as a rule, higher and there is in the early stages an irritability in small matters, an apathy, or a peculiar abstraction, a forgetfulness or tendency to sleep and to be dull with a lack of will power in regard to important events and matters of business. The latter has often been communicated to me by the relatives as common in cases of general paralysis. Physical symptoms evinced by headache, tremor of facial muscles and tongue, of the speech and the handwriting, also occur, the knee-jerks are increased (or possibly in tabetic cases absent), and pupil phenomena (noted in the Argyll-Robertson reaction) confirm the diagnosis of general paralysis. Age has certain controlling influences as already stated. The mental condition of coarse brain lesions is that of dementia and it is accompanied by physical signs according to the locality affected. It is this form which is familiar to the neurologist.

The mental state in association with epilepsy is recognisable by the peculiarly dull appearance of the patient not unlike that of slight drunkenness or of alcoholism, but the delusions if present are religious and sexual. There is a record of previous fits, the symptoms come on suddenly, but there may be marked fury or excitement which is uncontrollable, or there may be a state of more or less prolonged, dreamy, dull consciousness described by Crichton Browne. The mental condition associated with hysteria is of a superficial, changeable, and emotional character with a tendency to foolish mendacity and sexual ideas. That associated with chorea may in pregnant women be of very serious import. As a rule mild dementia accompanies chorea more often than mania or melancholia. Almost all alcoholic forms are characterised by the presence of hallucinations, which are often visual and mostly terrifying, by the presence of fixed delusions of a persecutory nature such as those of poisoning or mutilation; there is also marked amnesia of a special kind. The tremors, absent knee-jerks, and frequent morning sickness may help diagnosis in respect of alcoholic insanity. In some cases of mania there is a prodromal period of depression which is not easy to diagnose from primary dementia, only that explosions usually follow in mania and loss of memory in dementia.

In cases presenting motor excitement it is necessary to determine whether this be due to epilepsy, simple mania, or the maniacal phases of general paralysis. As general paralysis occurs in from 12 to 20 per cent. of all cases of insanity and as it is a disease of mature adult male life and one in which syphilis is a precursor, as also it is one in which dangerous excitement occurs and there is lavish prodigality of means and the disease is incurable, it is necessary to form an early and accurate diagnosis so that removal under care may be effected. It is best for the patient that he should linger out his days in a comparatively felicitous existence, unconscious of his fatal malady, such as may be secured in an asylum.

In conclusion, therefore, when a case of mental unsoundness as defined by our hypothesis is presented to us, we have to consider the import of delusions not only as to their content but also as to their systematisation, the question of psychical weakness in the abstract, abnormal irritability, defect or perversion of will power, and changes in the emotional states; confident that we are doing right by the patient in sequestering him from managing himself or his affairs if he is suffering from the acute form of any variety of insanity, for all such are potential suicides—if he is suffering from confirmed systematised delusions of a persecutory character, for all such paranoiacs are potential homicides—if he is suffering from the early symptoms of general paralysis or if there are great violence, noise, excitement, and sexual trouble—and that we are doing right by not certifying if the insanity is in a young person of either sex, is due to toxins, or is of a mild or subacute and temporary variety.

Claybury Asylum, Woodford.

THE ROYAL NAVAL NURSING SERVICE.—On Friday, May 29th, Her Majesty the Queen presented badges to two head sisters and 22 nursing sisters of Queen Alexandra's Royal Naval Nursing Service at Buckingham Palace. Rear-Admiral John Durnford, C.B., D.S.O., a Naval Lord of the Admiralty, Inspector-General Sir Henry F. Norbury, K.C.B., K.H.S., R.N., Director-General of the Medical Department, and Staff Surgeon W. J. Colborne, R.N., Assistant to the Director-General, also attended and had the honour of being presented to Her Majesty.

