some of the symptoms of thyroidism, notably the alimentary group—for example, nausea and diarrhoea—are, I think, to be explained by the presence of toxic products in the preparation employed. Since I have used preparations made by myself, of whose freshness I could be certain, I have seen nothing of this group of symptoms in the cases I have treated. On the other hand, I believe that the headache, pains in the limbs, and cardiac symptoms are due to a specific action of the thyroid, or are produced by some product of the exaggerated metabolism which it excites and that no degree of purity in the preparation employed is a guarantee that such symptoms will not arise. Seeing, moreover, that the organic iodine compound in the thyroid will stand prolonged boiling without having its activity in the least impaired, it ought to be possible to prepare a powder for administration which shall be entirely free from any products of decomposition. Whether the method of preparation of the thyroid powder of the *Pharmacopœia* eliminates the possibility of any toxic products remaining in it is, I should think, decidedly open to question.

Postscript.—Since the above article was written there has appeared in this JOURNAL (July 9th, 1898) a paper by Dr. William MacLennan describing a new thyroid preparation ("thyroglandin"). As that paper contains a number of what (in my judgment) are serious errors as to the facts of the chemistry of the thyroid and the nature of its active constituent, I feel that I ought to make a short reference to it. Dr. MacLennan asserts that the thyroid contains two important principles—an iodoglobulin and iodothyryn—and that both of these are requisite to produce the specific effects of the gland itself. This assertion is quite unfounded in fact. As I have shown elsewhere, the fresh thyroid contains only one iodine-containing compound—namely, the colloid matter. This consists of a proteid part (possibly a globulin) combined with an organic compound of iodine (crude iodothyryn), and the latter compound is split off on hydrolysis of the colloid. The specific effects of the thyroid can be produced by the administration either of the colloid matter as a whole or of the iodothyryn split off from it. The effects produced by both preparations are identical, provided an equivalent dose of each is employed. Further, the colloid matter contains all the activity of the thyroid, the extractives being incapable of producing any of the specific effects of the gland.

It is not the case that all of the processes which have been devised for separating the active constituent of the gland result either "in the destruction of the iodoglobulin entirely, or in the partial separation of the iodothyryn only." In the preparation of the colloid matter, as described by myself, the glands are extracted with dilute caustic soda without the aid of heat. The colloid matter is so soluble in alkalies that it goes entirely into the solution, and if any traces of iodothyryn happen to have been split off from it in the gland, these are also dissolved. The subsequent addition of acetic acid throws down the colloid, and it is afterwards dried without having undergone any decomposition whatever. Furthermore, this separation is accomplished without any other substance of "a useless or objectionable nature" being contained in the final product.

The process which Dr. MacLennan describes as that by which "thyroglandin" is prepared will be perceived at once by anyone conversant with the chemistry of the thyroid to result in the extraction of the colloid matter, *plus* the salts, extractives, and any other substance which happens to be present, and which is soluble either in water or in boiling caustic soda solution. As the salts and extractives have been shown to be "useless," and as the other substances (for example, products of decomposition) may very easily be objectionable, I entirely fail to see the superiority of this process over those already in existence. That the product is simply an impure form of the colloid matter I entertain no doubt at all, and by the administration of $\frac{1}{2}$ gr. of the latter thrice daily I have over and over again obtained quite as marked results as were produced by double that dose of thyroglandin. I therefore cannot regard the latter preparation as in any way superior to those with which the profession is already familiar.

BIBLIOGRAPHY.

For the convenience of other workers I append a classified list of papers bearing upon the pharmacological action of the thyroid. The numbers correspond to references in the text.

