The abdomen was rather swollen and flatulent. On November 14th laparotomy was performed, and complete atresia of the small intestine detected. At a point normally between the middle and lower third of the small intestine the bowel was completely missing, being represented by a cord along the edge of the mesentery connecting the blind ends. After applying Doyen's intestinal forceps, entero-entero-anastomosis was performed with two rows of silk suture. After the operation the temperature rose to 105.8° F., but soon fell and became normal, and five months later the child had quite recovered.

Congenital atresia of the small intestines is, on the whole, very uncommon. In the foundling hospital at Petrograd Theremin reported nine cases among 150,000 children, and I myself have come across only two cases among 41,000 children in the Royal Lying-in Hospital at Copenhagen.

Different hypotheses have been advanced to explain the pathology of atresia of the small intestine, but the most probable is that advanced by Tandler,² the Viennese anatomist. On examining eleven human fetuses aged from 30 to 60 days he found that on the thirtieth day an epithelial proliferation begins in the duodenum, and results in a more or less complete obstruction of its lumen. This obstruction is greatest on about the forty-fifth day, and seems to have ceased on about the sixtieth day. According to Tandler's theory, congenital atresia of the small intestine is due to persistent physiological epithelial obstruction.³ This theory was afterwards confirmed by E. Kreuter, and especially by H. J. Forssner⁴ of Stockholm; the latter writer maintains that a narrow epithelial stenosis may become a complete atresia later on in fetal life, and in this way he explains the presence of meconium below the atresia, as noted above in the report of my own case.

I think all will agree that the treatment of atresia of the small intestine must be surgical, but as to the kind of operation opinion still differs greatly. From the perusal of cases recorded (even during the later decennia), it will be noticed that in an astonishing majority only enterostomy has been performed, and it has always resulted in sudden death, associated with an enormous rise of temperature; yet even in 1902 H. Braun⁵ recommended this procedure as the normal method for deep-seated atresia of the small intestine. Naturally, I cannot share Braun's view; on the contrary, I maintain that if we are dealing with a fairly strong infant, without any other signs of bad deformity, we ought to perform a laparotomy, making the abdominal incision large enough to enable us to see where the obstruction is seated, and also to make sure that no second stenosis be present. Then the operator should make the anastomosis which the particular case demands. It will very seldom be possible to postpone the operation as long as in my case. As yet I have not been able to discover any account of anastomosis being performed for atresia of the duodenum. It will be noticed in the history of the recorded cases that while almost all the infants that have undergone this operation developed an exceedingly high temperature, although only enterostomy was undertaken, the infant operated on more radically by Fockens also got very high fever, yet completely recovered.

As we cannot suppose that failure is due in every case to defective personal asepsis on the part of the surgeon, we must direct our attention to the special source of the infection in the child itself. There is a risk on two sides—namely, from the skin and from the contents of the intestines. As is well known, the integuments of an infant during the first weeks of its life are always infected from the umbilical wound, and the delicate skin cannot stand any strong disinfectants. In order to eliminate this danger, I in the first place dressed the umbilical wound with cotton-wool moistened in a 1 per cent. solution of silver nitrate, before the putrefaction of the cord; and what was of still more importance, I sewed Mosetig batiste to the margins of the wound before laying open the sheath of the rectus, so that the intestines and compresses could not touch the skin. It cannot be doubted that the stagnant and decomposed contents of the stomach involve a great danger of peritonitis; it is necessary, therefore, if there be any suspicion of atresia, that the greatest care and cleanliness be taken in the feeding of the infant, hence only an experienced nurse should be entrusted with a case of this kind. The strictest care

should be taken to prevent any of the contents of the intestines getting into the peritoneum during the operation. I chose the antecolic type of anastomosis as being the easiest to perform. The fact was that I was not able to apply it to the lower part of the duodenum on account of the adhesion of that part of the bowel to the posterior abdominal wall. A retrocolic anastomosis might for purely theoretical reasons have seemed to allow of almost normal anatomical conditions, but I consider that the drawing of the gut through the mesocolon and the more difficult application of anastomosis would have increased the risk of the operation considerably. Later, on reading Fockens's report, I was greatly interested in the fact that he had argued in a similar way.

