PNEUMOPERITONEUM—A COMPLICATION OF NASAL OXYGEN THERAPY: A CASE REPORT

E A GAIN, M D ¹

PNEUMOPERITONEUM is usually the result of a perforation of the stomach or bowel by disease or mechanical trauma. This type rarely results in tension causing respiratory and circulatory embarrassment. Pneumoperitoneum can follow mediastinal emphysema produced by excessive airway pressure during anaesthesia (1, 2); the gas tracking down retroperitoneal and breaking through the peritoneum, but this is very rare (2). Everyone is familiar with the rather frequent error of attaching the oxygen to the gastric suction tube, an accident which is easily recognized.

We believe that the following case is of interest because of its rarity and its similarity to a case reported by Fenton (3) of pneumoperitoneum following nasal oxygen therapy.

Mrs S, a healthy 53-year-old female, was prepared for biopsy of a tumour of the right breast and possible radical mastectomy. Anaesthesia was induced with 0.25 gm Thiopentone followed by 25 mg Meperidine and nitrous oxide-oxygen 4.2 administered by a semi-closed circle absorption system. The respirations were assisted throughout but not controlled. There was a fifteen-minute delay between induction and the commencement of surgery. With the skin incision mild laryngospasm developed and was easily corrected in a very short time with Thiopentone 0.125 gm. Meperidine 25 mg increased assistance to respiration. The anaesthetist did not consider that excessive pressure was used at this time and it was definitely less than 20 mm Hg.

At the conclusion of the 20 minutes of surgery respiration was only 6 per minute so Nalline® 5 mg was given intravenously. The rate increased to 12 per minute and the patient was returned to the recovery room in good condition. Nasal oxygen by catheter was ordered in case respiratory depression should recur. The patient arrived in the recovery room and nasal oxygen at 8 litres per minute was commenced at 11.40 A.M. At 12.20 P.M. the recovery room nurse reported that the patient was in shock and not responding as rapidly as was expected, anaesthesia seemed deeper if anything. Examination revealed a deeper state of anaesthesia than one would expect, rapid predominantly thoracic respiration, systolic blood pressure of 70 and pulse of 74. The skin was pale, dry and cold, the abdomen was grossly distended, tympanitic, rigid, and palpation caused some pain-like response. At first only gastric distension was suspected, but because of tenderness X-rays were taken of chest and abdomen. In the meantime attempts to pass a gastric tube failed because of an apparent obstruction at the level of the cardia. The X-rays revealed a normal chest except for high diaphragms, a massive pneumoperitoneum and a distended stomach but no excess of gas in the small bowel. Displacement of the stomach was most probably the reason the gastric tube could not be passed.

¹From the Department of Anaesthesia, University Hospital and University of Alberta, Edmonton, Alta

A needle was inserted through the abdominal wall and gas under marked pressure gushed forth, the abdomen collapsed and was then soft with no evidence of peritoneal irritation. The patient's conscious level improved rapidly, undoubtedly because of the improved ventilation, and the blood pressure soon returned to normal levels.

Postoperatively the patient had an elevated temperature 99° – 101°) for two days and shoulder pain, the abdomen remained soft and not tender, no other evidence of peritonitis occurred and the patient was discharged well after five days of observation.

Two days later the patient was readmitted with the typical signs and symptoms of a left lower lobe pneumonia. Under conventional therapy this resolved rapidly and the patient was discharged and has remained well. During the last admission complete radiographic examination of chest, oesophagus and stomach were carried out, no abnormalities other than the resolving pneumonia were discovered.

At the time of the pneumoperitoneum it was believed that in spite of the anaesthetist's assurance that no excessive pressure had been used in assisting respiration this was the most likely cause of such a massive pneumoperitoneum. Fenton's (3) report of a similar case following nasal oxygen therapy was recalled and it is believed that the same sequence of events occurred as described by Fenton (3). She postulated that the nasal oxygen catheter had been inserted below the cricopharyngeus which acted as a true sphincter, and with a relaxed cardia and closed pylorus allowed distension and perforation of the stomach.

At autopsy Fenton's patient showed that the muscle fibres of the stomach were laminated and separated and there was a minute tear in the mucosa and extensive bleeding into the stomach and intestine. Since she does not mention the mode of exit of the oxygen from the stomach into the peritoneal cavity, one must assume a tear on the peritoneal surface of the stomach or intestine. As there was no sign of peritoneal irritation in our patient, it is suggested that possibly the gas had passed beneath the mucosa and out along the vessels of the stomach into the peritoneal cavity, as it does, in a similar manner, in mediastinal emphysema following alveolar rupture due to excessive airway pressure during anaesthesia (1, 2)

We cannot feel as absolutely certain of the aetiology in this case as could Fenton (3), an endotracheal tube was not used here and we believe that one could have overlooked the distension because of the surgical drapes and the site of the operation, and the cause therefore could have been excessive mask pressure. On the other hand, we doubt if the patient would have been considered to be in good condition if this distension had been present in the operating theatre or on arrival in the recovery room, and therefore the most likely cause was the nasal oxygen.

Measurement of the oxygen flowmeter used revealed that a pressure of 40 mm Hg was necessary to open the safety blow-off, this is undoubtedly an excessive pressure and such therapy apparatus should be manufactured to blow-off at a much lower pressure or this complication will continue to occur. Fenton's case resulted from the same fault, in her case a flowmeter was not used, only a simple pin-type valve with no pressure regulation.

This case again emphasizes the dangers of oxygen therapy using a nasal catheter, also the need for care in placing the catheter correctly and the use of low-pressure controlled flowmeters.

REFERENCES

1. MACKLIN, C C. *Canad M.A.J.* 36: 414 (1937).
2. SPENCE, M. *Anaesthesia* 10: 50 (1955)
- 3 FENTON, C S N *Brit J Anaesth* 28 220 (1956).