A handbook of obstetric operations.

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Playfair, W. S. 1836-1903.
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Publication/Creation

1865

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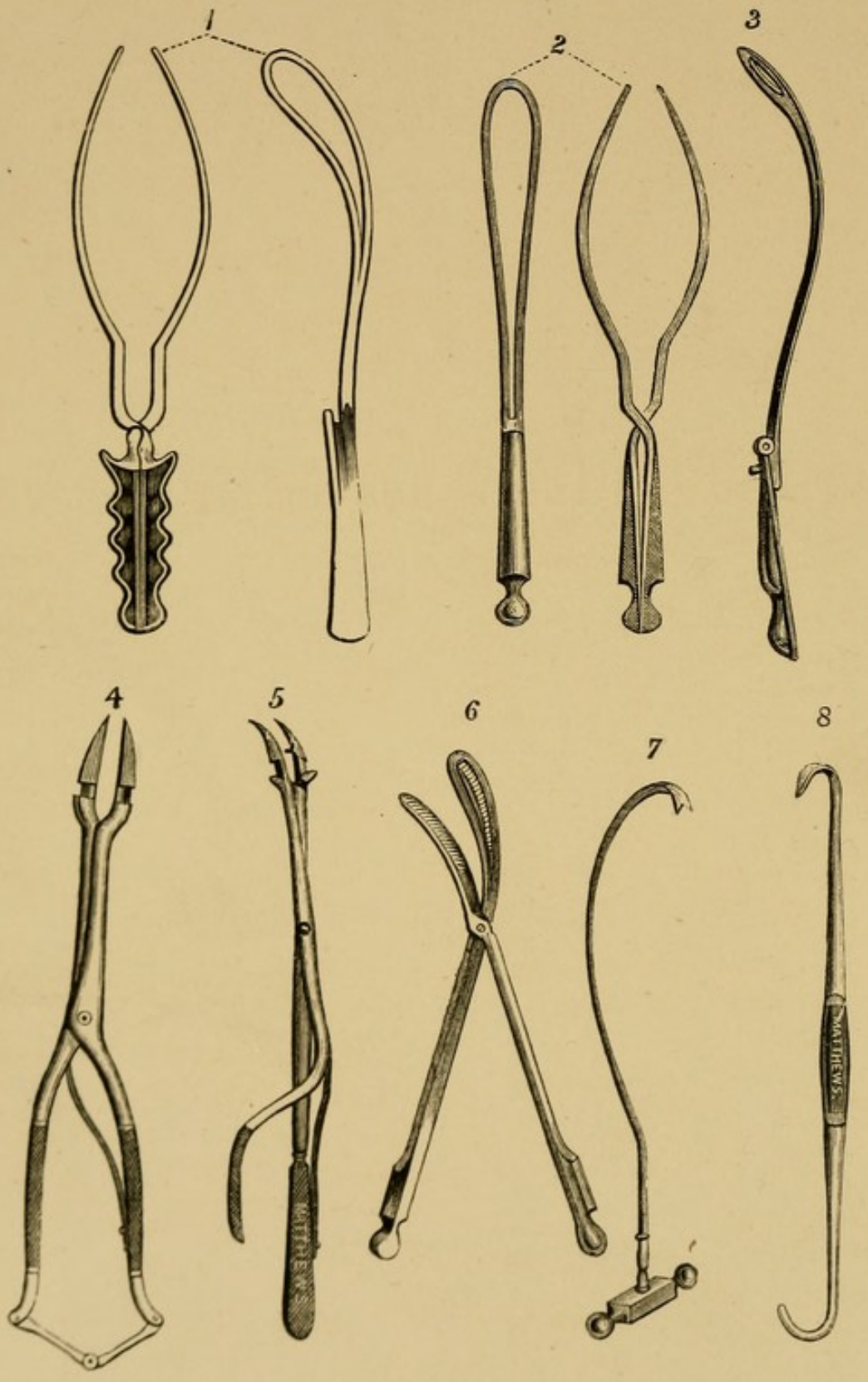
PLATE I.



C. G. Putnam.

A

HANDBOOK

OF

OBSTETRIC OPERATIONS.

BY

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LONDON:
HENRY RENSHAW, 356, STRAND.
1865.

LONDON:
SAVILL AND EDWARDS, PRINTERS, CHANDOS-STREET,
COVENT-GARDEN.

PREFACE.