Clinical Remarks

ON

THE TREATMENT OF GANGRENOUS HERNIÆ BY ENTERECTOMY.¹

Delivered at University College Hospital in February, 1903,

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

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GENTLEMEN,—Some time ago I gave you a few facts as to the results obtained in this hospital from the treatment of strangulated hernia, either by taxis or operation, in 406 consecutive cases (*vide* THE LANCET, May 30th, p. 1495). Certain conclusions seemed justifiable from this study, and above all that the mode of dealing with gangrenous hernia hitherto adopted appears to require modification at the present day. The question what to do in a case of gangrenous hernia is one the seriousness of which is well known to all surgeons of experience, and the factors which make such a case grave are also now fairly well recognised. They have been worked out by the anatomist, the bacteriologist, and the pathological chemist. In a given case, say, of gangrenous femoral hernia we have the following elements of danger: (1) the gut is destroyed by necrosis over a greater or less surface and therefore it cannot be returned into the abdomen; (2) the dead portion is septic in the highest degree; (3) the fluid of the sac, if there be any, is highly septic and may run back into the abdomen and infect it if the constriction has been divided before the sac has been well cleansed; and (4) the condition of things within the abdomen is also fraught with risk. Here the gut above the constriction is loaded with retained fecal matter which is virulent in proportion to the time it has been pent up in a stagnant condition. The bowel is distended by this fluid, often to an enormous extent, and it is paralysed owing to causes unnecessary to trace for the present. But not only is it distended and paralysed but its structure is in many cases much altered. Its mucous membrane is inflamed, or even ulcerated (*vide* Case 3 below), from the point obstructed upwards, *often for some feet*. The submucosa and muscular coat are oedematous and the serous covering is sodden and discoloured from extravasation of blood; it may also be flecked with patches of lymph either on its free surface or in its subserous layers. In this condition it is now well known that the bowel, although its continuity is unbroken, can no longer offer much resistance to the passage through its walls of septic organisms and sooner or later these transude and set up a septic peritonitis. This has been long known of the bowel caught in the sac. But it is now clear that the same infection will take place sooner or later within the abdomen from the unbroken bowel above the constriction if the evacuation of the retained fermenting fæces be not provided for. Probably a certain amount of toxic exudation from the obstructed bowel is tolerated by the peritoneum as long as it is sound and is removed by its lymphatics, but the time comes when it is not removed and peritonitis is set up.

But beside these dangers the patient has probably been exhausted by vomiting and inadequate feeding for days. The vomited matter has been foul and in many cases it has been inhaled in fluid or vapour form into the lungs with more or less damage to them. Moreover, the patient has been confined to the recumbent position and the bases of the lungs may have been imperfectly expanded owing to the position and the painful condition in the abdomen and so have become oedematous, rendering them particularly vulnerable to infection. Again, the toxins stored up in the bowel above the constriction are absorbed and exert a depressing effect upon the whole economy.

Now it is in these retained contents of the bowel above the constriction and in their local and general toxic effects

¹ We have thought it best to publish this lecture in immediate sequence to that published last week, as though delivered at some distance of time apart the two are practically different portions of the same subject.—ED. L.

that the main danger of strangulation with or without mortification lies. Their irritating properties have been known ever since the artificial anus has been made for their evacuation in gangrenous hernia. The rapid production of excoriation or even ulceration of the skin around such an opening bears witness to their acrid nature. Again, the facts so often noted in former times when herniæ were more frequently reduced by taxis alone than now point in the same direction. We have all seen many such cases attacked after reduction by severe diarrhoea with blood-stained stools and other evidence of acute enteritis often terminating in death. The cause here has been explained to be the rapid rush of the pent-up toxic fluid into the empty and starved intestine below the constriction, setting up there an acute inflammation continuous with the inflamed and sodden tract above. Again, how often have we seen in the days of frequent taxis a patient die from peritonitis starting from the sodden but still unperforated loop returned into the abdomen or from pneumonia combined with moderate enteritis or peritonitis (*vide* Table II.²). But in addition to all this the bacteriological examinations of the fluids retained above the constriction made within the last few years by a number of observers have amply demonstrated its virulence and the chemical analyses its toxicity. Cushing's bacteriological studies on the swarming life found in the first discharge from an artificial anus for gangrene and the gradual disappearance of the bacteria as evacuation of the contents proceeded show this most fully.

Now all this and the bad results of the earlier *primary* resections for gangrene have gradually led to the conclusion held by the majority of surgeons at the present day, that, in the words of Cushing, quoted here as one of the most recent and thoughtful writers on the subject and one of the most progressive surgeons, "If the gut is not viable experience has shown that the immediate establishment of an intestinal fistula is much the safest procedure, as this permits the immediate escape of the retained toxic products from the proximal bowel." Again, lower down: "Occasions doubtless arise when an immediate anastomosis can be made, but under ordinary circumstances I believe it is preferable, as stated above, to establish an artificial anus and allow all the contents of the bowel to be rapidly evacuated." But that the ultimate result in such cases is not generally good even in his hands may be inferred from the following lines in the same publication: "The cases with gangrenous bowel present a more difficult problem. With only two or three exceptions at this hospital (the Johns Hopkins) such conditions have led to a fatal termination. On one occasion Dr. Bloodgood resected and sutured a gangrenous bowel in a young man under general anaesthesia with recovery." The experience at University College Hospital bears out this statement. I find that in a series of years reaching down to date out of 20 consecutive cases of the formation of an artificial anus for gangrene only two ultimately recovered.

