

ON A CASE OF
OBSTRUCTION OF THE BOWELS DUE TO
VOLVULUS, TREATED BY ABDOMINAL
SECTION; RECOVERY.

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Clinical History.—H. G—, aged thirty-two, miner, was admitted into Ward 9 of the Glasgow Royal Infirmary on Feb. 2nd, 1883, under the care of Dr. Robert Perry. He complained of a stoppage of the bowels of seven days' duration, with great pain over the whole abdomen, as well as pain in micturition. The pain came on suddenly when he was at work, being at first located in the left iliac fossa, but soon spreading over the whole abdomen. Purgatives had been repeatedly administered before admission, both by the mouth and rectum, but had produced no effect. On admission, the abdomen was found to be much distended, tense, and tympanitic, but not tender under pressure. Percussion revealed no dull area, nor was there any external evidence of hernial protrusion. The heart was displaced upwards, but was otherwise normal. There was no vomiting. The pulse was good and the temperature normal. On Feb. 3rd the patient had considerable pain and a feeling of twisting in the abdomen. An enema containing some castor oil and turpentine was administered; it passed pretty readily into the bowel and was retained for some time, but was returned without bringing away any faecal matter. A hypodermic injection of morphia was given to allay pain, and one-third of a grain of extract of belladonna ordered to be administered by the mouth three times daily; small quantities of iced milk was the only food taken. On the 4th the abdomen was distended with gas, and more markedly in the course of the colon than over the small intestines. Dr. Perry called me in consultation, and it was agreed to have recourse to colopuncture. This was performed at the upper part of the descending colon; a large quantity of fetid gas escaped through the cannula, the distension of the bowels was much diminished and the patient expressed himself as a good deal relieved. The girth of the abdomen after the colopuncture was thirty-five inches. Pulse 76, of fair strength. Temperature in the morning 98.2°, in the evening 100.4°. An enema was again administered in the evening of this day, but with no effect. The patient continued much in the same state for several days. The abdomen became much distended by accumulation of gas, and relief was always experienced from puncture of the colon, which was repeated on Feb. 5th, 10th, 13th, and 18th. Paroxysms of pain came on twice daily, and sometimes more frequently, during which there was evidently powerful peristalsis going on; the pain was subdued by the use of hypodermic injections and by hot fomentations, but the benefit obtained in this way was clearly only temporary, and no real progress was made. In the hope that increased contraction of the muscular coat of the bowel might lead to the removal of the obstruction, it was ordered on the 7th that the abdomen should be well rubbed with warm castor oil and kneaded with the hand; and on the 10th a weak current of electricity was applied for about a quarter of an hour. On the 12th the patient had a large enema of salt-and-water, the last portion of which brought away a few bits of hardened faeces, each about the size of a walnut; during the evening he had a constant desire to pass something from the bowels, rising frequently to the stool, but obtained no relief. On the 20th Dr. Perry's journal report runs as follows: "Abdomen again becoming much distended, and paroxysms of pain more frequent. Patient looks more anxious, and is more rapidly emaciating during the last few days. Although a little flatus has from time to time been passed per anum, there has been nothing more voided. An enema again given last night was retained only a very short time, and brought nothing of faecal matter with it. It was quite evident that, except the obstruction of the bowels (which had now lasted twenty-five days) was speedily removed, the patient must slowly sink. There was no vomiting, and very little evidence of peritonitis; and taking everything into consideration, Dr. Perry and Mr. Clark agreed that it was a favourable case for gastrotomy."

Operation.—A consultation having been held, at which two physicians and two surgeons were present, it was decided