OPERATIVE MIDWIFERY seems scarcely to have received in this country the special attention it merits, since no recent book exists exclusively devoted to this department of Obstetrics, the importance of which, however, cannot be over-estimated. This little work does not profess to be a complete and exhaustive treatise on the subject; and the author has, as much as possible, confined himself to a discussion of those views and opinions which seem to him more particularly to merit attention. Still it is hoped that it may prove useful to the practitioner as containing a tolerably complete account of the more recent labours of obstetric writers, and as a guide in the trying emergencies of practice.

CURZON STREET, MAYFAIR,
February, 1865.

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CHAPTER I.

THE INDUCTION OF PREMATURE LABOUR.

HISTORY.—This operation was first suggested and carried into practice in England. It is also to the labours of our own countrymen that we are principally indebted for its establishment in the face of much opposition both at home and abroad. It is not known with certainty to whom we owe the original suggestion, but we are told by Denman that in the year 1756 there was a consultation of the most eminent physicians at that time in London, to consider the advantages which might be expected from this operation. The proposal met with formal approval, and it was shortly afterwards carried into practice by Dr. Macaulay, the patient being the wife of a linendraper in the Strand. From that time it has flourished in Great Britain, the sphere of its application has been largely increased, and we have the satisfaction of knowing that it has been the means of saving many mothers and children, who would otherwise in all probability have perished. It is to be hoped that we have not even yet reached the limit of its usefulness, and that the time will come when its value may be more widely

known, and when it will be still more frequently resorted to. On the Continent it was long before the operation was sanctioned or practised. Although recommended by some of the most eminent German practitioners, it was not actually performed until the year 1804. In France the opposition was long-continued and bitter. Many of the leading teachers strongly denounced it, and the Academy of Medicine formally discountenanced the procedure at so late a date as 1827. The objections were principally based on religious grounds; but partly, no doubt, on mistaken notions as to the objects proposed to be gained. Although frequently discussed, it was never actually carried into practice until the year 1831, when Stoltz performed it with success. Since that time opposition has greatly ceased, and it is now employed and highly recommended by the most distinguished obstetricians of the French schools.

Object of the Operation.—By the induction of premature labour we propose to avoid the risk to which, in certain cases, the mother is exposed by delivery at the full period of pregnancy, or to save the life of the child which might otherwise be endangered. We shall first discuss the various cases in which it is justified or indicated, stating under each head the particular circumstances as to the period or mode of operating which may call for remark.

I. *Defective Proportion between the Child and Maternal Passages due to some Abnormal Condition on the part of the Mother.*—It is in cases of pelvic deformity that the operation we are discussing is most frequently employed. When the pelvis is of such dimensions

that a living child cannot pass through it at the full period, we bring on labour at a time when the child is viable, but of such small size that it is enabled to pass through the narrowed pelvic canal with safety. By this means we not only save the life of the child, which would otherwise certainly be sacrificed, but also materially diminish the risk to the mother. In natural labour at the full period the maternal mortality averages about 1 in 150 cases. When we resort to craniotomy, besides the necessary destruction of the child, the risk to the mother is largely increased, the mortality being about 1 in 5. While in cases in which premature labour is induced it is estimated to be only about 1 in 50. These figures place the importance and value of the measure beyond doubt. In bringing on premature labour on account of pelvic deformity, the most important question to decide is the period of pregnancy at which we ought to interfere, and for this purpose we may divide the cases into two classes :—

a. Those in which the pelvis is diminished in size, but will still permit the passage of a living and viable child.

b. Those in which the pelvis is so small that a living child cannot pass through it, and in which the operation must be resorted to before it has reached a viable age.

The first class includes the greater number of cases, and in them the operation generally takes the place of craniotomy ; in the second, the alternative is the Cæsarean section.

a. Under the first heading we include those cases in

which the antero-posterior diameter of the brim, the direction in which the obstruction is generally met with, varies from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches. If the size of the pelvis exceeds the greatest of these measurements the operation is unnecessary, as a child at the full period is able to pass; while if less than $2\frac{1}{2}$ inches, there is not space for the passage of a child which has reached a viable age. Practically speaking, we are rarely required to decide the advisability of inducing premature labour in a primapara, as an amount of contraction ranging between these limits is seldom discovered until one labour at the full period has taken place. Should we, however, have reason to suspect the existence of such a deformity, it is our undoubted duty to make an attempt to discover the amount of contraction by the finger or some of the numerous varieties of pelvimeters, and to perform the operation just as we should in a multipara whose previous labours had been terminated by craniotomy. Some obstetricians believe that the operation should never be performed unless the capacity of the pelvis has been tested by a previous labour, because they consider it difficult to determine the exact amount of contraction which will prevent the passage of a living child at the full period until the patient has been examined when actually in labour. The objection is to some degree valid; but granting it its full force, it is surely better to induce labour somewhat sooner than may be absolutely necessary, than to subject the woman to the increased risk of craniotomy, and the child to certain destruction. Having determined that contraction exists, it is of importance to ascertain the exact

