Repeated inadvertent endobronchial intubation during laparoscopy

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Inadvertent endobronchial intubation occurred twice during laparoscopic surgery, with two different causes. Radiography was the only means of definitive diagnosis.

Keywords: complications, intubation endobronchial; surgery, laparoscopy

Accepted for publication: April 2, 2003

Unintentional endobronchial intubation is a common critical incident during anaesthesia. Once diagnosed, it should be easy to remedy. We report a case where direct laryngoscopy and bronchoscopy apparently excluded endobronchial intubation, although head and neck extension during these procedures probably moved the tip of the tracheal tube.

Case report

A 46-yr-old lady was to have a laparoscopy for ovarian cystectomy. She was moderately obese, but of normal height. Anaesthesia was induced with propofol and vecuronium given to obtain neuromuscular block. The trachea was intubated with a size 8.0-cuffed Portex tracheal tube, which was tied in place. The tube was 22 cm at the teeth. Correct tube position was confirmed with capnography and auscultation in the axillae. The patient was placed in the lithotomy position with approximately 10° of head down tilt to aid peritoneal insufflation for laparoscopy. Ten minutes after carbon dioxide insufflation of the peritoneal cavity to 16 mm Hg, it was noted that the peak airway pressure increased from 26 cm H2O to greater than 40 cm H2O and the pulse oximeter reading fell to less than 85% with an \( F_{\text{IO}_2} \) of 1. Air entry could not be heard in the left lung and right endobronchial intubation was diagnosed. The tube position was confirmed by direct laryngoscopy. The tube was adjusted so that the cuff was just visible below the vocal cords and the tube was retied, to 21 cm at the teeth. Peak airway pressure was slow to fall and the laparoscopic technique was abandoned. Gradual improvement of airway pressure and arterial saturation followed release of abdominal pressure, but air entry to the left lung remained poor. The upper airway was examined with a 4 mm intubating fibre-optic endoscope. The carina could be seen below the level of the tracheal tube and both main bronchi were patent and free of debris. A chest radiograph was also taken before the operation was continued by laparotomy. For the rest of the operation, air entry to the left lung remained poor and peak airway pressure was at 35 cm H2O although saturation remained at greater than 97% with an \( F_{\text{IO}_2} \) of 1. Endobronchial intubation was thought to have been excluded by direct laryngoscopy and direct bronchoscopy. However, when the chest radiograph was examined, the tracheal tube was seen in the right bronchus and the left lung was collapsed with moderate mediastinal shift. Using the radiograph as a guide, the tracheal tube was pulled back 2 cm to 19 cm at the teeth. Air entry to the left lung improved and the collapse was treated with sustained manual inflation of the lungs to 40 cm H2O. The patient was extubated and maintained an oximeter saturation of 98% with a Hudson mask and oxygen flow rate of 4 litre min\(^{-1}\). She was reviewed on the ward and found to have no respiratory sequelae.

Discussion

Unintentional endobronchial intubation is a common cause of arterial desaturation and increased airway pressure during anaesthesia. Once correctly diagnosed, it should be easily remedied by adjusting the position of the tracheal tube. The case described above illustrates some of the potential risks and causes of endobronchial intubation. Gynaecology is associated with increased risk\(^1\) presumably due to the number of laparoscopies. Laparoscopic cholecystectomy, with upward displacement of the carina by the abdominal pressure may cause bronchial intubation.\(^2\) The head down position, commonly used in laparoscopic procedures to
reduce the incidence of bowel injury, can make this problem worse.

The authors diagnosed endobronchial intubation promptly, but were misled by the results of direct laryngoscopy and fibre-optic examination. The only explanation is that the tube position moved because of flexion and extension of the neck during these examinations. Neck extension can move the tip of the tube up to 5.2 cm away from the carina. The tracheal tube was initially tied at 22 cm, which would not usually be associated with endobronchial intubation in a patient of normal stature. At the second laryngoscopy, the tube was only pulled back to 21 cm. The cuff could be seen directly below the vocal cords, but the patient’s head would still have been extended on the neck. For the radiographic examination, we assume that the head was in a more neutral, slightly flexed position, allowing the tube tip to enter the bronchus. During bronchoscopy, the patient’s pillow was removed to straighten the tracheal tube and aid passage of the instrument. This would increase the oro-carinal distance and thereby withdraw the tip of the tube. When the radiograph was seen, the tube was pulled back 2 cm to 19 cm with the patient’s head in the neutral position and sitting up. When the tube was repositioned first to 21 cm, the cuff was visible below the cords. By pulling it back by another 2 cm extubation might be expected, but the tube remained satisfactorily placed.

The clinical circumstances could have been caused by other conditions than endobronchial intubation. Because the diagnosis of endobronchial intubation appeared to have been excluded, we considered other diagnoses.

Our differential diagnosis included pneumothorax, bronchial obstruction by mucus plug or cuff herniation, and severe bronchospasm, which can occur with tracheal intubation and positive pressure ventilation. With laparoscopy, carbon dioxide pneumothorax or pneumomediastinum are possible.

Pneumothorax may be caused by a number of mechanisms. First, spontaneous rupture of a pleural bleb or bulla is possible, as in any other operation. Secondly, carbon dioxide may pass from the peritoneal to the pleural space, if there is surgical trauma to the diaphragm or falciform ligament or a congenital pleuropertitoneal fistula. Pneumomediastinum may present with hypercapnia and hypoxia alone, without signs of pneumothorax. After diagnosing pneumothorax, it may be useful to aspirate and analyse the gas in an analyser to determine if the carbon dioxide concentration is high. The treatment of carbon dioxide pneumothorax is to apply positive end-expiratory pressure and reduce intra-abdominal pressure. Most patients make a good recovery without the need for a pleural drain.

This report shows that radiography may be needed to distinguish between pneumothorax and endobronchial intubation. Direct laryngoscopy and bronchoscopy can mislead if the tube position is changed during the procedures.

References

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