An Address ON THE SINS AND SORROWS OF THE COLON.

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THE sins of the colon are its diseases. But I sometimes wonder whether it is not more sinned against than sinning, for what with attacks from above with purges, attacks from below with douches, and frontal attacks by the surgeon, its sorrows are numerous and real. I believe that a more thorough appreciation of its normal anatomy and physiology, and the routine employment of the various methods of examination, which modern science has made available, are wanted in order that its sins may be recognized at such an early stage that treatment may lead to their complete and permanent relief.

The Motor Functions of the Colon.

Like all other hollow organs, the motor functions of the colon depend upon tone and peristalsis, which are mutually independent. An atonic stomach or colon is often referred to as if it were one in which peristalsis was deficient, but peristalsis is often very active in the presence of hypotonus, and may be weak or irregular in the presence of hypertonus. The tone of the colon depends largely upon the bulk of its contents, and varies continuously according to the amount of faeces and gas present in each segment at the moment. Owing to this the internal pressure is normally constant and only rises when its tone or the volume of its contents is pathologically excessive, pain being then produced. As the caecum and ascending colon contain large quantities of semi-fluid faeces during the greater part of the day, their tone is less and their lumen is consequently much greater than that of the rest of the large intestine, especially the descending and iliac colon, which are generally empty and consequently in a state of tonic contraction, which more or less obliterates their lumen. Thus it is quite normal to find a large and splashy caecum, when the part of the colon which can be felt in the left iliac fossa feels like an almost solid cord.

Anybody who has made frequent x-ray examinations after a barium meal must have been struck by the remarkable contrast afforded by the continuous peristalsis of the stomach and continuous peristalsis and segmentation of the small intestine on the one hand, and the completely motionless colon on the other. On comparing the appearance of the colon every hour through the day, I was struck by the fact that it only changed materially after those hours in which a meal had been taken. By making a screen examination at intervals of a quarter of a minute during the latter part of a meal and immediately after we were rewarded by seeing on several occasions "mass peristalsis," which had already been described by Holzknecht, and is now recognized as being the only movement of importance which occurs in the colon. Two or three times a day a powerful peristaltic wave moves rapidly along a considerable length of the bowel, carrying all the contents before it. The chief stimulus to this movement is the gastro-colic reflex, which follows the entrance of food into the empty stomach. After all of the soluble material and most of the water have been absorbed from the intestinal contents, they are carried from the caecum and ascending colon by the mass peristalsis to the pelvic colon, where they remain until the first peristaltic wave of the following morning occurs, either as a result of the stimulus of getting up and dressing or of breakfast. They are then carried into the previously empty rectum, where they give rise to the desire to defaecate, which is followed by the normal reflex process of defaecation. Consequently during the greater part of the day the caecum, ascending colon, and pelvic colon are more or less full, but the rest of the colon is generally empty.

The Radiology of the Colon.

No attempt should be made to treat a case of constipation, which does not quickly respond to simple treatment, until an x-ray examination has been carried out. This should not be done until the patient has discontinued the use of aperients

for forty-eight hours, but, if necessary, an enema can be given the day before and again in the early morning of the day on which the examination begins.

By no other means is it possible to compare the position of the colon in the erect and horizontal postures, to determine whether adhesions are present, fixing its different segments to each other or to neighbouring structures, and to discover how quickly the intestinal contents traverse the bowel and how long their residue remains in each segment. It is, however, useless to carry out such an investigation unless the remarkable variations which may occur in normal individuals are thoroughly recognized. The times I gave in 1907 as the average rate for the passage of the intestinal contents in healthy individuals were nothing more than the average, though they have often been taken as the "normal" times, the slightest divergence from which has been regarded as pathological. Healthy individuals, however, vary within wide limits in this direction, and the position and mobility of the caecum, ascending and transverse colon are also subject to considerable variations. It is not pathological for the caecum to drop into the pelvis in the erect position, and a powerful forward in the Guy's fifteen of 1907, who had never had a day's indigestion or constipation, was only one of several perfectly healthy individuals I have seen with the greater curvature of the stomach over two inches below the umbilicus and the transverse colon reaching almost to the bottom of the pelvis.

Ptosis of the colon hardly ever gives rise to symptoms by causing kinks, and stasis in the colon must be considerable before it can be regarded as of real importance.

