there had been slight diarrhoea and rectal tenesmus, and the severe pain had recurred on four occasions, the most severe attack being two days previous to admission.

Condition on Admission.

The patient was very pallid and the pulse small and frequent, and on examination there was a large, tender, soft swelling behind the uterus, and the latter was enlarged and pushed forward by the swelling.

Operation.

On opening the abdomen a large mass was seen covered by omentum; on detaching the latter the tumour was found to consist of clotted blood, and this together with the tube and ovary was removed.

Description of Parts Removed.

The tube was found to have an extensive rupture on the upper surface of its ampullary portion. On cutting open the clots after they had been hardened in formalin one was found to contain a distinct amniotic cavity with a small embryo.

It will be noted that in only two of the cases did any interval of amenorrhoea precede the onset of symptoms, and, in my experience preceding amenorrhoea does not occur in more than 50 per cent. of cases of extrauterine gestation. The symptoms present in each of these cases were:

- (1) Irregular and unusual loss of blood per vaginam;
- (2) Intermittent attacks of severe pain in the lower abdomen;
- (3) The presence of a tender swelling in the pelvis;

and I believe that these are the most constant symptoms of extrauterine gestation after some disturbance of the ovum has taken place.

1. *Haemorrhage.*—The loss is frequently found to be unusual and to differ from normal menstruation both in its mode of onset and continuance, and in its character; thus it is often described as being darker than usual, or as having a brown colour.

2. *Pain.*—In two of the cases rectal tenesmus was a well-marked symptom, and, if inquiry is made, it will be found that this symptom is frequently present, especially with the first onset of the pain. The pain in the shoulder complained of by one patient is an unusual symptom, but it has been noted by other observers in cases of intraperitoneal haemorrhage. It is worthy of note that the case with the most serious symptoms proved to be a tubal rupture, and in the two with less marked symptoms there was no rupture but haemorrhage from the fimbriated opening. I believe that it will generally be found that the more severe symptoms are associated with tubal rupture and the milder with tubal abortion, but this relation is not constant and is not a safe guide to a differential diagnosis between the two conditions.

TREATMENT.

The first point to decide is whether surgical or expectant treatment should be adopted. There can be no doubt that a proportion of cases get quite well without operation, but the difficulty is to decide in any given case whether expectant treatment can safely be trusted. I should myself limit it to cases in which there are definite signs of haematocele but all evidence of active haemorrhage has ceased—that is, pains have disappeared, and the pulse, temperature, and colour of the patient are normal. If adopted it is essential that the patient should be kept in bed and should be within reach of surgical assistance should further intraperitoneal haemorrhage take place.

As regards "route," I would limit the vaginal to cases of well-marked haematocele in Douglas's pouch, with symptoms pointing to suppuration of the blood mass.

In each of these cases the Trendelenburg position was used; the slight risk of blood escaping into the upper regions of the abdomen is more than counterbalanced by the much greater readiness of access to the field of operation, and by the avoidance of handling of intestine which is possible in this position. I did not wash out or drain in any of these cases, and have long abandoned both washing out and drainage for cases of this kind. The abdominal wall was sutured in layers, the wounds healed by first intention, and each of the patients left the hospital on the nineteenth day after operation.

I am indebted to my house-surgeon, Mr. R. C. Allen, for many of the notes, and for much valuable assistance in the treatment of the cases.

THE SURGICAL TREATMENT OF THE UMBILICAL CORD.

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No obstetrician who gives a thought to the matter can ever feel that he has treated the umbilical cord in a surgical, not to say aseptic, manner when he has applied a ligature to it about 2 in. from the navel, divided it, and wrapped the stump round with a piece of sterilized gauze. Nevertheless, that is the method which is still almost universally employed, with the addition, in the practice of maternity hospitals and of certain obstetricians, of antiseptic applications on one or more occasions to the cord-stump. It may be said, in defence of the old-established plan, that it works very well, and that umbilical infection in the new-born infant is only an occasional occurrence; and it is quite true that in most cases neither septic nor sapraemic invasion of the tissues of the child takes place, or, rather, it ought perhaps to be said that if it does occur, it is not ascribed to the state of the funis.

