just on the corps side of the corps-divisional boundary, has ensured the wounded man getting as soon as possible to surgical care—the latter being provided in circumstances which afford the maximum facilities for surgeon and nursing staff and the maximum comfort for patient. This potential to-day is provided by that invaluable little self-contained unit the "field surgical unit."

6. *Pre- and Post-operative Treatment.*—There is no doubt that on both sides of the operating table considerable, if not dramatic, advances have been made. Resuscitation as provided by the Blood Transfusion Service has been in every respect admirable. They were responsible not only for actual resuscitation, both pre- and post-operative, but also for the selection of priority cases awaiting operation—a task demanding the soundest clinical judgment and common sense. They also delivered to all units requiring them supplies of blood, plasma, saline, glucose, and penicillin as if by divine inspiration, no request ever having to be made and no notification having to be given of change of location—even to the most out-of-the-way spot. Indeed, the supply system as interpreted by our Base Transfusion Unit might well serve as a model for the cutting of red tape during action. The gay good humour of all the B.T.U. personnel, even under the most trying and difficult circumstances, was an inspiration to all with whom they came in contact.

So also was the presence of nursing officers in forward surgical units. Much of the vast improvement in post-operative treatment (and with its penicillin injections and drips, its intravenous infusions, its gastric suction, its morphine, its sera, apart from all other routine nursing requirements, this is a complicated ritual to-day) was due to their excellent work. Added to this, too, is the undoubted value of a woman's presence both beside the bed of a recently wounded man and in the wards and theatres with the male personnel. In both spheres they have done much to raise morale, and their cheerful but quite obviously genuine enjoyment of their arduous and often dangerous work is deserving of the highest praise. In this connexion, too, mention must be made of our B.R.C.S. services, under the able and kindly direction of Major-Gen. Lindsay. They never failed, even in the most forward areas, to provide those little comforts and that personal attention which mean so much to a wounded man, and incidentally to his surgeon, who benefits from his patient's raised morale.

7. *Penicillin and Sulphonamides.*—Sulphonamide therapy was well established previous to this campaign, but in our lavish supplies of penicillin we have certainly been most fortunate, and to its beneficent effect must go considerable credit for the results achieved. Its prophylactic use on the scale employed in Normandy was an entirely new venture and paid handsome dividends. Since then both prophylactically and therapeutically it has been used to an increasing extent with consistently good effect. Among other clinical researches carried out in Army Group (and described in full in "21 Army Group Penicillin Therapy") was one which proved that penicillin alone offered as good protection against wound infection as did a combination of penicillin and sulphonamide.

8. *Surgeons and Surgery.*—By no means least has been the effect of consistently good surgery carried out by an enthusiastic and capable team of surgeons. We had but two women surgeons; we had many women anaesthetists, radiologists, and surgical general-duty officers—far more than any other theatre of war had ever dreamt of. Let it be said that their part in this saga was not one whit less praiseworthy than that of their male counterparts. We were very, and we think justifiably, proud of our whole team.

Conclusion

As was stressed at the beginning of this article the success of a medical service depends essentially on close collaboration and mutual understanding between the administrative and clinical sides, and it is with very genuine feeling that we express our gratitude for their unflinching and full co-operation, to our two Ds.M.S. (Major-Gens. Sir Percy Tomlinson and E. Phillips), to the D.Ds.M.S. Armies (Brigs. E. Phillips, Galloway, and Glyn-Hughes of Second British Army, and Brigs. Fenwick and Elder of First Canadian Army), to the D.Ds.M.S. Corps and to the Consulting Physician (Brig. E. Bulmer), all the clinical advisers of Army Group, and to the surgeons, nursing officers, and other ranks, both male and female—all of whom have contributed materially to making our task as pleasant personally as it was fascinating surgically.

B. M. Schwartz (*J. Amer. med. Ass.*, 1945, 128, 704) records his observations on 14 cases of Vincent's angina treated with penicillin. The recommended dose is 100,000 units, administered intramuscularly in 20,000 units every three hours, and was found to be of definite value. P. L. Shallenberger, E. R. Denny, and H. D. Pyle (*ibid.*, p. 796), who also treated 14 cases of Vincent's angina with penicillin, obtained equally good results from intramuscular injection.

THE MIKULICZ RESECTION OPERATION FOR GANGRENOUS INTUSSUSCEPTION IN INFANTS

BY

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When in an infant an acute intussusception becomes irreducible and gangrenous, not only is the choice of a suitable operation difficult but the results are usually bad. The operation commonly chosen in these cases is either resection of the gangrenous mass with end-to-end or lateral anastomosis, or exteriorization of the mass with the formation of an enterostomy, with a later attempt to close this if the child survives. Suture of the proximal part of the intussusciens to the intussusceptum has also been suggested, leaving the gangrenous mass to slough and pass per rectum. These operations are far from satisfactory; very few children survive.