- I. *Influence of the Thyroid on Metabolism: Nitrogen Elimination.*—1 Napier, *Lancet*, vol. ii, 1893. 2 Ord and White, *ibid.* 3 Douglas, *Proc. Roy. Soc. Edin.*, vol. xx, p. 330, 1895. 4 Bleibtreu and Wendelstadt, *Deut. med. Woch.*, 1895. 5 Dennig, *Münch. med. Woch.*, Bd. 42, 17, 1895. 6 Donath, *Virchow's Archiv*, Bd. 144, sup. heft., p. 253, 1896 (with full references). 7 Richter, *Centrab. f. inn. Med.*, No. 3, 1896. 8 Grawitz, *Münch. med. Woch.*, No. 14, 1896. 9 Schöndorff, *Pflüger's Archiv*, Bd. 63, 1896, and Bd. 67, 1897, p. 395. 10 Treupel, *Münch. med. Woch.*, No. 6, 1896 (good references). 11 Dinkler, *Münch. med. Woch.*, No. 22, 1896. 12 Irsai, Vas, and Gara, *Deut. med. Woch.*, No. 23, 1896 (with literature). 13 David, *Zeitsch. f. Heilkunde*, xvii, p. 437, 1896. 14 Schiff, *Zeitsch. f. klin. Med.*, Bd. 32, sup. hft., p. 284, 1897, and *Wien. klin. Woch.*, 1897, No. 12. 15 F. Voit, *Zeitsch. f. Biologie*, 35, p. 116, 1897. 16 Gluzinski and Lemberger, *Centrab. f. inn. Med.*, No. 4, 1897. 17 Zinn, *Berl. klin. Woch.*, No. 27, 1897. 18 Matthes, *Verhandl. d. 15ten Cong. f. inn. Med.*, 1897, p. 232. 19 *Gas Interchange*: 19 Magnus Lévy, *Deut. med. Woch.*, No. 31, 1896. 20 Magnus Lévy, *Verhandl. d. 14ten Cong. f. inn. Med.*, Wiesbaden, 1896. 21 Thiele and Nehring, *Zeitsch. f. klin. Med.*, xxx, p. 41, 1896. 22 Leube, *Sitzungsbericht d. phys. med. Gesellsch. d. Würzburg*, No. 7, 1896. 23 Mayer, *Deut. med. Woch.*, 1896, p. 186 (Influence on Uric Acid Excretion). 24 *Influence on the Circulation.*—25 Haskovec, *Wiener med. Blätter*, xix, 8, 1896. 26 Schäfer and Oliver, *Journ. of Physiology*, xviii, p. 277, 1895. 27 V. Vamossy and Vas, *Münch. med. Woch.*, No. 25, 1897. 28 Hutchison, *Journ. of Physiology*, vol. xxiii, 1898. 29 *Influence on the Blood.*—30 Perry, *New York Med. Rec.*, p. 289, 1896. 31 MacPhail and Bruce, *Lancet*, October, 1894. 32 Bruns, *Neurolog. Centrab.*, No. 11, 1895. 33 Lebreton (quoted in Limbeck's *Pathologie des Blutes*, and Ed., p. 337). 34 Donath, *Virchow's Archiv*, Bd. 144, sup. hft., p. 253, 1896. 35 V. Vamossy and Vas, *op. cit.* (31). 36 *Excretion of Active Principle.*—37 Ewald, von Jaksch, and others, *Verhandl. d. 14ten Cong. f. inn. Med.*, 1896 (Discussion on Thyroid Medication). 38 Frenkel, *Berl. klin. Woch.*, No. 37, 1896. 39 Baumann and Goldmann, *Münch. med. Woch.*, No. 47, 1896. 40 Blum, *Münch. med. Woch.*, 8 and 9, 1898. 41 *Dosage, Thyroidism, etc.*—42 Lanz, *Deut. med. Woch.*, 1895, No. 37. 43 Zum Busch, *Deut. med. Woch.*, 1896, No. 31. 44 Cunningham, *Journ. of Experimental Medicine*, iii, p. 147, 1898.

