
Clinical Report

Massive gastrointestinal hemorrhage after transoesophageal echocardiography probe insertion

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Purpose: To describe a case of a massive gastric bleeding following emergency coronary artery bypass surgery associated with transoesophageal echocardiographic (TEE) examination.

Clinical features: A 50-yr-old man was referred for an acute myocardial infarction and pulmonary edema (Killip class 3). Twelve hours after his myocardial infarction, he was still having chest pain despite an *iv* heparin infusion. Coronary angiography revealed severe three-vessel disease with multifocal stenosis of the left anterior descending, circumflex and total occlusion of the right coronary artery. The patient was transferred to the operating room for emergency coronary artery bypass graft surgery. After total systemic heparinization ($3 \text{ mg}\cdot\text{kg}^{-1}$) was obtained for cardiopulmonary bypass, a multiplane TEE probe was inserted without difficulty to monitor myocardial contractility during weaning from CPB. During sternal closure, the TEE probe was removed and an orogastric tube was inserted with immediate drainage of 1,200 ml red blood. Endoscopic examination demonstrated a mucosal tear near the gastro-oesophageal junction and multiple erosions were seen in the oesophagus. These lesions were successfully treated with submucosal epinephrine injections and the patient was discharged from the hospital eight days after surgery.

Conclusion: This is a report of severe gastrointestinal hemorrhage following TEE examination in a fully heparinized patient. This incident suggests that, if the use of TEE is expected, the probe should preferably be inserted before the administration of heparin and the beginning of CPB.

Objectif : Décrire un cas de gastrorragie survenue après un pontage aortocoronarien et associée à un examen par échocardiographie transoesophagienne (ETO).

Aspects cliniques : Un homme de 50 ans a été admis à l'hôpital pour un infarctus aigu du myocarde et un oedème pulmonaire (classification de Killip : 3). Douze heures après l'infarctus, il éprouvait toujours des douleurs thoraciques malgré une perfusion intraveineuse d'héparine. La coronarographie a montré une maladie tritronculaire sévère qui se manifestait par une sténose multifocale de l'artère interventriculaire antérieure, de l'artère auriculo-ventriculaire et l'occlusion totale de l'artère coronaire droite. Le patient a été transporté à la salle d'opération pour un pontage aortocoronarien d'urgence. Après que l'héparinisation générale totale ($3 \text{ mg}\cdot\text{kg}^{-1}$) a été obtenue pour la circulation extracorporelle, une sonde d'ETO multiplan a été facilement introduite pour contrôler la contractilité du myocarde pendant le sevrage de la CEC. Pendant la fermeture sternale, on a retiré la sonde d'ETO et on a inséré un tube orogastrique pour un drainage immédiat de 1 200 ml de sang rouge. L'examen endoscopique a démontré une dilacération près de la jonction oeso-gastrique et de multiples érosions ont été visualisées dans l'oesophage. Ces lésions ont été traitées avec succès par des injections sous-muqueuses d'épinéphrine et le patient a quitté l'hôpital huit jours après la chirurgie.

Conclusion : Nous avons rapporté le cas d'une hémorragie gastro-intestinale sévère survenu à la suite d'une ETO chez un patient complètement héparinisé. Cet incident permet de présumer que, dans le cas où on pense utiliser l'ETO, la sonde devrait, de préférence, être introduite avant l'administration d'héparine et le début de la CEC.

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TRANSOESOPHAGEAL echocardiographic examination (TEE) is a widely used monitoring procedure during cardiac surgery.¹ Daniel *et al.*² published an overall complication rate of 0.18% in 10,419 diagnostic procedures performed on awake and asleep patients undergoing TEE examination. Major upper gastrointestinal complications following TEE examination in cardiac surgery³⁻⁶ or vascular surgery⁷ have rarely been described. We present a case of a massive gastric bleeding following emergency coronary artery bypass surgery (CABG) when the TEE probe was introduced after complete systemic heparinization for cardiopulmonary bypass (CPB).

