precise amount of this loss ; but that it must be very great is evident from another consideration to which I directed attention—viz., the safety with which chloroform is given to infants by means of the towel, without any precaution to adapt the quantity of liquid used to the small capacity of their lungs. If anything near the whole of the chloroform that comes off were inhaled by children, its proportion would be enormously high and necessarily deadly. Their immunity from danger proves, therefore, the greatness of the waste of the anæsthetic.

From these facts it seems probable that, even when the chloroform has just been poured upon the towel, the amount actually inhaled does not exceed that which Mr. Clover uses as a constant quantity throughout the administration. And, considering how rapidly the rate of evaporation from the cloth diminishes, it is manifest that the average quantity taken into the lungs when this method is employed is very greatly below that supplied by Mr. Clover's apparatus. Mr. Clover may perhaps reply that this is impossible, seeing that patients cough more with the towel than with his apparatus, implying that what they breathe is more pungent, and therefore stronger. But greater pungency of the inhaled air does not necessarily imply a larger proportion of the irritating material. Any one who has watched the clear blue Rhone flowing side by side with the milky Arve, far below their place of confluence near Geneva, will readily understand this. When the chloroform has just been poured on the middle of the cloth, its vapour falls in very large proportion from the moistened part upon the mouth and nose ; but from the sides of the towel, and from beneath its edges, pure air rushes in simultaneously, and the two fluids pass imperfectly mixed into the fauces and trachea. On the other hand, the atmospheric gases and the chloroform are perfectly blended in Mr. Clover's balloon ; and just as a glass of spirits and water well stirred tastes milder than the same ingredients unmingled, so the gases inhaled from Mr. Clover's apparatus appear more bland, though in truth more potent, than the unmixed gases beneath the towel.

I have been accustomed to regard Mr. Clover's apparatus as in his hands a harmless luxury ; but when I find him at the outset of his article denying broadly that in deaths from chloroform the respiration is affected before the circulation, and when he relates in illustration a case "out of many which tend to show that the pulse must be watched", where during tranquil inhalation the pulse gradually failed and became imperceptible while the breathing continued free, though this also afterwards ceased, in spite of discontinuance of the inhalation, so that the patient seemed for a while really dead, I am led to doubt whether experience so entirely contrary to ours with the towel may not be due to the larger proportion of chloroform given. These statements of Mr. Clover make me more than ever satisfied that the cloth, though a rough and ready and somewhat wasteful means of administering chloroform, is the safest of any yet devised.

But even if Mr. Clover should reduce his percentage of chloroform, so as to ensure primary failure of the respiration rather than of the heart, it would not follow that his apparatus would be a desirable thing for general adoption. Its only advantage is the avoidance of irritation of the air-passages by the pungent vapour ; and this, after all, is but a trifling inconvenience, and patients seldom complain of it. On the other hand, not only are Mr. Clover's bag and mouthpiece a cumbersome means of effecting the object, but, though perfectly safe in his hands, they might not always prove so in those of others. I lately heard of a case in which this apparatus being employed, and the patient showing no signs of being influenced by the anæsthetic, it was found on investigation that the introduction of chloroform into the balloon had been omitted. Now, it is certainly full as likely to happen that too large a supply might be introduced through ignorance or hurry, in which case a more efficient means of quietly destroying human life could hardly be devised. For an agent adapted, like chloroform, for universal employment by medical men, it is of the utmost importance that the means of administering it should be as simple and uncomplicated as possible.

Before concluding, it may not be deemed out of place for me to advert shortly to Mr. Syme's experience with chloroform, more especially as my practice is simply that which I learnt from him. Though I may hope that I have done something to elucidate its theory, I have added nothing to it. It remains as it was at the outset, except that, instead of the tongue being drawn forward on every occurrence of obstruction to the breathing, it has of late years been found that the slight puncture inflicted by the artery-forceps may often be avoided by the means before referred to. With Mr. Syme, from first to last, a cloth on which the chloroform was freely poured was the only means employed. The breathing was taken as the only guide, while no inquiries were made into the state of the heart ; and the administration was conducted by junior officials of the hospital. Yet in a surgical career which has been estimated as involving the giving of chloroform

upwards of seven thousand five hundred times, he did not meet with a single death from the anæsthetic.

