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Hydrothorax: an unexpected complication after laparoscopic myomectomy

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We report a case of hydrothorax as a complication of laparoscopic myomectomy in an otherwise healthy woman. The most likely cause of the patient's hydrothorax was irrigation fluid moving from the peritoneal cavity into the pleural space via defects in the diaphragm. Anaesthestists and surgeons should consider hydrothorax as a potential complication in any patient undergoing laparoscopy.

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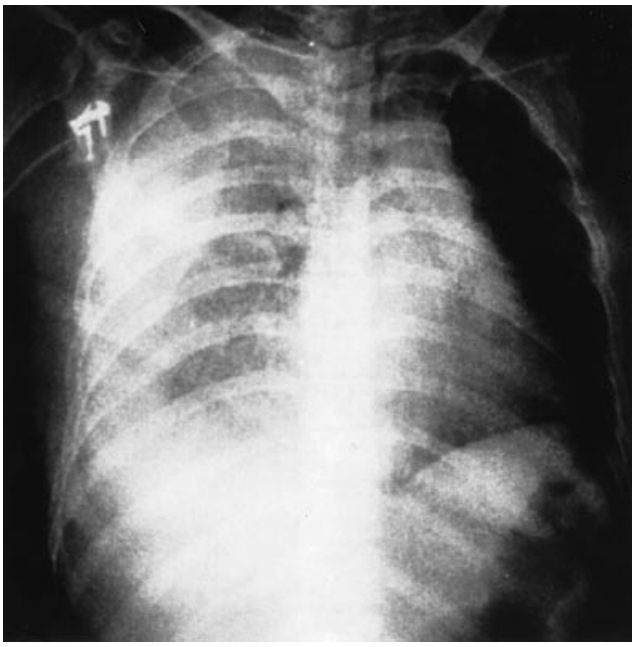

Fig 1 A chest radiograph of the patient after surgery, showing a massive right-sided pleural effusion with displacement of the mediastinum to the left.

Laparoscopic surgery is a common form of surgical therapy for many disorders. Although surgery using laparoscopy reduces morbidity and shortens recovery after surgery, laparoscopic surgery can cause unique problems. We present a patient who suffered from severe hypoxaemia after a laparoscopic myomectomy, caused by hydrothorax.

Case report

A 38-yr-old woman, weighing 52 kg and 148 cm tall, with a history of primary infertility was planned to have laparoscopic myomectomy. Pre-operative investigations were unremarkable.

Anaesthesia was induced with propofol and vecuronium, and the trachea intubated with an 8.0 mm tracheal tube. Anaesthesia was with nitrous oxide (66%), sevoflurane (1–2%), and fentanyl.

The patient was placed in the lithotomy position with slight Trendelenburg tilt. The peritoneal cavity was inflated with carbon dioxide to a pressure of 8–10 cm H_2O. Peak inspiratory airway pressure increased from 15 to 22 cm H_2O during laparoscopy. One hour after surgery began, the patient's haemoglobin oxygen saturation (Sp_{O_2}) decreased from 99 to 94%. As breath sounds were clear bilaterally, the $F_{I_{O_2}}$ was increased to 0.5, and the Sp_{O_2} increased to 99%. At the time that the patient became hypoxic, 2000 ml of saline had been used to irrigate the peritoneum, 1300 ml had been recovered. The remainder of the operative course was uneventful. A total of 6000 ml of saline was used for irrigation, and 5300 ml was recovered.

Four myomas were removed in a procedure that lasted for 4.5 h. The estimated blood loss was 150–200 ml. Fifteen minutes after the end of surgery, the patient was extubated and her Sp_{O_2} was 100% while breathing oxygen 6 litre min^{-1} from a face mask.

Ten minutes after extubation, the patient was moved to the post-anaesthesia care unit (PACU), while spontaneously breathing room air. On arrival in the PACU, she denied dyspnoea, but her Sp_{O_2} was only 75% while breathing oxygen 6 litre min^{-1} from a face mask. The oxygen flow was increased to 10 litre min^{-1}. Arterial blood gas analysis showed a pH of 7.38, a carbon dioxide tension (Pa_{CO_2}) of 44 mm Hg, and an oxygen tension (Pa_{O_2}) of 50 mm Hg. On auscultation, breath sounds were present but diminished over the entire right side of the chest. A chest radiograph showed a massive right-sided pleural effusion with displacement of the mediastinum to the left (Fig. 1). A chest tube was placed into the right side of the chest, and 850 ml of clear fluid was drained. The drained fluid had a sodium concentration of 149 mEq $litre^{-1}$, a potassium concentration of 2.8 mEq $litre^{-1}$ and a chloride concentration of 138 mEq $litre^{-1}$. After drainage, arterial blood gas analysis showed pH 7.38, Pa_{CO_2} of 42.9 mm Hg, and Pa_{O_2} of 123.3 mm Hg. Follow-up chest radiograph showed no hydrothorax, a midline mediastinum, and re-expansion of the right lung. The chest tube was removed 42 h after placement. The patient was discharged from the hospital 5 days after the operation.

