21362A esophageal ultrasound transducer probe (5.0 MHz; dimensions, 11 × 14-mm tip and 9.8-mm shaft) was passed into the distal esophagus easily and with-

out apparent incident. The heart and aorta were imaged (using a Hewlett-Packard Model 77020A Ultrasound Imaging System) alternately from the four-chamber and short-axis orientations without difficulty during the prebypass period. The probe was never left or manipulated in a locked position of flexion and resided in a neutral, unlocked position (power off) within the distal esophagus during the 138-min period of CPB.

After aortic valve replacement with a 21-mm Hancock porcine bioprosthesis and two-vessel CABG during the 82-min aortic cross-clamp period, separation from CPB was accomplished with atrioventricular sequential pacing, epinephrine, and phenylephrine infusions and an amrinone bolus. Transesophageal echocardiographic imaging of the heart from the esophagus was used to assist with removal of intracardiac air prior to separation from the pump-oxygenator. Echocardiographic evaluation of the aortic valve revealed an adequately functioning prosthesis with a small intravalvular leak and 1+/4+ regurgitation. The probe was then advanced into the stomach, and a short-axis view was obtained to assess ventricular filling and function. No problems were encountered in either manipulating the probe or obtaining high-quality images. In the postbypass period, a coagulopathy ensued requiring transfusion of 6 units of homologous packed red cells (in addition to 1,300 cc of Cell-Saver™ product), fresh-frozen plasma, cryoprecipitate, and platelets for laboratory-documented deficiencies of those components. Sufficient hemostasis to allow chest closure was obtained, and the patient was transferred from the operating room in stable condition.

On arrival in the postcardiac surgical unit, an orogastric tube was placed, and it immediately returned 500 cc of fresh blood. The following morning, after the patient had vomited fresh blood clots, an esophagogastroduodenoscopy was performed using an Olympus XP-10 gastric endoscope, 20% benzocaine topical anesthesia, and intravenous meperidine sedation. Initial endoscopy revealed bright red blood at the gastroesophageal (GE) junction and a large amount of old blood within the stomach. The stomach was lavaged with saline, and repeat examination revealed no active bleeding but a 2-cm linear tear in the mucosa just proximal to the GE junction. A small clot was adherent to the tear. There was no evidence of esophageal stricture, esophagitis, or varices, and the remainder of the examination was normal.

The tear was managed conservatively by removal of the orogastric tube and continuation of H-2 antihistamine therapy, and there was no evidence of further, clinically significant bleeding. An otherwise satisfactory recovery ensued, and the patient was discharged from the intensive care unit on the third postoperative day and from the hospital approximately 1 week later.

* Assistant Professor of Anesthesiology.

† Instructor in Clinical Medicine.

‡ Resident in Anesthesiology.

Received from the Dartmouth-Hitchcock Medical Center, Hanover, New Hampshire 03756. Accepted for publication May 1, 1990.

Address reprint requests to Dr. Dewhirst: Department of Anesthesiology, Dartmouth-Hitchcock Medical Center, Hanover, New Hampshire 03756.

Key words: Complication: esophageal damage. Esophagus: Mallory-Weiss tear. Monitoring: transesophageal echocardiography.

DISCUSSION

Intraoperative use of transesophageal echocardiography has enjoyed increasing popularity in cardiac surgery as the technique has been validated for assessment of chamber size and ventricular function,¹ prosthetic cardiac valve function,² hypotension following cardiac surgery,³ and detection of retained intracardiac air.⁴ It is used rou-

tinely at our institution for all cardiac valvular procedures and most myocardial revascularizations. Freedom from major complications of the procedure has been reported in many small series.^{2,5-7} However, intraoperative TEE monitoring would seem to pose some additional risk of injury to the patient relative to endoscopy or awake TEE since 1) the period of monitoring is often prolonged; 2) there is no endoscopic guidance of the probe; and 3) the patient provides no feedback during manipulation of the probe. Furthermore, the consequences of even a small hemorrhagic injury may be magnified by systemic anticoagulation and any post-CPB coagulopathy. In fact, the English literature is virtually devoid of reported traumatic complications of this monitoring technique.

Bleeding from diagnostic endoscopy, even with biopsy, is rare, with a reported incidence of 0.03 %, ⁸ although a Mallory-Weiss tear resulting from diagnostic, upper gastrointestinal endoscopy has been reported.⁹

Since this patient (despite a remote history of gastritis) had no active, upper gastrointestinal pathology other than the tear that resulted in her hemorrhage and had not wretched or vomited prior to the hemorrhage, it is concluded that the injury must have been caused by instrumentation of the esophagus with the TEE probe. In retrospect, a lower-than-predicted initial hemoglobin concentration (49 g/l) on commencement of CPB (despite using a 1-unit blood prime and low-volume pump reservoir) was probably a manifestation of the esophageal hemorrhage. Systemic heparinization and the subsequent post-bypass coagulopathy no doubt would have exacerbated the magnitude of hemorrhage from the injury.