But in spite of this dismal experience the rule is still followed to day by most surgeons that in cases of gangrene of the gut the safest thing to do is to make an artificial anus. And yet notwithstanding the wide acceptance of this rule I venture to think that the time has come for its modification. My own experience based upon the last ten or 12 cases of gangrenous or greatly damaged intestine which I have had to treat has forced me to the conclusion that this rule, however sound in the past perhaps, is not so applicable at the present day.

Let me define my position a little more clearly. It seems to me that for those cases of gangrenous bowel in broken-down individuals who have been neglected or badly treated and who come to us almost moribund the rule must still hold good. Any long operation, and above all any prolonged general anaesthesia, will almost certainly be followed by death. The formation of an artificial anus, on the other hand, in these cases is easily and rapidly done under local anaesthesia and offers the patients the best if slender chance of recovery.

But in those instances in which our patients reach us in tolerably good *general* condition, although the state of the intestine is hopeless, I venture to think that a *wide-reaching* resection of the bowel offers the best prospect of recovery. Such cases come to us nowadays, I think, as a matter of observation in relatively greater numbers. The delay on the part of the public is less in seeking operative aid, and the

pernicious practice of drenching these patients day after day with purgatives is less widespread than formerly. The previous treatment before they are handed over to the surgeon may still be dilatory, but it is more usual now to find that such cases have been placed under opium and the application of ice with occasional attempts at taxis. But, at any rate, they have been spared the constant forcing of the bowel under the stimulus of purgatives and the consequently increased stercoraceous vomiting. And though the local condition of the bowel is as hopeless as before, they are more frequently in a better *general* state than formerly. This, at least, is my experience in a fairly large number of cases. And it has led me to the following conclusions.

1. The most imminent danger to the patient with a greatly damaged or actually gangrenous loop of intestine *lies in the condition of the bowel for the three or four feet above the constriction*. If this is simply put back or an artificial anus made the risks are enormous. In either case it only *slowly* relieves itself, in the first instance by passing on its toxic contents into healthy bowel below, there to be more or less absorbed with the further production of enteritis and toxæmia, and in the last by slowly discharging on the surface of the body. It must not be forgotten that this evacuation will be *slow*, for the distended and sodden bowel is in a state of paralysis often for days after the relief is given. In the meantime the patient is on his back with all the risks of pneumonia, toxæmia, and peritonitis.

2. In a case where the patient is in a reasonably good condition I cannot help thinking that to excise this dangerous portion of paralysed and sodden or ulcerated gut *en bloc* together with all its virulent contents is relatively the safest course. At one sweep the three or four feet of gut with pints of toxic material can be cleanly removed. And, moreover, by dividing the gut high up we get a portion less widely dilated and therefore more easily adapted to the contracted lower tube. But this last is not the crux of the situation, for of course we might make a lateral anastomosis. The great point is to remove *at once the contents as well as the diseased bowel* and to make our suture junction in relatively sound and clean gut. It may be objected that this demands a large and long operation and consequently a great strain on a feeble patient. But this is only relatively true in these days of improved technique and is balanced, I think, by the enormous gain to the patient of having a veritable "cesspool" removed from the abdomen cleanly and with it most of the really damaged and dangerous bowel, leaving the part above where there is less paresis or none and where our stitches will hold in sound tissue. But the excision *must be wide*. On this point we need have but little misgiving as far as the general nutrition of the body is concerned. It was pointed out years ago by Senn that in dogs at least one-third of the whole intestinal tract may be removed without any damage to the economy. Since then, in many cases six, seven, or even eight feet of the human small intestine have been removed successfully and without any injury to the general health.³ If this be so and if, as I venture to think—indeed, it is almost certain—that the risks of gangrene of the intestine depend upon the conditions not only in the dead loop but in the three or four feet of gut above the point of constriction, there need be no hesitation on the ground of doubts as to the general future nutrition in removing any length of intestine up to some six or seven feet. Further, it may be pointed out that in only one particular does it take longer to excise six feet than it does to remove six inches. This is in the treatment of the divided mesentery. But I think that I can demonstrate a method by which the latter can be dealt with rapidly and effectively. Of course, the anastomosis of the actual ends can be made as quickly when several feet have been removed as when only a few inches have been resected and (if the respective lumina are in the former case more alike in size) even more rapidly.

