Two large wounds smeared with dirt and motor oil were seen on the inner and outer sides of the lower third of the leg and ankle-joint. After enlarging these wounds several fragments of the tibia, lying completely detached, were removed, and a considerable tag of soiled, hopelessly lacerated muscle, hanging out of the inner wound, was excised. The upper cartilaginous surface of the astragalus was visible through the widely opened ankle-joint. A few small bleeding vessels were ligatured, the wounds, treated by the bipp method, were sutured by silkworm-gut sutures, and the leg was fixed between two lateral Gooch splints, extending from the tubercle of the tibia above to the sole of the foot below.

After-Progress.

The symptoms of shock soon disappeared after he was put to bed, and his leg felt comfortably free from pain. After the second night pulse and temperature remained normal, he felt well, no discharge appeared through the dressings, and they were left unchanged for ten days. Then the wounds were found to be healed, except where a small tag of muscle had been left projecting from the inner wound, uncovered by skin. The sutures were all removed. The small granulating wound over exposed muscle dried up without showing any sign of infection, and the scab separated in three weeks. From this time his recovery was uninterrupted.

REMARKS BY PROFESSOR RUTHERFORD MORISON.

I saw this patient at the request of Dr. Monica Bell, to whom I am indebted for notes of the case, three months after the accident described. She wished to be advised when it would be safe to allow her patient to begin to walk. He had been getting about on crutches and undergoing massage treatment. There was still some swelling of his ankle, but the fracture result was excellent and the scars sound. Movements of the ankle-joint were limited to about half of the normal, but were steadily improving. He is now doing his work with the help of a calliper, to be used for about three months.

During the war I proved that with the aid of suitable antiseptics infected wounds could be safely closed, and that it was possible to obtain "healing by first intention" in many of them. This was to me a new and surprising discovery, as it was to many of the visitors who came to see our work in the Northumberland War Hospital. It also confirms my belief that the greatest advance in surgery depends upon the discovery of new and more efficient germicides, just as the treatment of syphilis did.

The general practitioner is in danger of losing acquaintance with Lister's principles of wound treatment and their application by the use of antiseptics, because aseptic methods are now used to the exclusion of everything else in all hospitals. With a trained staff and fully equipped service such ideal aims are justified by results, but they never will be in ordinary everyday surgical work, and patients have to pay the penalty for lack of this knowledge of the use of antiseptics.

The *Bipp Method of Treatment of War Wounds*, published by the Oxford Press (price 2s. 6d.), describes fully our practice.* Numerous papers from others as well as by myself have described the remarkable results achieved, of which the case recorded is a good example.

The only explanation I can offer as to why this method has not been adopted universally is that cases of poisoning, occasionally fatal, have followed it. From the first I pointed out the risk of poisoning by absorption of the medicaments, and a few of our early cases developed illness the symptoms of which I fully described. Of my later cases, after we had learned a better technique, none were ill, but an exceptional one showed the blue gum line characteristic of bismuth absorption. Of the hundreds of cases treated in the Northumberland War Hospital by my colleagues and myself none died of bipp poisoning. The only criticism possible is that our directions had not been followed with the necessary care in fatal cases. Few alterations have been made in our method, and the latest directions are:

1. Under an anaesthetic, usually open ether, cover the wound with gauze wrung out of 1 in 20 carbolic acid, and thoroughly clean the skin and the surrounding area with

* The mode of preparation of the paste is as follows: Iodoform 16 oz., bismuth subnitrate 8 oz., liquid paraffin 8 fl. oz., or a sufficient quantity. The powders are mixed together in a clean mortar, and the liquid paraffin incorporated. The quantity of liquid paraffin required varies according to the bulk of the powders, the bismuth in particular being liable to a considerable variation in bulk. A sufficient quantity should be added to form a thick paste. It is then advisable to rub down the paste in small quantities at a time, on a slab with a spatula, to ensure freedom from grit and other particles of powder. This paste is not specially sterilized.

the same lotion. (Preliminary washing, by causing swelling of the epidermic cells, prevents penetration of the carbolic solution, and so does harm.) Drape the surroundings with towels wrung out of 1 in 20 carbolic acid, and soak gloves and instruments in the same.