This patient's injury responded to conservative therapy, including treatment of her coagulopathy, but such a course is not always found with Mallory-Weiss lesions. In most patients, bleeding ceases spontaneously and re-bleeding is unusual. Although blood loss may be considerable, 90% or more of patients with Mallory-Weiss tears can be managed nonsurgically with appropriate blood component replacement.¹⁰ Balloon tamponade,¹¹ multipolar electrocoagulation,¹² and endoscopic alcohol injections¹³ have been advocated as therapeutic options for nonsurgical control of continued bleeding.

This case describes an unusual, although potentially serious, complication of transesophageal echocardiography in a cardiac surgery patient. To the concerns over potential mucosal and muscular damage from sustained TEE probe contact pressure addressed recently by Urbanowicz *et al.*,¹⁴ we would add confirmation that acute visceral trauma may result from introduction and manipulation of the probe in the distal esophagus, even in a patient without pre-existing esophageal pathology. Although we believe that this complication was neither predictable nor avoidable in our patient, the experience

serves to reinforce the principles of safe practice of intraoperative TEE monitoring: gentle introduction and positioning of a well-lubricated probe, avoidance of manipulation with the tip in a locked position or leaving the tip flexed for a prolonged period of time,⁸ and exercise of special caution in patients with known gastroesophageal pathology or coagulopathy. What is perhaps more unusual than the fact that this complication occurred, is that it is not more common, given the previously mentioned special considerations regarding TEE in the patient undergoing CPB.

REFERENCES

1. Konstadt SN, Thys D, Mindich BP, Kaplan JA, Goldman M: Validation of quantitative intraoperative transesophageal echocardiography. *ANESTHESIOLOGY* 65:418-421, 1986
2. Nellessen U, Schnittger I, Appleton CP, Masuyama T, Bolger A, Fischell TA, Tye T, Popp RL: Transesophageal two-dimensional echocardiography and color Doppler flow velocity mapping in the evaluation of cardiac valve prostheses. *Circulation* 78:848-855, 1988
3. Chan KL: Transesophageal echocardiography for assessing cause of hypotension after cardiac surgery. *Am J Cardiol* 62:1142-1143, 1988
4. Oka Y, Inoue T, Hong Y, Sisto DA, Strom JA, Frater RW: Retained intracardiac air. Transesophageal echocardiography for definition of incidence and monitoring removal by improved techniques. *J Thorac Cardiovasc Surg* 91:329-338, 1986
5. Abel MD, Nishimura RA, Callahan MJ, Rehder K, Ilstrup DM, Tajik AJ: Evaluation of intraoperative transesophageal two-dimensional echocardiography. *ANESTHESIOLOGY* 66:64-68, 1987
6. Seward HB, Khandheria BK, Oh JK, Abel MD, Hughes RW Jr, Edwards WD, Nichols BA, Freeman WK, Tajik AJ: Transesophageal echocardiography: Technique, anatomic correlations, implementation and clinical applications. *Mayo Clinic Proc* 63:649-680, 1988
7. Geibel A, Kasper W, Behroz A, Przewolka U, Meinertz T, Just H: Risk of transesophageal echocardiography in awake patients with cardiac diseases. *Am J Cardiol* 62:337-339, 1988
8. Shahmir M, Schuman BM: Complications of fiberoptic endoscopy. *Gastrointest Endosc* 26:85, 1980
9. Watts HD: Mallory-Weiss syndrome occurring as a complication of endoscopy. *Gastrointest Endosc* 22:171-172, 1976
10. Knauer CM: Mallory-Weiss syndrome. A characterization of 75 Mallory-Weiss lacerations in 528 patients with upper gastrointestinal hemorrhage. *Gastroenterology* 71:5-8, 1976
11. Welch GH, MaArdle CS, Anderson JR: Balloon tamponade for the control of Mallory-Weiss haemorrhage in patients with coagulation defects. *Br J Surg* 74:610-611, 1987
12. Laine L: Multipolar electrocoagulation in the treatment of active upper gastrointestinal tract hemorrhage. A prospective trial. *N Engl J Med* 316:1613-1617, 1987
13. Sugawa V, Fujita Y, Ideda T, Walt AJ: Endoscopic hemostasis of bleeding of the upper gastrointestinal tract by local injection of ninety-eight percent dehydrated ethanol. *Surg Gynecol Obstet* 162:159-163, 1986
14. Urbanowicz JH, Kernoff RS, Oppenheim G, Parnagian E, Billingham ME, Popp RL: Transesophageal echocardiography and its potential for esophageal damage. *ANESTHESIOLOGY* 72:40-43, 1990