The first case in which the above line of reasoning appeared to lead me to a successful result may now be mentioned briefly as it has already been fully recorded.⁴

CASE 1.—A young man, aged 20 years, was admitted into University College Hospital in July, 1899, for an inguinal hernia of moderate size but distinctly gangrenous after four days' strangulation. Instead of making an artificial anus according to rule with a prospect of secondary anastomosis I drew down the afferent limb of the loop until healthy bowel was reached. The mesentery was clamped and stitched, the

³ *Vide* author's paper in THE LANCET of April 27th, 1901, p. 1186 containing the bibliography of the subject.

⁴ Brit. Med. Jour., Dec. 23rd, 1899.

bowel was divided, and the nearly equal lumina were anastomosed end to end (method described below). A radical cure by Bassini's method followed at once. Recovery was uneventful. The portion of gut removed measured three feet.

CASE 2.—The next case⁵ was that of a woman, aged 46 years, with a gangrenous femoral hernia of three days' standing. Here the procedure was the same, but only one and a half feet were removed and the sac was drained with gauze for a few days. Recovery was without a hitch.

CASE 3.—The third case⁶ was still more to the point and convinced me that extensive tracts of small intestine can be rapidly removed with no more shock to patients than short. And further, that with the removal of the over-filled, engorged, and ulcerated proximal loop, one of the great dangers was at once eliminated which are so potent in such cases. The patient, a feeble woman, aged 76 years, was admitted into University College Hospital on Jan. 10th, 1901. For two years she had had a large ventral hernia in the scar of an ovariectomy performed 30 years before—in 1870. On Jan. 8th and 9th she had not felt well and had had pain in the abdomen but no sickness. At 10 A.M. on the 10th the patient was seized with severe pain in the abdomen and vomited bile-stained fluid. The large tumour was swollen and tender; no more flatus was passed and she became faint. Later in the day she had another attack of faintness and sickness and brought up undigested bacon. Her state on admission is thus described in the hospital notes: "Feeble woman with intermittent pulse of 108; face pinched, tongue moist; condition but for age good." At 10 P.M. I operated and on opening the thin scar about one pint of dark, evil-smelling fluid gushed out of the sac. About three feet of strangulated gut were then found constricted by a strand of omentum at the neck of the sac. It had not quite lost its lustre but it was very black, foul, and distended with sanious fluid and its recovery seemed hopeless. I at once measured off with my fingers what was roughly estimated as about six feet (really it turned out to be five feet six inches). At all events I ran it through my fingers until a part was reached above which seemed to be sound enough to retain sutures and to furnish healthy plastic lymph. The mesentery was then clamped and sutured (see below) and the bowel was cut away from it. End-to-end anastomosis by suture followed and the abdomen was closed. The junction was completed in 44 minutes after the beginning of the operation. The last stitch closing the abdomen was finished within 63 minutes from the first cut. There was no shock, a very remarkable fact in the case of such a feeble old woman, and the patient was induced to sit up the next day and afterwards, and as a rule, only to lie down for sleep. I had her placed in an arm-chair by the fireside on the sixth day. The wound was found to be perfectly healed at the first dressing on the tenth day. Except for a trace of bronchitis and a little diarrhoea from the fourth to the seventh day recovery was uneventful. She presented herself at the hospital more than a year after operation in the best of health.

The surgical registrar's report on the parts removed is specially interesting here.