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SOME HINTS ON TIME SAVING IN OPERATIONS.

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THAT an operation performed rapidly, without, of course, in any way impairing its efficient performance, is desirable in the interest of the patient, is, I think, admitted by all. Indeed, in many cases—for instance, a case of ruptured ectopic pregnancy—rapidity in operating may easily make the difference of life or death to the patient; and as necessarily the surgeon has frequently to undertake such cases, it is imperative that he should be able to act promptly, quickly, and safely. This is, however, not the point I am about to discuss; I am taking it for granted that it is better for the patient that any operation should be expeditiously performed. The gain, too, is not confined to the patient, but is time saved to the busy surgeon, and in hospital work, where operation succeeds operation, a saving of time is a great gain to all concerned.

How is time to be saved? First and foremost, I most emphatically state that it lies in efficient co-operation between the surgeon, house-surgeon, and theatre sister. I am, of course, now speaking of hospital work; any work in private must necessarily fall short of this. By constantly working together the surgeon, house-surgeon, and sister play into each other's hands and assist one another as do partners in any game—bridge or football, for instance.

Of the trio, perhaps the sister plays the most important rôle; a sister, such as we have at present at the Hull Royal Infirmary, must save hours in the course of a month's operating. A good sister knows the peculiarities of each surgeon she has to work with, and is ever ready to hand him the instrument he needs, never keeps him waiting a moment while she threads a needle but is ever alert, so that I often wonder that after five or six hours' work it is possible to remain good tempered and willing for anything further.

Then, too, much time is saved in a hospital between operations by efficient drilling of the nurses. I often sit and admire the way in which preparations are made for the next operation. After the dressings are applied the porters are summoned, the house-surgeon wheels the table out of the theatre, and then changes his gloves. The sister changes hers, and prepares the instruments for the coming case; one nurse swabs down the floor with a squeegee, another takes the bowls away, and replaces them with freshly sterilized ones; no one is in a hurry, all works as smoothly as a silent running motor car, and the theatre is ready before the anaesthetist has the next patient under.

After this, then, given a capable house-surgeon and a reliable theatre sister, what can the surgeon himself do in the saving of time? This, of course, varies with the individual; a man who in his youth has been accustomed to use his fingers as individual digits, who has practised such arts as carpentry, mechanical drawing, or piano playing, has all his fingers under control, and can use each one as required without any effort. The boy who is fond of using his fingers in any deft way, such as familiarity with the different knots in use among sailors, one who delights

in conjuring tricks with string, wire, etc., has developed his fingers to an invaluable extent if he is to become a surgeon.

Before the days of anaesthetics the surgeons felt the need for rapidity in operating, and when we read of the deeds of the great surgeons of those days one can only marvel at their dexterity, but to amputate at the hip-joint in half a minute demanded a very different dexterity from what is required to-day. Then the sutures were introduced with what would be regarded as a packing needle, and no effort was made for an artistic result; the main thing was to accomplish the operation as rapidly as possible.

In what ways, then, can the modern surgeon improve on his predecessor in time-saving devices?

Let us consider what is required in almost every modern operation, as if in manipulations that have constantly to be carried out a second can be saved in each motion a considerable amount of time is saved in the course of a year.

A very large amount of time is occupied in every operation in suturing; take gastro-enterostomy or intestinal anastomosis as examples; here really accurate and artistic work is demanded. When one observes the way that ladies work with the needle assisted by a thimble one is constrained to ask why surgeons do not adopt a similar device? Watch the accuracy and speed with which they do their work. Why are we so slow to adopt their ways? The fact is that we are hidebound by tradition, and to meet modern requirements have had to devise variously curved needles which can be pushed through with one hand, a hand composed of a bunch of fingers with an opposing thumb, and pulled out by another similar clumsy organ.

