TRANSPLANTATION OF A SEGMENT OF SMALL INTESTINE TO REPAIR THE RESECTED SIGMOID FLEXURE.

BY

W. STEPHEN FENWICK, M.S., F.R.C.S.,

SURGICAL REGISTRAR, CHARING CROSS HOSPITAL; SENIOR ASSISTANT SURGEON, QUEEN'S HOSPITAL FOR CHILDREN; SURGEON TO OUT-PATIENTS, GORDON HOSPITAL.

A COLOTOMY, to say the least, is an unpleasant thing. I think one may state without exaggeration that there are few patients who, learning for the first time that an artificial anus has to be made, regard the prospect with anything short of absolute horror. Apart from the actual inconvenience from the soiling of the skin of the abdomen and the wearing of a colotomy belt, the sense of decency is affronted. Social intercourse to all those doomed to a permanent colotomy must necessarily be a constant source of anxiety. It is true that some patients whose bowels naturally act with regularity manage a colotomy with surprising success, but even they have to be most careful in matters of diet and exercise. When, however, the bowels are normally loose, great difficulty is experienced in controlling the evacuations, and life becomes utterly miserable.

This was the case with the patient upon whom I performed the operation described below, and which I devised after witnessing his distress when told that the artificial anus could not be dispensed with.

For three weeks he had struggled with his colotomy. A belt had been fitted, but was constantly soiled, his clothing was ruined, and, as he said, it was impossible for him to associate with his fellow-men.

The patient (C. T. B.), a man aged 51, was first seen by me in consultation with Dr. Ronald A. Taylor, of Adelaide Road, Hampstead, on January 18th, 1911. I found him obviously suffering from chronic intestinal obstruction, and from the history that he gave I had little doubt that a stricture of cancerous nature existed in the sigmoid flexure of the colon. Owing to the kindness of Sir Frederick C. Wallis I was able to admit him to Charing Cross Hospital, and on the 21st I opened the abdomen between the umbilicus and pubes, and found a small, hard, freely movable growth situated in the colon just at the brim of the pelvis.

The small intestine was greatly hypertrophied and distended, and such was the congestion of the intestinal vessels that the abdominal cavity contained a considerable quantity of blood-stained fluid.

The colon above the growth was explored and found to have a very short mesentery not more than 2 in. in length. The patient's condition was too grave to allow of an attempt at resection, and indeed the distension of the intestines rendered it impossible. Accordingly the mid-line wound was closed in layers, an iliac colotomy performed, and a Paul's tube inserted. Owing to the shortness of the mesentery, great difficulty was experienced in bringing the bowel to the anterior abdominal wall. Next day the colotomy acted well, and subsequently three to four times daily.

For a week the patient, who is a chronic bronchitic subject, had a hard fight from chest complications, but after this the general condition rapidly improved, appetite returned, and weight was put on.

Twenty-two days after the operation an accident occurred—the patient was seized with gripping pain in the lower abdomen, the bowels were confined, distension rapidly ensued, vomiting commenced, in twenty-four hours became faecal, and it seemed clear that an attack of acute obstruction had supervened. The mid-line wound was again opened, and a band of recent origin low down in the pelvis was found to have obstructed the lumen of the small intestine about 2 ft. above the ileo-caecal valve. There was a linear patch of bowel which looked gangrenous; this was oversewn, and since the lumen was much narrowed by this procedure a lateral anastomosis was performed between the coils of intestine immediately above and below the stricture.

It was observed that some fairly strong adhesions

existed between the growth, the colon at the colotomy, and adjacent coils of small gut. These were left alone as time was flying; about 1 oz. of warm sterilized olive oil was smeared over the coils of intestine, and the abdomen closed rapidly in one layer by fishing-gut sutures.

Before the patient left the table a gush of fluid faecal matter rising some inches in height occurred from the colotomy, and one had the supreme satisfaction of knowing immediately that the obstruction was effectively relieved. The subsequent course was uneventful. The patient left hospital four weeks later in order to pick up strength preparatory to an attempt to remove the growth.

On April 3rd the patient was again admitted, looking the picture of health. In less than four weeks he had put on 21 lb.—nearly a pound a day. As before stated, he had had a miserable time, and both he and his wife implored me to do something to close the colotomy.

On April 6th, assisted by Mr. T. W. R. Strode, House-Surgeon to Sir Frederick Wallis, and Mr. Thomas Beaton, I again opened the abdomen. Knowing exactly the position of the cancer (it could be felt about 3 in. below the colotomy), I made the incision at the outer margin of the left rectus muscle, roughly midway between the colotomy and the mid-line scar. Previously the artificial opening had been isolated from the operation area as far as possible by collodion gauze, and the skin prepared by the iodine method.

