

## CURRENT COMMENT AND CASE REPORTS

CURRENT COMMENT is a section in ANESTHESIOLOGY in which appears invited and unsolicited professional and scientific correspondence, abbreviated reports of interesting cases, material of interest to anesthesiologists reprinted from varied sources, brief descriptions of apparatus and appliances, technical suggestions, and short citations of experiences with drugs and methods in anesthesiology. Contributions are urgently solicited. Editorial discretion is reserved in selecting and preparing those published. The author's name or initials will appear with all items included.

### THE ANESTHETIC MANAGEMENT AND PROBLEMS IN THE CLOSURE OF A TRAUMATIC TRACHEO-ESOPHAGEAL FISTULA IN AN ADULT (CASE REPORT)

Anesthesia for operative procedures to repair tracheo-esophageal fistulas is an interesting and stimulating problem to the anesthesiologist. Previous to the case reported here my experience had been confined to the congenital type of tracheo-esophageal fistula in infants, with repair attempted under local anesthesia, supplemented with ether and oxygen by an open technic. The congenital cases present individual problems but, generally speaking, the following complications are encountered:

1. The patient's nutrition is poor as a result of conservative procedures tried over a prolonged period before operation is proposed. During this time the patient is able to take little or no nourishment by mouth. It is very difficult to maintain normal nutrition by other than the oral route even when a gastrostomy has been done.

2. Usually inflammatory processes are present in one or both lungs owing to the passage of food through the fistula into the trachea and bronchi.

3. Mediastinitis is present as a result of direct extension of infection from the site of the fistula. This was formerly one of the most formidable problems, but the use of penicillin may minimize its importance in the future. Certainly in the case reported here mediastinitis was not a major difficulty.

4. There is mechanical interference with the administration of an anesthetic because of the location of the fistula. In other words, the fistula is sometimes so far distal

in the trachea that an intratracheal tube cannot be introduced past the opening without entering a main bronchus and thus shunting off the other lung. This is not an insurmountable situation but if the lung that is being kept inflated is the site of an inflammatory process, it is difficult to prevent anoxia.

5. Hemorrhage may occur at the site of repair, and blood may drain into the bronchi with resultant interference with respiratory exchange. Frequently, the edges of the fistula are friable and bleed at the slightest trauma.

#### REPORT OF CASE

On December 12, 1944, the patient, a Negro male aged 18 years, was admitted because of a crushed chest. Thirty minutes before admission, a 700 pound crate fell and crushed the patient against the ship's deck.

The patient was well developed but in evident shock. Pulse was 100, respiration 32, blood pressure 90 mm. systolic and 50 mm. diastolic, and he was quite dyspneic. The neck was swollen, heart sounds distant, and the mediastinum had shifted to the right. The tentative diagnosis was pulmonary emphysema and cardiac tamponade. He was placed in an oxygen tent and given 500 cc. of plasma.

December 13 the dyspnea was worse. Tracheotomy was done under local anesthesia. Pretracheal tissues were distended with air. Blunt dissection with the finger toward the mediastinum released more air.

Dyspnea was markedly relieved but any fluid taken by mouth came out through tracheotomy opening, so all fluids by mouth were stopped. Penicillin, 20,000 units every three hours, was started. Temperature was 100, pulse 98, respiration 20, and blood pressure 120 mm. systolic and 65 mm. diastolic. December 14 the left chest anteriorly was dull to percussion and bronchial breathing was heard in the upper half. December 17 the temperature was 99.2, pulse 98, and respiration 46. The patient constantly coughed up mucopurulent material through the tracheotomy tube. He had much pain in the left chest and had moist rales over most of the left chest. The roentgenologist reported that the tracheotomy tube was in place. The markings of the right upper lung field appeared to be somewhat increased in the manner of feathery infiltration. There was some increase in the mediastinal width near the superior sulcus on the left. This had an accurate border curving out above the apex of the left lung, suggestive of pleuro-mediastinal collection of fluid high on the left. No definite evidence of rib fracture was seen on either side. December 20 the patient's general condition had improved. He had a slight amount of crepitation in the submental and hyoid regions. The tracheotomy tube was removed. He was able to breathe through the upper respiratory passages, but anything taken by mouth entered the trachea. December 22 he had severe coughing bouts with discharge of mucopurulent material through the tracheotomy wound. The following day a Levine tube was passed through the nose to the stomach without difficulty. Continuous drip of milk and water was started. December 24 the roentgenologist reported that there appeared to be some slight infiltration or consolidation in the left lower lobe obscuring the diaphragm, which may represent pneumonia in this region. There was apparently a very small localized radiolucent shadow on the right side suggesting an oval localized pneumothorax in this region. December 27 the temperature, pulse and respiration were normal, but he was still bothered with coughing. December 31 gastrostomy was done under local anesthesia to permit more liberal feedings. January 4, 1945, the patient felt much bet-