REMARKS ON A CASE OF PENETRATING GUNSHOT WOUND OF THE ABDOMEN: IMMEDIATE LAPAROTOMY: SUTURE OF STOMACH: RECOVERY.*

By JOHN WARD COUSINS, F.R.C.S., M.D.LOND.,
Senior Surgeon to the Royal Portsmouth Hospital and the Portsmouth and South Hants Eye and Ear Infirmary.

PENETRATING wounds of the abdomen must be regarded at all times as severe and dangerous injuries, but gunshot wounds, from the serious damage they inflict upon the internal structures, are always surrounded by special dangers and complications. In civil practice wounds of this class are uncommon accidents, but on the field of battle they constitute 15 per cent. of the total number of gunshot injuries, and their fatal character is shown by the fact that the majority of the men wounded in this region never reach the military hospitals, but rapidly sink from shock and hæmorrhage. In these injuries the danger is in direct proportion to the damage done to the internal organs. Sometimes the projectile penetrates the peritoneal cavity and lodges within it; at other times it traverses the abdomen, and then lodges in some other part of the body or emerges at a second wound.

On October 26th, 1897, I met in consultation Drs. Sykes and Richardson of Gosport on the case of B. L., a girl, aged 16, who had received a severe wound of the abdomen by the accidental explosion of a six-chambered revolver. At the moment of discharge she was holding the weapon in both hands with the muzzle pointing to the region of the stomach. The bullet entered the abdomen 2 inches to the left of the umbilicus, at a point about midway between it and the ninth costal cartilage, and passed out on the right side of the spinal process of the twelfth dorsal vertebra. It did not penetrate the clothes behind, but dropped out of them as they were being removed. The missile was a cylindro-conoidal bullet, half an inch in length, five-eighths of an inch in thickness, and it weighed 225 gr. It was flattened on one side near the point, and the facet measured a quarter of an inch in diameter. Severe pain immediately followed the accident, the patient was cold and livid, and the pulse rapid and wiry, about 150 per minute. She was without delay very carefully removed to the Royal Portsmouth Hospital.

When seen two hours after the accident she had vomited a good deal of blood, and appeared in a state of severe collapse. After some subcutaneous injections of brandy and strychnine, she somewhat rallied. Ether was then at once administered, and abdominal section performed. The abdomen was opened by an incision through the wound of entrance, four inches in length, and two inches below and parallel with the costal margin. The black and ragged discoloration extended through the parietal track into the abdominal cavity. The omentum presented, but beyond it the track of the bullet could not be traced. After carefully raising this structure, and then rotating the stomach inwards, an irregular wound was discovered at the greater curvature, close to the reflection of the omentum. The wound was an inch and a quarter in length, its edges were dark coloured and ragged; and it was surrounded by

* Abstract of an Address delivered before the South-East Hants Medical Society, April, 1898.

coagula and thick gastric fluid. The colon and small intestines were free from injury. The region around was then very carefully cleansed, the wall of the stomach drawn into the incision, the mucous membrane tucked inwards, and the perforation closed by eight Lembert's sutures. The charred and discoloured structures in the track of the wound were cut out, and the abdominal incision closed with four layers of sutures. Two or three hours after the operation her general condition improved. Nutritive enemata were regularly administered. During the first four days she suffered from excessive thirst, but very small quantities of milk and water were given by the mouth. Her temperature never exceeded 101°. Solid food and fish were ordered on the fifteenth day. The abdominal wound healed by immediate union except in the track of the bullet, and here some suppuration occurred. The wound of exit gave very little trouble; it discharged for two weeks and then closed. The patient left the hospital in good health at the end of November with a depressed scar at the wound of entrance.

RESULTS OF PENETRATING GUNSHOT WOUNDS OF THE ABDOMEN.