I venture to hope that this discussion, though I fear it has been on my side carried to a tedious length, may tend to increase the confidence of the profession in this safe and simple practice. Should this prove to be the case, I shall not have abused the patience of the reader.

INTESTINAL OBSTRUCTION FROM A KNOT ON THE LOWER PART OF THE ILEUM.*

BY MICHAEL W. TAYLOR, M.D., Penrith.

MRS. S., aged 40, the wife of a small farmer, was a full-sized, finely made, robust woman ; she had been the mother of several healthy children, the youngest of whom, aged fifteen months, she had suckled until quite recently. She had led an active and regular life, and possessed all the attributes, and indeed had been in the enjoyment, of perfect health, and had never been subject to more than the most trivial derangement of the bowels. On Thursday, November 17th, 1870, whilst engaged in baking, on lifting a heavy pan from the ground, she was sensible of having strained herself on the left side of the abdomen, but the pain passed off directly and she ceased to regard it. Another circumstance which ought to be mentioned in this place as a possible cause of the intestinal entanglement, the results of which were soon to be developed, was, that on this evening at supper, and also on the following morning, she feasted very freely on boiled cockles, which to her were a very unusual kind of regalement. I have no evidence to show whether the slight "overreach" or this indigestible meal was the cause of her illness ; but on the evening of Friday she was seized with a cramp and twisting pain in the abdomen, recurring acutely for a time, and abating for intervals of twenty or thirty minutes. During the night she vomited frequently : what was rejected was not food that had been taken, but a yellow bitter fluid, having the colour and appearance of bile. A dose of castor-oil which was given to her was speedily vomited.

She was first visited in the forenoon of Saturday, November 19th. Her expression wore an anxious appearance, as of a person suffering from abdominal distress. The gripping pain was referred chiefly to the epigastrium ; it was intermittent, and there were periods of tolerable ease ; at other times she turned from side to side, as if suffering severely. There was but little tenderness or distension over any part of the abdomen—indeed, pressure somewhat relieved her. There was no increase of temperature, nor of rapidity of pulse beyond 80. The tongue was coated white. The last motion which passed from her bowels was on Wednesday. There was no abdominal protrusion, nor abdominal enlargement, nor thickening to be felt in any situation. On viewing the case at this period, the symptoms accorded with the presumption that the attack might turn out merely as one of colic, from the irritation of indigestible matter, and might pass off with the removal of the offending cause. To effect this, blue pill and colocynth were given, with alkaline and sedative draughts ; and frequent hot linseed-meal poultices were ordered. These pills and a portion of the medicine were retained, and it seemed that during the remainder of the day she felt herself easier and thought herself better, although no evacuation from the bowels had been procured. The night, however, was one of great suffering, from the frequent and violent recurrences of the pain and vomiting, so that a summons came to visit her at five on the morning of Sunday, the 20th. The matter vomited was green bilious fluid ; it was rejected from the stomach with considerable force. The pain was still referred to the epigastrium, over which she acknowledged a slight amount of tenderness, from which, however, the rest of the abdomen was free, although it was now becoming slightly rounded in contour and tympanitic on percussion. An enema of one pint of warm water and eight ounces of olive oil was injected, which had the effect of relieving the lower bowel of a considerable quantity of fecal matter in the form of scybala and pellets, but not of a loose nor fluid motion. Two pills, with a quarter of a grain of morphia in each, were left for administration every two hours. Shortly afterwards she obtained ease ; she was able to take a little beef-tea ; the paroxysms of pain and sickness ceased, and she obtained some sleep. On visiting her in the evening, the pain in the epigastrium, though not so severe, had become more constant, and more aggravated by pressure ; there was more general distress and restlessness, and great thirst, dry skin, dry tongue ; pulse 64, hard. She had vomited recently, from time to time, a quantity amounting to a washhand-basin full of brownish-yellow fluid, with a distinct fecal odour. There had been no further evacuation from

