preparations would produce any result at all if the thyroid element was cut out.

If therapeutic experiment along toxicæmic, endocrine, and similar lines can be called "investigation," we general practitioners are doing our duty nobly. But I see little of the patient laborious research to which Mackenzie devoted his life—these two kinds of inquiry lie poles asunder. Mackenzie's standard is too high for most of us; we lack the insight, even if we possessed the energy.

Is there not, however, some midway line along which we may all hope to do a little real, and possibly useful, work? There may be many; but anyone who forms the habit of taking short notes—if only of cases which are obscure or which possess some points of special interest—finds in the course of a few years that a fund of material has accumulated some of which will certainly throw light on his subsequent reading and experience. Much useful work which, among other results, helps to elucidate diagnostic problems, depends essentially on the existence of some such store. Further, if we keep our eyes open we all occasionally come across cases—or possibly cases in series—of obvious illness which, after careful investigation, are not found to conform to any known disease or even label. Such cases ought to be recorded. The work is seldom wasted, nor is it without reward.

A curious comment on the line of thought I have been pursuing is that, while a store of notes, such as I have referred to, has served me in good stead when impelled to deal with such matters as cardiac murmurs,² or the effects of opium on Cheyne-Stokes breathing and cardiac asthma,³ it has been the cases I have recorded as undiagnosable which have been noticed in quarters never anticipated, and have brought me unexpected recognition. A case of sudden death in a subject who had never shown cardiac symptoms, but which proved to have been due to the rupture of an aneurysm of the ventricle,⁴ has, I learn, been used by certain teachers in both hemispheres as an example of this (happily) undiagnosable condition; while a series of large spleens, recorded in the early nineties, presenting anomalous symptoms and occurring in three generations,⁵ is quoted as the initial link in the chain which led to the differentiation of acholuric jaundice,⁶ now a "known disease" with very characteristic features. These are examples of the fact that records which seem useless or lost may prove to be what some other observer is looking for, and that crumbs scattered on the waters may return to us after many days.

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VOLVULUS OF THE SIGMOID.*

BY

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VOLVULUS is a comparatively rare primary cause of intestinal obstruction in this country, though in some parts of Russia and Eastern Europe it forms approximately one-third of all the cases of intestinal obstruction, while many of the cases recorded in English literature concern Indian subjects.

Rokitansky described three forms of volvulus: (1) rotation of the bowel on its mesenteric axis; (2) rotation of the bowel on its longitudinal axis; and (3) the intertwining of two coils of intestine. By far the commonest of these, so far as the sigmoid colon is concerned, is the first, and it is to this variety that I shall confine my attention.

As far back as 1878 Leichtenstern clearly described the anatomical conditions necessary for the production of this form of volvulus. These are a long mesentery with a narrow attachment to the abdominal wall. Clearly the length of the mesentery is a developmental question, and the same is probably true of the narrowness of its attachment.

* A paper read to the Lancashire and Cheshire Branch of the British Medical Association.

Many writers have stressed the influence of chronic constipation in producing hypertrophy and dilatation of the sigmoid and in setting up chronic inflammatory changes in the meso-sigmoid leading to contraction of this structure. These changes are especially seen near the attachment of the meso-sigmoid to the abdominal wall, and lead to narrowing in this region. It is much more probable that the constipation so frequently present is the result of the anatomical peculiarities—namely, the omega loop arrangement of the sigmoid colon, which is looked upon by some authors as a mild form of idiopathic dilatation of the colon. The changes in the meso-sigmoid consist of fibrous bands on the peritoneal surface and not of fibrous changes in the structure itself, and probably result from plastic peritonitis set up by repeated attacks of partial strangulation. We shall see later on that these attacks often occur before the final acute attack takes place.

To sum up, the anatomical factors necessary are a long meso-sigmoid with a narrow attachment to the abdominal wall. Both of these may be congenital—that is, a condition of mego-sigmoid with, in some cases, an exaggeration of the normal V-shaped attachment of the mesentery. The narrowing of the base of the mesentery may be increased by repeated attacks of partial strangulation leading to the formation of fibrous bands on the base of the meso-sigmoid.