In view of these results we have recently chosen to treat the irreducible gangrenous intussusception by a modification of the Mikulicz type of resection, and we are able to report here two successes. We recognize the danger of generalizing from two cases, but the results in these were so much better than we have experienced with other methods that we feel justified in publishing this report. At this point, however, we wish to make clear our view that no major operation of this sort in an infant will be successful unless the child is given special pre-operative and post-operative treatment by those who are experienced in modern paediatric methods and can judge from hour to hour what measures are required to be taken. A note by Dr. Brenda Morrison on these measures is included in this paper.

The Mikulicz type of resection which we recommend is made possible in infants because at that age the caecum, ascending colon, and transverse colon are very mobile. In both of our cases it was found easy, after a small incision of the peritoneum on the outer side of the intussusception, to mobilize the mass and to bring it out of the abdomen with very slight trauma, thus leaving the next steps of the operation to be performed expeditiously and with relative ease. The operative procedure followed in both cases was similar. A preliminary attempt at ordinary methods of reduction having failed, the intussusception was found to be gangrenous, and some form of resection was therefore necessary. The viable portions of the ileum and colon were quickly joined together, in the usual double-barrelled Mikulicz colostomy method, by two layers of continuous catgut sutures, and the abdominal incision was closed around the bowel by interrupted sutures. The condition of both cases at the end of operation was satisfactory. After six days the spurs were crushed and removed by the ordinary Mikulicz method with small crushing clamps. Six days later—i.e., on the twelfth day after operation—the stomata were closed after the bowel ends had been freed and returned.

Case I has now made an excellent and permanent recovery. The patient has gained satisfactorily in weight, and a slight tendency to diarrhoea, due to loss of the ileo-caecal junction, has cleared up. The second case has made an excellent recovery after operation, and it is anticipated that this patient also will return to normal health.

Case I

On Oct. 11, 1944, two and a half days before admission to hospital, the patient, a female child aged 5½ months, started to cry suddenly and became deathly pale. Towards evening she became drowsy and difficult to feed. The doctor was sent for, and he put her on a glucose mixture. She was thought then to be suffering from a chill due to her teeth. The next day she appeared to revive to some extent. At 10 p.m. she was violently sick and the vomit was bright green. She looked very white and it was difficult to rouse her. She slept intermittently on the night of Oct. 12, and on the morning of the 13th she whimpered and vomited repeatedly, but did not appear to be in severe pain. Later in the day she was admitted to the children's department of the Royal Victoria Infirmary under Prof. Spence. No blood had been passed per rectum before admission and there had been only one small motion.

On admission she was found to be well nourished; her expression was anxious, eyes sunken, and tongue dry. The abdomen was slightly distended, and there was a readily palpable sausage-shaped tumour in the left flank extending down into the pelvis. Per rectum no mass was palpable, but some foul-smelling blood-stained fluid emerged on withdrawing the finger.

After pre-operative treatment had been carried out, at 4.30 p.m. one of us (T. A. H.) opened the abdomen through the usual lower right paramedian incision. A large intussusception was found extending well down into the descending colon. Attempts to reduce the mass inside the abdomen were not successful, and it was delivered out of the wound with some difficulty. After a portion of the intussusceptum had been reduced it was found that the remainder was completely gangrenous. The mass was then rapidly mobilized and removed by the modified Mikulicz method described; the loop was brought outside the abdomen, and healthy portions of the lower ileum and transverse colon were sutured together side by side. After the abdomen was closed the gangrenous loop was removed, and catheters were tied into the ends of the ileum and colon for drainage purposes. The opening was later dealt with as previously described, and the child ultimately made an excellent recovery.

Case II

This patient was a male child aged 10 months. On May 9, 1945, four days before admission, he vomited, and later in the day had attacks of crying. Between the attacks he lay quiet and looked very weary. All that night he vomited everything he took and had spasms of crying. Early next morning he passed a small reddish motion. There was no visible blood. The vomiting and screaming continued all day and the child seemed to become weaker. He lay very quiet between the attacks. The doctor was called in and prescribed a stomach mixture. On the 11th he was still vomiting, but was not crying nearly so much; he appeared very exhausted and whimpered occasionally. He continued like this until his admission to the children's department of the Royal Victoria Infirmary on May 13. The bowels had not moved since May 10 and there had been no frank blood passed per rectum.