2. Open the wound freely, and if possible sufficiently to permit of inspection of its cavity. A guide—a finger is the best if the size of the opening permits of it, and, if not, a thick probe—should be introduced to the bottom of the wound, and held there until fully exposed. In doing this special regard must be paid to nerve trunks and muscular branches of nerves, since the division of blood vessels, excepting the largest, and of muscles themselves does little harm as compared with that of the disability following nerve damage. Cleanse the cavity with dry sterile gauze mops, Volkmann's spoon, etc., and remove all dead tissues and foreign bodies.

3. Mop the surrounding skin and the wound cavity with methylated spirit, and dry it.

4. Fill up the wound with bipp, and rub it well in with dry gauze (clean hands and rubber gloves are, of course, understood). Then remove all excess, leaving only a thin smear covering over the wounded surfaces. (In bones special care should be taken to remove bipp from all surfaces and crevices, as excess may result in non-union of fractures.) Dress the wound with a strip of gauze wrung out of spirit. Sprinkle the surrounding skin with sterile boric acid powder, and cover all with an absorbent pad. This dressing requires no change for days or weeks if the patient is free from pain or constitutional disturbance. If bloody discharge comes through, the stained part may be soaked in spirit, and a gauze dressing wrung out of the same applied as a further covering, or re-dressing is very easily done. After removal of the old dressing the wound is covered with a dossil of wool soaked in spirit, and any discharge is wiped off the surrounding skin till it is clean. A dressing like the first is then reapplied when necessary.

Bipp should never be used as a "salve." Rubbed on cracks, squeezed into sinuses, spread over septic ulcers, it may cause an acute septic "flare-up"—a dangerous and disconcerting result of treatment.

GAS IN THE PERITONEAL CAVITY.

BY

W. McADAM ECCLES, M.S., F.R.C.S.,
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THE peritoneal cavity in the male is a closed sac. Into this cavity there is secreted or excreted normally a small quantity of serous fluid which serves mainly as a lubricant. Gas in the space is an alien. The peritoneal cavity in the female is not closed to the atmosphere, for air can theoretically pass through the vulval outlet into the vaginal passage, up through the cervical canal, the cavity of the body of the uterus, along a Fallopian tube, and so at its fimbriated end into the cavity of the peritoneum.

That it may actually do so may be surmised by the fact that air will enter, by suction, the vaginal space when the female is in the genu-pectoral position and the labia are separated. Further "inspiration" may cause it to travel along the rest of the female genital tract, and reach the peritoneal cavity. If it does it will act as a foreign substance, and may even cause some collapse by its irritating effect upon the sensory nerve fibres in the parietal peritoneum. This is possibly the reason why severe pain is felt when the wall of the uterus is perforated by a sharp instrument in criminal abortion. To put it briefly, the tract along which spermatozoa travel is also open to liquids and gases.

Gastric Gas in the Peritoneal Cavity.

Gastric is the type of gas which is most commonly met with in the peritoneal cavity. Perforation of the stomach wall, or the wall of the duodenum, by the corroding action of an ulcer, is the usual way in which the passage of this gas occurs. Again the entrance of the gas—accompanied, it is true, by irritating fluid—into the cavity is followed by intense pain, so that the patient cannot take a deep breath, and holds the abdominal muscles rigid. The free gas may

pass between the liver and the diaphragm, so that the normal area of liver dullness may be diminished or even lost. It is, however, unjustifiable to wait for this sign before undertaking laparotomy in perforation.

Intestinal Gas in the Peritoneal Cavity.