It is an interesting fact that more than half of the severe cases of constipation which have been sent to me in the last fifteen years have suffered from pure dyschezia, or inefficient defaecation, the passage through the intestines having been normal in rate. In such cases the only treatment required is re-education of the act of defaecation by a proper attention to the hygiene of the bowels, together with the use of graduated glycerin enemas in resistant cases. In the remaining cases stasis in the proximal part of the colon was most common; it is comparatively rare for the whole of the large intestine to be involved. An accurate diagnosis will show what form of treatment by diet, drugs, massage (given on the first occasion under the x-ray screen so that the exact manipulation required can be observed), exercise, and, in the case of general colonic stasis, intestinal lavage is indicated in each individual case.

Radiography after an opaque meal rarely reveals the presence of a growth in the early stage; in all suspicious cases a barium enema should be given, as this is often arrested at the seat of the tumour, but I have seen a few patients in whom this method also failed to show anything abnormal, although a growth was discovered by other means, or subsequent events showed that one was present.

Colitis and "Colitis."

Colitis is inflammation of the colon. But the term "colitis" is very frequently applied in the absence of any evidence that the colon is inflamed. I am convinced that the loose employment of the word is an important factor in the development of many cases of severe hypochondriasis. Colitis should never be diagnosed unless positive evidence of its presence is obtained by examination of the stools and by means of the sigmoidoscope. Under normal conditions the mucous membrane of the colon is kept moist by the secretion of mucus, which renders the onward passages of the faeces more easy. Like all other mucous membranes, it reacts to mechanical and chemical irritation by the secretion of excess of mucus, in order to protect its delicate lining epithelium from injury. Consequently the presence of hard faeces in the normal colon calls forth a secretion of mucus. If the faeces accumulate in the rectum, the mucus is unformed. If, however, the mucus is produced in the pelvic colon or more proximal part of the large intestine, and a thin layer of mucus remains in contact with the mucous membrane sufficiently long, a ferment, mucinase, which is present in the mucous membrane, causes it to coagulate, much in the same way as fibrinogen forms fibrin when blood coagulates. A membrane of coagulated mucus is produced, and this is subsequently passed in the form of shreds, or occasionally tubular casts of the part of the colon in which it was produced. Microscopical examination of this mucus may demonstrate the presence of desquamated epithelial cells, but there are no pus cells or other evidence of inflammation, and the sigmoidoscope invariably shows that the mucous membrane is perfectly healthy. The name "mucous or muco-membranous colitis" commonly applied to

this condition is therefore incorrect. When pain caused by spasm of the colon coexists, as it often does, the term "mucos-membranous colic" might be used, but in the absence of pain the condition should not be regarded as any more pathological than the presence of a little unformed mucus with scybala which have been retained rather longer than usual in the rectum.

When mucus is present with soft or fluid faeces colitis is more likely to be present. But inquiry must first be made as to whether an aperient has been taken, because the mucous membrane also, protects itself from the chemical irritation of drugs by the production of mucus. Thus the existence of colitis can only be inferred from the discovery of mucus if the faeces are unformed and no aperient has been taken.

More important than mucus is the presence of pus in the stools. This always indicates that some organic pathological condition exists. In cancer and in ulcerative colitis the pus can generally be recognized by the naked eye. If, however, it comes from the more proximal parts of the colon, it is likely to be intimately mixed with the faeces and the mucus, both of which should be examined microscopically, especially if the latter is unformed and opaque instead of transparent.

In the absence of haemorrhoids bright red blood in the stools is of equal significance. If no mucus or pus is present it probably comes from a rectal polypus, but if mucus and pus coexist acute haemorrhagic colitis, ulcerative colitis, dysentery, or cancer is almost certainly present.

Unless abdominal or digital examination of the rectum reveals the presence of a growth with certainty, a sigmoidoscopic examination should be made in every case in which the symptoms and the appearance of the stools suggest the presence of colitis or a growth.

The Sigmoidoscope.