On admission he was an obviously ill baby, pale and worn out, lying quietly with partly closed eyes. There were obvious signs of dehydration, but the nose and extremities were warm. The heart rate was 140. The abdomen was distended and tympanitic. There was guarding in the right hypochondrium and a suggestion of fullness, but no tumour was felt. Per rectum no mass was palpable, but on withdrawing the finger a small amount of brownish fluid was passed.

An intravenous drip was started immediately, and three hours later one of us (A. W. S.) examined the child under an anaesthetic. A fullness was felt in the epigastrium but no definite tumour. The abdomen was then opened and a small ileo-colic intussusception was found, extending to the middle of the transverse colon. Reduction inside the abdomen was unsuccessful, and the whole mass was delivered outside the abdomen with some difficulty. Some ileum was then reduced, and it was found that the remainder was obviously gangrenous. The mass was accordingly mobilized in the manner previously described, and healthy portions of ileum and ascending colon were secured together by two layers of continuous catgut sutures. After the abdomen had been closed the gangrenous mass was excised and catheters were tied into the ends of the ileum and colon for drainage purposes. The opening was later dealt with as described.

Pre-operative and Post-operative Treatment

Case I.—An intravenous drip infusion was set up on admission and 100 c.cm. of 0.2% saline with 4% dextrose was given before operation. The drip was continued during the operation and afterwards for six days. The total amounts of fluid given over this period were: 350 c.cm. pooled human serum, 200 c.cm. fresh whole blood, 300 c.cm. normal saline, and 1,600 c.cm. 0.2% saline and dextrose. In addition substantial amounts were taken by mouth (see Table I). Her immediate post-operative condition was fairly

TABLE I.—*Case I. Showing Fluid Intake and Output, with Blood Chloride Levels, during the First Week*

Date	By Drip (c.cm.)	By Mouth (c.cm.)	Aspiration and Vomits (c.cm.)	Blood Cl Level (mg./100 c.cm.)
13/10/44	230	60		
14/10/44	300	450	100	
15/10/44	420	300	500	320
16/10/44	300	350	50	
17/10/44	400	600	45	
18/10/44	400	400	0	310
19/10/44	400	400	0	

good—the heart rate was 200 per minute, but she was hydrating up and the circulation was satisfactory. The ileostomy did not drain at all for the first 36 hours, although the tube was patent, but the baby vomited only twice and took small drinks well. On the

evening of Oct. 14, however, she began to deteriorate, becoming restless, pallid, and anxious. By the next morning she appeared moribund; the temperature was 98°, but the heart rate 190. She was sunken-eyed and cyanosed, moaned continually, and was very restless. She vomited dark-green fluid, and a further 300 c.cm. was removed from the stomach by aspiration. During the morning the ileostomy began to drain, dark-brown fluid faeces coming down the tube in spurts with each peristaltic wave. Several ounces had drained after a few hours, and the child became more restful and less fluid was aspirated from the stomach. By next day (Oct. 16) the bowel was draining well and the child was considerably improved. Blood examination at 8 p.m. on Oct. 15 had shown a marked anaemia of post-haemorrhage type: haemoglobin, 50% (7 g./100 c.cm.); R.B.C., 2,800,000; haematocrit, 20%. Blood urea was 64 mg. per 100 c.cm., plasma protein 6.4%, and plasma chloride 320 mg. Cl per 100 c.cm. plasma (normal range 340–380 mg.). A transfusion of 200 c.cm. of fresh blood plus 100 c.cm. of normal saline was given over 16 hours; after this the blood picture was: haemoglobin, 90% (12.7 g.); R.B.C., 5,200,000; haematocrit, 37%. Blood urea was 35 mg., plasma protein 5.8%, and plasma chloride 310 mg. Cl per 100 c.cm. (Oct. 18). She was able to take fluids by mouth from Oct. 16, and was given 1 oz. hourly for three days, then 2 oz. two-hourly for 4 days. She fed fairly well, with only occasional vomits. Fluids given were water at first, then 1 in 8 dilution Nestlé's milk, then humanized Trufood.

The interesting features were (a) the marked anaemia, which was almost certainly a result of haemorrhage into the bowel, as she passed three large stools after operation, consisting almost entirely of altered blood; and (b) the low blood chloride level.