Yet there are certain facts which ought to provoke reflection. C. Keller, for instance, in an article on the relation of umbilical infection to infantile mortality in Berlin,¹ has shown that 2 per cent. of the total mortality of children is due to umbilical infection during the first month of life; he has also pointed out that the results of the infection are chiefly sepsis, tetanus neonatorum, peritonitis, inflammation of the navel, omphalorrhagia, and intestinal disturbances. Keller, therefore, had adopted stricter antiseptic methods of dealing with the cord, such as drying and disinfecting it with pledgets wrung out of a solution of alcohol (96 per cent.). There is also evidence that umbilical infection is more likely to occur in premature infants; and I pointed out in a contribution to a short-lived journal² that there was reason to believe that delayed closure of the umbilical arteries and vein might account for this greater liability. In proof I instanced, among other things, the cases reported by the Andions,³ in which systemic infection had apparently taken place through the umbilicus, and had been predisposed to by the persistent permeability of the umbilical vessels, and I stated that these cases should make us more careful in our inspection and treatment of the umbilical depression and the funic stump. Further, in an article on the Problem of the Premature Infant⁴ which I published in 1902 I attempted to distinguish between the risks of umbilical infection run by the mature as compared with the premature infant thus: In the former the umbilical route was effectually closed in part by the ligature of the cord, but more especially by the obliterative changes which took place in the umbilical vessels; but in the case of the premature infant the closure of the umbilical arteries and vein was apt to be incomplete, and septic and other pathogenic organisms found their way into the body on account of the persistent permeability of these vessels; the results of the infection were sometimes evident in the immediate neighbourhood of the umbilicus, in the form of peri-umbilical inflammation of an erysipelatos type, but at other times the umbilical vessels showed no morbid changes save permeability, and the pathological consequences of the microbic invasion might be found in the liver, the heart, or in some distant organ such as the brain. As I got a larger experience of hospital midwifery practice I was able to assure myself that the risks of umbilical infection in the premature infant (as stated above) were not exaggerated, and that even full-time children were not uncommonly the subjects of similar although less serious dangers. In fact, it seemed to me that many of the instances of so-called icterus, or jaundice of the newborn, might be ascribed to transitory attacks of hepatitis set up by microbes which had found their way to the liver by the umbilical vein from an infected umbilical stump or scar.

For all these reasons I was led to scrutinize closely the various methods of dealing with the cord which were being tried in a sort of sporadic fashion by different obstetricians in various places. There was Bacon's plan, for instance,⁵ by which the Whartonian jelly was cut at the base of the cord and the vessels tied with fine silk or catgut, after which the umbilicus had to be kept

perfectly sterile; there was Duke's method by means of a simple form of clamp, which reduced the portion of dead funic tissue adhering to the abdominal wall to a minimum,⁶ and there was the procedure recommended by Schell,⁷ in which the cord was first clamped and washed in an antiseptic lotion, and thereafter dealt with in detail, the covering being divided at the amnio-dermal junction, the jelly stripped away, and the vessels ligatured with catgut and cut off close. It was not, however, till the autumn of last year—when I was physician in charge of the Edinburgh Royal Maternity Hospital—that I had an opportunity of carrying out a series of experiments upon various modes of dealing with the cord which should more nearly attain to the standards of surgical asepsis than simple ligation of the whole thickness of the funis with thread or silk did. I am greatly indebted to Mr. J. Gibson Craig, M.B., Ch.B., F.R.C.S.E., one of the resident surgeons during the quarter, for carefully carrying out the different procedures now to be described; in fact, Mr. Craig's was by far the more onerous part of the experiment, for I simply proposed the various methods which were tried and supervised the results. In all, 16 experiments were made during September and October, 1908, and six different plans of dealing with the cord were used. I shall now describe the methods and the results.

