Right upper lobectomy in a patient with an iatrogenic tracheo-oesophageal fistula after laryngectomy

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Summary
A patient with a tracheostomy and an iatrogenic tracheo-oesophageal fistula presented for diagnostic bronchoscopy and right upper lobectomy. The anaesthetic management is discussed with reference to the options available and, in particular, the use of a Brompton Pallister single lumen endobronchial tube. (Br. J. Anaesth. 1995; 74: 461-463)

Key words
Anaesthesia, otolaryngological. Complications, fistula.

Thoracotomy and a right upper lobectomy in a patient with a tracheostomy and an iatrogenic tracheo-oesophageal fistula is very rare. We describe the management of the airway and the provision of one lung anaesthesia in such a patient.

Case report
A 58-yr-old man with an isolated 1.5-cm mass in the anterior segment of the right upper lobe presented for bronchoscopy and probable right upper lobectomy. The patient had been treated previously with radiotherapy and total laryngectomy for spindle cell carcinoma of the larynx in 1991. An iatrogenic tracheo-oesophageal fistula had been created and maintained with a Blom Singer valve enabling the patient to speak with an "oesophageal voice" [1]. During a routine follow-up, a chest x-ray revealed that there was a small lesion in the right upper lobe, although he was otherwise in good health. He was receiving no medication. The proposed anaesthetic and surgical procedures were explained. Pre-medication comprised temazepam 20 mg orally.

In the anaesthetic room a cannula was inserted into a suitable vein and an ECG, arterial pressure cuff and a pulse oximeter were attached. The patient breathed humidified oxygen-enriched air through a tracheostomy mask. Additional sedation was produced with a combination of fentanyl 100 μg, droperidol 1.0 mg and midazolam 2.0 mg i.v. The trachea was anaesthetized using 10% lignocaine spray (Astra Sweden). A cuffed size 10 Portex tracheostomy tube was introduced without difficulty, connected to a breathing system and confirmed to be in the correct position. Anaesthesia was induced with thiopentone 150 mg and vecuronium 10 mg, and maintained with nitrous oxide and isoflurane in oxygen. The Blom Singer valve was removed and a size 16 nasogastric tube was passed and used to keep the stomach decompressed and to remove any gastric secretions. Bronchoscopy was performed through the tracheostomy tube using a flexible fibreoptic LFI Olympus bronchoscope with an airtight seal. No abnormalities were found and it was decided to proceed with a thoracotomy.

The lungs were hyperventilated with oxygen and isoflurane before the tracheostomy tube was removed. A size 9 Brompton Pallister single-lumen endobronchial tube [2], mounted on a rigid Storz Hopkins (10326F) intubating bronchoscope, was introduced without difficulty under direct vision (fig. 1). An airtight seal was made by inflating the tracheal cuff and the position of the tube confirmed by auscultation, capnography and fibreoptic bronchoscopy. The tube was secured firmly.

An arterial cannula was inserted. The patient was placed in the left lateral position and the position of the endobronchial tube confirmed. Additional monitoring included inspired oxygen concentration, spirometry, inflating pressure and a disconnect alarm.

One lung anaesthesia was produced by inflating the endobronchial cuff and the operation was completed without any difficulties. During the procedure, morphine 10 mg i.v. was given. At the end of the procedure, intercostal blocks were performed under direct vision using 0.5% bupivacaine 10 ml. Two underwater seals were introduced and surgery completed.

The patient was returned to the supine position, the endobronchial tube was removed and replaced by a size 10 Portex tracheostomy tube. Neuro muscular block was antagonized and the patient transferred to the recovery room. Further analgesia was provided by i.v. morphine delivered by patient-controlled analgesia (PCA).

Postoperative management in the high dependency unit was unremarkable except for a greater than average blood loss which required insertion of a central venous pressure (CVP) catheter. Blood loss...
was replaced and low-dose dopamine administered. There were no other complications and the patient was discharged 2 weeks later.

Discussion

The main anaesthetic objectives were to optimize airway control and provide one lung anaesthesia (OLA). The tracheostomy tube was introduced under sedation and local anaesthesia. This permitted fibreoptic bronchoscopy which enabled the surgeon to assess the operability of the lung tumour. There were no contraindications and it was decided to proceed to thoracotomy and probable right upper lobectomy. The surgeon expressed a desire for a "quiet", that is a totally collapsed, right lung.

There are several anaesthetic techniques available and these are discussed briefly. The tracheostomy tube could have been used throughout the procedure. However, this would neither allow the use of OLA nor would it prevent possible contamination of the dependent lung. In addition, surgery would have to be performed with the non-dependent lung ventilated intermittently. A single lumen tracheal tube could have been used. When OLA was required the tube could have been advanced with the aid of a flexible fibreoptic bronchoscope into the left main bronchus. When two lung anaesthesia was again required, the tube would be simply withdrawn. These manoeuvres would have to be performed in a patient with a permanent tracheostomy in the left lateral position. There would be two major dangers: the relatively large cuff could have obstructed the left upper lobe bronchus and the tube could have slipped out of the trachea during the withdrawing manoeuvre. These possible risks were considered unacceptable.