* Read before the Cumberland and Westmorland Branch, May 3rd.

the bowels. It became certain now, that physical occlusion existed in the intestinal tract. The question of the first importance was to define the site and locality of the obstruction; and, in the second place, from among the multiform and diversified, and sometimes anomalous, pathological causes of ileus, to differentiate to which the present symptoms might be more precisely referred. The parietes of the abdomen seemed to contain a considerable thickness of muscle and fat, but not to such a degree as to depreciate the results of an exploratory examination by palpation and percussion. There were no coil-like markings over the abdomen; the bulging there was to a moderate extent only; the regions presenting the fulness were the epigastrium, the umbilical, and the hypogastrium: the percussion resonance over this superficies was drum-like and amphoric. There was no fulness nor distension of the sides above the *crista ilii*, in the localities occupied by the ascending and descending colon, nor was there dulness over these spaces—the signs which generally supervene in strictures at the sigmoid flexure. Viewing these indications, and moreover the fact that this morning the injection had penetrated a portion of the colon and cleared it of its contents, there was already ground for the presumption that the obstruction was not in the large intestine, but at some point at or above the cæcum.

To consolidate the diagnosis thus far, and also as a remedial measure of the first importance, it was determined to use O'Beirne's long tube. A flexible tube was passed up carefully into the colon to the extent of twenty-two inches, and the presence of its extremity in the neighbourhood of the transverse arch was rendered unequivocal by auscultating the passage of the injection as it flowed at that spot. A pint of linseed-oil suspended in a quart of warm milk was thrown in. The injection flowed readily; it caused pain, and it was discharged in a few minutes without having contracted any fecal odour, or having any fecal admixture of any consequence.

When it became apparent that this aid, often so useful, but useful chiefly in cases of impaction in the larger bowel, had failed, I resolved to try a method which in two desperate cases of ileus I have used with immediate and unmistakable success; viz., the inflation of air charged with the vapour of chloroform.

The method by insufflation is as old as Hippocrates; for, after antiphlogistic and emollient measures and clysters had no effect, he then ordered "wind to be thrown into the belly by a pair of smith's bellows, that both the abdomen and cramped muscles might be distended, and then, withdrawing the bellows, a clyster to be injected—not prepared of things very warm or heating, but of such as dissolve or mollify the fæces; then the patient was to sit on a perforated chair over a sponge of hot water charged with the ingredients of a clyster". Alexander of Tralles, or Trallian, as he came to be called, in treating of the cure of the present malady, gives us the following express caution and sound advice regarding inflation. "If it be a cold colic, or an iliacal affection without any preceding inflammation, in that case it might be of use to practise the cure by inflation; but if the bowels are locked up by an inflammation antecedent, the method of cure by inflation will be not only useless but even prejudicial."

The method by which I cause the air to be charged with chloroform is by an apparatus fixed between the hand-bellows and the flexible rectum-tube, consisting of a circular wooden-box containing a sponge; the box is pierced with an aperture fitted with a plug or screw, through which the chloroform may be dropped when required. The air, on being forced through the sponge by the bellows, becomes highly charged with the chloroform-vapour. This method was used in the present case: air and chloroform-vapour were blown into the bowels for some minutes slowly and gradually, until great distension, apparently of the whole abdomen, was produced. It was attended, however, with no immediate benefit nor satisfactory result; no stool nor flatus were passed. As she seemed much exhausted and faint from the pain of the procedure, nothing further was then attempted. A pill with half a grain of opium and a quarter of a grain of belladonna was ordered every three hours, to be alternated with small doses of sulphate of magnesia and sulphuric acid and tincture of belladonna.