There is really no satisfactory record of this class of injuries prior to antiseptic times. Penetrating wounds of the abdominal cavity were then generally regarded as fatal injuries; surgical interference was very seldom attempted, and opium was freely administered as the only remedy. There are, however, many well-authenticated recoveries mentioned in surgical literature. Patients have survived after receiving dangerous wounds of the stomach, and many of them have suffered from a permanent gastric fistula. Sir W. Mac Cormac² mentions the case of a patient wounded in the American war who lived two years after receiving a penetrating gastric injury. After death a circular cicatrix was found in the central part of both the anterior and posterior surfaces.³ Another unequivocal case of pistol-shot wound of the abdomen occurred during the same war. The patient recovered, but he remained permanently disabled by a persistent flexure of the body in consequence of the severe cicatricial contraction which followed in the track of the bullet as it passed through the abdomen.

Gunshot wounds of the intestines are very fatal injuries, and the recorded recoveries have been for the most part limited to wounds of the large intestine. Some of these injuries have resulted in the formation of an artificial anus, which after a time has gradually contracted into a faecal fistula.⁴ During the Crimean campaign a soldier was wounded in the loin, and many months after the missile was discharged *per anum*. Four years later the patient died of albuminuria, and at the *post-mortem* examination a part of the bullet was found fixed in the surface of the spleen.

The instances in which soldiers have been discharged from the service for the after-results of gunshot wounds of the abdomen are very rare. Some recoveries have occurred after the lodgment of a bullet in the peritoneal cavity, but the wound has usually resulted in serious disablement. Penetrating gunshot wounds are always followed by localised peritonitis in the track of the bullet, and dangerous consequences have resulted from the formation of cicatricial bands. Some years ago a case of intestinal injury of this kind came under my observation. An officer of the Royal Artillery received a severe gunshot wound of the abdomen during the Indian Mutiny in 1858. The bullet penetrated the cavity two inches above and one inch to the right of the umbilicus. The wound healed in four or five weeks, and he appeared to regain his usual health. On his return to England he consulted several surgeons, who were unanimous in the opinion that the bullet had lodged in the abdomen, and he was urged to refrain from all unnecessary exertion. He continued in fair health up to October, 1865, when he was suddenly attacked with sickness and abdominal pain. The next day I was called to see him in consultation, but he had then passed into a state of hopeless collapse. After death the small intestines were found bound together by several old and firm adhesions, and around one of these—a short and narrow band attached to two adjacent coils—another portion of the gut had become completely twisted. At the seat of the twist the intestine was stretched into the semblance of a cord and completely occluded, and about 3 inches below it the bullet was discovered lying loose in the canal. From the position of the cicatrix and the direction of the track of the bullet through the abdominal wall, together with the distinct traces of bygone inflammation, it appeared evident that the missile penetrated the body obliquely, passed into the peritoneal cavity, and there found a lodgment between the intestines in the right iliac region. It also appeared

certain that the bullet must have remained encysted for a period of seven years, either in some portion of the mesentery or between the intestines, and that under the influence of muscular action and the changes produced by the absorption of the surrounding tissue, it escaped into the alimentary canal. The mesentery and intestines were carefully examined, but it was found impossible to determine the part where the ball had been so long impacted.⁵

DIAGNOSTIC INDICATIONS OF VISCERAL INJURY.

As a general rule, a wound of an internal organ is speedily followed by urgent symptoms. The patient is at once collapsed, and soon after acute abdominal pain and vomiting set in. When, however, the internal hæmorrhage is only small in quantity, or the perforation of an organ is not immediately followed by the escape of the secretions into the peritoneal cavity, the symptoms may be less distinct. It is often quite impossible to determine the direction the projectile has taken, or to diagnose the particular organ that has been injured. Gunshot wounds of the stomach are generally attended with more definite indications than wounds of any of the other organs. Wounds of the intestine are marked by sudden collapse and acute pain, and these symptoms are soon followed by tympanitic distension. Occasionally after a severe injury intestinal gas has been observed to escape through the abdominal wound.