This incision gave splendid access to the growth. Some adhesions between the small intestine and the colon were broken down, but these were slight and gave no trouble. As far as could be made out from a rapid examination, there were very few adhesions in the abdominal cavity—apparently the oil used at the previous operation had done good work. The cancer was pulled up and two clamps were placed above the growth and two below, the upper pair being situated 1½ in. above the growth and about 1½ in. below the colotomy; the lower pair 2 in. below the growth.

The mass was cut away with a V-shaped portion of mesentery in which enlarged glands could be felt. As one of these glands was situated well to the outer side of, and at some distance from, the growth, it became necessary to remove rather more mesentery than was considered quite safe, having in view the blood supply of the portion of colon left below the colotomy.

After pulling up the rectum as much as possible, an interval of about 3 in. existed between the raw surfaces, and to close the cut ends, leaving a permanent artificial anus, seemed the obvious course. The conditions being favourable, I decided, however, to attempt to isolate a segment of small intestine, and with it bridge the gap in the large.

The extremities of the large bowel were guarded; a loop of ileum fairly low down was taken, and a portion about 5 in. in length was double clamped off, as indicated in the diagram (2). The bowel was divided between the clamps at A and B and the mesentery, with great caution to avoid blood vessels towards its root, for a distance of 2½ in. One or two vessels required ligature, but haemorrhage was not troublesome, and after the division the four cut surfaces were of good colour and oozed blood freely. The continuity of the small gut was next restored by uniting the cut ends C D in front of the mesentery of the freed segment with two complete rows of thread sutures, the innermost passing through all the layers of the bowel, the outer only the sero-muscular. The segment of small intestine, it was found, could be easily brought into excellent position between the cut ends of the large.

The problem now remained as to the manner in which the small bowel should be united to the large above and below, and restore the continuity of the sigmoid flexure. It was clearly impossible to suture in the usual way, as the upper extremity (F) of the large bowel was tucked away under the outer edge of the incision in the abdominal wall, and the lower extremity (E) was below the pelvic brim. The upper anastomosis might have been performed by Maunsell's method, through the colotomy as a dorsal incision, but it would have been very difficult. It was decided to employ two Murphy buttons—no risk of leakage existing because the colotomy was above the proposed junctions.

This was accordingly done, and proved not very difficult;

a male half was tied in by means of a purse-string suture at E and B, and a female at A and F.

It may be remarked that there was very little difference between the size of the lumen of the small gut—hyper-trophied by long obstruction below—and that of the large bowel, which had diminished after the performance of colotomy. At this stage it was observed with some mis-giving that the large bowel at F looked rather blue and congested, but, as bleeding was going on, it was considered safe to leave it *in situ*. As subsequent events proved, however, this was not the case. Presumably the congestion, added to the usual sloughing which occurs between the halves of the button, produced a small ring of gangrene in the colon which almost proved the undoing of the patient. A further $\frac{1}{2}$ in. should have been removed.

After the anastomoses were completed a few stitches were placed, drawing together the cut edges of the mesenteries, as indicated in the diagrams, to avoid the possibility of internal herniae. Finally the abdomen was closed rapidly by interrupted fishing-gut sutures, and a rubber tube, with some gauze packing, was inserted at the lower end of the incision.

The whole operation, from first incision to the last stitch, occupied ninety minutes. There was little or no shock. Pulse 96, and of good volume.

Next day, the temperature having risen to 100° and the pulse to 110, the wound was dressed. The gauze looked dirty; there was some thin sero-purulent discharge, which had a faecal smell. A linear strip of the mucosa at the lower end of the colotomy appeared to be sloughing, and it was feared that some gangrene of this portion of the bowel was occurring. The upper Murphy button could be seen with a speculum 1 to $1\frac{1}{2}$ in. below the colotomy opening, and the bowel immediately above appeared black in colour.

Next day the patient's general condition remained fairly good, although the chest was again troublesome, but it was obvious that something had gone wrong in the operation area; apparently the bowel above the upper Murphy button had sloughed to some extent. It was decided to see what could be done under spinal anaesthesia. An oblique incision was made between the colotomy opening and the lower end of the recent wound. The general abdominal cavity was found to have been shut off by recent adhesions; the segment of ileum looked healthy, but a small portion of the colon between the upper Murphy button and the artificial anus had sloughed, the gangrenous intestine being about $\frac{1}{4}$ in. in extent at the mesenteric attachment, and spreading up as far as the colotomy at the anti-mesenteric border. The dead tissue was cut away and the colon stitched with catgut as far as possible to the small intestine around the upper button. Considerable sepsis ensued, but healing gradually took place. The

patient's general condition never caused any real anxiety. Each day the bowel was irrigated gently with weak peroxide solution from colotomy to anus.

On the seventh day after the operation the Murphy buttons were found free—the upper in the colotomy, the lower in the rectum.