CASE I (Method A).

A female infant, the second child of a married woman, 26 years of age, weighed 7 lb. 6 oz. at birth. The cord was cut through with scissors 1½ in. from the umbilical ring; the fetal end was grasped between the forefinger and thumb of the left hand while Wells's artery forceps were applied singly to the umbilical vein and the umbilical arteries; these vessels were then ligatured separately with No. 1 catgut; the sheath of the cord was stitched over the resulting stump and united with fine silk sutures. On the third day the child weighed 7 lb., on the fifth 6 lb. 14 oz., on the seventh 7 lb. 2 oz., and on the eleventh 7 lb. 6 oz. It never showed any jaundice. When the child left the hospital there was a dry, black scab at the umbilicus, closely resembling that seen when the cord is treated in the ordinary fashion—that is, by ligation.

CASE II (Method A).

A female infant, weighing only 5 lb. 14 oz.; it was the first child of an unmarried girl, aged 20 years. The cord was treated exactly as in Case I, and the result did not differ in any obvious manner from that obtained in ordinary ligation of the funis. On the third day the child weighed 5 lb. 9 oz., on the fifth 5 lb. 6 oz., on the seventh 5 lb. 12 oz., on the ninth 6 lb., and on the eleventh 5 lb. 15 oz. There was no jaundice.

CASE III (Method B).

A female infant, weighing 6 lb. 15 oz.; it was the first child of an unmarried girl, aged 21. The clamp was applied to the cord 1 in. from the umbilicus; it was then tightened as much as possible, crushing the end of the cord stump, and it was then removed, no bleeding following. By the pressure of the clamp the jelly had been expressed from the part of the cord in its grasp, and the covering of the cord formed naturally a hood over the stump. The sheath was then sewed over the stump with a continuous silk suture. Rather much pressure was applied in this case, with the result that a slight tear was caused in the epithelial covering of the funis running for about ½ in. in its long axis towards the umbilicus; this was covered in with a continuous Lembert suture of silk. No ligation was applied to the vessels or cord, the pressure of the forceps having been sufficient to stop all bleeding. On the fifth day the infant weighed 6 lb. 9 oz., on the seventh 6 lb. 11 oz., on the ninth 6 lb. 10 oz., and on the twelfth 6 lb. 9 oz. There was no jaundice. When the child was discharged the cicatrization at the umbilicus was nearly complete and the result was better than in Cases I or II.

CASE IV (Method C).

A male infant, weighing 8 lb. 9 oz., the first child of an unmarried girl of 21. The sheath of the cord was cut through with a scalpel in a circular fashion about 1½ in. from the umbilicus, but the umbilical vein lay so superficially that it was nicked in the process. An attempt was made to catch hold of the wounded vein with pressure forceps, but this was unsuccessful, and so the cord was cut through with the knife; even then the vessels were so brittle that forceps applied to them tore off. Finally a silk ligature was applied round the whole cord 1 in. from the umbilical ring, and the cord was cut short immediately distal to it. The edges of the sheath were brought together with silk sutures. In this case, therefore, the attempt to treat the cord by stripping back the sheath failed, and the method adopted was really the ordinary one of ligation, with stitching of the sheath. The cord sloughed off on the eighth day, the process being quite dry. There was no jaundice. The infant's weight on the third day was 8 lb. 5 oz., on the fifth the same, on the seventh 8 lb. 6 oz., on the ninth 8 lb. 7 oz., on the eleventh 8 lb. 13 oz., and on the thirteenth 8 lb. 14 oz.

CASE V (Method C).