Case Report

A 50-yr-old man was referred to our institution for an acute myocardial infarction with pulmonary edema (Killip class 3). Medical history was remarkable for coronary artery disease associated with a myocardial infarction in 1996. Two years previously, he had been treated by percutaneous coronary dilatation of the right coronary and the circumflex artery. The patient had no symptoms of gastrointestinal disease or coagulopathy. He had no allergies and was not taking any medications before admission. More than 12 hr after his myocardial infarction, he was still having chest pain despite an *iv* heparin infusion. Emergency cardiac catheterization was performed and revealed severe three-vessel disease with multifocal stenosis of the left anterior descending and circumflex arteries, and total occlusion of the right coronary artery. The end diastolic pressure of the left ventricle was around 40 mmHg. Therefore an intra-aortic balloon pump was inserted and the ventriculography was not performed. The presence of 2/4 mitral insufficiency was also documented. The preoperative haemoglobin concentration was 138 g·l⁻¹ and there were signs of moderate pulmonary oedema on the chest X ray. The intra-aortic balloon pump was in good position. The patient was then transferred to the operating room for an emergency coronary artery bypass graft surgery.

Along with standard monitoring, intravascular arterial and pulmonary artery catheters were inserted using local anaesthesia. The patient was stable with an arterial pressure of 110/70 mmHg and a pulmonary artery pressure of 43/26 mmHg. Anaesthesia was induced with 160 µg sufentanil, 4 mg midazolam and muscle relaxation was achieved with 10 mg cisatracurium. An infusion of norepinephrine and nitroglycerine was started following anaesthetic induction to maintain the systemic arterial pressure and to decrease the pulmonary artery pressure. After the anaesthetic induction, a bolus of 2 m units aprotinine was given followed by an infu-

sion of 50,000 KIU·hr⁻¹. Before CPB commenced, a bolus of 3 mg·kg⁻¹ (290 mg) heparin was given to raise the activated coagulation time (ACT) to 726 sec. After the heparin was given, a multiplane TEE probe (Aloka SSD-2200, Tokyo, Japan) was positioned without difficulty for monitoring myocardial contractility during weaning from CPB. The CPB lasted for 85 min and the weaning was done with the help of norepinephrine and nitroglycerine. After weaning, TEE examination was performed with transoesophageal two- and four-chamber views as well as a transverse transgastric view with minimal antelexion of the probe. We identified moderate mitral insufficiency measured from colour Doppler flow mapping, as well as an inferior and inferolateral akinesis. The ejection fraction was estimated at 45%. After CPB, 290 mg protamine were given to reverse heparin. During sternal closure, the TEE probe was removed and an orogastric tube was inserted with immediate drainage of 1,200 mL red blood. Haemodynamic status was stable at the time of TEE probe removal. The patient was treated with iced saline gastric lavage and two units of red packed cells were transfused. After haemodynamic stabilization, endoscopic examination demonstrated active bleeding in the posterior aspect of the stomach. A mucosal tear was seen near the oesophago-gastric junction and multiple erosions were seen in the oesophagus. These lesions were successfully treated with submucosal epinephrine injection and the patient was discharged from the hospital eight days after surgery.

Discussion

We report a case of gastrointestinal bleeding associated with the insertion of a TEE probe after total systemic heparinization was obtained for CPB. The use of TEE during cardiac surgery may create a risk of bleeding from gastro-oesophageal sites because high doses of heparin are given and coagulopathy may occur after CPB. Moreover, it has been suggested that insertion of the TEE probe with the patient asleep may predispose to GI bleeding because the patient cannot assist with probe insertion by swallowing or resist when insertion does not proceed easily.³ Mucosal folds may be exaggerated because of the laxity of the oropharyngeal musculature from the neuromuscular blocking drugs, potentially increasing the risk of the probe lodging in a mucosal fold. An attempt to advance the probe in this situation can lacerate soft tissue and produce a false passage.³ Although pharyngeal^{3,6} and oesophageal^{4,5,7} injury following TEE examination in cardiac or vascular surgery have been described, this is the first report of massive gastrointestinal bleed associated with a TEE probe being inserted in a patient fully heparinized for cardiopulmonary bypass.