amount as nearly as possible, in order that we may delay the operation to the latest period of pregnancy compatible with the safe passage of the child. We take it for granted that the child is not viable until the end of the seventh month, and that the nearer it approaches the full period of gestation, the greater is the chance of its being successfully reared. Cases of living children being born at an earlier period are not wanting, but practically speaking the date mentioned may be looked upon as the earliest at which we can hope to save the child. In order to form a proper idea of the time to operate, we must endeavour to acquire some knowledge of the size of the fœtal head at various periods of gestation. For this purpose the following table by Siquiera, copied from Dr. Churchill's work, will prove of service. It is to be remembered that all such calculations can at best only teach us the average measurements, and that exact knowledge in any particular case can never be acquired. We are also liable to error from another source, since it is impossible to state with accuracy the exact period of pregnancy at which any individual case may have arrived. No doubt, however, it is advisable, as Dr. Churchill recommends, to assume that the woman has advanced to the longest possible period. It is certainly better to operate a little too soon, than to run the risk of failure by delaying the operation until the head has become too large to pass with safety through the deformed pelvis.

TABLE I.

Age of fœtus.	Bi-parietal diameter.	Occipito-frontal diameter.	Occipito-bregmatic diameter.
7th month	2 in. 9 lines.	3 in. 8 lines.	2 in. 10 lines.
7½ „	3 „	3 „ 9 „	3 „
8 „	3 „ 1 „	3 „ 10 „	3 „ 1 „
8½ „	3 „ 2 „	4 „	3 „ 2 „
9 „	3 „ 4 „	4 „	3 „ 4 „

From the comparison of these measurements with those of pelves of various sizes the following table has been drawn up, which may guide us as to the proper time for interference.

TABLE II.*

	Inches.	Lines.		
When the sacro-pubic diameter is	2	and 6 or 7	induce labour at	30th week.
„ „	2	8 or 9	„	31st „
„ „	2	10 or 11	„	32nd „
„ „	3	—	„	33rd „
„ „	3	1	„	33rd „
„ „	3	2 or 3	„	34th „
„ „	3	4 or 5	„	35th „
„ „	3	5 or 6	„	36th „

Having determined the exact size of the pelvis with as much care as we are able, we may safely take the above table as our guide, bearing in mind that the longer the gestation, the greater the chance of successfully rearing the child. It has been suggested that we might interfere at a later period, or succeed in extracting a living child in cases in which there would otherwise be no chance of so doing, by combining version with the induction of premature labour. This proposal has not been sufficiently tested in practice to admit of a

* *New Sydenham Society's Year-book*, 1863, p. 377.

definite conclusion as to its merits, and there are objections to it which will probably prevent its frequent adoption. The addition of version necessarily adds an element of danger as regards the mother, to which we should scarcely be justified in exposing her; and it seems also questionable, whether the increased risk to the child involved in turning in its immature condition, would not more than counterbalance any advantages to be derived from the plan. It may be remarked, however, that transverse presentations are certainly more common in premature labours; so that on this account it will frequently be found necessary to resort to version.

b. When the contraction is beyond the limits mentioned, the induction of premature labour, or rather of abortion, is still more urgently called for, not for the sake of the child, but to save the mother the deadly risk which the alternative operation involves. There is no amount of deformity, however great, in which we could not succeed in bringing on miscarriage by some of the numerous means at our disposal. As in these cases the mother alone is concerned, we shall find it advisable to resort to the operation as soon as we have positively determined the existence of pregnancy. No object can be gained by waiting till the development of the child is advanced to any extent, and the less the fœtus is developed, the less will be the pain and risk which the mother has to undergo. The same rule of operation holds in every case in which premature delivery is indicated before the child has reached a viable age. The operation has not been frequently performed in these cases of extreme contraction, and, although there