A female infant, the third child of a married woman aged 27. It weighed at birth 10 lb. 1 oz. The sheath of the cord was cut

through 1 in. from the umbilicus, and the attempt was made to strip it back on the fetal side of the circular cut, so that the vessels could be secured, and then it was intended to pull the reflected sheath over the ligatured vessels and stitch it there. Unfortunately it was found that Wharton's jelly did not lend itself so easily to removal as, perhaps, a more solid substance would, and although the purpose was attained after a fashion, it was far from being an easy or a neat procedure. The result did not differ from that obtained by the ordinary method of ligation, and the stump separated on the twelfth day. There was never any jaundice. The weight of the infant on the third day was 9 lb. 11 oz., on the fifth day 9 lb. 12 oz., on the seventh 10 lb. 1 oz., on the ninth 10 lb. 2 oz., on the eleventh 10 lb. 7½ oz., and on the twelfth day 10 lb. 8 oz.

CASE VI (Method D).

A female infant, weighing 8 lb. 3 oz., the first child of an unmarried girl, 20 years old. The cord was grasped between the left thumb and forefinger close to the umbilicus; a circular incision with a knife was made through the whole cord 1½ in. from the navel, and the vessels were picked up separately with artery forceps and ligatured with catgut. The same difficulty was met with as before, namely, tearing of the vessels; and yet, if the attempt was made to tie the vessels with Wharton's jelly adhering to them, the ligatures always slipped. The sheath was stitched over the stump. There was no jaundice, the cord separated on the tenth day. On the third day the body weight was 7 lb. 8 oz., it was 7 lb. 9 oz. on the fifth day, 8 lb. on the seventh, 8 lb. 3 oz. on the ninth, and the same on the eleventh day.

CASE VII (Method D).

A male infant, weighing 5 lb. 12 oz., the first child of an unmarried girl, 27 years old. The cord was treated as in Case VI, and separation of the stump took place on the twelfth day. On the third day the child weighed 5 lb. 3 oz., on the fifth 5 lb. 3 oz., on the seventh and ninth 5 lb., and on the eleventh 5 lb. 2 oz.

So far our experiments with surgical methods of treating the cord showed very little advantage over the ordinary plan of ligation *en masse*. It could not be said that the weight of the infants had been beneficially affected; and, although there had been no jaundice in any case, it was doubtful whether this immunity could be ascribed to the method adopted.

CASE VIII (Method D).

A male infant, weighing 5 lb. 14 oz. at birth, the second child of a married woman, aged 31 years. The method of dealing with the cord was the same as in Case VI, save that the circular incision was made ½ in. from the umbilicus. There was no jaundice, and the cord separated on the eighth day. The body weight was 6 lb. on the seventh day, and 6 lb. 2 oz. on the eleventh.

CASE IX (Method E).

A male infant, the seventh child of a married woman, aged 28, weighed 6 lb. at birth. A circular incision was made with a knife through the sheath of the cord as near to the umbilical ring as possible without cutting the skin. A perineal needle was then used to transfix the cord in the way the ovarian pedicle is treated. A piece of catgut (No. 3) was pulled through on the needle, so that when the catgut was divided to release the needle two pieces of catgut were left transfixing the cord; the two pieces were now tied, each one constricting one-half of the cord. The funis was now divided just outside the ligatures, and the sheath was brought over the raw end and stitched there. On the twelfth day a little black scab of the size of a three-penny piece was found attached to the umbilicus. The child's weight on the third day was 5 lb. 6 oz., on the fifth day 5 lb. 7 oz., on the seventh 5 lb. 10 oz., on the eleventh 5 lb. 11 oz., and on the twelfth 5 lb. 12 oz. There was no jaundice.

CASES X, XI, AND XII (Method E).

Cases X and XI were female infants, weighing 8 lb. 6 oz. and 7 lb. 5 oz. respectively, the children of married women, aged 24 and 22 years; and Case XII was a male infant weighing 9 lb. 6 oz., the child of an unmarried girl of 18 years. In all of them the cord was treated as in Case IX, and in all a small black scab was left at the end. Dr. Craig was of opinion that the time this procedure required was too great for ordinary use, and that the method itself had no advantages to warrant its adoption. Further, it had some disadvantages: in the first place, there was the prolonged exposure of the child (at least ten minutes, when everything went smoothly); second, there was the risk of ligatures slipping and consequent loss of blood; and third, the procedure could only be carried out with the assistance of two persons, one to look after the mother and keep a hand upon the fundus uteri, and the other to control the movements of the child.