Five and a half feet of small intestine: three inches from the lower end is the seat of the distal constriction. The gut at this spot becomes intensely congested and hæmorrhagic, of a purple-black colour, and its walls are thickened with intense œdema. At the time of the operation there was a definite groove at this spot which has now disappeared after lying in weak spirit for 12 hours. On tracing the gut upwards from this point the first three feet are all intensely congested, thickened, and œdematous, but the changes become less marked above, and the upper two feet, though now only pale and œdematous, were congested at the time of the operation. There is no groove or sudden change in the pathological appearances to mark the seat of any constriction of the proximal loop of gut, the congestion and œdema becoming gradually less when followed up the gut. On slitting up the gut the mucous membrane of the lowest three feet has a deep purple-black colour and the valvulæ conniventes are so swollen, discoloured, and pulpy-looking that it is difficult to say whether any ulceration exists. After lying some days in weak formalin the parts merely congested became paler and revealed three large patches in the last 18 inches of the gut where the mucosa was hæmorrhagic, partly gangrenous, and superficially eroded. Each patch involved the whole circumference for about three inches and the lowest, where the changes were most marked, had a definite abrupt linear border marking the seat of the distal constriction. In the next foot of the gut above there were two similar but smaller patches of mucous hæmorrhage and erosion only involving a part of the circumference of the bowel for about one inch by half an inch.

This condition of the bowel confirmed my belief that had it been returned into the abdomen whether *with* or *without* the formation of an artificial anus and with all its acrid contents which had already fouled the effusion in the sac

nothing could have saved the patient. My only doubt for some days was whether I had removed enough of the bowel to secure a sound material capable of reparative energy for the anastomosis. But, at all events, the whole of the ulcerated portion with the large quantity of toxic material both within its lumen and infiltrating its walls had been removed and there was no evidence in the after history, except a little diarrhoea, that any dangerous amount had been left behind.

If anything was needed to strengthen the conclusion that the removal of large tracts of intestine above a gangrenous portion is desirable it appeared to be furnished by this case, and the absence of shock, even in so old and feeble a woman, seemed to prove that the removal of so much gut is not *necessarily* a severe strain, even upon a feeble patient.

In another recent successful case of a similar kind now to be briefly recorded I had, looking back at the last, no hesitation as to the course to be pursued.

CASE 4.—A woman, aged 52 years, was admitted into University College Hospital on Feb. 7th, 1903, at 1.30 A.M. with a left femoral hernia strangulated since the previous Monday (Feb. 2nd). There had been stercoraceous vomiting for the last two days. The patient was placid and in fair condition. The pulse was 72 and the temperature was 99° F. Coils of greatly distended intestine could be seen moving under the abdominal walls. After washing out the stomach and administration of chloroform lightly the sac was opened, the gut drawn down, and the constricted part found to be grey and gangrenous; in fact, it leaked on being handled and the destruction of the two inner coats could be felt between the finger and thumb. Both limbs of the coil were tied firmly above the constricted portion and the loop was cut away. With the threads used thus a strip of sterile gauze was tied over the cut ends previously well washed with normal saline solution. The abdomen was then opened in the middle line and the proximal and distal limbs were caught in the fingers and drawn from the neck of the sac and out of the abdominal wound followed by the gauze. The proximal loop of the bowel, measuring about two inches in diameter, was very largely distended with dark fluid and deeply congested for several feet. The mesentery was clamped (see below) and ligatured close to the bowel which was then cut away from it to the extent of over six feet with all its foul contents. (Be it remembered that a cylindrical tube two inches across will contain for every foot over one pint.) End-to-end anastomosis was then attempted, as in the other cases, but when nearly completed was found to be unsound owing to the difference of calibre. The portion sutured was therefore cut away and a lateral anastomosis was made higher up and the abdomen closed. The femoral wound was then sutured in the usual way. All this consumed more time (two and a quarter hours) than I like to think of—just double the time spent over the last operation mentioned above. But as the procedure included two enterectomies and a femoral herniotomy and was complicated by a tendency to bleed from the mesentery this is not so surprising. There was no shock and recovery was uneventful except for 13 loose stools within the first week and a little discharge from the femoral wound and from one stitch in the abdominal incision.

I should now like to sketch in outline the procedure I have adopted in these and the last five or six cases.⁷ It differs in many respects from those which are commonly described and aims at saving time, securing accuracy of adjustment, and the elimination of undue manipulation with possibly tainted fingers.

When the gangrenous or extensively damaged loop has been drawn well out of the abdominal cavity, as in the last two cases, as far as the points to be divided the wound is packed with one end of a long roll of sterilised gauze, none of which can thereby be lost in the abdomen.

The first point, then, is to select the spot at which the distal and proximal ends of the damaged loop are to be divided, the first some two or three inches below the constriction and the other at any distance above it up to six or seven feet which may be considered to have reached sound bowel. Here the two portions are placed accurately side by side in their long axes and are clamped together firmly with one (first) pair of Doyen's forceps. Next the damaged loop is stretched to its full length so that each half of the mesentery is evenly applied to the other half. The two halves of this structure are then firmly clamped together

⁵ Ibid.