On the morning of the 21st, it was found that she had passed a better night, and had slept for two or three hours at a time. There had been no vomiting, and but little tormina. She had not been sensible of the voidance of the air injected on the previous day, nor of any movement or rumbling in the bowels. In the course of the day, however, the attacks of tormina returned, and she twice discharged, with a jerky action of the stomach, several mouthfuls of greenish-yellow fluid without fecal odour; there were some hiccough and thirst; pulse 80. The long tube was again introduced, and an injection of six ounces of milk, in which ten minims of croton-oil were suspended, was thrown into the colon. This had the effect of setting up energetic peristaltic action of the bowels; in half-an-hour the injection was returned, but without fecal

admixture, though still with a fecal smell; a vast quantity of flatus also came away, but without characteristic odour. She stated that for the first time she now felt a stir and rumbling in her bowels, whereas hitherto all had been fast and torpid, noiseless and without movement. At this stage a hope was entertained, from the slightly more favourable indications presented by a return of peristaltic action, that some passage might be effected. So far there had been an absence of the general or local symptoms of inflammation either of the peritoneum or of the bowel itself. The case was judged to be one of simple ileus, with distension and paralysis of the muscular coat of the bowel, without inflammation, as described by Abercrombie; and it was certain from the results of the exploratory injections that the site of the mischief was above the cæcum.

Early on the morning of the 22nd, the retchings, which had abated after the enema, returned. There had been several attempts, but no evacuation. The abdomen was not altogether free from pain, and there was a very slight amount of tenderness; pulse quiet. An enema of warm water and a dose of two ounces of spirit of turpentine was administered; shortly afterwards the injection was returned, mixed with a small quantity of fecal matter. The whole surface of the abdomen was kneaded with oil, and emollient poultices were applied, and pills with compound tincture of colocynth and one minim of croton oil given.

In the evening it was found that the purgative pills had been speedily vomited; the nausea and retching were more aggravated; hiccough frequent; no stool. She stated that she recognised the taste of turpentine distinctly in the fluid rejected from the stomach to-day; and the discharges which had been preserved certainly gave out the smell of turpentine, showing apparently that some of the injection had ascended to and penetrated the constriction, and mingled with the retained intestinal contents above—a fact most noteworthy, as showing that the occlusion was not thorough nor complete. The abdomen was rubbed with equal parts of belladonna and glycerine. The pills of opium and belladonna, which had been taken up to this time, were stopped, as they were frequently rejected, and their physiological effects was not discerned.

November 23rd. The vomiting and hiccough continued, but with longer intervals; beef-tea and effervescing drinks having been sometimes retained for two or three hours. There had been great thirst; pulse 86. Half an ounce of spirit of turpentine was given by mouth, and an enema containing the same was administered, and stupes of turpentine were applied to the abdomen. The turpentine draught was retained for three or four hours, and she passed several times a quantity of flatus. Urine had all along been passed in large quantity, containing abundance of urates. She was ordered to continue the turpentine applications.

November 24th. She passed an uneasy night, with no sleep. She vomited twice during the night a quantity of yellowish green fluid; pulse 104. There was no increase of tension nor of pain in the abdomen. An ounce of castor-oil was given and retained. *Vespere*: There had been no more retching; she continued to pass wind in small quantity; pulse 98; tongue red and dry. A large injection of oil and soap and water was given; on its return it brought away a large quantity of wind, after which she expressed herself much relieved.

November 25th. About 3 A.M. an attack of vomiting occurred, which brought up the castor-oil which had been swallowed fourteen hours before. At 7 A.M., having felt a desire to go to stool, she rose up, unaided, and passed flatus with great force, and with a strong fecal odour, and also a small quantity of thin fluid of a fecal nature; she passed at the same time a quantity of urine. At 9 A.M., stercoraceous vomiting occurred, and again at 12 noon. She broke out in a profuse clammy perspiration, and expressed herself as being relieved afterwards. The pulse was more frequent, 104, weak and constricted.