It is not so common for gas from the intestines to pass into the peritoneal cavity. Occasionally an ulcer, usually a typhoid one, perforates the ileum near the caecum, and again intense agony follows. But little gas escapes when a vermiform appendix perforates, probably owing to the fact that the inflammation has blocked the connexion with the caecal cavity. Here the very irritating fluid contents of the appendicular cavity produce the pain. Perforation of the colon by carcinoma, or of a diverticulum, may allow septic and irritating gas to pass into the peritoneal cavity.

The question whether intestinal gas can pass through the uninjured and non-inflamed wall of the small or large intestine is one of great interest. Enormous distension of the intestines may occur, usually in some form of very chronic intestinal obstruction, and the wall of the bowel becomes so thinned that it would seem as if it must give way, and yet it very rarely does so. In these extreme cases, in the past, an attempt used to be made to evacuate the gas by a fine trocar and cannula, and in some cases with temporary success. When this has been done by a deliberate puncture through the abdominal wall and into the intestine, the door would appear to be opened for infection from the bowel and fatal peritonitis, but this has by no means always followed. Possibly in such cases the intestinal gas is not very septic, and but little of it reaches the actual peritoneal cavity, most passing out through the cannula.

Cases have been recorded in which gas has transuded from the unbroken wall of the intestine into the general peritoneal cavity. The exact manner in which this occurred it is difficult to say. The gas itself appears in these circumstances to be aseptic, and therefore innocuous. The following is a deeply interesting case of this nature.

A lady, now aged 61, had the following history in brief. From the first she had pain at the menstrual periods. At the age of 21 she had a carriage accident. At 25 she was said to have a "tumour" in the abdomen (? intestinal distension). She saw a physician in Harley Street, who advised her not to have any operation, but further advised her not to walk! But she did continue to walk, and did not appear to be the worse for it. It is possible that the exercise helped to expel flatus. From 30 years of age the abdomen had gradually become more distended, and at times remarkably so. While there was some pain, it was never really severe up to 44 years, and vomiting only occurred now and again. About the age of 45 she began to have attacks of great distension with acute pain; she became utterly "unnerved" thereby, and at times had "neurotic" paralysis of limbs.

First Operation: Laparotomy.

In June, 1913, the abdomen was explored by a very competent provincial surgeon, who found much distension of the large intestine, but nothing radical was done. For a while she was distinctly better, pain and distension being less, but a year later she was as bad as ever. Examination by x rays at this juncture merely revealed great colon stasis, and left her with a troublesome burn. It was then (in 1916) that I saw her for the first time.

First Ileo-sigmoidostomy.

On June 7th of that year I explored the abdomen, and determined to try the effect of a large ileo-sigmoidostomy. The result of this was perfect for three years, as distension and pain vanished. Then gradually all her old symptoms reappeared.

Second Ileo-sigmoidostomy.

In October, 1920, I saw her again. From examination I came to the conclusion that the ileo-colic anastomosis was faulty in its functioning. She would not hear of another x-ray examination, so confirmation by a barium enema was denied us. As the previous operative measures had relieved her so greatly she was very desirous I should attempt something further. I therefore opened the abdomen, found the anastomosis itself perfect, and that by invagination of bowel wall the stoma would admit the tips of three fingers easily. There was, however, considerable distension of small intestine, and of large intestine proximal to the junction between them. After consultation I decided to make another ileo-sigmoidostomy close to the previous one, in the hope that a very free intercommunication would relieve symptoms once more, and perhaps permanently.

Again she was pleased with the immediate result, and left London rejoicing. But on April 30th, 1924, three and a half years after the second anastomosis, I received a letter from Dr. E. M. Knott of Sutton Coldfield to say he had been called in to see her, and she was distended, in pain, and vomited occasionally. Feeling that further operation was negatived I advised temporizing with enemata, pituitrin, etc., and this treatment certainly gave some relief.

Third Laparotomy: Large Catheter Tied In.

