NEW METHODS OF PERFORMING ENTERORRHAPHY.

By FRED. BOWREMAN JESSETT, F.R.C.S.,
Surgeon to the Cancer Hospital, Brompton.

SINCE the time Travers wrote his treatise on *An Enquiry into the Processes of Nature in Repairing Injuries of the Intestine* in 1812, and Jobert his work on *Maladies du Canal Intestinal* (1829), it has been universally admitted that the success or failure of the operation of enterorrhaphy must depend upon whether or not the surgeon is able accurately to approximate the serous surfaces of the two ends of intestine to be united. This view, however, may now be considerably modified, as will be seen by the result of experiments which I am about to narrate, and also by the experiments of Dr. Robinson, of Toledo.

Numerous suggestions and experiments have been made with a view of enabling the surgeon to attain perfection in uniting the divided intestine, but to Lambert is due the credit of pointing out the importance of passing the connecting sutures through the muscular and serous coats only, care being taken that the needle does not pierce the mucous coat.

It was not until Senn brought the subject of intestinal surgery more prominently before the profession that any further great progress was made, although Mr. Stanmore Bishop, in the year 1885 introduced a considerable improvement in the method of operating, details of which were contained in his paper which was read before the Royal Medical and Chirurgical Society.¹

In 1888 Mr. Croft² operated on a man for rupture of the small intestine, making an artificial anus and deferring the more radical operation for a month; unfortunately, owing to the combined effects of the first lesion and the long second operation, it was unsuccessful, the man dying thirteen hours after the operation. In May, 1889, Mr. Croft³ operated successfully on a boy aged 14, who had been kicked by a horse in the abdomen, by which the intestine was ruptured. Mr. Croft cut away a V-shaped segment of the gut, and united the cut ends opposite the attachment of the mesentery by sutures, so as to draw together the muscular coats—applying these coats *dos à dos*. Five sutures were needed for this. In bringing together the rest of the bowel Lambert's sutures were employed, about twenty being inserted. Mr. Croft rightly attaches considerable importance to bringing the intestinal walls, where they are not covered with peritoneum, by their muscular coats carefully *dos à dos*; and the brilliant success attending this case eloquently confirms his conclusions.

In 1889 I conducted a number of experiments with a view of overcoming the difficulties and dangers of the operation, following, in the first instance, Senn's method of operating. It soon became apparent to me that, admirable as was Senn's mode of performing circular enterorrhaphy, yet there were great difficulties in invaginating the proximal cut end of the intestine into the distal; the chief difficulty was the inversion and invagination of the divided distal end, especially at its mesenteric border.

To overcome this difficulty, Dr. Widenham Maunsell,⁴ late of New Zealand, and Mr. Paul,⁵ of Liverpool, have devised methods of operating whereby they found they could invaginate the intestine with comparative ease. Neither of these operations, however, ingenious as they are, were to my mind by any means perfect; and it was only after some considerable time and patience that I succeeded in finding a method which appears to overcome many of the difficulties in the way of invaginating the upper segment of the divided bowel into the lower, so as to invert the divided end of the lower segment for a sufficient distance to insure accurate apposition of the two serous surfaces.

It will be observed that all the operations that have been devised are simply modifications of Jobert's, or, I may say, the perfecting of his operation. When employing Senn's method of performing circular enterorrhaphy, the idea occurred to me that the operation might be performed in a very much more

simple manner if I could only steady both ends of the divided intestine by means of some form of tube. After numerous experiments on the cadaver, I found, in the first place, that a single tube did not fulfil all I wished, neither did a double tube of equal calibre throughout, as the same difficulty arose of sliding the distal portion over the proximal; moreover, the tube being separate, I obtained no fixity at the point of union of the two divided ends of the intestine. Finally, I determined to have a double tube made after the pattern of the accompanying sketches.

Fig. 1.

Fig. 2.

Fig. 3.

It will be observed that the tubes, which are of decalcified bone, consist of two portions, and, when united, form a hollow cylinder (Fig. 1), the greatest diameter of which is at the union of the two parts. It measures $2\frac{1}{2}$ inches in length, and the diameter at the centre is nearly twice that of either end. For convenience I have designated one tube—the male, and the other—the female.