CASES XIII, XIV, XV, AND XVI (Method F).

With these four infants—two boys and two girls, the children of three unmarried girls and one married woman—a new plan of procedure was tried: in all of them the cord was cut off flush with the skin of the umbilicus, and the skin surfaces were joined. With a scalpel a circular incision was made at the junction of the skin of the infant with the sheath of the cord; gradually the incision was deepened until the vessels were approached; then by careful dissection the vessels were cleared from the jelly and tied separately; next the cord was severed; and finally, the edges of the skin were rawed and united together, in one case with silkworm gut, and in the other three

with catgut. The time required for the operation was ten minutes. No jaundice occurred in any of these infants, and their weights were well maintained. With regard to the umbilicus, there was in these four cases a very remarkable result, as compared with all the others. On the fourth day in each case the umbilical stumps were quite healed, and the cicatrix was already retracted. The stumps had healed like ordinary surgical wounds kept aseptic. The good results were evidently due to the complete removal of all the dead structures and to the freshening of the cutaneous surfaces; no putrefactive changes took place, and the surfaces united by first intention. At first it seemed to us that there might be apprehension of danger from ligatures so near the umbilical ring slipping; but, as a matter of fact, it was found that the supporting structures were firmer near the umbilicus than at a distance from it, and there was actually less risk of slipping and consequent haemorrhage.

These experiments brought home very clearly to my mind the conviction that, if the umbilical cord was to be treated on strict surgical principles, Method F was the only plan which fulfilled all the requirements. All the other procedures left pieces of funic tissue to separate by putrefaction, and the process of cicatrization was apparently lengthened rather than shortened. It was certainly remarkable that none of the infants showed jaundice; but I cannot confidently affirm that their immunity was due to the unusual treatment given to the cords. It was also very satisfactory that none of the children had any morbid developments, and as a rule regained their original weight well; but, again, it can hardly be claimed that this result was the consequence of the various modes of dealing with the umbilicus, although they may have contributed to it.

The sixth plan (Method F) certainly gave very satisfactory results, for to obtain a cicatrized and retracting umbilical scar at the fourth day was something worth working for. The great objection to it which will at once come into the mind of the general practitioner, as well as into that of the maternity hospital surgeon, is the length of time it requires and the fact that it takes the medical attendant away from the mother at a critical part of the third stage of labour. The second difficulty might be got over by clamping the cord temporarily and treating it surgically after the third stage is over; and the first objection will, of course, become less formidable as the obstetrician acquires skill in the performance of the necessary manipulation. I am inclined to think that this method will find its greatest usefulness in cases in which at previous confinements there was evidence of umbilical infection of the new-born infant, more especially when such infection occurred in prematurely born infants, in whom we must suppose the umbilical vessels are more liable to remain permeable for a time. I do not think we can hope that it will yet be adopted as the routine treatment of the umbilical cord, but I trust that it will be found useful in cases where infection through the umbilicus is dreaded, and by obstetricians who are dissatisfied with the ordinary method of ligaturing the funis.

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A CASE OF CHRONIC INVERSION OF THE UTERUS,

WITH REMARKS ON THE MECHANISM OF REINVERSION.*

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The following is a brief history of the case:

Mrs. M'C., a primipara, aged 24 years, was delivered on November 29th, 1908. Labour was slow, and forceps were used to complete delivery. The expulsion of the placenta gave some trouble, and was followed by copious loss. This was checked by hot douches, but slight haemorrhage persisted during the whole of the puerperium, and a profuse bleeding occurred on December 25th. Other symptoms were obstinate constipation, and a "feeling of something coming down," which was only present during micturition while she remained in bed, but became constant on her rising at the fourteenth day.