She continued with bouts of distension and pain until the beginning of 1927, when her distress became very great, chiefly because the pressure upon the diaphragm caused respiratory and cardiac embarrassment. I was asked by Dr. W. Leslie of Penzance to go down to see her prepared to operate. Accordingly, on February 26th, I reopened the abdomen. There was no free gas in the peritoneal cavity, but the small and large intestines were greatly distended, looking as if ready to burst. In order to make quite sure that one or other of the anastomoses was working I deliberately incised the sigmoid opposite the second junction. This caused a considerable quantity of odourless gas to escape from the lumen of the bowel. The stoma was perfect. I then decided to pass a No. 12 oesophageal catheter (stomach tube) through the anus, up the rectum, into the colon, and through the anastomosis. Considerable difficulty was experienced in manoeuvring the tube through the upper part of the rectum, there being apparently at this spot a definite narrowing of the lumen. Eventually the catheter was manipulated the whole distance, and to make sure it should not slip out it was tethered by a silkworm-gut suture to the side of the anus. The incisions in the colon and in the abdominal wall were closed. The wound healed well. Dr. Leslie reported that for four days whilst the tube was *in situ* the distension remained in abeyance, and the patient was much more comfortable. At my suggestion he removed the tube at the end of this time, but she immediately began to distend once more, and experienced considerable pain. In spite of enemata, pituitrin, and strychnine, only partial relief could be obtained. The reintroduction of the tube again brought about a reduction of the distension.

Fourth Laparotomy: Gas in Peritoneal Cavity.

On March 24th she passed a tubular cast of intestinal mucous membrane by the rectum, after having had several loose motions, but distension recurred, and on March 25th it was so great that Dr. Leslie determined to perform colostomy. He opened the abdomen on the left side above my last incision. He writes:

Imagine my astonishment when, on opening the peritoneal cavity, there was a rush of gas, and the abdomen went down like a pricked balloon. I only made a small opening, but could by pushing my finger into the abdominal cavity withdraw a loop of small and also of large intestine, which appeared perfectly normal. There was no faecal odour about the escaping gas, and the peritoneal cavity—so far as I saw it—appeared to be perfectly aseptic. I left a small rubber drainage tube passing into the peritoneal cavity and did not make a colostomy.

Dr. Leslie rightly remarks that the case is an extraordinary one. The gas must have come from the bowel, from the lung, or else have been formed in the peritoneal cavity itself. It was odourless, and there was no peritonitis, but this does not negative it being intestinal flatus. There had been no signs or symptoms indicating any pulmonary lesion which could have allowed air to pass from the lung through the diaphragm into the peritoneal cavity. The spontaneous formation of gas in the cavity of the peritoneum is not unknown, but it is only produced by gas-forming organisms, and peritonitis is invariably present. Had the extreme distension of the intestines forced gas through their wall, filtered it on its way, and so allowed the collection of innocuous gas in such considerable quantity as to cause great distension? The distension has been held in check ever since to date (September, 1927)—that is, for more than five months—by allowing the tube to remain as an exit for the gas from the peritoneal cavity.

I have detailed this case fully so that others who have had similar cases may put them on record. To sum up, I consider it to be probably one of congenital megacolon, with osmosis of intestinal gas.

Oxygen in the Peritoneal Cavity.

Warmed aseptic oxygen gas has been introduced into the peritoneal cavity by means of a cannula passed obliquely through the abdominal wall. Introduced slowly and carefully, it does not seem to cause discomfort or to be fraught with danger. A skiagram taken after this inflation gives

very clearly the outlines of the solid abdominal viscera or of an intra-abdominal tumour. It is a method which may be given more trial in expert hands for cases of difficulty in diagnosis—as, for example, in the differentiation of a distended gall bladder from a right-sided mesenteric cyst. The oxygen gas is absorbed within twenty-four hours. It is well known that laparotomy, with or without subsequent drainage, has been of considerable therapeutic service in the serous variety of tuberculous peritonitis. What is the exact reason for the benefit which follows is still a matter of doubt, but some consider that the introduction of atmospheric oxygen may play a part. If this be so, might not the evacuation of a large proportion of fluid in tuberculous ascites and its replacement by pure warm aseptic oxygen have a similar remedial action?