Sometimes gunshot wounds and severe contusions of the abdominal wall produce serious internal injuries without actually penetrating the peritoneal cavity. In some cases the question of penetration can be determined at once by a careful examination of the wound; in others the question cannot be so easily settled, and under these circumstances it is prudent to wait for the development of clear indications of visceral lesion. Some months ago a young man accidentally received a pistol-shot injury at the Royal Theatre, Portsmouth, and when the explosion took place he was standing only a few feet from the weapon. He was immediately taken to the hospital in a state of severe collapse. The ball had struck him in the epigastric region, and the poor fellow and his friends believed that he had been mortally wounded. A careful examination of the seat of injury, however, yielded no evidence that the missile had penetrated the abdominal cavity. He rallied in a few hours, no urgent symptoms supervened, and he left the hospital in two weeks. The bullet was afterwards picked up in the theatre.

The diagnostic indications of wound of the stomach were well marked in my case by the position and direction of the wound, the epigastric pain and tenderness, and the persistent hæmatemesis. The pistol was discharged almost at a right angle to the surface of the body, and the bullet entered the peritoneal cavity at its highest rate of speed. The track it took was visible to the omental surface, it then lacerated the lower border of the stomach close to the origin of the great omentum, and fortunately finished its course through the abdomen without damaging any other organ. The ball penetrated an intercostal space and the muscles of the back, and then finally escaped near the body of the twelfth dorsal vertebra. After thus traversing the body it is not surprising that a well-marked facet was found upon it. This may have been caused by the first impact with the patient's clothes, and not from contact with any bone during its circuitous passage. A bullet may receive very delicate marks from soft and yielding objects with which it has been brought into collision, and one has been known to strike against unsupported canvas with such force that it has been altered in shape, and has retained markings of the cloth.⁶

TREATMENT BY IMMEDIATE LAPAROTOMY.

The great progress of abdominal surgery during the last few years has practically transformed the treatment of abdominal wounds and gunshot injuries, and in a large number of these cases immediate laparotomy is now regarded as yielding the only hope of saving life. In these pressing emergencies the experience and judgment of the surgeon will guide him in deciding upon the expediency of surgical interference, and, fortunately, he can now undertake the exploration of the abdominal cavity with every modern precaution, and also with the conviction that the operation is attended with far

less risk than reliance upon the administration of opium and the expectant treatment of former times.

We may now accept it as a surgical axiom that in every case of penetrating wound in which there is reason to believe that an internal injury has been inflicted, the abdomen ought to be opened with the intention of arresting hæmorrhage, securing by suture any lacerated or wounded organ, removing blood and other extravasated fluid, and cleansing the peritoneal cavity. In cases of gunshot injury, whenever a projectile has penetrated the abdomen, and urgent symptoms are present, it is surely useless to hope that the viscera have escaped damage. As soon, then, as the patient has sufficiently rallied from the shock, an exploratory operation is clearly indicated, and any delay for the development of more urgent symptoms aggravates the danger, as these can only be the outcome of pathological changes which are associated with septic poisoning and fatal peritonitis. In many cases the chance of success wholly rests on immediate action. The flickering pulse, persistent vomiting, and cold extremities are the outward expression of internal hæmorrhage and extravasation, and the hope of rescue hangs on at once exposing the wounded organs and then securing them by suture. It is of course useless to operate when the patient is rapidly sinking, for the proper treatment under these circumstances would be hypodermic and rectal stimulation and external heat; and we may rest assured that whenever the judicious application of these remedies has failed to rally the patient, abdominal section would certainly have been of no avail. Even in extreme cases we must not readily relinquish our efforts, for a patient may rally very unexpectedly from a state of profound collapse. Some time since a sailor in a state of intoxication fell 20 ft. from the side of a vessel anchored in Portsmouth Harbour into a boat, and he was not discovered for some hours after the accident had occurred. On his arrival at the hospital the poor fellow appeared to be rapidly sinking. On removing his clothes, a lacerated wound of the abdomen was discovered extending from the cartilages of the right and ninth ribs down to the umbilicus, and a large portion of the small intestine, a part of the colon, and a mass of omentum were protruding through it in a state of strangulation. After dividing the edge of the wound, excising torn pieces of omentum, securing many ruptured vessels, and clearing away blood clot and dirt, the viscera were carefully washed and returned. The patient's condition rapidly improved after the operation, and in three weeks he left the hospital.