Discussion

We describe hydrothorax as a complication of laparoscopic surgery in an otherwise healthy woman. Fortunately, she recovered uneventfully with standard treatment. The most likely cause of the patient's hydrothorax is the passage of a large volume of irrigation fluid from the peritoneal cavity into the pleural space via defects in the diaphragm. This theory is supported by the evidence that the electrolyte concentrations of the drained fluid (Na 149 mEq $litre^{-1}$, Cl 138 mEq $litre^{-1}$) which were almost identical to that of the saline, which was used as irrigant solution. During surgery, 6000 ml of saline was used for irrigation. The recovery irrigation was in a negative balance throughout surgery. Although theatre irrigation balances are often inaccurate, we suspect that this volume drained into the pleural cavity. The chest radiograph clearly demonstrated a large hydrothorax, and 850 ml of fluid was drained. The fact that the patient was small probably explains the marked x-ray findings. The surgery took a long time (4.5 h), because four myomas were removed. This may have affected the development of the hydrothorax as the patient was in Trendelenburg position during the course of operation.

One hour after beginning of the operation, the Sp_{O_2} decreased to 94%. At this time, pleural fluid may have already accumulated because the irrigation fluid balance was –700 ml. However, the effect of the effusion on Sp_{O_2}

may have been overcome by the increase in $F_{I_{O_2}}$, which improved the $S_{p_{O_2}}$ to 99%. Throughout surgery, intermittent positive pressure ventilation may have prevented further collapse of the lung. A high $F_{I_{O_2}}$ prevented a decrease in $S_{p_{O_2}}$ immediately upon extubation. Breathing room air during the transportation to the PACU showed the pathology.

Possible channels of communication between the peritoneal cavity and the pleural cavity have been reported. They can be collectively and comprehensively regarded as porous diaphragm syndrome.[1] Hydrothorax complicating abdominal ascites and peritoneal dialysis has been reported. Hepatic hydrothorax is defined as a pleural effusion in a patient with liver cirrhosis and no cardiopulmonary disease.[2,3] Recent studies have confirmed that small defects in the diaphragm allow for passage of ascitic fluid into the pleural space.[1,4] A defect in the diaphragm in a patient with cirrhosis and hydrothorax was first described in 1955 and proposed as a cause of hepatic hydrothorax.[2] These diaphragm defects can be demonstrated both grossly and microscopically.[5,6] Hepatic hydrothorax is usually right-sided (85%).[3] Hydrothorax complicating peritoneal dialysis is also well documented,[7–9] also more commonly on the right.[9] Congenital or acquired defects in the diaphragm[8] allow the dialysate to reach the pleural space. Hydrothorax in dialysis patients may appear during the first dialysis treatment, or may be delayed and not appear until after months or even years of dialysis.[9] This bimodal incidence pattern, also seen when artificial pneumoperitoneum leads to pneumothorax, suggests that the diaphragmatic defect may be either congenital or acquired.[1]

Gallagher and colleagues described a case of tension hydrothorax after hysteroscopy complicated by occult uterine rupture.[10] McConnell and colleagues reported tension hydrothorax during laparoscopy in a patient with ascites and pleural effusions;[11] who may have already had a patent pathway for the movement of ascites into the pleural space.

Congenital (pre-existing) defects are probably less prevalent than acquire defects. Hydrothorax is found in liver cirrhosis and peritoneal dialysis with prevalences of 6% (range, 0.4–12.2%) and 2% respectively.[1,4,9] If we assume that these incidences are representative of the percentage of the general population who have peritoneothoracic communications, then a substantial number of patients are at risk for developing hydrothorax or pneumothorax after laparoscopic surgery. It is important for anaesthesiologists and surgeons to recognize hydrothorax as a potential complication in any patient undergoing laparoscopy especially when a negative irrigation balance is identified.

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