ENTRY OF NITROUS OXIDE INTO A GIANT GAS-FILLED OVARIAN CYST

A Case Report

BY

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SUMMARY

Thirty minutes after starting the administration of nitrous oxide a substantial quantity of this anaesthetic was demonstrated in a gas-filled pelvic cyst.

The entry of nitrous oxide into body cavities containing gas has been demonstrated clinically by Hunter (1955) (pneumothorax, pneumoperitoneum) and experimentally by Eger and Saidman (1965) (small intestine and pleural cavity) and Saidman and Eger (1965) (pneumoencephalography).

The following case report illustrates another example of this phenomenon.

History.

A female, age 45 years, weight 61 kg. A total vaginal hysterectomy was performed for menorrhagia secondary to a submucous fibromyoma. The postoperative period was complicated by the development of a right ovarian abscess which responded slowly to antibiotics, leaving a firm indurated mass 4 cm in diameter above the region of the right broad ligament. During the next five months the patient developed lower abdominal fullness and discomfort with frequency of micturition. A tense cystic mass was palpated, filling the lower abdomen and rising to the level of the umbilicus. She was afebrile. Radiography (fig. 1) showed a gas-filled cyst 15 cm in diameter in the lower abdomen and pelvis. Barium studies failed to reveal any communication with the bowel. Injection of contrast medium into the vagina under pressure also failed to show any vaginal communication with the cyst.

Anaesthetic technique.

Pethidine 100 mg, atropine 0.6 mg, was given intramuscularly 45 minutes before surgery. For induction, thiopentone 300 mg and suxamethonium 50 mg were administered intravenously. The lungs were inflated with oxygen for 1½ minutes and then an 8.5-mm Forreger "Snozite" cuffed endotracheal tube was passed. The induction was completed and anaesthesia maintained with nitrous oxide 4 L/min and oxygen 2 L/min (administered by a circle system containing fresh soda lime), augmented with pethidine (total dose 80 mg). Relaxation was obtained with tubocurarine (total dose 42 mg). Manually controlled ventilation was applied throughout the procedure and, from previous measurements of the author's use of this type


of circuit, the PaO2, would be expected to fall into the range 23-33 mm Hg. The arterial pressure remained stable throughout; systolic 110 to 120 mm Hg, diastolic 80 to 85 mm Hg. Blood loss during exposure of the cyst was minimal (100 ml) and during this time 100 ml of 5 per cent dextrose were administered intravenously.

A sample of gas removed from the cyst for analysis was obtained after nitrous oxide had been administered for 30 minutes.

Findings at operation.

The abdomen was opened through a lower midline incision. The cyst was at least 15 cm in diameter,

Fig. 1

Female patient, age 45 years. Radiograph of abdomen showing the presence of a large gas-filled cyst.
thin-walled, tympanitic, apparently arising from the right ovary and firmly adherent to a portion of terminal ileum and the rectosigmoid junction. No communication with either vagina or bowel was demonstrated. Two hundred ml of gas were aspirated through a 21-gauge needle into four 50-ml syringes made gaslight by wetting the barrels with water. Spontaneous filling of each syringe indicated that the gas was under considerable pressure. When opened, the cyst was found to have a smooth but rugous inner membrane and to contain no fluid. There was a substantial blood supply to the cyst from the right ovarian artery, adherent loops of bowel and other adherent areas in the pelvis.

Bacteriology and histology.
Although the cyst was devoid of fluid, two colonies of a Clostridium species were obtained by prolonged incubation of material rubbed from the inner wall. Microscopically, the wall of the cyst showed dense inflammatory infiltration with numerous giant cells, scattered fragments of fibrelike laminated material, and masses of yellowish-brown pigment. In some parts, there were areas of ovarian stroma and also hyaline connective tissue. The inner membrane did not have a distinct epithelial lining. There was no evidence of any other type of ovarian neoplasm.

Analysis of gas from the cyst.
The gases removed from the cyst were analyzed in a gas chromatograph, using a molecular sieve column and a thermal detector. To help identify the gases, the effluent gas from the chromatograph was connected to a mass spectrograph. The composition of the mixture was determined to be: oxygen 5.5 per cent, nitrogen 74 per cent, carbon dioxide 10 per cent, nitrous oxide 4.5 per cent, methane 6 per cent, hydrogen 0.1 per cent.

DISCUSSION
Colquhoun (1965) has reviewed the problem of intramural gas in hollow viscera. The origin of the cyst under discussion is most likely explained on the basis of a post-vaginal hysterectomy ovarian abscess which ruptured into the rectosigmoid bowel and/or the terminal ileum. Although the bowel perforation healed, bacteria of bowel origin were presumably responsible for the continuing production of gas with enlargement of the cyst. The carbon dioxide and methane components in the gas from the cyst would support this hypothesis. The history of increasing symptoms and the radiograph suggested that the gas in the cyst was under relatively high pressure before surgery. The findings by needle puncture at operation confirmed that the gas in the cyst was under pressure. The entry of nitrous oxide would be expected to increase this pressure, while re-equilibration of carbon dioxide during hyper-ventilation might be expected to decrease the pressure in the cyst. It seems likely that most of the pressure in the cyst was the end result of the production of gas by bacteria, rather than the replacement of nitrogen by nitrous oxide.

The entry of nitrous oxide into the cyst was relatively slow compared with the findings of Eger and Saidman (1965) in the small intestine and pleural cavity of the dog. This was presumably due to the lower concentration of nitrous oxide administered in the present case together with a relatively poorer blood supply to the lining membrane of the cyst.

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REFERENCES

SOMMAIRE
Trente minutes après le commencement d'administration du protoxyde d'azote, une quantité substantielle de cet anesthésique a été démontrée dans le gaz contenu dans un kyste pelvien.

ZUSAMMENFASSUNG
Dreissig Minuten nach dem Anfang der Erteilung von Stickstoffoxydul, wurde eine beträchtliche Quantität dieses Betäubungsmittels in einem mit Gasgefüllten Beckenzyste dargelegt.