November 26th. Occasional retchings occurred during the night, without fecal admixture. There was no passage from the bowels; the general condition was much the same. One-twelfth of a grain of strychnia and a quarter of a grain of belladonna was ordered to be given every three hours. The abdomen was rubbed and kneaded with camphorated oil.

November 27th. There was no material change; four pills had been taken. She stated that, after having swallowed any food or fluid, she felt an impulse downwards to the lower part of the bowels, where the action stopped and became inverted, and was by and by followed by vomiting.

As is often the case in this malady, we had arrived at a point in the treatment at which we were brought completely to a stand, at which it was in vain to affect the repetition of measures which had failed, and when it was becoming evident that it was too late to cast about for fresh principles of treatment. It had so happened that this morning, on the persuasion of a friend, she had been induced to take a large quantity of

fresh brewer's yeast—the intention of which remedy I suppose to have been that it might evolve in the bowels a quantity of fixed air, and so extricate any unnatural twist or convulsion that might have been formed. She was desired to continue it along with treacle-beer.

November 28th. There had been no vomiting since yesterday. There had been sensations of movement and peristaltic action in the bowels, and offensive flatus had been passed repeatedly. She had felt more relieved and easier than for several days, and she was even hopeful. This result she attributed to the yeast which she had taken. It was a delusion, however, created probably by that mental perverseness, not unusual, which is apt to bias sense in favour of nostrums and advice derived from unorthodox or spurious sources, for in material respects no improvement could be substantiated—indeed, on the 29th, fæcal vomiting had recommenced, with much hiccough and general anxiety and distress. The abdomen had become decidedly tympanitic and painful on pressure; pulse more frequent, very feeble and compressible. Enemata of beef-tea were ordered every three hours.

November 30th. Fæcal vomiting occurred; she had hiccough, eructations, great prostration; the exposed parts were cold and clammy; she was nearly pulseless; the tongue was red, and there were sordes about the gums; the mental condition was drowsy and semi-stupid. Diffusible stimuli were ordered.

December 1st. Death took place at 3 A.M. She had passed nothing from the bowels, and had vomited fæcal matter to the last. The mind was conscious. The duration of the disease was fourteen days.

Necropsy Eight Hours after Death.—The body was plump, with a considerable layer of fat in the parietes of the abdomen, which was greatly distended, and had a drum-like resonance. The peritoneal covering was smooth and glistening, and disclosed no inflammatory appearances nor products. The small intestines were much distended, and concealed from view all other organs; their parietes were thin and transparent, without rupture, and not remarkably changed in colour, until approaching the right iliac region, where a livid mass of strangulated bowel indicated the site of the obstruction. The lower portion of ileum along with the cæcum was removed for examination; and the cast now exhibited was taken from the preparation. A portion of the ileum, about

a. Ileum. b. Colon. c. Cæcum. d. Inclosed loop of Ileum. e. Knot.

twenty-two inches in length, was found tied in a running knot about two inches above the cæcum. The entanglement must have taken place in this wise: about twelve or fifteen inches of the lowest part of the ileum must have become coiled in a circular loop; the portion of the intestine directly above must have twined round from behind to the front of this coil; a knuckle or rather elbow of this portion of the bowel must then have accidentally slipped through the loop, and, having become embraced by it, on the tightening of the noose, have been caught in a slip-knot, or the same knot as that by which sailors hang their necktie. This included portion formed a sort of *cul-de-sac*, being bulged out into a globose form, with a semilunar outline, like a bag or pouch, measuring five inches by three, and marked on the surface with the depressions of six or eight sacculi or folds. It was drawn into puckers at the neck, but the little finger could be passed freely under the point of constriction; it contained fluid, and was not immoderately distended, and the colour was heightened only and not livid. It was the cæcal or distal end of the ileum which constituted the knot, which was in one place of a dark brick-dust or brown colour, and in another coil of a livid purple, and in parts black, soft, and gangrenous. This was the point at which the constriction was greatest. Below the knot the distension and dark colour terminated abruptly. The cæcum and colon were white and collapsed. The stomach was empty; the gall-bladder full. No disease was found elsewhere.