On April 26th—twenty days after the resection—an attempt was made to close the colotomy under local anaesthesia (eucaine). This proved very difficult, owing to the fixation of the tissues from sepsis, but was eventually effected. The peritoneum was not opened.

A normal motion was passed on the 29th, just over three weeks after the major operation. A considerable faecal fistula remained and much faecal matter escaped, but the bowels were opened naturally every other day.

Subsequently (May 25th) a further attempt to close the fistula was made under local anaesthesia, but without complete success. A small faecal fistula still persists, but is gradually diminishing. The condition of the abdominal wall at the present day is shown in the accompanying photograph.

The bowels move naturally every morning, and the patient states that very little faecal matter comes through the fistula, and then only when straining at stool. Throughout the rest of the day he suffers no inconvenience.

While walking about he wears a belt, owing to some weakness of the abdominal wall in the region of the colotomy. He has put on 2 st. in weight, and looks a strong, sturdy man.

I hope that the fistula will completely close in the course of time; failing this I may be tempted to try another operation. Obviously the difficulty in closing the colotomy opening resulted entirely from the sepsis following

the loss of bowel above the upper Murphy button.

It may be argued, Why not simply anastomose the ileum to the colon below the gap? Obviously this would do away with almost the whole water absorbing surface, and in a patient already possessed of abnormally loose bowels would undoubtedly lead to a disastrous result. Again, unless the whole large bowel were removed, the colotomy opening could not be dispensed with; moreover, in this case anastomosis could only have been effected by Murphy's button, which admittedly is not safe

where faeces are continually passing. Cases in which this operation might be performed are obviously rare, but it is an additional procedure at the command of surgeons which may occasionally enable them to restore a patient to, at any rate, a semblance of the normal. In view of W. Sampson Handley's researches on the spread of carcinoma of the large bowel, in the case recorded the amount of bowel removed above and below the growth is considerably less than one could wish, but the cancer was obviously a slow-growing one, and it is

Photograph of abdominal wall showing scars of incision and faecal fistula on left.

Diagram 1.—Removal of growth from sigmoid.

Diagram 2.—Growth removed from sigmoid, segment of lower ileum isolated.

Diagram 3.—Small intestine (lower ileum) reunited in front of freed segment by two layers of sutures, Murphy's buttons in position in the large and the freed segment of small bowel. For the sake of clearness the mesentery of the segment of small gut has been drawn longer than it should have been.

possible that sufficient has been removed to prevent local recurrence. It is scarcely necessary to point out that this procedure will enable one to remove a very much larger amount of bowel above and below a growth, where a large loop exists, and to bridge over any deficiency of bowel resulting.

Without a preliminary colotomy the operation would have been impracticable; the manner in which the patient gained weight and strength after drainage of the large intestine was remarkable. This is by no means unusual in such cases; one very often sees a patient who has been brought to death's door by the intestinal stasis caused by a fibrous carcinomatous growth rapidly improve when the stasis is relieved. The fact that such improvement does occur is a very strong point in favour of a preliminary operation before attempting the much more grave resection.

Referring to the employment of the Murphy buttons in the anastomoses between the large and small intestine, it would have been much preferable to have used sutures, but in this case it was out of the question; if an inch more of large bowel had been present below, it might have been done, but would have occupied a much longer time.

When one considers the facts of the case—that is, that the buttons were not in the course of the faecal stream, and that the whole portion of intestine involved was, practically speaking, easily accessible—it will be seen at once that the majority of the objections to Murphy's invention did not apply. It is true that sloughing of the bowel occurred at one place, but I am convinced that this was due to the fact that the blood supply at that point was not as good as it might have been. Had the vascular supply been perfect, it is practically certain that the patient would have pursued an uninterrupted course to absolute recovery.

Report on Growth.—The specimen was a portion of large intestine $4\frac{1}{2}$ in. in length with a short mesentery of 2 in. On opening the bowel its lumen was found to be contracted to a diameter of $\frac{1}{4}$ in. by a typical, hard, carcinomatous growth, which occupied, roughly, the middle inch of the bowel.

The growth was found to have ulcerated especially towards the mesenteric attachment; $1\frac{1}{2}$ in. of normal bowel existed above the growth and $1\frac{1}{2}$ in. below. There was some hypertrophy of the muscular coat above the growth, but no difference in size of lumen above and below.

In the mesentery seven to eight glands were found; one attached to the bowel immediately opposite the ulcerating surface appeared definitely infected; the others were enlarged, but suggested fibrosis only.

Microscopical examination of the growth showed it to be a columnar carcinoma. One gland was infected; the others showed no evidence of invasion.

My sincerest thanks are due to Sir Frederick Wallis for his great kindness in granting me the use of one of his beds for so long a period.