When these factors are present an attack of volvulus may be precipitated in various ways. Undoubtedly, constipation, by loading the bowel, may so increase its weight that the loop falls into the pelvis and the root of the mesentery becomes twisted. The resulting obstruction produces a distension of the bowel and the twist becomes increased. Finally, the circulation is obstructed and still further distension follows, and the picture becomes complete. In many cases the exciting cause is a powerful aperient taken to relieve the constipation. Sometimes an acute attack is produced by violent physical exertion, the movements of the abdominal wall pressing on a loaded and enlarged sigmoid and twisting it on its mesenteric axis.

It is a significant fact that volvulus is commoner in men than women owing to the stronger abdominal wall in this sex, together with the smaller capacity of the pelvis. In one of my patients the final acute attack which brought him to operation resulted from the exertion of mowing his lawn, followed by an aperient which was necessitated by several days' constipation.

Diet may have some effect, and it is said that a vegetarian diet, with its large residue, is liable to produce volvulus. Possibly this factor accounts to some extent for the geographical distribution of the condition.

CLINICAL SYMPTOMS.

The usual mental picture one forms of volvulus is that of an extremely acute intestinal obstruction with rapid and excessive distension of the abdomen and early onset of peritonitis. This is the description which is presented in Keen's *System of Surgery*, and also by Treves and Barnard, though both the latter writers comment on the fact that vomiting is an inconspicuous feature at the onset, and may be entirely absent. Both these writers state that visible peristalsis is very rarely seen.

While there can be no doubt that the final attack which leads to operation or death is of this type, it is becoming increasingly recognized that long before this takes place there may be symptoms of a more chronic and recurrent type. Fernström¹ discusses this aspect of the condition very thoroughly, and differentiates clearly between acute and chronic forms. In many of the acute cases an investigation of the previous history will reveal the fact that the patient has suffered from vague colicky abdominal pains from time to time, often associated with diarrhoea and offensive stools. The attacks are often terminated by the passage of a large quantity of flatus or a very large stool. In one of my patients, a man of 52 years, there was a history, dating back six months, of attacks of abdominal colic with constipation. These were usually brought to an end by a dose of salts, which produced a copious evacuation of motion and flatus.

The chronic symptoms, which are probably due to slight twists rectified spontaneously, therefore resolve themselves

into attacks of abdominal colic coinciding with constipation, followed by relief with a copious stool and the passage of a large quantity of flatus. Any one of these attacks may terminate in an acute volvulus, and it seems probable that the determining factor is the circulation in the affected loop. So long as the twist is not sufficient to interfere with this there is a chance of spontaneous untwisting. The importance of this factor is illustrated by the varying way in which an acute attack supervenes. In most cases the onset is quick, but in some it is much more gradual.

Many years ago I had under my care in the Booth Hall Infirmary a mentally deficient man, aged 55 years. My attention was called to him by the attendant because he was complaining of abdominal pain. I found him not urgently ill, with a moderately distended abdomen and very evident visible peristalsis of the large bowel type all over the abdomen. His condition was not serious, and I watched him for some days before I operated. At operation there was an enormous volvulus of the sigmoid without any strangulation, and I successfully excised the sigmoid loop in two stages by Mikulicz's method. Visible peristalsis was also a well-marked feature in the case I mentioned previously.

That the progress of the final attack may be slow when strangulation is absent is also supported by the case of a mentally deficient male, aged 22 years, reported by Edward Milton Foote.² The first symptom was abdominal distension, noticed by an orderly, and operation was undertaken three days later because of increasing distension and visible peristalsis.

A much more striking example was recorded by Maurice Richardson.³

The patient, a man aged 47, congenitally deaf and dumb, had suffered from severe attacks of abdominal pain with constipation for five years. The attack which led to operation was precipitated by a dose of castor oil, and for a month after the onset there was no passage of motion. The abdominal distension gradually increased, until at the time of operation it was very great, and was accompanied by visible peristalsis. There was no vomiting. Although the attack had lasted so long there was no gangrene, but the affected loop was dark in colour. The bowel was aspirated, untwisted, and fixed in position. The volvulus recurred five months later, and was then resected successfully.

X-ray examination in patients suffering from symptoms of chronic volvulus may be of great value. A barium enema will show the greatly enlarged sigmoid loop. On two occasions I have operated in cases of this type and have successfully removed the sigmoid loop. In one this resulted in a complete cure of the symptoms, but the other patient still suffers from constipation and abdominal pain.

TREATMENT.

