insist on their use under the conditions pertaining in Abadan, where the maximum shade temperature may rise to 123° F. (50.55° C.), and was maintained during the summer of 1947 at a daily average of over 110° F. (43.3° C.) for two months. The only equipment they would consent to use was overalls and goggles, and the latter but rarely. These workers therefore have spent their working days with D.D.T. in oil solution in contact with the skin of their hands, arms, and shoulders. They also inhaled it in fine droplets or mist as it emanated from the " Four Oaks " sprayer.

So far as this investigation goes there is no reason to believe that the continual use of D.D.T. in kerosene in a concentration of 3.1% gives rise to any toxic effects. We agree with Gordon (1946) that it is unfortunate that kerosene is the commonest, cheapest, and most readily available solvent, and would add our voice to his plea for the use of a less noxious solvent, or for the increased use of emulsions where these are practicable.

Summary

Iranian workers engaged in handling D.D.T. in oily solution were examined clinically and compared with a control group of sanitary workers, especially as regards weight and blood pressure, without significant difference being observed.

It would seem that intoxication is most unlikely to arise from exposure to D.D.T. in oily solution under the conditions of use described here, where the wearing of protective clothing is impossible.

We wish to thank Dr. S. D. McClean, Chief Medical Officer to the Anglo-Iranian Oil Co., Ltd., for permission to publish this article.

REFERENCES

Buxton, P. A. (1945). *Trans. R. Soc. trop. Med. Hyg.*, **38**, 367.
Cameron, G. R., and Burgess, F. (1945). *British Medical Journal*, **1**, 865.
Gordon, I. (1946). *Brit. J. industr. Med.*, **3**, 245.
Neal, P. A., and von Oettingen, W. F. (1946). *Soap*, **22**, 136.
Smith, M. I., and Stohlman, E. F. (1944). *Publ. Hlth Rep., Wash.*, **59**, 984.
West, T. F., and Campbell, G. A. (1946). *D.D.T.—the Synthetic Insecticide*, p. 64. Chapman and Hall, London.

TRAUMATIC PSEUDO-CYST OF THE PANCREAS WITH PLEURAL EFFUSION

REPORT OF TWO CASES

BY

B. J. BICKFORD, M.B., F.R.C.S.

Registrar, Liverpool Chest Surgical Centre, Broad Green Hospital, Liverpool; late Wing Commander, R.A.F.V.R.

The general features of cysts and fluid collections in relation to the pancreas are well known. The two cases here reported were associated with a left-sided pleural effusion and appear to be unusual enough to warrant publication.

Case 1

An R.A.F. sergeant aged 20 was crushed between two motor vehicles on Nov. 28, 1945, and was admitted to an R.A.F. general hospital on the same day. He was found to have multiple injuries, the most important of which were fractures of the left side of the pelvis and of the lower end of the right radius. There was no apparent fracture of the ribs. He was at first treated in a plaster spica, and the wrist was immobilized in a plaster cast after reduction of the fracture. As reduction of neither fracture remained satisfactory, on Dec. 7 the wrist was again manipulated, and the left leg was placed in a Thomas's splint with extension by skin traction. Four days later the patient complained of pain in the left lower chest and his temperature rose to 101.4° F. (38.55° C.). The pyrexia gradually abated. but by Dec. 13 it was apparent that he had a considerable left pleural effusion. This was confirmed by *x*-ray examination : no rib fracture could be seen in the film. Pleural fluid to the amount of 10 ml. was aspirated for diagnostic purposes. It contained many red cells ; of the leucocytes present 52% were polymorphonuclears and the remainder lymphocytes. As the fluid continued to increase, 1,090 ml. of blood-stained fluid was aspirated on Dec. 17 and 400 ml. on Jan. 5, 1946.

His temperature subsided after the initial fever, but rose to 100° F. (37.8° C.) on Jan. 7. He had no abdominal symptoms or physical signs until Jan. 8, when a swelling was noticed in the left upper abdomen. This swelling rapidly increased in size and on the 9th presented a smooth, well-demarcated semicircular edge which reached the midline in the epigastric region and extended downwards almost as far as the umbilicus. It appeared to originate beneath the left costal margin, did not move with respiration, and was dull on percussion. A radiograph of the chest showed that a moderate-sized pleural effusion was still present, and a film of the abdomen showed a dense smooth shadow in the left upper abdomen which displaced the stomach to the right and the intestine downwards. The left pleural cavity was aspirated, but only 20 ml. of deeply blood-stained fluid could be withdrawn.