to perform abdominal section. The patient was therefore anaesthetised by means of ether, and when fully under its influence a rectal exploration was made which showed the existence of an obstruction very near to the anus. The abdomen and pubes were now shaved, and an incision was made in the middle line from the umbilicus to the pubes, and was afterwards carried a little higher up to the left of the umbilicus, the total length of the incision being about eight inches. The peritoneum being exposed, a small portion was picked up with the forceps and cut, and, a director being introduced, was slit up to the entire extent of the external incision. An enormously distended portion of the bowel now came into view, looking at first sight like a dilated stomach; it was rather congested, contained a large quantity of gas and faeces, and presented none of the characteristic appearances of large intestine. When this was brought out through the wound the hand could be passed down beside it into the pelvis, and a constriction easily made out, occupying the lower part of the rectum. It thus became evident that the distended portion was colon, and examination soon showed that this had become twisted by the sigmoid and descending portions passing around the upper part of the rectum, thus crossing the lower part of the abdominal cavity from left to right, and returning at a higher level from right to left. By twisting the enlarged portion in the opposite direction, so as to make three half turns from right to left, the constriction was readily removed, and it was gratifying to note that apparently no structural change had taken place in the portion of bowel so constricted. The descending meso-colon was so lax that a portion of the descending colon had passed over to the other side of the abdomen, and was found near the right iliac fossa. Beyond some slight congestion of the peritoneum, and the presence of a few flakes of lymph, nothing abnormal was observed in the peritoneal cavity. The question now was how to reduce the bowel to such dimensions as to allow of its being returned to the abdominal cavity, which proved a task of greater difficulty than was anticipated. Gentle pressure on the bag produced little expulsion of gas, and none at all of faeces, so that it was found necessary to introduce a large tube into the rectum, and pass it well into the distended bowel. But even then the expulsion was not effective, as the major part of the bowel contents consisted of faeces which were too solid to pass through the tube; we therefore introduced, by means of a Higginson's enema syringe, large quantities of olive oil and warm water, and thus managed to evacuate a considerable quantity of faeces. It was necessary, however, to repeat this process of washing out the bowel five or six times before there was a sufficient reduction in the size of the sac, our later experiences tending to show that warm water alone (so warm as to be only just borne by the hand) was more effective than the mixture of oil and water. This washing out took a long time to accomplish, and during the whole period the bowel was out on the abdominal wall, covered with towels dipped in a hot watery solution of carbolic acid (1 in 60), the count up at the end of the operation showing that three dozen towels had been so employed. At length the bowel was safely returned, and a search in the peritoneal cavity showing that no other manipulation was required, we proceeded to close the wound. Three deep stitches of chromic acid gut were passed through about the centre of the rectus muscle on each side, and fastened by means of pairs of buttons; the peritoneum was next stitched with chromic gut, and the superficial part of the wound closed with sulphurous chromic gut sutures in two sets—long ones to approximate the mass of the walls, and short intermediate ones to accurately bring together the cut edges of the skin. The operation had been commenced under the spray, but when the bowel was covered by towels its use was no longer necessary; on the bowel being replaced it was renewed, and was maintained till the dressing was applied. The latter consisted of the usual layer of protective, wet and dry gauze and gauze dressing, with jaconette; and, finally, a bandage of elastic webbing on the outside. The operation lasted fully two hours, during the whole of which time the patient's pulse kept good and the breathing easy and regular. The anaesthetic was sometimes ether and sometimes chloroform, the change depending on the state of the patient; it was administered by Mr. Wilson, my house-surgeon, and I was most ably assisted by Dr. Macewen, and by Mr. Stewart, Dr. Perry's house-physician. When the patient became conscious he expressed himself as feeling much relieved. He was ordered to be kept strictly to ice and milk, and to have one grain of solid opium at night. The same evening the temperature was 101.8°, and pulse 120. Passed a

good night, feeling very little pain, but had retention of urine, and the catheter had to be used every eight hours; the urine drawn off had a slightly smoky appearance, possibly due to absorption of carbolic acid. The temperature twenty hours after the operation was 99.8°. It is not necessary to follow the progress of the case from day to day; the patient got on excellently, the wound healing very kindly, and the abdomen resuming its natural appearance. On two occasions there was a slight rise of temperature, this being accounted for in the first instance by a small abscess forming in the arm where a hypodermic injection had been introduced, and in the second by a slight accumulation of pus in the sheath of the rectus after the antiseptic dressings had been dispensed with. A copious alvine evacuation took place on the third day after the operation; it came away without the patient being able to control it, and this loss of control lasted for the next two weeks, gradually, however, passing off. For several days there was diarrhoea, and for this I recommended that more solid food should be given, as up to this time the patient had been kept on beef-tea and milk. This slight drawback did not seriously impede the progress of the patient, he made a most excellent recovery, and was dismissed convalescent on March 28th, five weeks after the operation.