The treatment of acute volvulus is entirely surgical. Little is to be gained by wasting time with enemata, and purgatives only make conditions worse. When the loop is viable it is often possible to evacuate it by a tube pushed up from the anus guided by a hand in the abdomen. The twist is then easily undone, and, so far as that attack is concerned, the patient is cured. Many attempts have been made to prevent future twists by fixing the sigmoid to the abdominal wall or by plecting the mesentery. All of these are liable to be followed by recurrence. Indeed, one might almost say that recurrence is the rule.

There can be no doubt that the ideal treatment is resection of the sigmoid loop. This is always essential when the bowel is too damaged to recover, and I believe it is the right treatment in all cases. I have employed it in all four acute cases I have had to deal with. One patient, with a gangrenous sigmoid, died from prolapse of the small gut alongside the double-ended colostomy I had made. This happened on the fifth day, and up to that time the patient had been very well. The accident was certainly due to an error in technique. The other three patients, in all of whom gangrene was absent, recovered. The method I adopted in all four cases was immediate resection of the affected loop with a double-ended colostomy. Later an end-to-end anastomosis was made in two of these patients. The third saved me the trouble by re-establishing her intestinal canal spontaneously. This two-stage operation has seemed to me to be safer than an immediate end-to-end union. There is no doubt that immediate anastomosis gives a much cleaner and pleasanter result, and it may be, as Mr. Morley points out, that there is not the same accumulation and distension in the colon

above the volvulus as there is in cases of carcinomatous obstruction, and therefore not the same risk with immediate anastomosis as there is in these latter cases.

Finally, it is sometimes possible to recognize the presence of intermittent symptoms from chronic volvulus. When this is so, and the diagnosis is confirmed by the x-ray appearances, it seems justifiable to excise the sigmoid loop, as I have done on two occasions.

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THE PRESERVATION OF YELLOW FEVER VIRUS

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THE study of yellow fever has recently been greatly facilitated by the important discovery (Stokes, Bauer, and Hudson, 1928) that the common rhesus monkey (*Macacus rhesus*) is very susceptible to this infection. Hitherto the necessity of using human volunteers for any experiments has prevented a very systematic study of the disease, and therefore the value of this discovery cannot be overestimated.

Unfortunately the cost of transporting monkeys from India to the West Coast of Africa, necessitating transshipment in Europe, is very considerable, as the double journey involves a very high mortality. One of us (A. W. S.) found the mortality of monkeys sent to West Africa was such that their average cost came to nearly four times that in London. Apart from financial considerations, the study of the yellow fever virus can be conducted far more readily in countries where the natural carrier of the infection is absent. Experiments in localities where *Aedes aegypti* may be present involve keeping all infected animals under mosquito netting to prevent the chance of their being bitten by any mosquito and possibly starting an epidemic. Consequently infected monkeys in such localities are always a potential source of danger to the community and involve continual attention. In temperate countries these difficulties do not arise, as even in the presence of *Aedes* the temperature conditions are such that the mosquitos could never become infective. The development of the virus in the intermediate host is extremely slow and uncertain at a temperature of 22° C., and the optimum temperature seems to be in the neighbourhood of 28° C. Consequently the disease is restricted definitely to countries where such conditions prevail, and has never become endemic in temperate zones.

Hitherto the study of the disease has been confined to the regions in which it occurs, unlike the majority of human infections, which can now be investigated in the main laboratories of Europe and America, for although the French Yellow Fever Commission (Marchoux, Salimbeni, and Simond), 1903, carried infected mosquitos back to Paris from Brazil, no method of maintaining the virus was then known.

Considering the evidence in support of the view that yellow fever is caused by a filterable virus, it seemed of interest to see whether the virus could maintain its vitality when frozen, in the same way as many other filterable viruses, and accordingly an attempt was made to transport infected material in this manner.

The strain of virus employed was isolated from a case of yellow fever in a young Syrian at Dakar (Mathis, Sellards, and Laigret, 1928). This patient suffered from a mild attack, characterized by two febrile periods separated by a short intermission. The conjunctivae were slightly jaundiced and congested, and the urine contained a trace of albumin. On the seventh day of the disease, just before convalescence, the patient showed signs of collapse, with marked cardiac symptoms. Twenty hours after the commencement of the fever sixteen mosquitos (*Aedes*