NOTE.—After extensive research through the literature of abdominal surgery the only reference I can find dealing with a similar operation to that described above is that given by H. Hartmann in his address before the Sixteenth Conference of Surgery at Paris.

“Dans l'entéroplastie on emprunte à une anse grêle une longueur d'intestin suffisante pour qu'en l'interposant entre les deux segments du gros intestin à anastomoser on puisse faire des sutures sans tiraillements. Ces deux derniers procédés l'entéroplastie (et l'anastomose récurrente) n'ont guère été employés sur l'homme.”

No case is mentioned, no reference quoted, as to the actual performance of this operation in the human subject.

ALEXANDER GRANVILLE, M.R.C.S.Eng., L.R.C.P.Lond., of the Egyptian Ministry of the Interior, has received the King's permission to accept the Third Class of the Imperial Ottoman Order of the Osmanieh, and Reginald Gower Kinton, M.D., Chief Medical Inspector of Prisons, Cairo, the like permission to accept the Third Class of the Imperial Ottoman Order of the Medjidieh, conferred upon them by the Khedive of Egypt in recognition of valuable services rendered by them.

THE will of the late Mr. Edward Davis, recently of Cheltenham, but formerly a watchmaker of Glasgow, directs that the residue of his estate shall be divided between such general hospitals and infirmaries in Scotland as his executors may select. The net value of the estate was £145,255, and the institutions in question seem likely to receive at least a third of this sum.

THE DERMATITIS PRODUCED BY EAST INDIAN SATINWOOD (“CHLOROXYLON SWIETENIA.”)

[With Special Plate.]

By J. THEODORE CASH, M.D., F.R.S.,

REGIUS PROFESSOR OF MATERIA MEDICA IN THE UNIVERSITY OF ABERDEEN.

Two kinds of satinwood appear in commerce in the United Kingdom, derived respectively from *Chloroxylon Swietenia* and *Fagara flava*—the former an East Indian and the latter a West Indian species. Both varieties of satinwood are highly ornamental when smoothed and polished, and are extensively used for the fittings of cabins and saloons in ships.

In 1898 and again in 1904 there were outbreaks of dermatitis in wood-working departments of shipyards on the Clyde which were traced to the irritant action of satinwood, and on the latter occasion a number of papers on this subject were published by medical men.¹

The attention of the Imperial Institute was directed to this matter by Mr. J. Whittom, Superintendent of Parks and Curator of Botanic Gardens to the Glasgow Corporation, and as both kinds of satinwood are produced in British colonies their examination for irritant substances likely to be the cause of dermatitis was undertaken at the Imperial Institute.

At this time considerable doubt existed as to whether both East and West Indian satinwoods possessed irritant properties and were equally active, but my examination of the substances isolated from both woods submitted to me from the Imperial Institute indicates that the East Indian wood is the more active and is probably the usual cause of the satinwood dermatitis. This conclusion is in harmony with that stated in the *Annual Report* of the Chief Inspector of Factories for 1907, and arrived at as the result of an inquiry by inspectors of factories in workshops using both kinds of satinwood in the United Kingdom.

CHEMICAL EXAMINATION.

The chemical examination of both varieties of satinwood was undertaken at the suggestion of Professor Dunstan, F.R.S., Director of the Imperial Institute, by Dr. S. J. M. Auld, Senior Assistant in the Scientific and Technical Department of the Imperial Institute, who published the results of his work on the East Indian wood in 1909.² These results show that the chief constituents of East Indian satinwood are a crystalline alkaloid, chloroxylonine ($C_{22}H_{33}O_7N$), two resins, a fixed oil, a peculiar protein compound, and calcium oxalate. It is of interest to note that the quantity of alkaloid present in East Indian satinwood shows great variation, some specimens examined at the Imperial Institute containing only traces, whilst others yielded up to 0.07 per cent. of the alkaloid.

Considerable progress has also been made at the Imperial Institute with the investigation of West Indian satinwood, and the products isolated have been examined pharmacologically. The chemical and pharmacological results obtained will probably be of sufficient interest to form the subject of future papers.

SATINWOOD DERMATITIS.

Reference has been made by Jones,³ and subsequently by Gardiner⁴ to the condition of the skin which arises amongst satinwood workers. The former describes a case in which not only the hands and wrists, but the face and neck of a joiner in a Govan workshop showed an acute inflammatory condition of erysipeloid character, but without concomitant sickness or fever. The inflamed surface became moist in places and subsequently desquamated. Improvement followed on suspension of work, but a return to the workshop caused a speedy reappearance of the symptoms. The first attack was slow in developing (six weeks after first handling the wood), but relapses were rapid after recovering from the initial disorder and return to work. Thus, in the case of the mechanic just mentioned, three days sufficed to determine a second dermatitis. Gardiner saw a papulo-vesicular rash on the backs of the hands extending to the forearms and a condition of the face and neck at first strongly suggestive of