Remarks.—The course of the case as detailed in the foregoing notes presents many features of interest, and it is well to consider these, not only as they have a bearing on the progress of our patient, but as aiding us in the diagnosis or directing our treatment in cases of a like nature. Volvulus is one of the rarest causes of intestinal obstruction, its rarity depending on the normal connexions of the bowels by means of the peritoneal processes; it is therefore singular to note that in most of the recorded cases the twist has been found in the large intestine. I say it is singular because this is the most fixed portion of the bowel, for in the majority of instances not only is the ascending and descending colon bound down to the posterior wall of the abdomen by peritoneum covering only its front and sides, but also the hepatic and splenic flexures are especially firmly connected with the wall, the latter indeed being kept in place by one of the strongest of the peritoneal folds called the costo-colic ligament. The rectum has invariably a double fold of peritoneum or "meso-rectum," and is thus in the upper part free to move from side to side, and the sigmoid flexure has often a double fold or "sigmoid meso-colon." When this is the case a considerable freedom of movement of that part of the great bowel lying in the left iliac fossa is allowed. Pollock experimented by the injection of water into the rectum in the dead subject, and found that when there was a distinct and large sigmoid meso-colon, "this portion of the bowel was first seen to bulge forward and then gradually rise up towards the diaphragm."¹ When, however, there exists, as in the case before us there was found to be, a descending meso-colon, still greater freedom of movement is permitted, and the costo-colic ligament may be so lax originally, or may become so stretched, as to permit of the descent of the splenic flexure, so that it is possible for it to pass across the lower part of the abdomen, and to twist round the sigmoid flexure or upper part of the rectum. While, therefore, it is not difficult to understand the mechanism by which volvulus is brought about, it is at the same time easy to understand why the affection is so rare, since it depends for its production on an abnormal arrangement of the peritoneal folds, a condition not in itself, as far as I am aware, conducive to constipation, but certainly permitting a more free excursion of the bowel, and so increasing the risk of twisting if any arrest of the faecal flow take place. The affection is generally marked by great obscurity in the symptoms. There is, of course, marked obstruction, and this may exist for many weeks without any great urgency in the symptoms; in our case, although twenty-five days had elapsed without a motion, the patient was not in any great distress, his pulse was full and steady, he could and did readily take food, and he slept fairly well. In these respects the case presented a marked contrast to the picture of volvulus drawn by Brinton in his *Lectures on Intestinal Obstruction*, for he says: "In its phenomena, as contrasted with those of obstruction generally, we see duration shortened, inflammation paramount, and, as regards the bowel, paralysis early and frequent, peristalsis often subdued from the very first onset" (p. 86). In not a single particular does this description hold true with regard to the case under dis-

cussion. A curious feature, well exemplified in our patient, is that not unfrequently in volvulus injections may be readily passed into the bowel and are thus retained, leading to the conclusion that the obstruction is higher up, the truth being that the twist is not tight enough to prevent fluids being passed up, but forms a valve-like fold, effectually preventing any return. This character presents a serious difficulty as regards diagnosis, but it is an important point, taken in conjunction with the other symptoms, and should have its place in the consideration of all cases where volvulus may be the possible cause of the obstruction. Another puzzling feature was the entire absence of vomiting. We know that in all cases where the obstruction is low down, vomiting takes place late in the history, but I know of no recorded cases where it is stated to have been entirely absent. Both this and the very chronic nature of the affection were dependent on the healthy and strong condition of the bowel-wall; the colon formed a large sac, in which the faeces went on accumulating, and as the gas was removed by colo-puncture room was left for the further storage of faeces. Indeed, it might have gone on for many days longer without any serious result taking place. Volvulus is frequently marked by great flattening of the abdomen at one part and distension at another (Erichsen); but this was not noted in our case, but what was observed was as follows:—Periodically the man had extreme paroxysms of pain, caused by active and powerful peristalsis, and at such times there was marked indrawing of the abdomen in the middle line, between the umbilicus and pubes, with bulging of the surrounding parts, more especially of the left lumbar and iliac regions. The twist had probably taken place at first in the sigmoid flexure, and gradually worked down; for it was found at the operation to be situated low down in the rectum, whereas in the earlier treatment of the case rectal examination furnished no evidence of obstruction in that part of the bowel. The patient frequently complained of the sensation of twisting of the bowel, but it is at all times difficult to know how much or little value to attach to the feeling of the patient; still, it is worthy of note that this was a prominent symptom in the present case, and that knowledge may be of use in the diagnosis of other cases of a like nature.