Some six or seven years ago I set myself the task of learning to sew with a thimble, and I am sure that it will well repay any surgeon to spend a quarter of an hour each day under the direction of his wife in learning to sew. I began by sewing odd pieces of rag together, and was soon promoted to hemming such coarse articles as dusters, but after a few weeks' practice I was able to hem a fine cambric handkerchief quite accurately and with some approach to speed. I found it best to have the thimble on the third finger, using the thumb and two first fingers to hold it, and I still use that method. To any beginner, however, I should advise the usual method adopted by the sempstress, and become accustomed to having the thimble on the second finger, as, although you will not have at first the security of grasp which is given by using the two first fingers and thumb, this will be compensated by the greater directive control of the thimble. Still, by using the two fingers with the thimble on the third, the point can readily be made to pursue a semicircular course. When some proficiency is obtained, the first feeling that something has been gained is that the needle is so easily directed that its pointed portion is at once taken hold of by the thumb and forefinger of the same hand and pulled through, leaving the left hand entirely free for other work, such as steadying the part to be sutured. For example, when a piece of omentum is tied and cut off, it is desirable to bury the cut surface in order to prevent it forming adhesions; the stump can readily be invaginated and the mass held in the left hand while the right hand does the suturing; no assistance is needed, and while this is being done the house-surgeon can be replacing bowel or otherwise advancing the operation.

It may be urged that there are many positions in which it would be impossible to use a straight needle in preference to a curved one; this is so, but to a less extent than would at first be expected. It might be thought that for suturing the vagina or cervix after hysterectomy, where the surgeon has to work deeply in the pelvis, that a curved needle would be essential, but it is not so. In such circumstances a short needle must be used, the parts can be steadied by forceps, and only one hand has to be introduced into the pelvis. It is not in such cases as this that the straight needle is contraindicated, but rather in those in which there is no space available for the depression of the eye of the needle, as in sewing up the abdominal wound after an operation on the stomach or gall bladder in a fat muscular man; here, with rigid structures, I have often to use a curved needle, but this hardly ever happens in wounds below the umbilicus.

Second to acquiring the facility with the thimble I would place the ability to tie a surgeon's knot with one hand. The method of doing this was described by Borchgrevink.¹ After reading this article I was convinced of the importance of being able to tie the knot with one hand, and for some months carried a piece of string in my pocket and practised at the knot in any spare interval, passing the string through a buttonhole of my coat. It is a difficult knot to learn from a written description, but the time given to acquiring facility in its use will be very well spent by anyone. The first part of the knot is quite easy, but the second is at first distinctly difficult, and to learners I would give the hint that success in rapidly tying the second part lies in having plenty of laxity in the hand holding the distal end of the thread. Facility once gained the pleasure in knot-tying is greatly enhanced, and one uses, in preference, the single-handed method in cases where the double-handed method might equally well be employed, as one can do it more easily and quickly.

It will be asked, How can this method of tying a knot accelerate the operation? Take, for instance, a breast case where there are twenty or more artery forceps applied and waiting for ligatures. A reel of catgut is taken in the right hand, its end passed round the forceps held up by the house-surgeon, the knot tied with the left hand, and held by the left hand while the house-surgeon cuts it off; while he is doing this the right thumb and forefinger grasp the new end of the catgut; the left hand then casts off the useless portion, and the house-surgeon lifts up the next clamp, and the surgeon has the end of the suture in his fingers ready to pass round it.

The house-surgeon should keep his scissors in his right hand, and not put them down until all the ligatures are tied. With his left hand he should lift the clips and unfasten them. This requires a little practice, but after a time the whole of the combined manœuvre goes on like a machine; there is no hurry, but time is saved, and one feels that the work is progressing favourably.

Then, in applying interrupted sutures, as in the closure of an abdominal wound, the combination of the use of the thimble with the ability to tie the one-handed knot helps immensely. The needle is driven through with the thimble and taken by the finger and thumb of the right hand; meanwhile the left hand takes hold of the end of the strand of gut and ties, the right hand keeping hold of the needle, which is then ready for the next suture. The left hand now takes the ends of the first knot and holds the skin taut for the introduction of the second stitch; the needle is passed for the second time and then cast off while the house-surgeon cuts the gut from the first suture. The gut is now not long enough to enable one again to tie the single-handed knot, so one proceeds as follows: The left hand is holding one end of the gut to be used for the second stitch and also the short piece cut from the first suture; this latter may be disregarded, and the first portion of the single-handed knot tied, the second part being tied by the right hand. In this way a little time is saved by not having to discard the cut portion of the first knot and pick up the end again for the second one; the waste portion from the first knot falls away automatically when the second is completed.