The male tube (Fig. 3) may be described as consisting of two parts: the cylindrical portion, which is fastened into the proximal end of the intestine, and the spur which slides into the female portion of the tube. In the end of the larger portion, at its junction with the spur, four holes are drilled; these pass in a slanting direction from without inward, ending just at the junction of the spur. Through the four holes two long threads of chromic gut, armed at the ends with ordinary sewing or intestinal needles, are inserted, one thread being passed through two holes and the other thread through the other two openings, as shown in (Fig. 3.) The female tube is of a conical shape, and measures one inch and a-quarter in length; it has four holes drilled in the edge of the larger end, through which two long threads of chromic gut armed with needles are passed in a similar manner as in the male tube (Fig. 2).⁶

The method of using these tubes is as follows: The portion of intestine to be excised being removed, the male tube is inserted into the proximal end of the divided intestine as far as the flange, the spur being allowed to project beyond the divided surfaces. The four threads are next passed, from within outwards, through all the coats of the intestine, close to the edge. Care must be taken that two of the threads are passed close to the mesentery, one on each side, the other two being passed equidistant from these on the opposite side of the gut; the needles are now removed and the four threads

¹ *Med. Chir. Trans.*, vol. lxx, p. 343.

² *Clinical Society Report*, 1888.

³ *Clinical Society Report*, 1890.

⁴ *Report of Intercolonial Medical Cong.* 1889.

⁵ *Lancet*, 1891, vol. i, p. 1196.

⁶ I have had these tubes made in three sizes, the largest being five-eighths of an inch at its greatest diameter, the middle size being half-an-inch and the smallest three-eighths of an inch. These tubes have been made with much care for me by Messrs. Krohne and Sesemann.

held by means of clamp forceps while the female tube is being introduced in a similar manner into the distal portion of the divided intestine and the threads passed through all its coats at points corresponding to those in the proximal end. The two divided ends are now approximated by passing the spur of the male tube into the female; the corresponding opposing threads are tied firmly; the parts are now in the position indicated in Fig. 5.

Fig. 4.

Fig. 5.

The ends of the sutures being cut away, the surgeon next steadies the proximal end of the intestine over the tube between his left thumb and finger—while with the thumb and finger of the right hand he gently slips the distal part of the intestine over the proximal for a quarter to half an inch. He then, with four quilt chromic gut sutures, fastens it in place, being careful to insert one suture on each side of the mesenteric border (Fig. 4). If a V-shaped piece of mesentery has been removed, it must be brought together with a few interrupted sutures. The parts may now be dropped back into the abdominal cavity and the parietal wound closed in the ordinary way. It is of importance that the tubes should slip quite easily into the intestine, as if they fit at all tightly there is much more difficulty in invaginating the one portion of intestine over the other; moreover, there is the risk of gangrene, as the tubes may swell somewhat after their introduction.

The following experiments were conducted at the Laboratory of the Royal Colleges of Physicians and Surgeons, with the kind assistance of Dr. Morotti, of Milan:—

CASE I.—June 22nd, 1891. A small dog was placed fully under the influence of ether, and an incision made in the middle line below the umbilicus. A loop of intestine was withdrawn and divided. The approximation tubes were introduced in the manner above described. The tubes were rather large, and fitted tightly into the canal, and I experienced some difficulty in slipping the distal portion of intestine over the proximal: this, however, was accomplished, and duly fixed with stitches. The dog died two days after, and on examination I found the intestine gangrenous, owing to the tubes being too large and causing compression.

CASE II.—June 25th. A terrier dog was placed thoroughly under ether. The tubes in this case I had made smaller and of the present pattern. I had no difficulty in inserting them, and when fastened in position the distal portion of the intestine was slid over the proximal with the utmost ease, and fastened with four quilt sutures, and the operation completed. The dog had no bad symptoms, and was cheerful and frisky the next day. I killed him a month later, and found the specimen perfect.

CASES III, IV, V, and VI were performed in a similar manner, and were all successful; in every case the specimens are all that can be desired.