Treatment.—A few words as to the treatment will suffice. Had we in the first instance distinguished the case as one of volvulus, we should not have recommended or adopted treatment by means of abdominal friction or the continuous current, as there can be no doubt that the twisting was likely to be thereby increased; but the symptoms were very obscure, and the fact that enemata passed pretty freely into the colon led us to hope that the obstruction might be transient, and that increased peristalsis might result in the re-opening of the passage. It is possible that by the introduction of the hand into the rectum in the early stage of the affection the twist in the bowel might have been overcome, but this experiment would have been attended by considerable risk of perforation of the bowel, for in at least one recorded instance where this was tried the bowel was found after death to have been lacerated by the attempt. Nor would it have been easy to have undone the twist even if the hand could have been introduced; indeed the only possibility of such a favourable result lies in its being practicable to unload the bowel beforehand by means of a long tube introduced into the distended gut. As Pollock well observes, "It may be stated as an axiom in these cases that, once formed, the twist prevents the escape of the contents, and the contents of the twisted portion maintains the distortion, and to remedy the latter the contents must be removed." If such a case comes under my notice again, I shall feel inclined to try what can be done in the way of unloading the bowel by the aid of a long and large rectal tube, and then attempt to untwist the twisted portion. Very great benefit was experienced from the use of colo-puncture, large quantities of gas being thus got rid of. It was practised six times, and on each occasion produced a reduction of girth of about three inches; it was, however, soon apparent that this treatment was merely palliative, and the fact that after the evacuation of fetid gas small quantities of semi-fluid faeces began to pass through the cannula, showed that the bowel contained a large amount of faecal matter which could only be removed by some other means. The question thus became one of operative procedure. Colotomy might be successful as regards a free outlet for the intestinal contents, and might save the life of the patient, but it had two disadvantages—it would leave an artificial anus, and we should

¹ Holmes's System of Surgery, second edition, vol. iv., p. 608.

be still in the dark as to the nature of the affection, and might possibly leave that condition unrelieved. Abdominal section on the other hand, though more risky, ensured that we should truly ascertain what we had to deal with, and should thus be able more effectually to remedy the diseased state. The success of our operation was in great measure due to the fact that we had a strong and healthy patient to deal with, that very little constitutional disturbance had resulted from the long constipation, and that the peritonitis had been so slight in degree and limited in extent; but we can also claim that by performing abdominal section when we did we gave the patient the best chance of life and cure. The result is certainly encouraging, and in the treatment of abdominal obstruction, where every experience is instructive, this one may be of use in inciting others to a more early and active treatment than is commonly adopted, for it is, we fear, too much the custom to wait till the patient is moribund, and then very wisely decide that he is too far gone for operation.

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SEASIDE DRINKING WATER.

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A NOTE in THE LANCET of Sept. 15th induces me to give some of my experience on its subject. During a varied experience of Southern India I had an opportunity of examining the water-supply of many of its stations, and thus controlling the accounts given of the water-supply of many other stations. A great part of Southern India is "seaside," and much that is now dry land, even plateau-land 1000 feet high, has been seaside at a comparatively recent geological period. The recognition of this led me to use water-analysis as a means of geological investigation as a test of the past history of the country, and the results of prolonged investigation led me to discredit a great part of the sanitary opinions deduced from analyses of water made without sufficient recognition of the past history of the soil. The presence of much chlorides in water is too often concluded to be due to sewage contamination. Waters must not be judged from some abstract standard of purity; in each locality there is a general standard of pure subsoil water, to which the various waters may be referred, and the cause of deviations from the standard must be investigated. More or less salinity may arise, not only from the mineral part of sewage, but from marine salts deposited in various ways:—1. From old deposits in a soil not long risen from the sea. 2. From the residue of saline rain water. 3. From the migration of deposits down the subsoil of a valley to a previously pure spot. Another supposed source is the infiltration of sea water into wells near the shore. But this is far less frequent than is supposed. There may be wells of desalinated sea water, of water purified from salt by filtration; but I doubt whether there are many instances of wells in which originally good water is spoiled by infiltration from the sea. Let us suppose rain falling, for instance, on a coral island; if the rainfall be sufficient, the porous soil will soon become saturated with fresh water which will sink down and displace infiltrated sea water. In course of time the saline deposits will decrease to a minimum, and the island will retain in its porous subsoil a head of water which, so long as it is higher than the sea water, will effectually keep this out. As a matter of fact, all seaside places in which the level of the subsoil water is higher than that of the sea are secure against infiltration of sea water. The greater the rainfall, and the greater the height of the retained water in the subsoil, the more effectual will be the washing out of any marine deposits in the subsoil. Where the land is of comparatively recent upheaval, where the rainfall is small, where the land is too low to keep up a steady outward pressure of subsoil water against the sea, the process of washing out is slow, and the water may be normally brackish. I would instance the whole eastern or Coromandel coast of India. There the rainfall is small, coming principally in bursts which flood the rivers, but do not penetrate the soil thoroughly. Consequently it is found that the water is frequently brackish, except where the well is in the neighbourhood of a watercourse. Long after the Indian watercourses, from the small nullah, or ravine of a

