eventually made a good recovery and returned to duty. He was well and fit a year afterwards, when I last heard of him, and suffered no inconvenience.

In this case the shock, as compared with a case of perforated ulcer, was out of all proportion to the injury and the subsequent operative "manhandling," and suggests Neuberger's theory that in these cases there is usually some damage to the coeliac ganglion.

REFERENCES.

¹ *Die Verletzungen des Magens durch stumpfe Gewalt*, 1896. ² Über traumatische subcutane Rupturen des Magen und Darmkanals, *Deut. Zeit. f. Chir.*, 1909, xcv, p. 101. ³ Su di un caso di rottura sottocutanea traumatica dello stomaco, *Riforma Medica*, 1922, xxviii, p. 1038. ⁴ Ein Fall von contusio subcutanea cum ruptura ventriculi, *Norsk Mag. f. Laegevidensk.*, 1922, II, 7, p. 514. ⁵ Ein Fall von subcutaner Magenruptur, *Wien. klin. Woch.*, 1923, xxxv, p. 849.

AUTO-BLOOD-TRANSFUSION IN TWO CASES OF RUPTURED TUBAL PREGNANCY.

BY

H. B. BUTLER, F.R.C.S.ED.,

SURGEON TO THE GYNAECOLOGICAL DEPARTMENT, ROYAL SURREY COUNTY HOSPITAL.

AUTO-TRANSFUSION, first used in Germany by J. Thies in 1914, appears to have found more favour in that country than in England or America. Reports received are, however, eminently satisfactory, and it is difficult to understand why the method is not more frequently adopted in cases of emergency, when much recoverable blood has been lost. Two cases illustrating its value are here recorded.

CASE I.

A woman, aged 36, who had been married eleven months, was admitted to the Royal Surrey County Hospital at 11 a.m. on June 14th, in a collapsed condition. No pulse could be felt at either wrist, and there was considerable dyspnoea. She was conscious. She had had amenorrhoea for two months, and had remained well until the evening before admission, when, at 8 o'clock, she was attacked with violent abdominal pain, diarrhoea, and vomiting. Thinking that the attack was due to some error of diet, her husband gave her castor oil, brandy, and gin. She spent the night in great agony, and fainted in the morning; arrangements were at once made to remove her to hospital. Her menstrual history had been normal except for dysmenorrhoea; she was cured at the age of 23 with some improvement, and there had been no dysmenorrhoea after marriage.

Operation.—The abdomen was opened and found to be full of blood, which was mostly fluid, but there were many large clots. Three pints of it were ladled out of the abdomen into a large jug; the larger clots were rejected, but many clots went into the jug. This blood, strained through several layers of gauze, was citrated and 1½ pints were transfused into a vein in the right arm by my colleague Mr. Steele. The left tube was found to be ruptured at the ampulla and was removed. The ovum was not seen. At the end of the operation the patient had a small but countable pulse, and by evening her condition had ceased to cause anxiety. Convalescence was smooth and uneventful.

No suitable donor was available at the moment, and I feel certain that the reinfusion is responsible for saving the patient's life.

CASE II.

A married woman, aged 38, with nine children, the youngest aged 1 year and 4 months. The last menstrual period ceased on October 5th, 1929. At 7 p.m. on October 29th she was taken with sudden severe abdominal pain, which continued throughout the night. She was admitted to hospital in a collapsed condition at 1.30 p.m. on October 30th, completely blanched; the pulse was just palpable, but not countable, and could not be felt at all during her preparation for operation, though it was just palpable at the wrist immediately before operation.

Operation at 2.30 p.m. under gas-oxygen anaesthesia. Three measured pints of blood were rapidly ladled out of the abdomen and put into a jug, being filtered through several layers of gauze. This was again filtered into another jug containing the appropriate quantity of the solution of sodium citrate, and from thence infused into a vein in the right arm by Mr. Steele, the infusion being finished at the same time as the operation. The left tube was ruptured in its middle portion and was removed; the ovum was not seen.

The patient went back to bed in good condition. There was very little coagulation of blood in the abdomen, and she must have recovered a very large proportion of the blood she had lost. There was no shock or reaction, and at 6 o'clock the same evening she was sitting up in bed with a good colour, talking to her neighbours, a little excited by her adventure, but otherwise none the worse. There has been no hitch in her recovery to date.