On one occasion, when trying Paul's method, I failed entirely to invaginate the upper into the lower segment of bowel, and as there was considerable extrusion of mucous membrane I cut this away, and in again endeavouring to invaginate the bowel, it slid over very easily, but the edge was not inverted, so that, instead of the two lower surfaces being in

apposition, the inner side of the muscular coat, denuded of its mucous membrane, was opposed to the peritoneal coat of the upper segment. I fastened this in place, and the dog made a perfect recovery. On killing him some time after, I found the union where the mucous membrane had been removed perfect, while where the mucous surface came into contact with the peritoneum, no attempt had been made at union. I thought from this I had made an important discovery, and one of great value. I found, however, that I had been forestalled by Dr. Robinson of Toledo, who in the *Annals of Surgery* only a month or two before had propounded the same theory, which he had successfully put into practice in numerous experiments.

In dealing with the mucous membrane in this operation, it must not be forgotten that we have to do with a gland-secreting surface; it will be necessary, therefore, to be most careful to shave off and scrape away all the glandular tissues before attempting to apply the abraded surface to the peritoneum, which, by the way, should also be scarified, although I do not think this is absolutely necessary.

Dr. Robinson used in his experiments an india-rubber tube from three to six inches long and one-fourth of an inch in circumference, which he introduced into the proximal end of the intestine. I adopted in my experiments a decalcified bone tube similar to that adopted by Paul, and about two or three inches long. I found that it was important that the tube should fit easily into the lumen of the gut; if it was too large there was a fear of gangrene; moreover, the intestine after division invariably contracted considerably. I found in every instance the bone tube lasted quite long enough to allow of firm union taking place, after which time it became absorbed and gave no further trouble. In the case of the rubber tube adopted by Robinson, much anxiety must be felt as to its whereabouts until it has passed *per anum*. Moreover, it must of necessity be a fruitful source of obstruction. The operation as performed by me, assisted by Dr. Morotti, has been most successful.

EXPERIMENT.

CASE I.—A dog was placed under the influence of ether on October 1st. A portion of small intestine was withdrawn through the parietal wound and a piece cut away. A decalcified bone tube about two inches long was introduced into the proximal end of the intestine, and a row of continuous sutures introduced around so as to secure the divided end of the intestine to the lower part of the tube. The distal portion of intestine was then everted and the mucous membrane cut away with scissors, care being taken afterwards to scrape away all the glandular tissues by means of a curette. This denuded surface was then slipped over the proximal end of the bowel in which the bone tube was fixed, and fastened with a half a dozen quilt or Lembert sutures, being careful to place one on each side of and close to the mesentery. The dog had no bad symptoms, and was killed a month afterwards. The union was perfect, and the lumen of the canal was very little contracted.

CASES II and III were operated on in a similar manner and made equally good recoveries, the specimens showing most perfect union, and the calibre of the canal being well maintained.

MANSLAUGHTER BY AN INMATE OF A WORKHOUSE.—An inmate of the Totnes Workhouse was tried at the Devon Assizes last week for the manslaughter of another inmate suffering from partial paralysis. It would appear that the defendant, John Thomas, had to watch the deceased, and, becoming wearied with his task, had dragged him from the ward to the bathroom, where he struck him with a strap and a stick, afterwards pouring water over him, so that the unfortunate patient died from the shock of the injuries he had received. Mr. Justice Wills characterised Thomas's conduct as heartless and cruel, and sentenced him to five years' penal servitude. This is all very well, as far as it goes; but it appears to us the authorities are also to blame for placing a case of paralysis under the care of another inmate whose subsequent conduct proves him to have been totally incompetent. Surely paralysed cases require competent nurses.

PRESENTATIONS.—Mr. J. Rowlands, who has filled the post of surgeon to Her Majesty's prison at Carmarthen for forty-two years, has been presented by the officials with a "smoker's companion."—Dr. G. H. Butler, on his leaving Whitechurch, has received from the inhabitants of the town and neighbourhood, as a memento of their friendship and esteem, an illuminated address and a purse of £60.

At the suggestion of the Superior Sanitary Council of Austria, the Austro-Hungarian Government has made the notification of cases of epidemic cerebro-spinal meningitis compulsory.