Referring again to my own case, the patient was in a very critical position at the time of the operation. Fortunately the bullet had escaped from the body, and there was no anxiety as to the position of the projectile. If, however, this had not happened it would have been injudicious to have made a prolonged search for it, as the effort would have added to the risk of the operation. When the seat of the internal injury was discovered there appeared to be no indication of any other visceral wound, and no blood or extravasated fluid was found in any other part of the cavity.

Immediate laparotomy for penetrating wounds and severe contusions must be performed with strict attention to all the preliminary details and general principles which now regulate the practice of abdominal surgery. As soon as the diagnosis of visceral injury has been made, provided the patient has sufficiently recovered from the shock, the operation ought not to be delayed, for these serious accidents are soon followed by acute abdominal symptoms and peritonitis, and when these complications set in surgical interference can be undertaken with very little hope of success.

Acute septic peritonitis attended with diffused suppuration may follow any form of perforating lesion of the abdomen. Sometimes life has been saved by timely abdominal section; but in these fortunate cases the entire peritoneal sac is seldom involved, and there is a limitation to the inflammatory process. The signs of general peritonitis may appear to be fully developed; but, by the copious exudation of lymph, a protective barrier surrounds the purulent formation, and the result is a localised abscess, which greatly augments the chance of recovery.

In perforating laparotomy for penetrating gunshot wounds the incision ought to be long enough to admit of free exploration, and whenever possible it should be made through the wound of entrance. One or two strong silk threads intro-

duced on both sides through the whole thickness of the abdominal wall make excellent retractors. They never slip, occupy no space, and greatly assist the inspection of the cavity. During the manipulation of the hollow organs great care is necessary to prevent the escape of their contents, and as soon as the seat of injury is discovered the wound must be temporarily secured with the fingers or forceps. The wounded organ can now be gently drawn into the incision, surrounded with sponges or moist antiseptic gauze, and sutured or excised according to the extent of the injury. When the wounds of the intestine are large or numerous, or a portion of the gut is severely contused, partial or complete resection must be practised. If the kidney or spleen is hopelessly damaged, it ought to be excised at once.⁷

In hepatic injuries hæmorrhage must be arrested by pressure, ligature, or the thermo-cautery, and the lacerated parts brought together with catgut sutures. Torn omentum or mesentery must be cut away and the edges carefully united, but these important structures must always be spared as much as possible, as upon them the vascular supply of the intestinal tube mainly depends. In closing the abdominal incision all charred and injured tissue should be excised, and the track of the projectile deodorised with the greatest care; because gunshot wounds are at all times difficult to disinfect on account of the damage done to the structures, and the forcible insertion of dirt and foreign substances which may carry pathogenic germs far beyond the limits of the actual wound and the power of sterilising agents.

In some cases of deep visceral lesion it is necessary to temporarily establish drainage from the site of the internal injury to one end of the laparotomy incision. Sometimes the wounded region may be effectively drained by a lumbar incision. When blood or extravasated fluids have penetrated to the deep recesses of the peritoneal sac, every part must be washed out with sterilised water at the temperature of 105° or 110°, and if after irrigation is finished any excess remains behind it should be removed with clean sponges, although a little residual fluid certainly does no harm. Any solid masses or pieces of food are easily removed by antiseptic gauze or clean fingers. The lumbar and pelvic hollows always require special care, and in some cases of diffused extravasation two drainage tubes are serviceable—one placed in the seat of injury and fixed to the upper end of the abdominal wound, the other inserted in Douglas's pouch, and secured through a small incision just above the pubes.