Although 90% or more of patients with Mallory-Weiss tears can be managed with appropriate blood component replacement,⁵ the continued bleeding encountered in our patient was successfully treated with submucosal epinephrine injection. Balloon tamponade, multipolar electrocoagulation and endoscopic alcohol injections have also been advocated as therapeutic options for nonsurgical control of continued bleeding.⁵ The most serious complication is perforation, which, if undetected, has a high risk of mortality from bleeding or mediastinal infection. The treatment of a patient with perforation includes 1) localization of the site of perforation, 2) early surgical intervention, 3) antibiotic therapy, 4) NPO regimen with total parenteral nutrition and gastric drainage via nasogastric tube, and 5) radiological testing for a fistula originating from the site of perforation before reinstating oral nutrition.⁶

Norton *et al.*,⁸ in a study of 10,573 patients, identified the following risk factors for postoperative gastrointestinal bleeding following cardiac surgery: positive history for peptic ulcer, advanced age, the use of inotropic support and the absence of preoperative histamine-2 receptor antagonist use. The authors also identified duodenal ulcer as the most frequent cause of postoperative gastrointestinal (GI) bleeding. Others have identified long CPB time, emergency cardiac surgery and reoperation as risk factors for GI complications of all types.⁹ The use of preoperative anticoagulation as a contributing factor for the development of postoperative GI bleeding has been suggested. Hulyalkar *et al.*¹⁰ did not demonstrate any increase in the incidence of bleeding associated with the use of TEE in cardiac surgery.

Our patient had some risk factors for gastrointestinal bleeding (inotropic support, absence of preoperative histamine-2 receptor antagonist use, emergency cardiac surgery and preoperative anticoagulation).⁸⁻¹⁰ In addition, the TEE probe was inserted while he was fully heparinized for CPB. In the light of the endoscopic findings in this patient, we believe that the gastroesophageal tears were caused by the TEE probe.

The nasogastric tube placement may have contributed to the gastrointestinal bleed, but the magnitude of this potential contribution is difficult to assess. Except for the mucosal tear near the oesophagogastric junction and multiple erosions in the esophagus, no other lesions were found during the endoscopic examination. Given that the insertion of the nasogastric tube at the end of surgery was uneventful and the nasogastric tube drained 1200 mL of red blood within seconds, we believe that the oesophagogastric lesions were present before its insertion. The insertion of the TEE probe is a more likely explanation for the mucosal tears.

Finally, most reported cases of gastrointestinal complications associated with intraoperative TEE examination were described for valvular disease surgery^{4,5} and in patients with low ejection fraction.⁷ It is possible that the elevated venous pressure often seen with valvular diseases causes venous engorgement of the oesophageal mucosa with a propensity to mechanical trauma by the TEE probe. In this case, the moderate mitral insufficiency and cardiac failure could have played the same role, providing an elevated pressure to venous filling. The apparent higher incidence of GI bleeding in valvular pathology may only reflect the frequent use of TEE in this population.

Although safe, intraoperative TEE is not innocuous. If a tear is produced by the probe, systemic heparinization will interfere with the normal process of coagulation at the level of the mucosal trauma causing a severe gastrointestinal bleeding. These complications are unusual but are avoidable. Therefore, some rules should be followed. Firstly, any contraindications for the TEE probe insertion must be identified. These include oesophageal obstruction (cancer, web, stricture, ring), active gastrointestinal bleeding, perforated viscus, oesophageal diverticulum, profound oropharyngeal distortion, past-oropharyngeal surgery.¹¹ The presence of oesophageal varices is a relative contraindication.¹¹ The probe must be well lubricated and gently inserted. It should not be left in the locked position or manipulated in this position. When a patient has received a large dose of heparin, the anesthesiologist should evaluate the possibility of gastrointestinal bleeding especially if other risk factors can be identified. As a result of this incident, we suggest that, if the use of TEE is expected, whenever possible the probe should be inserted before the administration of heparin and the beginning of CPB. However, TEE may be required urgently after heparinization or during post-pump coagulopathy, and in this setting, the risk of haemorrhage may have to be accepted.

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