⁶ THE LANCET, April 27th, 1901, p. 1186.

⁷ Ibid.

with a second Doyen's forceps placed parallel to, and about one inch from, the bowel (Fig. 1). Another Doyen's forceps is now made to close on the rest of the two leaves of the mesentery if it is too long to be included in one pair. The forceps can start from the point of the

FIG. 1.

a, Constriction. *b*, Proximal distended gut. *c*, Distal contracted gut. *d*, Mesentery. *e*, Doyen's clamp on both loops. *f*, Doyen's clamp on mesentery. The folded loop here represented is for convenience of drawing only a short one.

second pair, one blade being pushed through the two folds of the mesentery, and should close the latter up to the point at which the two limbs are held together in the first pair used to keep the two limbs of the gut together. This latter pair is now removed and is placed only on the distal portion at the same spot (Fig. 2). Another is

FIG. 2.

a, Constriction supposed to be open in a basin on the floor. *b*, Proximal distended limb going to basin. *c*, Distal limb clamped. *d*, Mesentery partly tied off. *e*, Doyen's clamp closing distal limb. *f*, Doyen's clamp holding folded mesentery. *g*, Threads tying both layers of mesentery.

placed about half an inch more distally and between the two the gut, previously packed with gauze, is divided. The whole of the bowel still closed by forceps is now cut away from the mesentery round to the point opposite the forceps on the distal limb (Fig. 2). The piece of bowel thus freed at one end and in its whole length is left hanging out of the abdomen over the edge of the table (Fig. 2) into a basin and then the forceps closing its end is removed, allowing the contents to escape into the basin and draining the bowel both outside and inside the abdomen. While the latter process is going on the two halves of the mesentery are stitched together laterally by strong threads passed through them from side to side between the clamps and the cut edges, all being tied on one side and including

about two-thirds of an inch of mesentery in each ligature (Fig. 2). This closes the hole in the mesentery and at the same time the vessels going to the edges cut away from the bowel. All this time the contents of the bowel are running off into the basin on the floor. The anastomosis now remains to be made. But before the junction is begun the distended gut within the abdomen can be further unloaded by pressure on the abdominal walls and by drawing the coils if necessary through the fingers with a kind of "milking" action until their contents flow off into the basin below. The advantage of thus unloading the bowel cannot be over-rated, and though I did not carry it out in the last case exactly as described I had so planned it for some time.

The junction of the two ends was done in all my last cases as follows. The clamped distal portion and the unclamped proximal, now empty and more or less reduced in size, were laid side by side in such a position that while their attached mesenteric margins corresponded at one point the axes of the two portions crossed one another obliquely. When now both were included in one pair of Doyen's forceps at the point at which their mesenteric borders crossed, their free margins also corresponded by the greater obliquity of the smaller bowel. In other words, when they came to be cut off flush with this forceps more was cut away from the free margin of the smaller bowel than from the proximal tube (Fig. 3) which was divided only a little obliquely.

FIG. 3.

a Of previous figure has been cut away. *b*, Proximal distended limb. *c*, Distal limb clamped obliquely to latter. *d*, Mesentery stitched and cut from bowel. *e*, Clamp holding two limbs together. *g*, Tail thread of suture uniting ends through all coats. *i*, Sewing needle and thread *in situ* closing part of cut ends.

The two tubes thus held together side by side in one forceps are again clamped nearer the abdomen by another pair as close as possible to the first and then being carefully packed with sterile gauze are cut with a knife or scissors flush with the distal edge of the first pair of forceps. The freed long coil of intestine and the stump of the distal end held in the forceps applied earlier in the operation now drop off and the gauze packing is changed. Then the forceps at the edges of the approximated tubes is removed, the second pair being left on with the cut edges previously clamped in the first projecting about a third of an inch beyond it (Fig. 3).