Unfortunately the death-rate after operative interference in gunshot wounds of the abdominal cavity is extremely high. Ninety-seven surgeons operated upon 167 cases, with 62 recoveries and 105 deaths—a mortality of 65.45 per cent.⁸ We are greatly indebted to many eminent American surgeons for their labours in this department of abdominal surgery. We must not estimate the value of immediate surgical interference from statistical statements, however carefully prepared; for gunshot injuries are so variable both in their extent and severity. Dr. Ernest Maylard, after giving an interesting summary of ten successful cases of laparotomy, remarks: "Statistics do not afford any very safe means for determining the value of operation; for so much depends upon the size of the projectile, the range at which it is fired, and the period of time elapsing before operation. Numerous cases of recovery are recorded where it appears certain that but for the operation a fatal result must have ensued."⁹

In conclusion, very few laparotomies appear to have been performed during the recent Greco-Turkish war. Mr. J. H. Davis (late Surgeon National Fund for Greek Wounded) states that he was present at only one laparotomy. The patient was a man who had received a penetrating wound of the abdomen, and the ball had escaped through the lumbar region. When brought in urgent signs of internal hæmorrhage were present, so the peritoneal cavity was opened and many clots removed, but no visceral injury could be discovered, and the patient recovered. Mr. Davis remarks: "This was the only laparotomy on the Greek side during the war that I heard of. Some had been performed by foreign Red Crescent surgeons with the Turks, but these, I am told, mostly proved fatal."¹⁰

REFERENCES.

- ¹ *Wounds of War*, Surgeon-Colonel Stevenson, p. 321. ² *Heath's Dictionary*, vol. i, p. 646. ³ *Longmore's Gunshot Injuries*, p. 373. ⁴ *Ibid.*, p. 259. ⁵ *Med. Times and Gazette*, October 27th, 1866. ⁶ *Longmore's Gunshot Injuries*.

p. 259. ⁷ Partial resection has been successfully performed in gunshot injuries of kidney (MORRIS, BRITISH MEDICAL JOURNAL, March 26th, 1898, p. 812). ⁸ Abdominal Traumatism, Dr. T. S. K. Morton, Philadelphia. ⁹ The Surgery of the Abdominal Canal, p. 323. ¹⁰ West London Medico-Chirurgical Journal, January 1898, p. 17.

A NEW SUTURE FOR THE INTESTINE, MESENTERY, ETC.

By ARTHUR E. BARKER, F.R.C.S.,

Professor of the Principles and Practice of Surgery, and Professor of Clinical Surgery at University College; and Surgeon to University College Hospital.

IN operations upon the abdomen all surgeons of experience will agree that any saving of time compatible with accuracy of manipulation is a most important factor in success. The use of small needles within the abdomen, whether straight or curved, whether held like Hagedorn's in forceps, or in the fingers as in the case of ordinary sewing needles, has always required much time, whether for threading, handing, or fixing the needle in a holder, and many surgeons have tried to avoid this by the employment of buttons and other ingenious contrivances. But, being a believer in suture *versus* other mechanical contrivances, I have been experimenting for a year or two past on various forms of needles and holders which might save time by securing greater command over so small

an object as a fine needle in awkward situations, and in avoiding the threading of one of these frequently, or of many to be handed to the surgeon in the course of an operation.

In the end I have designed an instrument with which the finest needles may be held at any angle clear of the hand, and which only requires to be threaded once before the operation is begun. Moreover, the threads introduced with the needles so held can be used not only for the ordinary interrupted suture, and tied separately, but also (which in some cases is much better) for a row of suture identical with the stitching of many sewing machines, and requiring no knot until the final stitch.

I have used this little surgical "sewing machine" now for some months past, in various modifications, on several different kinds of case, including suture of the intestine and mesentery, and closing skin wounds, with much satisfaction. It has passed through various stages of evolution as its previous defects have been recognised, and is now, I venture to think, worthy of recommendation to others in its mature form.

The "sewing machine" consists of two thin steel blades, 1 inch broad at the handle end, and tapering to $\frac{1}{4}$ inch at the needle end.