The sigmoidoscope is one of the most valuable of all instruments used in the investigation of disease, and yet it is rarely employed except by surgeons, especially those interested in diseases of the rectum. In my opinion every physician and every practitioner should familiarize himself with the sigmoidoscope. With a little practice it can be introduced with perfect safety into the bowel of women as well as men without an anaesthetic and without causing anything more than a moderate degree of discomfort. An anaesthetic makes it impossible to assume the knee-elbow position, in which the passage round the pelvi-rectal flexure can be negotiated in almost every case without inflation, which is a matter of great importance, as inflation not only causes pain, but may also be dangerous when the wall of the colon has become thinned by ulceration.

It is no more justifiable to treat colitis without first inspecting the mucous membrane of the colon with the sigmoidoscope than it is to treat a sore throat without looking at the pharynx. I have seen numerous cases, which had been treated for months as "colitis," in which the sigmoidoscope revealed the presence of a growth. It must be remembered that the pelvi-rectal flexure, the most common place in the colon for the development of cancer with the exception of the rectum, is beyond the reach of the finger introduced per anum, and a growth here and in the lower six inches of the pelvic colon, which are also accessible to inspection with the sigmoidoscope, is often palpable from the abdomen, although it can sometimes be felt through the front wall of the rectum or by bimanual examination.

With the sigmoidoscope, too, the various forms of colitis can be recognized, the absence of any inflammation in mucos-membranous "colitis" can be demonstrated, the diagnosis between amoebic and bacillary dysentery can be made, and the process of recovery in colitis and dysentery can be watched. The symptoms of ulcerative colitis and dysentery, like those of gastric and duodenal ulcer, disappear under treatment long before the ulcers are healed. We have the great advantage in treating the former that the sigmoidoscope makes it possible to determine when the cure is really complete, and no case should be allowed to pass from active treatment until the sigmoidoscope has demonstrated that the mucous membrane is perfectly healthy. By this means alone can disappointing relapses be prevented. Only when the sigmoidoscope comes into its own will the surgeon see most cases of cancer of the pelvic colon and upper part of the rectum at the early stage, in which alone a radical cure by operation is still possible.

The Use and Abuse of Purgatives.

If the fortunes made from purgative pills had been devoted to the hospitals which treat the victims of their abuse, the financial problem of the voluntary hospitals would have been solved. About £10,000,000 was expended in 1921 on patent medicines, the majority of which contain purgatives.

I have already pointed out that the stools should be inspected and the x-ray examination carried out whilst no aperient is being taken. It is interesting to observe how large a proportion of patients, who are supposed to be the victims of toxæmia from intestinal stasis, feel better whilst these examinations are being carried out. The fact is that symptoms result far more frequently from the artificial diarrhoea produced by purgatives than from intestinal stasis. Purgatives often cause abdominal pain, intestinal stasis very rarely. Bacterial decomposition is very active and excess of toxins is produced and absorbed in the colon when its contents are kept fluid by the use of purgatives, but the reverse is the case in the semisolid or solid contents of the colon in intestinal stasis.

On several occasions when I have been asked to decide whether the operation of colectomy, which had been recommended for "intestinal stasis," should be performed, I have found that all the symptoms disappeared on giving up purgatives and adopting some more rational treatment. It is sad that the description Gulliver gave the Houyhnhnms of the habits of his fellow countrymen is as true to-day as it was in 1727: "They take in at the orifice above a medicine, equally annoying and disgusting to the bowels, which relaxing the belly drives down all before it; and this they call a *purg*." I do not say that an aperient should never be used, but when required, one should be chosen and a dose should be found which result in the passage of a single formed stool each morning.

Intestinal Lavage.

The mythical origin of intestinal lavage should be of interest in Harrogate, where many thousand Plombières douches are administered every year. Pliny (A.D. 77) tells how the Egyptians learnt to wash out their bowels from observing the habits of the ibis: "He washes the inside of his body by introducing water with his beak into the channel, by which our health demands that the residue of our food should leave." It is cruel to deprive the ibis of his claim to this epoch-making discovery, but the truth must be told: the ibis does not give himself a Plombières douche, but after washing his beak in water he oils it in his preen-gland, which is situated near the anus, in preparation for preening his feathers.

In the seventeenth century the enema reached the height of its popularity. It is recorded that Louis XIV received several thousand intestinal douches in the course of his life, and that the pious Duchess of Alva treated her sorely ill son with enemata of an emulsion of religious relics. Unhappily they failed to save him.