Now commencing at the mesenteric border, the adjacent edges of the two tubes are stitched together with a continuous suture, taking up *all* their coats until the free margins are reached. Here the corner is turned and the opposite edges are similarly stitched until the suture reaches the mesenteric margins again and can be tied with the tail thread at the starting point (Fig. 3, *g*). Another forceps is then made to clamp both tubes three or four inches nearer the abdomen and the forceps holding them together for the first row of suturing is taken off. This enables the operator to place another line of continuous suture over the first and folding it in. This second row should, of course, take up only the serous, muscular, and fascial layer under the latter, avoiding the mucosa. When this has been carried quite round the

bowel and has been tied to the tail thread at the starting point on the mesentery the anastomosis is complete and the forceps higher up is removed. The whole area of operation is now washed with sterile saline solution, especially the anastomosed portion of gut. The latter is then replaced in good position in the abdomen and this is closed with sutures. A pint of normal saline solution may be injected under the skin of the arm towards the axilla and five minims of solution of strychnine hypodermically. All other means for keeping up the patient's vitality, such as warmth and a rectal injection of brandy, are, of course, followed. And besides this I have long made it a practice to encourage such patients to spend all their waking hours in the sitting posture and only to lie down for sleep. This helps in preventing hypostatic pneumonia, as also probably does an occasional thorough rubbing over the back and bases of the lungs. In my oldest patient, aged 76 years, it has been mentioned that she was lifted out of bed to an armchair by the fireside on the sixth day with manifest advantage.

Since I began to employ this method of procedure in 1899 I have done seven enterectomies for gangrenous herniæ. Of these five have recovered. One of the fatal cases died from obstruction due to an old fibrous band pressing on the bowel after its return; the other case did well for several days and then slowly developed peritonitis, starting from the remains of the infected sac which I had unfortunately not drained and which having contained the cæcum was difficult to shut off by suture from the abdominal cavity. There was no failure of any kind at the seat of the anastomosis.⁸

These results, I feel, justify the hope that primary enterectomy may often take the place of the formation of an artificial anus in gangrenous hernia if the principle of *excising a large tract* of damaged gut above the constriction is followed for the reasons given above.

ON THE RELATION EXISTING BETWEEN URIC ACID EXCRETION AND THE BREAKING DOWN OF THE WHITE CORPUSCLES.¹

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THE important fact that uric acid can under certain conditions be experimentally produced from the white blood corpuscles was first observed by Horbaczewski.² Following his research the relation of uric acid excretion to leucocytosis has been worked at by many writers from the clinical standpoint; among these Kühnau³ and Richter⁴ in Germany, Douglas⁵ in this country, and Zarnier,⁶ Giajmis,⁷ and

⁸ Since the above was written I have successfully operated on an eighth case of gangrenous hernia and excised the necrosed portion, consisting of a strangulated Meckel's diverticulum.

¹ A thesis read at Cambridge for the degree of M.D.; also read before the Pathological Society of London.

² J. Horbaczewski: Untersuchungen über die Entstehung der Harnsäure im Säugethierorganismus. Wien Sitzungsbericht, Band 98, Abtheilung iii., S. 301. Also Sitzungsbericht der Königl. Akademie der Wissenschaften Math. Naturw. Cl., Wien, 1889, Band xcviii., pp. 301-318. Also Sitzungsbericht der Königl. Akademie der Wissenschaften, 1890; Band 48, 1891; Band c., 1892. Also Beiträge zur Kenntniss der Bildung von Harnsäure und der Xanthinbasen, sowie der Entstehung der Leucocyten im Säugethierorganismus, Monatschrift für Chemie, Band 12, pp. 221-275. c. confr. J. Horbaczewski, Zur Theorie der Harnsäurebildung im Säugethierorganismus, Wiesbaden, J. F. Bergmann, 1892.

³ W. Kühnau: Zeitschrift für Klinische Medizin, 1895, vol. xxviii., p. 534, Experimentelle und Klinische Untersuchungen über das Verhältniss der Harnsäureausscheidung zu der Leucocytose. Also W. Kühnau and F. Weiss: Weitere Mittheilungen zur Kenntniss der Harnsäureausscheidung bei Leucocytose und Hypoleucocytose, sowie zur Pathologie der Leukämie, Zeitschrift für Klinische Medizin, Berlin, 1897, Band xxxii., pp. 482-500.

⁴ P. F. Richter: Ueber Harnsäureausscheidung und Leucocytose, Zeitschrift für Klinische Medizin, Berlin, 1895, Band xxvii., pp. 290-311.

⁵ Carstairs C. Douglas: Some Observations on the Excretion of Uric Acid, with Special Reference to its Connexion with Leucocytosis, Edinburgh Medical and Surgical Journal, 1900, new series, vol. vii., pp. 32-42.