By proceeding in this way time is saved by not having to pick up the needle, which is not let go until it is finished with. Contrast this with the double-handed method: The needle is passed and then laid down while the knot is tied, and if all goes well it has now to be picked up again, which takes a little time. But it is not always so; while left to itself it not infrequently becomes unthreaded, or, what is still worse, it contrives to turn round and prick one's finger. By using the single-handed method the needle never leaves the fingers, and its point is therefore always under control until it is finished with. Further, the short end of the gut can be held between the third finger and the ball of the thumb, so that there is no likelihood of its becoming unthreaded. When facility has been obtained with the single-handed method quite 50 per cent. is gained in time by its use, and this amounts to something when one has a long wound—as after amputation of the breast—to close.

Further, when one is operating without an assistant, it is easy to place all the sutures in a long wound without having to use the scissors until the completion of the operation, when all the strands may be cut at once. Thus,

the first suture is applied as described and the strands held taut with the left hand while the second suture is applied. The needle is then unthreaded and the second knot tied with the right hand, leaving a loop connecting the two knots. This is repeated as often as required, and when the wound is closed the strands can all be rapidly cut off.

Here time is saved by not having to pick up and discard the scissors at every suture. Of course this is a very small point, but it is the small points which tell.

So much, then, for ligatures and sutures; now about the instruments for use during the operation.

The first point is to use as few instruments as possible; a large number in a tray only adds to the difficulty of finding any one required. For most operations a pair of dissecting forceps, one toothed ditto, a pair of straight scissors, a couple of scalpels, and six to ten artery clips and half a dozen needles will be all that need be used.

Needles.

As the needle has to be threaded, so it is important that it should have an eye sufficiently large compatible with strength. The next point is that it should not too readily become unthreaded. These two points are admirably met in the Pattison needle, which has a pear-shaped eye; the thread can be easily passed through the large part of the pear-shaped opening and then pulled down to the narrow portion, which grips the suture and prevents its slipping. This valuable device is a great time saver, and also a help to keeping one in a good temper. Nothing is so exasperating as for the needle to become unthreaded at a critical moment.

There are some needles on the market adapted for easy threading. One of these is the calyx-eyed, in which the thread is passed through a couple of slots. It is true that it is easily threaded, but it also often becomes unthreaded, the suture slipping out by the way it entered. This is an objection, but not the greatest. I do not use such a needle in a gastro-enterostomy, for instance, as the thread can so easily be partly sawn through at the calyx, and as the life of the patient is literally hanging on that thread for two or three days it behoves one to make sure that the thread is not weakened in any part.

There is another self-threading needle which was once on the market, but is now, for some reason, difficult to obtain. This has a slot in the eye, so that the thread can be passed through in the same way in which one attaches a watch to the hook at the end of the chain. This is a useful time-saving device, and is free from the objection of liability to saw through the suture.

I always use a straight needle if possible, as I can then be sure where the point is, and in driving a needle through any tissue which opposes a perceptible resistance the needle may rotate on its own axis. If it is straight the point is not deflected, but if curved the point describes an arc of a circle and often comes out in a different place from that intended. Moreover, with a straight needle the thumb can be employed and by it the point directed in any desired direction.

Scalpels.

Some years ago the advantages of a round-ended knife were pointed out by a surgeon in the South of England, but I am unable to give the reference. This scalpel is shaped like a dinner knife, and I have found it most useful. In dissecting out glands in the neck, for instance, there is no likelihood of pricking an unseen vein, as there is with the ordinary pattern. The round-ended knife can be used in cases in which scissors ordinarily would be used. Time spent in laying down the knife and taking up the scissors is saved. As an example, the opening of the abdomen in appendectomy may be taken. When the external oblique is exposed the blunt-ended scalpel can be used to cut a slot at the lower angle of the wound, and the knife then inserted edge upwards and the incision made through the fibres of the oblique, as with a scissors. There is no point to catch in the underlying muscle, and all goes smoothly.