ter, but he still had an annoying cough. January 17 to February the patient took small amounts of fluids and solids by mouth but this was often followed by severe coughing. On fluoroscopic examination February 5 it was noted that whenever the patient swallowed barium, violent fits of coughing were started. There appeared to be some widening of the esophagus in the region of the aortic arch and just below this arch at the level of the bifurcation of the trachea. Some of the fluid barium appeared in the bronchial tree fluoroscopically and radiographically but this was probably some liquid barium which had been inhaled during the fit of coughing. No definite broncho-esophageal fistula could be demonstrated. On bronchoscopic examination February 17, a small fistula opening was found at the distal end of the trachea, posterior surface, about  $\frac{3}{4}$  inch above the carina on the left side. This was surrounded by a moderate amount of granulation tissue. During quiet respiration it did not appear to be more than 1 or 2 mm. in diameter. On coughing, however, it was larger and slit shaped—possibly 3 to 4 mm. long. Its edges were touched with 20 per cent silver nitrate. Secretion drained from this into the lower bronchial tree. The patient continued to have severe paroxysms of coughing after swallowing any type of liquids or solids and seemed to be losing ground. March 20 the red blood count was 3,200,000, white blood count 8,600 and hemoglobin was 10 gm. On esophagoscopic examination March 25 a rent was plainly visible in the esophagus 22 cm. from the teeth at about 10 o'clock. There was an atrophic area around it for a short distance. It was approximately 5 mm. long and 1 mm. wide. There was no granulation tissue nor evidence of esophageal obstruction. April 1 all intake by mouth was stopped to allow cough and lung reaction to subside as much as possible before operation. Transfusions of 500 cc. of citrated blood were begun every other day. April 5 the red blood count was 3,640,000 and hemoglobin 12 gm. April 8 the esophago-tracheal fistula was excised and closed through a posterior approach. As the pleura was adherent, only the upper lobe was mobilized and retracted

anteriorly exposing the mediastinal pleura. The mediastinum was opened, the trachea and esophagus exposed, and the fistula identified and excised. One hundred thousand units of penicillin was sprayed into the pleural cavity, the lung reexpanded and the thorax was closed without drainage. Recovery was uneventful. The sutures were

removed April 15 and the gastrostomy tube April 22. The patient improved steadily and was eating a normal diet by April 27. There was no coughing or difficulty in swallowing. The penicillin was discontinued. On May 17, the patient was evacuated to Mainland hospital for further convalescence.

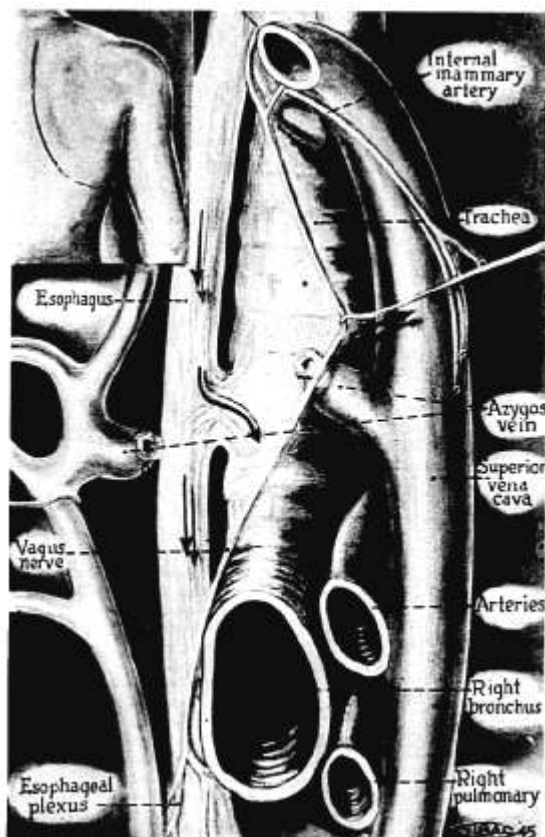


FIG. 1. Tracheo-esophageal fistula before operation.

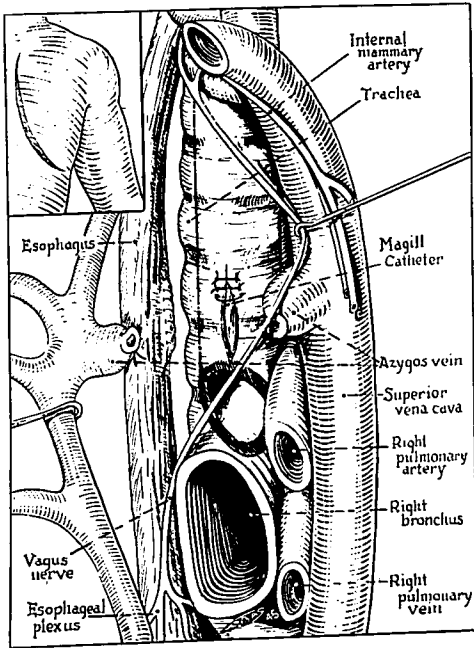


FIG. 2. Closure of the fistula, showing Magill catheter acting as a splint for suturing of the tracheal opening.

