of nitrogen. The symptoms in published cases have been sometimes trivial and sometimes, as in the third case reported here, very severe. None of my patients complained of the pain beneath the left shoulder which is reported by Neumann (1943) as characteristic of artificial pneumoperitoneum (an observation confirmed by personal experience). The normal intra-abdominal pressure as measured by a manometer connected with the peritoneal cavity was -9 cm. of water in the knee-elbow position, but slightly positive in the erect position (Eisenmenger, 1935; quoted by Moberg, 1937). Moberg himself found the intra-abdominal pressure in a rabbit normally negative. My own observations in two cases of artificial pneumoperitoneum gave a normal slightly negative pressure with a very quick rise to positive pressures after introduction of quite small quantities of air at the site of the manometer needle; one could, however, continue to introduce air, without much further rise in pressure and with very little discomfort to the patient, to a total of anything up to one or more litres. No pain except slight discomfort at the shoulder was complained of by these two patients. Coombs (1922) found no immediate alteration of pressure when air or fluid was introduced into the peritoneal cavity.

Almost all the reported cases of spontaneous pneumoperitoneum have been thought to be due to escape of gas from the stomach or the first part of the intestine by a perforation so situated as to allow the escape of gas only, and healing so rapidly as not to be followed by the escape of other duodenal or gastric contents. There are at least two other possible sources of free gas in the peritoneum: (a) vaginal, via the Fallopian tubes; and (b) thoracic, via the diaphragmatic hiatus. The forcing of air through the Fallopian tubes, presumed due to vaginal douching with careless use of a syringe, has been reported by Moberg (1937), and, by the same author in another case, from supposed alteration in intra-abdominal tension secondary to gastric dilatation. This latter patient, an elderly woman with carcinoma of the pylorus, was in the habit of adopting a stooping position to provoke vomiting, and Moberg considered that she produced an unusually low pressure in the peritoneum with subsequent suction of air through the Fallopian tubes. Dr. T. N. MacGregor informs me that it is unusual to require a pressure exceeding 4 cm. Hg for artificial inflation of the Fallopian tubes, and that he considers spontaneous suction of air through the vagina very unlikely. Only one of my patients (Case III) had been using vaginal douching for leucorrhoea before the occurrence of her symptoms, and the recurrence of distension in her case makes it quite obvious that this could not have been the source of her pneumoperitoneum. It is nevertheless odd that almost all the reported cases should have been in women. An exceedingly rare cause of intraperitoneal gas is so-called "pneumatosis cystoides peritonei," which is due to infection by parasites.

Lastly, at least one case has been recorded (Hinkel, 1940) in which pneumoperitoneum was thought to be the result of an extension of gas from the thorax to the peritoneum by way of the diaphragmatic hiatus. His patient, a woman aged 70, had sudden symptoms of abdominal distension and tenderness, without severe constitutional symptoms and without fever. She was discovered to have an old left basal pleurisy with a high left dome of the diaphragm, and a bronchogram showed, just above the diaphragm and close to the heart shadow, a large emphysematous bulla which was considered to be the probable source of the gas.

The case reported by d'Allaines is the only one I can find in the literature which bears a close resemblance to Case III, reported here as having had severe symptoms without any definite evidence of perforation at operation. d'Allaines suggested that the explanation in his case lay in a perforation of the stomach so minute and so close to the oesophageal opening as to be inaccessible to observation. He recalled one patient of his, with a perforation on the anterior wall of the stomach just beneath the diaphragm, who gave a history suggesting an escape of gas preceding the appearance of the actual peritonitis by several days. He recalls, in support of his explanation, the fact that many surgeons have observed perforations to heal satisfactorily after laparotomy in which no procedure was undertaken except that of drainage of the peritoneal cavity.

Summary

Three cases of free gas in the peritoneum without evident peritonitis (pneumoperitoneum) are reported, all presumed due to minute perforations of stomach or duodenum.

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Medical Memoranda

An Unusual Case of Meningococcal Meningitis

The occurrence of two attacks of meningococcal meningitis in the same patient within a short period seems worthy of record. The case is one of a series of 30 severe cases of this disease in which there were four deaths (two moribund on admission).

FIRST ATTACK

The patient, a pagan private aged 25, was of good muscular physique. On admission he was unconscious, with marked signs of cerebral irritation. The general condition showed toxæmia, with temperature 104° . C.N.S.: neck very rigid, incontinence, Kernig's sign positive, knee- and ankle-jerks increased, with bilateral plantar extensor reflex, abdominal reflexes absent. Lumbar puncture yielded turbid fluid under pressure; globulin was increased; centrifuged deposit contained pus cells and scanty meningococci. Two grammes of soluble sulphapyridine were given intravenously, and the same amount four hours later; then 1 g. of sulphapyridine intramuscularly four-hourly. (Total course of 35 g.)

Two days after admission the breathing became distressed, with moist rales in both lungs and patchy consolidation. Recovery took place from this hypostatic pneumonia. Five days after admission the patient suddenly became unconscious and had repeated convulsions. Spasmodic twitching began in right facial muscles, with conjugate deviation of eyes to left. The spasm spread to the muscles of the upper and lower limbs on the right side, finishing with conjugate deviation of eyes to right and spasms of the left side of the body. Convulsions ceased after one hour, and further recovery was uneventful. Lumbar puncture gave clear fluid; no increase in globulin, cells 7 c.mm. in centrifuged deposit. No micro-organisms seen. The patient was discharged fit on March 1 (21 days after admission). He had no complaints and was ambulant during the last 12 days. He returned to full duty.

SECOND ATTACK

The patient was readmitted on March 27 complaining of headache and pain in the back of the neck for 24 hours. Condition on admission: temperature 103° ; neck rigidity marked; Kernig's sign positive; knee, ankle, and abdominal reflexes absent; plantar reflexes not obtained. Lumbar puncture yielded cloudy fluid under pressure; marked increase of globulin; plus cells and meningococci present in centrifuged deposit. Soluble sulphapyridine, 2g., was given intravenously, and sulphapyridine, 1 g. intramuscularly, every four hours (total course of 53 g.).

Sixteen days after admission patient was afebrile and ambulant. On the 17th day he complained of weakness on the right side of body. The temperature was 100.8° . There was right facial palsy with general loss of tone and power of the muscles of right upper and lower limb. Pupils reacted equally to light and accommodation and were equal in size. Movements of the tongue were unaffected. Hearing and vision were normal. Reflexes were generally sluggish except for increased abdominal reflexes on the left side.

His general condition deteriorated, with increasing right-sided weakness and increasing neck rigidity and a positive Kernig's sign. White cell count showed a leucocytosis of 17,000 with 70% polymorphonuclears. Lumbar puncture: turbid fluid with increase of globulin, pus cells, and scanty meningococci in deposit. He was transferred to another hospital so that further investigations could be carried out. Death took place shortly after transfer. Post-mortem examination disclosed a superficial cerebral abscess over the left temporal lobe. Direct smear showed scanty meningococci.

I am indebted to Major P. E. Rees-Davies, officer commanding, for permission to publish this case.

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