The last twenty years have seen a remarkable revival in the popularity of the intestinal douche, a popularity which has led at times to its indiscriminate use for conditions in which it was not suitable. It is a valuable remedy, but its precise indications require to be defined, and I should like to say a few words about the technique of its administration.

In the first place intestinal lavage is of use when it is necessary to remove retained faeces from a colon which, on account of its irritable or inflamed condition, ought not to be further irritated by the use of aperients. Mucos-membranous "colitis" comes under this category. The fluid used should be of a non-irritating character, or a condition of catarrhal colitis will be added to the hypertonic and hypersecretory condition already present, just as the inhalation of irritant fumes produced by the burning of the powders used in asthma causes catarrhal bronchitis to be added to the simple hypertonic and hypersecretory condition of the bronchi, which is alone found in uncomplicated asthma. I had thought at one time that the Harrogate sulphur water used for intestinal lavage might sometimes act as such an irritant, but I have found by actual experiment on the healthy mucous membrane of the colon that it is no more irritating than normal saline solution. It would be interesting to know whether it owes to its radio-active or other constituents any healing properties not possessed by the latter. There is a real danger that a course of intestinal lavage in cases of this kind might lead to constipation by making the patient too dependent upon them.

For this reason patients should attempt to get their bowels open naturally each morning before they receive their douches; if this is impossible they should have paraffin, together, when necessary, with the minimal dose of senna required to produce a stool.

Secondly, intestinal lavage is of great value in the treatment of the severer forms of colitis, and especially of ulcerative colitis. Antiseptic and astringent drugs can be applied by this means directly to the mucous membrane in any required strength, without becoming diluted in the stomach and small intestines and without irritating them. The drug I have found most valuable in the local treatment of colitis is albargin, a silver nucleinate, which Rogers proved experimentally was the most satisfactory antiseptic in cases of dysentery. A solution of 1 grain to 1 ounce of water should be used.

It is of great importance that the douche should be properly administered. Nurses are always taught to pass the tube as far into the rectum as possible, and they are rarely satisfied unless twelve or more inches have been introduced. Until comparatively recently I understood that this was the practice not only in Plombières, but also in Harrogate and the other English spas in which the treatment has been employed. But the pelvi-rectal flexure, where the freely movable pelvic colon joins the fixed rectum at an acute angle, is four and a half inches from the anus, and it is a physical impossibility to pass a rubber tube beyond the flexure, except through a sigmoidoscope which has been manipulated through the flexure. This was proved long ago by Sir James Goodhart in the *post-mortem* room, and in 1908, and again more recently, I demonstrated the same fact with the *x* rays, which show that the tube turns back when the flexure is reached, and then curls up in the rectum. The end of a tube passed in the usual way must therefore rub against the mucous membrane of the rectum, and when twelve or more inches of stiff tubing are introduced into the rectum it is obvious that a considerable amount of damage may be done. This explains the observation I have frequently made, that in cases of severe colitis treated by douching through a tube introduced in the ordinary manner, the sigmoidoscope shows a pelvic colon either healed or nearly healed, whereas the whole of the rectum, which has been rubbed every day with the tube, is still acutely inflamed. The tube should therefore be introduced not more than two inches beyond the anus. The fluid should be run in slowly at a pressure not exceeding twelve inches of water, and not more than a pint and a half should be used. The *x* rays have shown that a barium enema of a pint and a half of fluid, introduced, at a pressure of twelve inches, through a tube inserted two inches beyond the anus, invariably reaches the caecum, whatever position is assumed by the patient, unless organic obstruction is present. I believe that de Graaf was correct when he wrote in his monograph, *de Clysteribus*, in 1668, that the usual ritual of lying on a series of positions during the administration of the douche has not the slightest effect. There is no doubt, however, that the knee-elbow position, by making the pelvi-rectal flexure less acute, allows the fluid to pass more readily into the pelvic colon and so prevents the overdistension of the rectum, which otherwise may make it difficult for the patient to retain the fluid for twenty or thirty minutes, as is advisable in the severe forms of colitis.

The Surgery of the Colon.