#### COMMENTS

In the case reported most of the complications mentioned previously were present. The patient's nutrition was poor because of prolonged conservative measures, despite the employment of gastrostomy feedings during that time. He had a pneumonic process in one or both lungs during part of the time when he was treated conservatively, and at operation there appeared to be mild interstitial pneumonitis in the right upper lobe.

Previous to operation there was an elevation of the temperature and it is reasonable to assume that the mediastinal involvement was contributory; however, at

operation there appeared to be little inflammation about the fistula. This favorable situation was probably the result of the prolonged massive administration of penicillin as there was less reaction than had been previously observed in infants in the pre-penicillin days.

The presence of the fistula  $\frac{3}{4}$  inch above the carina complicated the administration of the anesthetic. The use of closed technique with a Magill intratracheal tube with a balloon would have been preferable; however, the portion of the tube covered by the balloon occupied about 3 inches, so that the balloon could not be employed. Some bleeding from the fistula site during the repair was anticipated, and the inflated

balloon would have kept the blood out of the bronchial tree. The second choice was a large number 7 Magill tube, the outside diameter of which was 17 mm. This proved advantageous because it slipped easily past the fistula without causing any bleeding and was advanced to just above the carina. It filled the trachea so closely that the mucous lining of the trachea caused the edges of the fistula to adhere to the tube and there was almost no loss of gas through the fistula. In addition to this, the firm tube acted as a splint to the edges of the fistula, making it easy for the surgeon to place two layers of fine interrupted silk sutures. There was little bleeding from the closure and, as one surgical assistant had been assigned the sole job of aspirating at the site of the repair, hemorrhage into the bronchial tree was not a problem.

Because of the possibility of a gas leak through the fistula, it was decided to use nitrous oxide, oxygen and ether instead of cyclopropane. The administration of the anesthetic was routine and there were no appreciable difficulties at any time during the operation. Because of the excellent closure of the fistula the intratracheal tube was removed immediately after operation and the patient's convalescence was entirely uneventful.

#### SUMMARY

The anesthetic technic and the complications encountered in the repair of tracheo-esophageal fistulas are discussed.

The anesthetic management of the successful repair of a traumatic tracheo-esophageal fistula in an adult is reported.

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### A METHOD OF ADMINISTERING ETHER VAPOR

#### APPARATUS

The top was cut from a half pound ether can. The edge was turned down smoothly to reinforce the rim. Two  $\frac{7}{16}$  inch nipples were placed on opposite sides about  $\frac{1}{4}$  inch from the bottom of the ether can. An intratracheal tube of suitable size with any fitting was employed. A short piece of rubber tubing (1 to 2 $\frac{1}{2}$  inches) was used to join the nipple on the ether can to the fitting on the intratracheal tube. An air compressor or gas machine with the ether bottle on the intake side of the absorber was used. An aspiration catheter and suction were employed to aspirate secretions from the trachea.

#### TECHNIC

Induction may be accomplished by the open drop method until the reflexes of the pharynx and larynx have been abolished. At this point an intratracheal tube is inserted.

The use of a Macintosh laryngoscope simplifies the procedure. If anesthesia is maintained in plane two for five to fifteen minutes, it may be lightened to upper plane one without causing spasm or cough-

ing. The can acts as a resonance box and respiration may be observed by placing the ear near the can. Ether vapor is heavier than room or expired air and occupies the bottom of the can; inspiration pulls the mixture from the bottom of the can into the lungs. Expired air is warmer and lighter and rises rapidly to spill over the top of the can into the room. There is very little rebreathing, and breathing and anesthesia are easily controlled by regulating the flow of ether from the machine. The anesthetist may increase the concentration of carbon dioxide by placing the hand over the top of the ether can for a minute or two, the only indication being when it is desirable to shift anesthesia from a higher to a lower plane rapidly. In cases in which swelling, inflammation or tumors obstruct the airway to a degree where induction of anesthesia may be considered dangerous, tracheotomy may be done, with local infiltration, and an intratracheal tube inserted through the tracheotomy opening. A few drops of 0.5 to 1 per cent solution of pontocainé dropped through the opening into the trachea will usually control coughing so that the tube will not produce spasm when inserted through the tracheotomy opening. Gen-