storm-torrent, to the river half a mile broad, have dried up under the influence of the dry season, there remains an underground sheet of water in the interstices of the subsoil; this sheet of water presses down the valley and supplies any well which may be sunk within its influence. This water is generally free from salinity in proportion to the washing effect it has had in past times on the subsoil. There is, however, an exception. The moving sheet of water carries along with it a certain quantity of salts, and should it all be drawn to the surface and exhausted by the effect of prolonged drought, its salts are deposited in the soil. Next year's rains dissolve the salts and carry them further down the valley, hence the phenomenon of a diffused mass of salts migrating along the lands and either sterilising them or rendering the waters brackish during their sojourn. Where the position of the country is unfavourable to this washing-out process the brackishness may be persistent. This must not be confounded, as it is likely to be in seaside places, with infiltration of sea water.

Thus, the salts which cause more or less brackishness in the subsoil water may not be from original marine deposits in the soil; they may be deposits by rivers or torrents which have since taken another course or which have dried up. And it must be remembered that salts may not be marine in the ordinary sense. There is a perpetual circulation of salts between sea and land, and, though it is probable that the sea is becoming, in the present geological period at least, more and more saline, yet a great part of the millions of tons of salts swept every hour, nay every minute, into the sea is being continually restored to the land. A remarkable instance has recently come under my notice. I began some weeks ago an examination of the waters of Guernsey, where I was then stationed, and I was surprised to find that the purest subsoil water contained nearly eight parts in 100,000 of sodium chloride, out of a total of seventeen parts of mineral constituents left on evaporation. This water was from a well in which the water lies at about 230 ft. above the sea-level and 60 ft. from the surface; the well is about a quarter of a mile from the edge of the cliffs; its situation and surroundings (in an unmanured field, without any buildings within several hundred yards, and pumped by machinery) are such as to remove all suspicion of contamination. Yet, what would theory not say of a water containing 4·6 centigrammes per litre of chlorine and 1·1 centigramme of nitric acid? Its quality would be expressed in terms of London sewage. Other waters from wells of equal purity were found to contain 5·3 centigrammes of chlorine and 1·9 of nitric acid in the litre. The approximate constitution of the solids was as follows:—

	Centigrammes.
Alkaline chloride	8·7
Alkaline sulphate	4·0
Nitrates	2·3
Earthy silicates	4·5
Earthy carbonates	3·3

22·8 per litre.

The hardness of the water was 9·6° (centesimal scale).

	Centigrammes per litre.
Ammonia, free	·002
Ammonia, albuminoid	·0056
Oxygen required by the permanganate process	·003

Whence could come these large proportions of marine salts, more than half of the solid constituents of the waters? The subsoil of Guernsey is gneiss, and the wells are cut in this rock. The source of the salts is to be found in the high salinity of the air saturated with marine vapours, and I have no doubt that the whole of the salts are air-borne. These salts are continually being returned to the sea by the streams which pour down every valley and trickle from every cliff, but they are restored to the island as fast as they are washed away.

I regret that my departure from Guernsey cut short these investigations of an interesting subject. I, however, ascertained another fact bearing on the present subject. Several wells supplying houses on the esplanade in the lower part of St. Peter's Port (for the whole island is dependent on wells and rain-water cisterns) were found to yield brackish water. In some cases there was obvious sewage contamination, but where this was not evidenced by the amount of ammonia, it was pleaded that marine infiltration might be the cause of