Various possible diagnoses were entertained at this time, but the presence of a rapidly enlarging abdominal swelling could not be readily reconciled with a pleural effusion becoming gradually more deeply blood-stained. It was thought that there might be a delayed rupture of the spleen, with a haematoma in the lesser sac. The abdomen was explored through a left subcostal incision under general anaesthesia on Jan. 9. A very large cystic swelling was found to be occupying the left side of the upper part of the abdominal cavity. It was about 8 in. (20 cm.) in diameter and presented between the stomach and the transverse colon, displacing the former to the right and the latter downwards. The spleen, in the region of its hilum, was adherent to the thick wall of the cyst. The cyst wall was anchored to the anterior parietal peritoneum and was drained by a large tube brought out through a separate stab incision. The cyst contained about 1,100 ml. of clear yellowish fluid with a slightly green tinge. The diastatic index of the fluid was 10 units, and small amounts of trypsin were present, but no lipase.

The patient made an uninterrupted recovery from the operation. By connecting the drainage-tube to a bottle beside the bed excoriation of the skin was entirely avoided. By the 46th post-operative day the fistula had become dry and remained permanently so.

During convalescence the pancreatic function was further investigated. There was normal splitting of the faecal fat, and the glucose-tolerance curve was normal. The haemothorax progressively diminished after operation. On Jan. 16, 150 ml. of blood-stained fluid was aspirated ; eight days later only 15 ml. could be removed, and no further aspiration was needed. By March 5 the patient was feeling very well. A radiograph of the chest showed that the effusion had completely disappeared. He was discharged on March 25, and when seen again on April 8 he had no abdominal symptoms and his wound remained soundly healed.

Case 2

An airman aged 21 was crushed between a wall and a motor vehicle on Nov. 20, 1945, while serving in Germany. He was admitted to a British general hospital and underwent laparatomy on the same day. A ruptured spleen was removed and an intussusception of the small intestine was reduced. At first he made a good recovery from the operation, but eight days later he developed a cough with blood-streaked sputum. A left-sided pleural effusion was discovered, and 16 days later, on Dec. 14, 850 ml. of orange-coloured fluid was aspirated. He was evacuated by air on Dec. 31, and was admitted to an R.A.F. general hospital in this country.

He complained only of occasional cramp-like pain in the left lower chest and upper abdomen. On examination he was rather thin, but the only definite abnormality was a left pleural effusion, confirmed by *x*-ray examination. On Jan. 3, 1946, 10 ml. of the fluid was aspirated for diagnostic purposes. It contained fairly numerous leucocytes, of which 92% were lymphocytes. It was sterile on culture. He had few symptoms, but showed little clinical improvement. On Jan. 16, 57 days after his accident, he vomited once, and himself noticed a swelling in his abdomen. None had been present when he was examined four days before, but now there was a large swelling in the left

subcostal region. It felt tense and was somewhat tender. It extended downwards from beneath the left costal margin almost to the umbilicus, and, to the right, 1 in. (2.5 cm.) across the midline. It was dull on percussion, with a band of resonance crossing its lower part. Coming so soon after the previous case, a confident diagnosis of pseudo-cyst of the pancreas was made, and a laparotomy was undertaken under general anaesthesia on the following day. A midline upper abdominal incision was made and a large thick-walled fluid collection was immediately found. It filled the lesser peritoneal sac, and the stomach and transverse colon were spread out over its anterior wall, to which they were intimately adherent and from which they could not be separated without causing troublesome bleeding. It did not appear to be possible to perform an anastomosis between the cyst and the stomach or jejunum, and after aspirating 1,700 ml. of slightly blood-stained fluid a drainage-tube was inserted into the cyst between the stomach and the transverse colon. The cyst wall was anchored to the abdominal wall and the tube was brought out through a separate stab incision to the left of the main incision, which was then closed.

There was a considerable ooze of blood from the wound on the first post-operative day, and as this was not affected by blood transfusion and by injection of 80 mg. of vitamin K intravenously the wound was reopened under general anaesthesia. Numerous small bleeding-points in the superficial part of the wound were secured, and thenceforward progress was satisfactory.

The fluid drained from the cyst had a diastatic index of 8 units, and contained trypsin in fairly large amount, but lipase was not present. From 200 to 300 ml. of fluid was drained daily at first and was deeply blood-stained for three weeks. By the 30th post-operative day the amount of discharge had greatly diminished and the tube was removed. Ten days later the discharge, although small in quantity, had produced an area of digestion around the sinus mouth. The reaction of the fluid was alkaline, and dressing with 1% acetic acid produced rapid improvement, although it was not until the 79th post-operative day that the sinus was finally healed.

The pleural effusion rapidly subsided after operation, and a radiograph of the chest on Feb. 1 (15th post-operative day) showed that the fluid had absorbed. During convalescence the pancreatic function was normal, as judged by a glucose-tolerance curve and by splitting of the faecal fat. On March 20 a barium meal showed normal appearances in the stomach and duodenum, without any displacement. A cholecystogram showed normal gall-bladder concentration, filling, and emptying. He was sent to a rehabilitation unit on April 16, and when seen four weeks later he was feeling quite well apart from becoming rather easily fatigued.