Fig. 1. — (Half size.) The lower blade with the reels *in situ*.

Fig. 2.—Instrument threaded with needle ready for use.

These blades are fitted together parallel to one another, leaving an interval of $\frac{1}{4}$ inch between them in which two, or better still, three reels, 1 inch in diameter, are held, which

carry the thread. (Fig. 1.) The axles of the latter run in holes drilled in the blades, their ends being flush with the latter.

The circumference of the metal reels is almost flush with the edges of the blades, so that the pulp of the finger resting upon the latter can stop the play of the reel, or, on the other hand, roll it in either direction either to "pay out" thread or to "take in the slack," if any. The blades are held together by screws with T-shaped heads, which pass through longitudinal slits as the upper blade is laid upon the lower, and are then given one or two turns across the slits. When thus fixed the blades ought to just touch the shoulders of each reel round the axle. A turn of the T-screws one way or the other affects the adjustment either to hold the reel tightly or loosely.

The narrow ends of the blades are brought together by pressure, and when nearly touching the head of a third T-shaped screw held in the lower blade near its point, passes through a longitudinal slit in the upper blade, and when turned crosswise once or twice holds the points together. Between these points the needle is gripped firmly by an extra turn of the screw.

The "grip" for the needle is arranged thus. The end of the lower blade is drilled vertically $\frac{1}{8}$ inch from its point. The fine hole thus made carries a screw which is the axle of a hard steel disk $\frac{3}{16}$ inch thick and $\frac{1}{4}$ inch in diameter, drilled through its centre, which lies on the upper surface of the lower blade point, and can be swivelled on the screw passing through it into the point of the lower blade. The head of this screw, which is countersunk in the disk, holds the latter down on the blade point, while a shoulder on its axle portion prevents it gripping the disk too tightly when twisted home. The upper surface of the disk has a groove running across it just clear of the axle screw. The disk is also pierced eccentrically by a hole parallel to its plane surfaces, at about a right angle to the groove on its upper surface, and terminating under the left-hand end of the groove in the upper surface. The needle is laid in the latter, and the upper blade point is brought down upon it. The T-screw is then given one or two turns, and the needle is firmly fixed for use.

The thread previously wound wet on the reels, which are then boiled, is passed through guiding holes in the stops of the blade, and finally through the oblique hole in the swivelled "grip." It is then passed through the eye of the needle, which is near the point. The needle is, in fact, a sewing-machine needle, either straight or curved, either Singer's or Frister and Rossmann's pattern. It can be set at any angle to the blades by turning the swivelled disk, but the relation of the thread to the undermost groove running from the haft of the needle to its eye is not thereby changed. In this way it can be used for a right or left-handed thrust, and can be altered in a moment, without unlocking the blades, and simply with the fingers.

The needle so threaded can be used in several ways. It can be passed through the tissues to be united, and when the point emerges for about half an inch, it is slightly drawn back. This throws the loose portion of the thread on its upper surface into a loop, which can be caught by the fingers and drawn out to any desired length as it unrolls from the reel. When the needle is withdrawn this portion can be cut off, and used for one of the interrupted sutures.

But perhaps the best suture, as saving time, is the ordinary sewing-machine stitch—which, I think, is new in surgery. The needle having been passed as before and the loop caught from the eye, the first loose "tail end" is drawn out without unthreading the needle. The latter is then passed for the next stitch and slightly withdrawn until the loop appears, which is caught and enlarged. Then the loose tail end of the previous stitch is passed through the loop and the latter is drawn home by withdrawing the needle, the finger meanwhile resting on the reel so as to stop it paying out thread. Then the needle is used as before, the loose end being passed through its loop, just in each case as the shuttle of the sewing machine passes through the loop of the thread as the needle in rising slacks the latter and throws it into a loop. This saves all the time and trouble of tying individual sutures until, of course, the last, which is fastened in the usual way. But care should be taken not to draw the stitches too tight, as one is decidedly inclined to do. Straight and