⁶ G. Zarnier: Rapporto tra Leucocytosi ed Eliminazione di Acido Urico, Gazzetta degli Ospedali, Milano, 1896, vol. xvii., pp. 676-679.

⁷ C. Giajmis: La Genesi dell' Acido Urico in Rapporto alle Sostanze Nucleiniche, Gazzetta degli Ospedali, Milano, 1898, vol. xix., pp. 545-547.

Reale⁸ in Italy may be mentioned. If it be true that uric acid is formed from the white corpuscles, the fact is to be explained by its production from the nuclein contained in these cells, either as a result of their destruction or in consequence of their metabolism. The conclusions arrived at by the above-mentioned observers have, when definite, been by no means in agreement. Kühnau, in an extensive and careful research, showed that, following the crisis of lobar pneumonia, at which period there is an increased destruction of the white cells, there is an increase in the daily amount of uric acid excreted. Making observations in various other diseases he found that following a decrease in the leucocyte count there is in most cases a corresponding increase in the daily amount of excretion of uric acid, an increase which he considers is caused by the increase in destruction of the white blood corpuscles. He further showed that in leucocythæmia, in which condition the number of white cells in the blood is largely increased, the daily excretion of uric acid is also markedly increased.

With regard to his observations showing a rise in the amount of excretion of uric acid following a fall in the leucocyte curve, I would point out that the latter may be referable not to an increased destruction of leucocytes but simply to a diminished production. As regards his researches in leucocythæmia, Milroy and Malcolm⁹ have shown that in medullary as well as in lymphatic leukæmia, and Hale White and Hopkins¹⁰ have demonstrated that in medullary leukæmia, the daily amount of excretion of phosphoric acid is diminished, so that the increased amount of uric acid excreted in these diseases can hardly be ascribed to an increase in the breaking down of the white corpuscles. The other observers mentioned (with the exception of Richter who lays stress on the importance of making observations extending over a considerable period of time) contented themselves with making in each case at most two or three observations on consecutive days of the numbers of white cells in the blood and comparing these with the amounts of uric acid excreted on the same days. Now inasmuch as the physiological amount of the daily excretion of uric acid varies for different individuals within wide limits (between 0.2 gramme and 1.5 grammes) it is obvious that the amount excreted in a particular individual under pathological conditions may be very largely increased without this amount exceeding these limits. It would seem to follow from this that observations of the ratio between the average amount of the daily excretion of uric acid and the average number of white corpuscles in the blood in a particular case are of less value than consecutive observations in the same case, showing alterations in the one side by side with alterations in the other. It must be confessed that, apart from Horbaczewski's experimental work, the only convincing observations as to uric acid being formed from the white blood corpuscles are those of Kühnau on pneumonia.

My object in making the observations which are recorded below has been to determine in pathological conditions the times in each case observed at which an increased destruction of white cells is taking place, and to notice whether this is followed by an increase in the amount of the daily excretion of uric acid. With this end in view daily observations were made of the number of white corpuscles in the blood for many consecutive days, whilst corresponding daily estimations of the total amount of uric acid excreted in the urine in the 24 hours were also performed. It is fairly obvious that in any condition such as advanced pulmonary tuberculosis, in which there is a leucocytosis for a considerable period of time, there must be associated with this (always assuming that the leucocytes concerned are not specially long lived forms) an increase in the amount of the daily destruction of the white cells. When I refer below to increased destruction (as evidenced by certain alterations in the differential count to be presently explained) it must be understood that I mean an increase in the amount of destruction of the white cells over and above what has just previously been taking place (i.e., a relative increase in the breaking down of the white blood corpuscles). In order to prove that a rise

⁸ E. Reale: Il Ricambio della Nucleina in Rapporto alla Genesi dell' Acido Urico ed alla Patologia delle Affezioni Uricemiche, Clinica Medica, Pisa, 1898, vol. iv., pp. 169-171, 185, 225.

⁹ The Metabolism of the Nucleins under Physiological and Pathological Conditions, by T. H. Milroy, M.D., B.Sc., assistant to the professor of physiology, Edinburgh University, and J. Malcolm, M.B., Journal of Physiology, Supplement, 1898-99, also 1899-1900.

¹⁰ Hale White and Hopkins: On the Excretion of Phosphorus and Nitrogen in Leukæmia, Journal of Physiology, 1899.