Nitrogen in the Peritoneal Cavity.

The formation of adhesions in the peritoneal cavity, either spontaneously or after laparotomy, is a very real matter, and may have serious consequences. Undoubtedly prophylaxis is of the utmost importance. The introduction of a harmless and not quickly absorbed gas into the peritoneal cavity might have a value in lessening the formation of adhesions. After a prolonged operation in which there has been considerable handling or stripping of peritoneum the whole of the incision might be closed except for a small space through which a fine catheter might be passed into the peritoneal cavity. Nitrogen, purified and warmed, may then be slowly introduced until a moderate distension of the cavity has been obtained, when the catheter should be withdrawn and a suture tied to close the abdomen. Very little if any discomfort results therefrom, even when the patient comes out from the effects of the anaesthetic.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

ACUTE PHOSPHORUS POISONING.

ACUTE phosphorus poisoning is rather rare nowadays, and the following details of a case which came under my care this year may, therefore, merit recording.

A married woman, aged 37, was admitted to hospital on September 7th with a history of having swallowed a teaspoonful of phosphorus mice paste two days previously. Within a quarter of an hour of taking the paste her stomach had been washed out and sulphur administered. The patient was said to have vomited several times after the washing out of the stomach. On admission to hospital she appeared rather nervous, but answered questions quite sensibly. She said she had no pain anywhere, but had belched wind several times. She asked for food, but was only allowed water to drink since it was thought that milk might aid absorption of the phosphorus. There was no ulceration of the lips, tongue, buccal mucous membrane, or throat. The pulse was 80 and of good volume and tension; there was no hepatic enlargement, jaundice, or abdominal tenderness. Next day her physical and mental condition was apparently better, and she was allowed tea and sugar and a piece of dry toast. There was no sign of enlargement of the liver and no jaundice. The pulse remained the same, and she had no pain or sickness; the food was retained. On September 10th she was drowsy, but not comatose. She resisted strongly attempts at palpation and percussion over the lower right costal margin. Slight jaundice of the skin and conjunctivae now appeared, and the liver could be felt by deep palpation under the right costal margin. Albumin and bile were found in the urine, but no leucine or tyrosine. A few granular and cellular casts with occasional polymorphonuclear leucocytes were seen, and the urea percentage was 2. On the next day the patient was troubled with retching, but did not vomit. The jaundice was more pronounced, especially in the conjunctivae, and the lower edge of the liver was felt easily about an inch below the right costal margin. The patient appeared to be tender over this area and became restless on palpation, though she lay quietly and dozed, except when being examined. The tongue was dry and there was sordes of the mouth, but no petechial haemorrhages of the skin were observed. She became comatose and died on the morning of September 12th.

The necropsy report included the following details. There was marked jaundice of the skin and conjunctivae, some petechial haemorrhages were seen on the surfaces of both lungs, and there were fluid effusions (10 oz. and 8½ oz.) into both pleural cavities. The heart was normal in size, but showed some fatty degeneration of the wall, with well marked petechial haemorrhages in the papillary muscles. The pericardium was normal, but the cellular tissue in front of it showed obvious haemorrhages. Petechiae covered the upper surface of the diaphragm, particularly over the left dome. The liver was enlarged and there was evident fatty degeneration. The right lobe extended to the level of the third