Apart from the treatment of cancer of the colon, diverticulitis, and other causes of acute and chronic obstruction, the indications for surgery in diseases of the colon are few. At one time I believed that appendicostomy or caecostomy should be performed in every case of ulcerative colitis of any severity, as Lockhart-Mummery has so persistently urged. But since I discovered that anti-dysenteric serum has such a remarkable healing effect on the disease,¹ I believe that it will in the future only be necessary to perform the operation in the exceptional cases in which no improvement follows the intravenous injection of large doses of serum.

I have always held that intestinal stasis only required surgical interference in very rare and neglected cases, in which, prolonged medical treatment fails to relieve local and general symptoms of real severity. In the fifteen years I have been interested in the subject I have only recommended five patients to undergo an operation for this condition—three times short-circuiting and twice partial colectomy. One patient died, one was completely and per-

manently cured, and the remaining three were benefited to a varying extent. Short-circuiting of the part shown by the *x* rays to be affected, without dividing the bowel, or its excision should be performed in preference to complete colectomy. The statistics of Guy's Hospital show that the mortality in total colectomy for intestinal stasis is about 16.5 per cent. The ultimate results of the operation would require to be extremely good to justify such a high mortality, considering that with the exception of one case recorded by Lockhart-Mummery² intestinal stasis has never, so far as I know, proved fatal. I have come across an occasional brilliant result, but improvement is much more frequently only partial, and in many cases the patient is either no better or is actually worse than he was before the operation. It is a surgical aphorism that no operation should be performed on the stomach in the absence of a demonstrable lesion, and I look forward to the time when a similar aphorism will be applied to the colon. I have been appalled in the past to see how lightheartedly colectomy has been recommended for comparatively trivial symptoms before any serious effort has been made to treat them by other means. But it is satisfactory to note that the operation, which reached the height of its popularity shortly before the war, is gradually becoming obsolete. I was told in 1919 during my visit to Cleveland, Baltimore, and the Mayo clinic, that, after an unsatisfactory trial, colectomy was now no longer practised for intestinal stasis, and in contrast to the forty colectomies performed at Guy's in 1914 only one was performed in 1920 and not one in 1921.

A Diagnostic Clinic for Harrogate.

I have endeavoured to show how the treatment of diseases of the colon should never be undertaken before a thorough investigation has been carried out. I have not referred to various other examinations of equal importance—such, for example, as that of the secretory functions of the stomach by a fractional test meal, which may reveal the presence of achlorhydria, one of the most common causes of chronic diarrhoea, and a powerful predisposing factor to infection of the bowel.

These investigations require team-work. Each physician practising in a health resort like Harrogate should have at his disposal a diagnostic clinic, into which his patients could be admitted for ten days or a fortnight whilst he investigates them by the usual clinical methods, inspects their stools, and, when necessary, makes sigmoidoscopic examinations, whilst his radiological, biochemical, and bacteriological colleagues carry out such examinations as he may direct. At the end of this period he will be in a position to advise what treatment is required during the remainder of the patient's visit.

If possible the physicians should have no financial interest in the nursing-home side of the clinic. Patients should receive two accounts, one from the clinic and one from the physician. The latter should be an inclusive one, fixed beforehand, which should cover every examination which may be required. A certain proportion of the physician's fee should be paid to a central fund, out of which the radiographer and pathologists receive their salaries, which would thus be proportionate to the amount of work they are called upon to perform.

During the past year I have been associated with a clinic run on somewhat similar lines. Investigations have been carried out by clinicians, pathologists, and a radiographer, working as a team, and I can assure you that my work has been more interesting, less fatiguing, and more satisfactory from my own and from my patients' point of view than it ever was before. I believe that the future of medicine lies largely in the development of team-work in diagnostic and treatment clinics. In this direction Harrogate has a great opportunity. It should lead the way in establishing spa treatment on a sound scientific basis, so that those earlier days will sink into oblivion when spa treatment meant the application of spa water to the skin, the stomach, and the bowel, whatever was the matter with the patient, and Guy Patin's criticism of mineral waters, "I do not believe much in these, they never cured anybody, and I never believed that they would," was justified. Harrogate will then maintain its position as the Mecca for the sins of the colon, and will be free from any suspicion of reproach as adding to its sorrows.

REFERENCES.

- ¹A. F. Hurst, *Guy's Hospital Reports*, lxxi, 1921. ²P. Lockhart-Mummery, *Proc. Roy. Soc. Med.*, Supplement to vol. vi, 186, 1913.