Presumably the dislike of reintroducing into the circulation blood which has been lying in the abdomen is due to the fear of sepsis or of the blood having acquired some toxic character secondary to coagulation. As a student I was taught that the raised temperature, which so frequently accompanies the process of absorbing blood which has been effused into the tissues, was due to the absorption of fibrin; but from the recent experiments of Horace Greeley,¹ it seems likely that the poisonous property is present, or also present, in the defibrinated blood, and is dependent on the disintegration of platelets. When there is no reason to suspect contamination, the danger of sepsis does not appear to be a large one, as no cases of septicaemia following autotransfusion have been reported. Burch² recommends that blood, even when known to be contaminated, should not be thrown away, but should be given as a rectal drip.

The fear that reinfused blood may have some toxic action is not confirmed by a study of the reported cases. Topler³ reports twenty-four cases of smooth recovery after reinfusion, in ruptured extrauterine gestation; similar success accompanied Burch's four personal cases. In the 164 cases reported in European literature (collected by Burch) there were only fourteen deaths, and of these only one (haemoglobinuria) could possibly be attributed to the toxic character of the blood reinfused. In only six cases was there a post-operative reaction. It may be that this immunity is due to the tendency of blood which has been effused into the peritoneum or pleura to remain fluid for a considerable time, thus enabling whole unaltered blood to be used for transfusion, any clots being strained off in the gauze without breaking them up. Two of Burch's cases were ruptured tubal pregnancies; another was a case of splenectomy, in which much blood had been lost, and the fourth a nephrectomy. Burch says (1923) that "two cases are reported in English literature, one by Dr. Ogilvie of Guy's Hospital, and one by Sampson of the General Hospital, Birmingham." Mention may also be made of the case reported by Devine and Kinsella (*British Medical Journal*, 1928, vol. ii, p. 568), in which auto-transfusion was successfully employed for traumatic intra-abdominal haemorrhage in a boy aged 12.

In a recent article by Lillian K. P. Farrar⁴ the early history of auto-blood-transfusion is traced from the first suggestion by William Highmore in 1874⁵ to two articles by Duncan⁶ in 1885 and 1886. In Duncan's second article he states: "I make it a practice in all larger amputations, because there is no risk and every ounce of blood is serviceable; . . . to my own mind the principle of reinfusing the patient is now definitely established." Nevertheless, the practice seems to have lapsed until it was reintroduced by Thies in 1914. Dr. Farrar kept sealed ampoules of sodium citrate solution in the operating room, ready for auto-blood-transfusion in cases of ruptured tubal pregnancy, but the frequent changes of personnel made it impossible to secure all the help required for the transfusion when the operation itself needed her entire attention. She concluded that the necessary team work could only be obtained by frequent practice of the technique in simpler cases, and arranged to try the measure in clean hysterectomies for myoma uteri. She was surprised to find the transfusion so valuable in these simpler cases.

Except in cases where large quantities of blood have accumulated in the abdomen, Dr. Farrar collects the blood by a suction apparatus. She points out that sponges should never be used, as the squeezing out injures the red cells, and, for the same reason, care is taken not to shake or stir the blood.

Dr. Farrar reports twelve cases, the last being especially dramatic. She says that the technique could not have been carried out in such a grave emergency if the staff had not been trained to team work in the simpler cases.

REFERENCES.

- ¹ Horace Greeley: *Proceedings of Staff Meetings of Mayo Clinic*, vol. iv, No. 22, May, 1929.
- ² Lucius E. Burch: *Surg., Gynecol. and Obstet.*, vol. 36, 1923.
- ³ B. Topler: *Deut. med. Woch.*, 1922, xlviii, 92.
- ⁴ Lillian K. P. Farrar: *Auto-Blood-Transfusion in Gynaecology*, *Surg., Gynecol. and Obstet.*, 1929, vol. xlix, p. 454.
- ⁵ William Highmore: *Lancet*, 1874.
- ⁶ Duncan: *British Medical Journal*, 1885, 1886.