A combination of a single-lumen tracheal tube and a bronchus blocker could have been used. The bronchial blocker could have been placed in the right main bronchus and OLA provided when appropriate. The traditional Vernon Thompson [3] or Magill blockers [4] are no longer available. More recently, both Foley [5] and Fogarty [6] catheters have been used. All of these catheters should be placed under direct vision, but are difficult to fix and have a tendency to become displaced during positioning, coughing or surgical manipulation. Consequently, the use of such bronchial blockers has decreased considerably.

However, the theory behind the combination is sound and thus, modern design and technological advances have produced similar combinations constructed of polyvinyl chloride (PVC). This material also produces less mucosal damage than tubes made from the traditional red rubber, particularly during prolonged intubation [7].

The best known combination is the Univent tube [8–10]. In essence a tracheal tube is introduced into the trachea in the first instance. When OLA is required, the “movable bronchial blocker” is introduced through the wall of the tracheal tube into the bronchus of the lung which is to be collapsed. The manoeuvre can be accomplished blindly but most anaesthetists who use these tubes recommend that the blocker is advanced under direct vision using a fibreoptic bronchoscope. Indeed, not only have these blockers been used to completely collapse the diseased lung but also have been placed so accurately that single lobes have been isolated. The anaesthetist must remember however to withdraw the blocker before the surgeon applies a stapling gun to the bronchus. Such accidents have caused difficulties with subsequent extubation [11]. Another disadvantage is that should any untoward event occur immediately after bronchial stapling or suturing, for example if an air leak develops, it is virtually impossible to produce OLA. However, if all goes well, the blocker is simply withdrawn into the body of the tracheal tube at the end of surgery.

The second combination in the “Nazari” tube [12]. This tube is similar to an open-ended co-axial system. The outer tube is a standard oral tracheal tube. A smaller well lubricated tube is inserted inside the tracheal tube. When OLA is required, the inner tube is advanced into the appropriate bronchus and the cuff inflated. There is a special adaptor on the right-sided inner tube to prevent possible obstruction to the right upper lobe bronchus. The proximal connectors (the Y piece) allow for selective lung ventilation. The position of the inner tube is confirmed using the usual methods.

There is a major difference between the two combinations. The inner tube of the Univent system blocks off the lung (or lobe) which requires surgery while the inner tube of the Nazari tube allows selective ventilation of the lung which is used for OLA. Both of these combinations depend on several
factors, the main one being that the essential component is a tracheal tube introduced into the trachea through the mouth. The main tracheal cuff may cause problems similar to those discussed earlier. Finally, these tubes are not easily available in the United Kingdom and, therefore, there is probably limited experience with their use in clinical practice.

Simpson reported the use of a Robertshaw double-lumen tube in a patient with a tracheostomy who required a thoracotomy [13]. The anticipated problems with a double-lumen tube were passage via the tracheostomy and the position of the tracheal cuff. In Simpson’s report, the tracheal cuff was just wedged at the stoma but not inflated. This problem may also have been solved by the ultra-short double-lumen tracheostomy tubes (Rüsch & Co., Ltd).

The Brompton Pallister single-lumen endobronchial tube was chosen as it could be introduced easily under direct vision into the left main bronchus using the modern rigid fibreoptic intubating bronchoscope. This single-lumen tube is easily recognized as it has three pilot tubes and three cuffs. The proximal cuff “anchors” the tube in the trachea. The two other cuffs overlay each other so that if the first is accidentally damaged, the one underneath can be inflated. In addition, the tracheal and bronchial cuffs are smaller than those in tracheal or double-lumen endobronchial tubes. The larger single lumen also enables easy passage of a fibreoptic bronchoscope to confirm position and can facilitate ventilation of both lungs or, in this case, the left lung when required. In addition, it was easy to fix under the prevailing circumstances. The disadvantage was that it would not totally prevent possible contamination of the dependent lung. In the event, this somewhat unusual choice was found to produce clinically safe OLA.

Finally, the reinsertion of the tracheostomy tube at the end of operation protected the airway for a subsequent 24 h when it was removed. In addition, it allowed controlled oxygen therapy and efficient physiotherapy. After it was removed, the Blom Singer valve was replaced.

It is our usual practice to site a central venous catheter via the internal jugular on the same side as the non-dependent lung. This was not undertaken because of previous radiotherapy to the neck. Furthermore, the patient requested that, if possible, his right arm should not be used for access for any monitoring as he used his right hand to obstruct his Blom Singer valve during phonation. We therefore agreed to use his left arm only for venous and arterial catheters. Retrospectively, this proved to be an error as prolonged bleeding required a CVP catheter introduced through the left brachial vein for monitoring pressures and administration of dopamine.

It is possible that similar cases may present in the future. Most anaesthetists would agree that such surgery should occur in thoracic centres. The management of such cases depends on both the experience of the anaesthetist and the equipment available.

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References