rib above, and below to about an inch below the right costal margin, and 2½ inches below the ensiform cartilage. The abdominal viscera smelt very strongly of garlic. The spleen, which weighed 6½ oz., was deeply congested, but there was no peritonitis. The left kidney weighed 6½ oz., and there were well marked haemorrhages beneath the capsule and into the lower half of each pyramid; the capsule stripped readily. The right kidney weighed 5½ oz., and both organs showed fatty degeneration. There was no inflammation of the outer coats of the stomach. This viscus contained a blackish-brown glairy fluid resembling altered blood, which did not smell of phosphorus. Black specks, looking like altered blood, were studded over the inner coat, but these were not firmly adherent to the stomach wall. Haemorrhages were seen on the surface of the pancreas. The uterus was non-gravid and appeared to have undergone some fatty degeneration. Haemorrhages, each about the size of a split pea, studded the mesentery surface. The bladder was distended, but the urine was not luminous in the dark; no naked-eye pathological changes were found in the brain.

I am greatly obliged to Dr. Charles Gordon Lewis, resident medical officer, London Road Hospital, Newcastle, Staffs, for permission to publish particulars of this case.

C. F. SWINTON, M.B., Ch.B.

Newcastle-under-Lyme, Staffs.

ARTHRITIS DUE TO PARATYPHOID B BACILLUS WITHOUT GENERAL SYMPTOMS.

A FEMALE child, aged 14 months, was brought to the out-patient department of the Belfast Hospital for Sick Children, with the following history.

About two weeks earlier the child's mother had noticed a disinclination to move the left leg, and that the knee-joint was swollen. The child had previously been quite healthy, and there was no history of any infectious disease.

On admission the left knee-joint was found to be swollen, and evidently contained a considerable quantity of fluid; it was not acutely inflamed. There were no other abnormal signs on general examination and the temperature was 98.8° F.

On the following day Mr. Hall explored the joint, and a thick glairy exudate was withdrawn. From this fluid, which contained many pus cells, I was able to grow, in pure culture, a Gram-negative, actively motile bacillus. On testing the sugar reactions of this organism I found it to agree exactly with the *Bacillus paratyphosus* B. I then made an agglutinable culture by Dreyer's method, and obtained strong agglutination (up to 1 in 500) with standard *B. paratyphosus* B serum, and no agglutination with *B. paratyphosus* A nor *B. typhosus* serums. The serum of the patient also gave a strongly positive agglutination with standard *B. paratyphosus* B cultures (1 in 500), and no reaction with *B. typhosus* nor *B. paratyphosus* A. There were no general signs of paratyphoid infection. A rash did not appear, nor was the spleen ever palpable, and the stools and urine both failed to show typhoid or paratyphoid organisms on culture.

The girl remained in hospital for eleven days. The temperature was normal throughout her stay, except on two evenings when it rose to 99.6° F.

The patient was taken home, but is now attending the out-patient department, and receiving an autogenous vaccine. There has been a gradual improvement, and at the end of one month's treatment the swelling has subsided and the joint is apparently normal.

I could obtain no history of infection in the family; but several cases of paratyphoid B fever have occurred in the district in which the patient lives.

J. T. LEWIS, B.Sc., M.D., M.R.C.P.Lond.,
Bacteriologist, Belfast Hospital for Sick Children.

SEVERE HAEMORRHAGE FOLLOWING VAGINAL TEAR.

THE following case is sufficiently unusual to merit record. A married woman, aged 28, ceased menstruating about 4 p.m. At midnight, immediately following coitus (the first attempt), she had a severe vaginal haemorrhage, losing about three pints of blood. On my arrival the haemorrhage had ceased, but she was suffering from very severe shock. I found it necessary to give her a subcutaneous infusion of saline, to which she responded well. The following day she was removed to hospital, where a more complete examination was made. A dense central adhesion was found between the anterior and posterior vaginal walls, leaving two small lateral apertures. This was situated about midway between the hymen and the vault of the vagina. A deep tear in the vaginal wall about 1½ inches long extended from the lateral aperture on the right side towards the hymen. The adhesion was broken down and the tear sutured. The patient made a good recovery.

Shanklin, I.W.

J. ALFRED GAYNOR, F.R.C.S.I.