Hypopharynx Perforation by a Transesophageal Echocardiography Probe

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TRANSESO EphAGEAL echocardiography (TEE) generally is considered a low-risk procedure. Major complications occur in approximately 0.2%; mortality is reported as 1 in 3,827 and 1 in 10,218 examinations, respectively. These fatal complications were due to unspecified respiratory problems and massive bleeding from a malignant lung tumor penetrating into the esophagus. To the best of our knowledge, perforation along the orogastric pathway (hypopharynx, esophagus, stomach) by TEE probe has not been described in the literature so far. We report a case of hypopharynx perforation by TEE probe with special emphasis on treatment and future prevention.

Case Report

A 75-yr-old woman with unstable angina was scheduled for emergency coronary artery bypass graft surgery. Cardiac catheterization revealed a 95% stenosis of the left main coronary artery and a 95% stenosis of the right coronary artery. A triple coronary artery bypass was planned.

After monitoring radial arterial pressure, five-lead echocardiogram, and peripheral oxygen saturation by pulse oximetry, anesthesia was induced with fentanyl (11 μg/kg), fentanyl (5.5 μg/kg), and pancuronium (0.15 mg/kg). Endotracheal and gastric tubes were inserted without difficulties. Mean arterial pressure decreased, a significant ST-segment depression occurred in echocardiogram lead V5, and repetitive doses of phenylephrine (1 μg/kg each) were given. For further monitoring, a triple-lumen central venous catheter and a pulmonary artery catheter were inserted. The operation was begun and, because of still unstable hemodynamics, cardiopulmonary bypass was instituted immediately after sternotomy and cannulation of the aorta and the right atrium. Meanwhile, a second surgical team prepared the saphenous vein. On both legs, only two short segments of suitable saphenous veins were found. Because of the small caliber, the internal mammary arteries also were considered unsuitable bypass vessels. Thus, only the right coronary artery and the left anterior descending coronary artery could be grafted. Therefore, we decided to use TEE to monitor global cardiac function and, in particular, regional wall motion in the area of myocardium supplied by the left circumflex coronary artery. Inserting the TEE probe proved difficult. Elevating the mandible did not permit insertion of the probe into the esophagus, and the laryngoscope could not be used, because at our institution, the head of a patient undergoing cardiac surgery is placed under a cage-like construction that leaves only an approximately 2.2-4.4-cm space around the head in the oral area. After several attempts to advance the TEE probe gently, we suddenly were able to advance the probe; however, instead of having advanced the TEE probe into the esophagus, the TEE probe was protruding into the operating field from the upper mediastinum (fig. 1). The TEE probe was withdrawn, and a drain was advanced from the operating field into the perforation channel. This drain was exteriorized in the right pectoral area beside the incision of the sternotomy. Antibiotic therapy with vancomycin (initial dose 22.2 mg/kg) and imipenem (initial dose 9.2 mg/kg) was begun. The patient was separated from the cardiopulmonary bypass without electrocardiographic evidence of myocardial ischemia. The remainder of the operation was uneventful, and the sternum was closed in the normal manner.

Fig. 1. Transesophageal echocardiography probe (TEE) lying on the heart after hypopharynx perforation.

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An otolaryngologist was consulted to localize the exact site of perforation by rigid hypopharyngoscopy and to decide whether a local repair would be necessary. A highly stenotic entrance of the esophagus (diameter 3 mm) was found, which was caused by a massive hypertrophy of the cricopharyngeal muscle. Due to this stenosis, the hypopharynx was enlarged, but a classic Zenker's diverticulum could not be found. The perforation was localized on the left side of the hypopharynx 2.2 cm proximal to the cricopharyngeal muscle (fig. 2). The otolaryngologist decided to surgically close the defect, and the patient was brought back to the operating room.

Approximately 4 h after the perforation, the esophagus and the hypopharynx were exposed via a lateral cervicotomy on the cricoid level, and a myotomy of the cricoid muscle was performed. The perforation was sutured by an inverting method. To avoid a connection between the cervicotomy and the sternotomy, the previously placed drainage, which was advanced into the perforation channel, was shortened, and the cervicotomy was drained by an additional drainage, exteriorized at the neck. Postoperatively, the rigid hypopharyngoscopy was repeated and revealed an open passage to the esophagus and a closed perforation site.

The patient was retransferred to the cardiopulmonary intensive care unit in stable condition. Antibiotic therapy was continued with vancomycin, dosed according to plasma concentrations (before administration 3–10 mg/L, after administration 40–50 mg/L), and imipenem (9.2 mg/kg four times daily). The evening of the operations, the husband of the patient was informed. He also was interviewed on the swallowing habits of his wife. We learned that the patient had significant swallowing problems during the last 20 yr, so significant that her diet was almost totally fluid nutrients.