Artery Clips and Scissors.

I much prefer the box joint, for it is more durable and the teeth of the clips are more accurately approximated. Those with take-off joints are so liable to fall in two when taken up, and nowadays, when boiling is universal for sterilizing instruments, the need for taking them to pieces

is not so obvious. Twenty years ago, when the dependence was on carbolic for disinfecting them, the take-off joint was a decided advantage.

It is well to have them made with large rings for the thumb and finger, so that they can be easily picked up and let go. When several artery clips, which have been used only as pressure forceps, are to be removed, there is no need to put each one down when it is released; three or four can be taken up one after the other, letting the rings slide up the fingers; then if the rings are large they can all be slipped off at once, thus saving a little time. There are some made with a little projection on each side near the handles, so that they do not lie flat on the table, but the rings are slightly lifted off it; the instrument is then more quickly picked up.

As an example, let us take the opening and closing of the abdomen for appendicitis by the gridiron method.

The incision is made through the skin with an ordinary scalpel, which is then laid aside and not used again, for aseptic reasons. A round-ended knife is then used to divide the subcutaneous fat. Any bleeding points are now secured and tied off in the manner already described. The skin wound is retracted by means of the thumb and second finger of the left hand, and the round-ended scalpel taken up again and not laid down until the peritoneum is reached; a slot is made through the fibres of the external oblique at the lower angle of the wound. Into this the knife is slipped and the aponeurosis slit up, then with the handle of the scalpel it is freed from its loose attachment to the underlying muscle. The wound in the external oblique is now retracted by means of the first two fingers of the left hand and the thin covering of the internal oblique divided; then, with the handle of the knife aided by the fingers of the left hand, the muscle fibres are separated down to the peritoneum. The knife is now laid aside, and a further separation effected by means of the two fingers of each hand. If the patient is a strong muscular man, or very fat, retractors may be needed to expose the peritoneum, but, as a rule, I find them unnecessary. The peritoneum is now picked up with a couple of pairs of clips and the opening made with scissors. The two clips are allowed to remain on, and with two others the upper and lower angles of the wound secured.

In closing the wound, the upper of these clips is taken in the left hand and a catgut suture passed with a straight needle and thimble and tied with the left hand, the right not letting go of the needle. The forceps is cast off with the left hand and peritoneum pulled up by means of the thread; the house-surgeon at the same time holds up the remainder with the three other clips and approximates the margins. It is now easy to pass an uninterrupted suture rapidly to the lower end of the wound, where it is tied off with the left hand, the right keeping hold of the needle. The same needle, which has not been laid down, now picks up the lower margin of the internal oblique at the anterior part of the wound, and is passed down the length of the opening in the muscle and the upper margin taken up; then a lace-like suture is applied and knotted off where the needle was first introduced. The aponeurosis of the external oblique is united by continuous suture, using a straight needle and thimble, and finally the skin sutures placed as already described.

The whole proceeding is done very rapidly, although there is no hurrying; each one of the trio knows exactly every little step that is to be made, so there is no confusion, and all goes perfectly smoothly.

The above was written some time ago and laid aside, but after reading the interesting paper on "Time in Surgery" by R. P. Rowlands in the *BRITISH MEDICAL JOURNAL* of April 15th, I am constrained to publish it in the hope that after such an able introduction to the subject as Rowlands has given, other surgeons may be induced to give some account of their own particular "fads" conducive to time saving at operations.

REFERENCE.

¹ *Surgery, Gynaecology, and Obstetrics*, vol. x, p. 530 (May, 1910).

THE Association for the Promotion of Medical Research for the Prevention and Cure of Tuberculosis has recently been incorporated in the State of New York. Its objects are the foundation of professorships and scholarships in the various medical schools of the United States and the maintenance of institutions for the treatment of sufferers from tuberculosis.