REMARKS.—It is the disclosure of the pathological cause that attaches to this case of ileus an interest and importance; and the value of it depends on the circumstance, that it affords a perfect example of an exceeding rare form of intestinal lesion—viz., true knotting of the bowel. Amongst the various causes of intestinal obstruction seated in the bowel itself, as distinguished from those which proceed from constrictive agencies external to the intestine, we may arrange under the one head of volvulus, two subdivisions—viz., (a) twists or folds of the intestine on its own axis; and (b) twists around another piece of bowel, or knots. Volvulus, even strictly in its generic sense, as including both these two forms of entanglement, is a comparatively unfrequent cause of ileus; and species b, or knotting of the bowel, is a lesion of the extreme degree of rarity. Dr. Hilton Fagge (*Guy's Hospital Reports*, 1868) has given the records of all the cases of intestinal obstruction which have occurred at Guy's Hospital for fifteen years, from 1854 to 1868 inclusive. The necropsies were fifty-four in number; and only seven died from twists or folds of the intestine, or volvuli; and I do not find one case amongst them from knotting of the bowels. The most elaborate essay on intestinal obstruction is that of Duchaussoy, published in 1860 (*Mem. de l'Académie de Médecine*, 1860, xxiv). It is founded on the results of five hundred and eighteen observations, in which the anatomical changes are accurately described. Out of these five hundred and eighteen fatal cases of ileus, twenty-one were caused by "strangulation of the intestine by the intestine", and are tabulated by him under head No. 2, under which he includes various forms of displacement and compression, as well as twists and volvuli. On examination of the causes of the strangulation in these twenty-one cases, as set forth by Duchaussoy, I find that thirteen were caused by twisting of the bowel on its own axis in various ways; that four were from *enroulement*, or from a piece of bowel being wrapped or rolled around another; and amongst these only one case of the bowel being knotted. The case is reported from Parker, and the facts are given in a note. Like the case just related, the entanglement was formed on the lower ileum, near the cæcum, by two loops, one passing within the other, and drawn tight into a knot an inch and a half long. In one of the loops was a cherry-stone. The case was operated on by enterotomy. The knot could not be unravelled, but was cut off. The case recovered in four and a half months.

I have examined the volumes of our British medical periodicals for half a century. They furnish many reports of cases of ileus, the more numerous being cases of intussusception. Cases arising from twisting of the bowel, are related by Abercrombie, Oudney, and one or two others; but I have found no reference to any case of knotting of the bowel.

I have no remark to make about the diagnosis, as there are no means by which to distinguish this from some of the other forms of internal strangulation.

A consideration of the condition of the parts, as shown by the cast, will make it manifest that no medical remedies could have been of service; and that the only available chance, would have been enterotomy and untwisting and reducing the loop by the hand, which would have been feasible in this instance.

EXCISION OF THE ELBOW-JOINT: PRESERVATION OF EXTENSION OF THE FOREARM.

By C. F. MAUNDER, Esq.,
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OF the major operations, probably no one is more successful in saving life and securing a useful limb than excision of the elbow-joint. The articulation is reached, and the ends of the bones are exposed and removed with comparative ease, by a posterior longitudinal incision, with or without the addition of a short transverse cut—the latter through the skin only. By complying with the general principles of surgery applicable to resections, few important structures are injured by the knife, and as a result we have a most useful limb—one, it is said, generally oapable of performing to a large extent *all* the functions and movements of the healthy member.

It is from this latter statement that I venture to differ. Flexion shall be good, supination and pronation tolerably good; but *extension* of the forearm is generally impossible. For the latter defect, the mode of operating is responsible; but the remedy is easy, and our knowledge of anatomy will supply it. Although probably the majority of surgeons now employ the longitudinal incision, yet a certain structure to be alluded to is often severed to facilitate the operation, because its value is unknown. It is possible that the reader will be surprised when I say that the power of extension is rarely preserved; and when