Case II.—On admission this baby was in a state of established dehydration, with sunken eyes, inelastic skin, and greyish pallor. He was given 200 c.cm. of plasma in 1½ hours before operation and improved considerably, his face and lips becoming pinker. 50 c.cm. of fresh blood was given during the operation, and the drip was continued afterwards at a rate of 100 c.cm. of fluid every six hours. Normal saline and 0.2% saline and dextrose were given alternately for the first 36 hours, then plasma and normal saline alternately, and later normal saline and 0.2% saline again. Altogether the drip ran for 4½ days, and the total amounts given were: 450 c.cm. plasma, 50 c.cm. fresh blood, 1,250 c.cm. normal saline, 950 c.cm. 0.2% saline and dextrose. The stomach was aspirated every 4 hours for the first 3 days. He was given fluids by mouth from the start and drank well throughout. At first there was very little fluid obtained by aspiration from the stomach and no vomiting, and the child appeared fairly fit. However, on May 14—i.e., 48 hours after operation—his condition deteriorated considerably. He became sunken-eyed, with cold extremities and frequent restless spasms. Dark-green fluid was now aspirated from the stomach in large quantities and nothing was draining from the ileostomy. The blood chloride level was 305 mg. Cl per 100 c.cm., plasma protein 5.6%, and blood urea 58 mg. per 100 c.cm. It seemed that large amounts of fluid and salt were accumulating in the small intestine, and, though peristalsis was audible, drainage was not yet established. The chloride intake per drip was increased. During the next 24 hours drainage via the ileostomy became established and the amount removed by gastric aspiration lessened steadily. The patient's condition improved considerably, but he still appeared very dehydrated. By 10 a.m. on May 16 he was drinking eagerly and not vomiting, but the blood chloride level was down to 285 mg. Cl per 100 c.cm. The blood urea was then 23 mg. and haematocrit 36%. He was passing very little urine and still looked dehydrated. Two oz. of normal saline was given by mouth, alternating with 4 oz. of Trufood and Prosol mixture every two hours; he drank all this eagerly, taking unusually large amounts of fluid and sodium chloride for a baby of his age (see Table II). By May 18 the chlorides were up to 321 mg.

TABLE II.—*Case II. Showing Fluid Intake and Output during the First Week*

Date	Intake		Output		
	By Drip (c.cm.)	By Mouth (c.cm.)	Aspiration and Vomits (c.cm.)	Ileostomy (c.cm.)	Urine (c.cm.)
12/5/45	300				
13/5/45	400	90	50	10	30
14/5/45	600	720	560	30	90
15/5/45	700	540	360	300	60
16/5/45	600	580	0	140	60
17/5/45	100	1,230	0	?	
18/5/45	0	2,220	270		

and he appeared much better hydrated. The ileostomy was now draining soft semi-solid faeces. By the end of the week he was definitely out of danger and appeared remarkably well and contented.

The interesting feature of this case was the very low level reached by the blood chloride, and the amazingly high intake of sodium chloride by mouth and drip, which was very well tolerated; in fact, he showed great eagerness to drink the normal saline and never

refused any of it during the period of chloride deficiency. The estimated intake of sodium chloride per day is shown in Table III. This does not include the salt content of the milk food (Trufood and Prosol).

TABLE III.—Case II. Showing Estimated Sodium Chloride Intake (apart from the Salt contained in the Dried Milk) and Plasma Cl Levels during the First Week

Date	NaCl Intake (g.) *	Blood Chloride (mg./100 c.cm.)
13/5/45	2.9	
14/5/45	3.4	305
15/5/45	6.4	
16/5/45	4.8	285
17/5/45	10.8	
18/5/45	11.1	321

Comment

It is of interest that both these children were most profoundly ill about 48 hours after operation, with signs of intestinal obstruction, which was relieved when drainage from the ileostomy became properly established.

It is worth pointing out what large amounts of fluid, such as 0.2% saline and dextrose or normal saline, can be taken by mouth and retained by these ill children in addition to fluids given intravenously.

Summary

We report two cases of gangrenous intussusception, of two and a half and four and a half days' duration respectively, treated by a modified type of Mikulicz resection.

We consider that this method of treatment can be expeditiously carried out and that it offers a better chance of recovery in the "bad-risk" case than the ordinary methods of treatment recommended, such as end-to-end anastomosis or lateral anastomosis after resection or enterostomy.

We wish to emphasize the necessity for treating this type of case in a properly staffed and equipped children's department, as we feel that skilful pre-operative and post-operative treatment must play a major part in the recovery of these patients

TRICHOMONAS VAGINALIS INFECTION IN THE MALE

BY

F. L. LYDON, M.B., M.R.C.P.

Major, R.A.M.C.