I saw her on December 26th. She was very anaemic, and on

examination presented the typical signs of a chronic inversion of the uterus. The inverted organ was of about the size and shape of a large hen's egg, and was soft and elastic in consistence. I looked for the orifices of the Fallopian tubes, but failed to discover them. Attempts at taxis, both without and with an anaesthetic, made no impression on the displacement. We then decided to try repositors. I was unable to procure Aveling's, which are highly recommended, and had to take an instrument designed by a Mr. Lawson Tait. I inserted his largest repositor on December 28th, and as no effect had been produced next day, I tightened up the elastic bands. Two days later the cervix was re-formed, and two days later still the apex of the inversion was flush with the external os. On the next day it had receded within the widely dilated cervix. Wide as the cervix was, Tait's smallest repositor could only have been inserted into it with considerable difficulty. I contented myself therefore with putting a small plug of gauze in the vagina. On removing this two days later, eight days after treatment had been commenced, the uterus could be felt bimanually in its normal position and completely reinverted.

One or two points in this case are worthy of a remark in passing.

1. Unskilful conduct of the third stage has been often assigned as the cause of this accident. The method employed in this case was a combination of expression and gentle traction on the cord, and has served the practitioner who was in charge of the case for twenty years, during which he has never had any trouble. If undue pressure on the fundus or traction on the cord are the causes of this displacement, why is it the rarest complication of midwifery? Dr. Atthill has recently revived the view originally taken by Crosse that inversion is due to attachment of the placenta to the centre of the fundus, and on examining the inverted organ in this case I detected a rounded area about as large as a halfpenny on its apex. This area was slightly deeper in colour and less smooth than the surrounding mucous membrane. It may have represented the placental site, but, on the other hand, it may have been caused by inflammatory changes in the part most dependent and most exposed.

2. It is worth noting that the accident was quite unaccompanied by shock, which seems to be regarded as a constant symptom by all but the most recent authorities.

3. The last point to which I wish to direct attention is in connexion with the treatment of this case. The classical method of using repositors is, of course, to begin with the largest size and to end with the smallest, which is introduced into the cavity of the uterus, and remains there until reduction is effected, whereupon it is recovered, often with considerable difficulty, if one may judge by reports. It will be noticed that in this case, as it was not easy to introduce the smallest repositor into the cervix, it was dispensed with altogether. This was done advisedly and on the following line of reasoning: Inversion occurs while the cervix is stretched and its muscular fibres paralysed. If the fundus be not reduced before this paralysis has been recovered from, the restoration of tone to the cervical muscular fibres effectually closes the cervical canal against the return of the uterine body, and this resistance can only be overcome by continuous elastic pressure, as with the repositor, or by forcible dilatation or section. But once the apex of the inverted uterus has come within the cervix the tone of the cervical muscle fibres, which has been overcome but by no means abolished by the pressure of the repositor, bars the way against subsequent extrusion of the fundus, and the effect of the muscular contraction of the containing shell of uterus on the contained partially inverted fundus must be to drive it upwards and to reinvert it. Cases of inversion due to tumour stand in a different category.

CONCLUSION.

The practical point which I wish to make is that in reducing inversion by means of repositors there is, on my theory, no need to use an intrauterine instrument, troublesome to introduce and to withdraw. I suggest that when the fundus has been reduced within the external os the use of repositors may be discontinued, and the uterus will reinvert itself, like an indiarubber cup, turned not quite half inside out. I am well aware that one case is quite insufficient to base a theory upon, but I think my suggestion is at least plausible, and I would ask those who may have an opportunity of testing its value to do so. The experiment can do no harm, and if it does not succeed one can still fall back on an intrauterine repositor and recover it afterwards by means of "elastic bands fastened to the foot of the bed."

* Read before the Ulster Branch of the British Medical Association.