Discussion

Much the most common type of cyst of the pancreas is the "pseudo-cyst" due to the escape of pancreatic secretion into the tissues after injury or acute pancreatic necrosis, or associated with chronic pancreatitis. The frequency of trauma in cases reported in the literature is variable. Thus of 134 cases recorded by Judd (1921), McWhorter (1925), Judd, Mattson, and Mahorner (1931), Koucky, Beck, and Todd (1941), Rabinovitch and Pines (1942), Johnson and Lee (1942), and Pinkham (1945), 14 (9.6%) appear to have been preceded by significant trauma. On the other hand, almost a quarter of the cases in the large series collected by Koerte (1898) and by Takayasu (1898) had a history of injury.

The two cases now reported are peculiar in that each was accompanied by a large left-sided pleural effusion, an association which does not seem to have been previously noted. The cause of the effusion in each case is uncertain. It seems most likely that the effusion was the result of injury to the chest wall or lung at the time of the initial accidents. In Case 1 there may have been a small haemothorax which in turn excited a reactive effusion. In Case 2 a post-traumatic consolidation of the lung may well have caused a pleural effusion. It is unfortunate that there was no reason for giving particular attention to the chest in the early stages of the illnesses, but no sign of a fracture of the ribs could be seen in radiographs of the chest taken after the effusion had cleared. Injury to the lung may, of course, occur even in the absence of obvious fracture of the ribs. Other possible causes of effusion would appear to be pulmonary infarction, or a reaction to the collection of irritating fluid under the left dome of the diaphragm. But effusion is very rare after infarction of the lung, and it seems certain that a reactive effusion would have been noted in other reported cases of pseudo-pancreatic cyst if this sequence of events was at all common. Furthermore it is not possible to reconcile the deeply blood-stained fluid noted in Case 1 with the irritation hypothesis.

One other feature of these two cases calls for comment. It is that increase in the size of the swelling in the abdomen took place very rapidly—indeed, in the first case causing some alarm on this account. Koucky, Beck, and Todd (1941) reported six cases in which a pancreatic pseudo-cyst ruptured spontaneously into the general peritoneal cavity. Four of these patients died. It is evident that the rapid enlargement of a swelling suspected of being a pseudo-cyst of the pancreas is an indication for early operation without too much delay on account of uncertainty of the diagnosis.

The usual method of treatment of a pancreatic pseudo-cyst in the past has been simple drainage, and this gives results which appear on the whole to be satisfactory. Sometimes secondary collections of fluid need drainage, and occasionally a chronic pancreatic fistula needs further treatment—e.g., by implantation into the stomach (Gutierrez, 1926) or by radiotherapy (Culler, 1920; Hamilton, 1922). Where it is practicable the most satisfactory operative procedure would seem to be primary anastomosis of the cyst to the stomach (Mahadevan, 1943) or to the jejunum (Chesterman, 1943): it may not always be technically possible on account of the situation of the cyst and the nature of its wall. Treatment by repeated aspiration is both ineffective and dangerous.

Summary

Two cases of pancreatic pseudo-cyst following closed abdomino-thoracic injury are described. Both were associated with a left-sided pleural effusion which is thought to have been due to a concomitant injury to the chest wall or lung.

The aetiology and treatment are briefly discussed.

I wish to express my thanks to Group Captain J. C. Scott and Wing Commander Christopher Hardwick, who referred these cases to me. Acknowledgment is also due to the Director General of Medical Services, Royal Air Force, for permission to publish details of these cases.

REFERENCES

Chesterman, J. T. (1943). *Brit. J. Surg.*, **30**, 234.
Culler, R. M. (1920). *J. Amer. med. Ass.*, **75**, 20.
Gutierrez, A. (1926). *Int. Abstr. Surg.*, **43**, 214.
Hamilton, C. S. (1922). *Surg. Gynec. Obstet.*, **35**, 655.
Johnson, T. A., and Lee, W. E. (1942). *Surg. Clin. N. Amer.*, **22**, 1677.
Judd, E. S. (1921). *Minn. Med.*, **4**, 75.
—— Mattson, H., and Mahorner, H. R. (1931). *Arch. Surg.*, **22**, 838.
Koerte, W. (1898). *Deutsche Chirurgie*, Lfrg. 45D, p. 234. F. Enke, Stuttgart.
Koucky, J. D., Beck, W. C., and Todd, M. C. (1941). *Surg. Gynec. Obstet.*, **73**, 113.
McWhorter, G. L. (1925). *Arch. Surg.*, **11**, 619.
Mahadevan, R. (1943). *Indian med. Gaz.*, **78**, 278.
Pinkham, R. D. (1945). *Surg. Gynec. Obstet.*, **80**, 225.
Rabinovitch, J., and Pines, B. (1942). *Arch. Surg.*, **45**, 727.
Takayasu, M. (1898). *Mitt. Grenzgeb. Med. Chir.*, **3**, 89.

The Mental Nurses' Subcommittee has recommended increased salary scales for post-registration student mental nurses. They are endorsed by the Nurses' Salary Committee and accepted by the Minister of Health. The total annual value of salary and emoluments now ranges from £230 to £250 according to qualifications.