The trachea was intubated the first postoperative day, and the patient was informed about the events of the previous day. She confirmed the significant swallowing problems during the last 20 yr. Intravenous antibiotic therapy was continued, the drainages were shortened by 1.1 cm daily, the gastric tube was left in situ, and the patient was not allowed to eat or drink (NPO). Hence, total parenteral nutrition was begun. Under this regimen, the patient remained essentially afebrile despite a considerable elevation of the leukocyte count (11,000·mm\(^{-3}\)) and C-reactive protein (200 mg/dl). On postoperative day 4, the patient was transferred to the regular cardiosurgical ward. Total parenteral nutrition, antibiotics, and NPO were continued.

On postoperative day 11, a radiologic contrast agent swallow examination was performed. During this examination, the patient aspirated some contrast agent and coughed heavily. On postoperative day 12, a significant subcutaneous emphysema was detected. A computed tomography scan of the neck and upper thorax was performed to determine the extent of the emphysema. The computed tomography scan revealed that the emphysema was restricted to the neck; no penetration into the mediastinum was detected.

The NPO regimen with unchanged antibiotic therapy was continued, pending spontaneous closure of the air leakage. Three days after the cervical emphysema had disappeared, a second radiologic contrast agent swallow study was performed (postoperative day 19). No fistula could be found, and the patient was allowed to start eating small portions of soft food under the assistance of a specially trained swallow therapist. Antibiotic therapy was discontinued, and infectious parameters remained low. On postoperative day 21, the patient aspirated considerable amounts of food into the trachea, and significant bilateral aspiration pneumonitis developed. The aspiration pneumonitis was treated with intense pulmonary physiotherapy and intravenous antibiotics (vancomycin and imipenem). Infectious parameters were continuously decreasing, and the antibiotic therapy was stopped on postoperative day 31. The patient was discharged from the hospital on postoperative day 49. Six months after the operation, no signs of late infections have occurred.

**Discussion**

Perforations along the orogastric pathway during fiberoptic gastroscopy occur with a rate of 1 in 3,020 to 1 in 12,644.\(^{3,4}\) Twenty percent of these perforations occur in the hypopharynx, 40% in the esophagus, 5% in the stomach, and 35% in the duodenum.\(^{4}\) Therefore, esophageal stricture, tumor, varices, diverticulum, esophageal interruption, and recent suture lines are considered absolute contraindications for the insertion of a TEE probe.\(^{6}\) Significant swallowing problems can be regarded as indirect evidence for narrowing of the orogastric pathway and thus may be regarded as an additional, absolute contraindication to insertion of a TEE probe. Therefore, it is suggested that patients in whom TEE monitoring is planned be questioned as to swallowing difficulties, even in emergency situations.

The treatment of a patient after a perforation with a TEE probe includes (1) exact localization of the site of perforation, (2) probable surgical intervention, (3) immediate and aggressive antibiotic therapy, (4) NPO regimen with total parenteral nutrition and gastric drainage *via* nasogastric tube, and (5) radiologic testing for a fistula originating from the site of perforation before reinitiating oral nutrition. Early surgical repair may improve prognosis. In a large survey of more than

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**Fig. 2. Perforation site (PS) in the left lateral hypopharynx. For better orientation, the following structures were labeled: laryngoscope (LS), larynx (Lx), endotracheal tube (ETT), and orogastric tube (OGT).**

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250,000 fiberoptic gastroscopies, a 10% mortality was observed in surgically treated perforations as compared to 37% in medically treated perforations, and mortality decreased from 56% to 0% when intubation-related esophageal perforations were treated by early (less than 12 h) surgical intervention.

Surgical intervention includes the local repair at the site of perforation and, most importantly, the separation of the perforation site at the neck and the primary site of operation, the mediastinum. This separation of operation fields is of prime importance, because it increases the chances that a potential infectious process may be limited to the neck rather than expanding into the mediastinum.

The NPO regimen until radiologic confirmation of consolidation of the local repair and absence of a fistula originating from the site of perforation is important, because penetration of food particles into a fistula could induce major infectious complications.

Interviewing patients on swallowing difficulties can alert the anesthesiologist to a yet unknown narrowing of the orogastric pathway and potentially prevent future perforations by TEE probes. Also, inserting the TEE probe under direct vision using the laryngoscope is advisable should resistance be encountered at the initial attempt of blind insertion of the TEE probe.

REFERENCES


**Early Thrombus Formation on Heparin-bonded Pulmonary Artery Catheters in Patients Receiving Epsilon Aminocaproic Acid**

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ADMINISTRATION of antifibrinolytic drugs to prevent bleeding has become an increasingly widespread prac-

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... and the rapid formation of thrombus on a heparin-bonded pulmonary artery catheter after aprotinin administration. To date, no reports have described this complication in association with the synthetic antifibrinolytics (*i.e.*, epsilon aminocaproic acid and tranexamic acid). We describe two recent cases during which large thrombi were detected on heparin-bonded pulmonary artery catheters shortly after administration of epsilon aminocaproic acid and the subsequent precautions we have taken to minimize the risk of this complication recurring with the administration of antifibrinolytic therapy.