The frequency of *Trichomonas vaginalis* infection in the female has for many years been recognized, but the similar infection in the male has not received the attention it merits, since it is by no means an uncommon cause of urethritis. During the past few years I have seen numerous cases of this nature, some of which I was fortunate enough to observe over many months, and the results of my investigations are put forward in the hope that with a higher index of suspicion when confronted with a "urethritis," especially one showing a tendency to relapse and chronicity, other workers will discover that many of these cases are due to infection with *T. vaginalis*.

The Organism

The description of the organism as regards size, shape, flagella, etc., may be found in most laboratory textbooks, but I would like to add some personal observations.

(a) *Shape*.—Although usually described as round or pear-shaped, I have seen in some preparations what appeared to be a stoma at the flagellated extremity, suggesting that the organism is in fact globular when not subjected to pressure. The flagella therefore may act primarily as a means of directing food particles into the body of the organism and not for the purpose of locomotion.

(b) *Method of Reproduction*.—It is, I think, generally assumed that reproduction is by simple fission, but on two occasions I have watched for a period of two hours a process best described as "budding." In one case a large organism (parent cell) was attached to a much smaller one (daughter cell) by a bridge of clear cytoplasm, the outer covering of both organisms being continuous. Separation resulted by the stretching and final rupture of this bridge owing to the action

of the flagella of each organism in opposite directions. After separation the daughter cell was morphologically identical with the parent, though much smaller in size (6–8 μ). On the second occasion (one parent and two daughter cells) the same appearances and results were observed.

(c) *The Occurrence of a Resting Phase*.—In some of my cases the active organism disappeared completely from the discharge for periods varying from about one week to two months. During these intervals, however, cells with a "hard" limiting membrane could always be found on dark-ground examination, which suggested that the organism had entered an encysted stage. Differentiation between these cells and some medium-sized epithelial cells is extremely difficult, but a certain facility is acquired by experience. If confirmed this observation of a resting phase is obviously of great importance both in diagnosis and in assessment of cure.

(d) *Method of Demonstrating the Organism*.—For convenience and clarity the dark-ground method is by far the best for the clinician. A drop of normal saline is placed in the centre of a slide. A loopful of the discharge is now dipped into the saline until the fluid takes on a slight opalescence. Recognition of the degree of opalescence necessary comes after a little practice, and I find that holding the slide to the light and looking at the fluid through the glass is of great assistance. A cover-slip being applied, dark-ground examination is carried out in the usual manner.

Pathology

Much divergence regarding the pathogenicity of the *T. vaginalis* is found in the literature: some support its claim as the primary pathological cause, while others look upon it as a parasitic invader following a primary bacteriological infection. Undeniably this latter view is supported by the marked number of organisms found in stained smears of *T. vaginalis* urethritis even on the second day of the appearance of the discharge; in fact, in my department, in any case in which stained smears of urethral discharge show large numbers of organisms the presence of *T. vaginalis* is suspected, and often confirmed. In spite of this, however, I feel that at the moment the problem is best considered in the same light as a Vincent's infection of the mouth, where somewhat similar conditions are necessary for the development of the disease—i.e., dead or damaged organic tissue on which the two organisms flourish together, each being necessary for the development of the other owing to some mutual symbiotic characteristics. This view saves a great deal of useless argument, since either *T. vaginalis* must be first grown in pure culture (or one of the many bacteria present) and shown to produce the disease before the problem can be finally settled.

Turning to the condition in the female, the marked preponderance in young unmarried women is of great interest, and in my opinion one must consider the possibility of extension to the vagina from the bowel in spite of the insistence by some workers on the specific nature of this organism for the vagina. It is well known that cyclical changes (in the vagina) occur, which cause a denudation of the vaginal mucous membrane at regular intervals, and this fact must, owing to poor drainage in young women, bring about a favourable nucleus for the invasion of parasitic organisms. Again, organisms very similar to *T. vaginalis* are often found in the *intestine*, and unless evidence as to the specificity of *T. vaginalis* is beyond doubt, one feels that here at least is a reasonable explanation of the method of infection.

With regard to upward extension of the pathological process, recurrent attacks simulating pyelitis have been common in my experience, but there has been no involvement of the prostate, epididymis, or testis. Cases of prostatitis have been described in the literature, but I doubt if this occurs, since microscopical examination of prostatic fluid (obtained after previous posterior irrigation with two pints of normal saline) always yielded negative results even in the very chronic cases. The possible admixture of anterior urethral pathology with prostatic fluid due to the common, and to be condemned, practice of "milking" the penile urethra after prostatic massage has, I believe, led to such erroneous conclusions. The rarity of stricture (in only one case was a possible previous history of gonorrhoea obtained) is surprising when one considers the chronicity and the marked destruction of the urethral epithelium in this