can be little doubt of its advisability, an interesting moral question has been raised with regard to it, which has received different answers from practitioners. Dr. Radford has strongly insisted that we should not repeat the operation time after time in these cases of pelvic deformity: he believes that we must take the life of the child into consideration, and that if a woman willingly subjects herself to the risks of pregnancy, knowing that she cannot give birth to a viable child, we are not justified in repeatedly destroying a living being, in order that the mother may indulge her passions with impunity. When such a case presented itself for the first time he would bring on early abortion; but if, in spite of due warning, a second pregnancy occurred, he would spare the life of the child, and subject the mother to the risk of Cæsarean section. Few, however, would, we think, be inclined to agree with Dr. Radford's argument. The life of the child has always been held, in this country at least, as very secondary to the safety of the mother; and we believe, that however often a woman with such a deformity might chance to become pregnant, we should always be justified in sparing her the great risk which a gestation to the full period would involve, even though the procedure necessitates the frequent destruction of the fœtus which she carries. Such a practice would by no means prevent us from earnestly advising her to take measures to prevent the recurrence of pregnancy. But there are other causes giving rise to narrowing of the maternal passages, which equally indicate a resort to the operation. Amongst these are osseous growths from some part of the pelvic bones, uterine

or ovarian tumours, and cicatrices in the vagina. The same rule should guide us in these cases as in deformity of the pelvis itself. As regards ovarian and fibrous tumours, some authors advise the induction of premature labour even when they do not encroach on the cavity of the pelvis, believing that in the latter months of pregnancy they are apt to undergo unhealthy inflammation and softening, and other morbid actions. It is very questionable, however, how far such consequences depend on the existence of advanced pregnancy. They are quite as likely to result from the contusion and pressure to which they are subjected when the uterus takes on expulsive action, and to this they would be equally exposed were the labour induced prematurely. But it frequently happens that tumours are so situated, that they are likely to lessen the calibre of the vagina when labour sets in. This is particularly the case with pediculated fibroids of the uterine wall, or with the more solid varieties of ovarian tumours. When these are forced down in front of the presenting part, they may give rise to cases of the most formidable and complicated character, and if we are aware of their presence there can be no question as to the advisability of artificially putting an end to the gestation. The time of operation must be determined in each case after a careful consideration of the size, nature, and compressibility of the tumour. If it can be excised, tapped, or otherwise treated, the necessity for the operation may be obviated. Cicatrices in the vagina may also greatly narrow the calibre of the canal. In such cases the operation is performed principally to save these

adventitious structures from the extreme contusion to which they would be subjected by the head of a full-grown child, and to prevent the risk of laceration.

II. *Defective proportion between the Child and Maternal Passages the result of an unusually large Fœtal Head.*—It may happen that a patient has a pelvis of natural size, but that she habitually gives birth to children whose heads are unusually large, and more firmly ossified than is generally the case. This may give rise to very difficult labour, although the maternal structures are in no way in fault. In such a case, premature labour may be induced with the best results, and the proper period of delivery would require to be anticipated by a very short time. A week or a fortnight may make all the difference between a labour of extreme severity and one of comparative ease.

III. *Certain Conditions affecting the Mother only.*—There is a large class of cases in which the condition of the mother indicates the necessity of resorting to the operation. One of the most common is continuous and uncontrollable vomiting, the result of reflex irritation from the pregnant womb. Such an occurrence is by no means infrequent; and if the sickness resists all treatment, and the patient is unable to retain any food on the stomach, it is generally admitted that we are fully justified in inducing premature labour. Of course, so serious a step will never be taken without the most anxious consideration, and then only after all other means have been tried unsuccessfully. We should take care, however, not to delay the operation until the patient is so reduced by inanition as

to be unable to rally. To operate when she has arrived at so advanced a stage of debility would only have the effect of making matters worse, as the mere shock of delivery might then prove fatal. Chorea, convulsions, or mania, may also be originated or aggravated by pregnancy, and on their account it may be necessary to put an end to the gestation. Excessive anasarca, ascites, or dyspnœa, connected with disease of the heart or lungs, may be in a great measure caused by the pressure of the enlarged uterus. Dropsy of the amnion may likewise give rise to such increase of bulk as seriously to embarrass respiration. In fact, any condition or disease affecting the mother will justify the operation, provided only we are convinced that it would give the patient relief to put an end to her pregnancy, and that its continuance would involve danger. No general rules applicable to all cases can be laid down; each must be treated on its own merits. If the child has arrived at a viable age, we can have less hesitation in consulting the safety of the mother than before that period of gestation has been reached. Both accidental and unavoidable hæmorrhage may call for the induction of premature labour. If the flooding is severe, especially when the child is viable, it may be preferable to operate at once, without temporizing by rest and the usual antihæmorrhagic treatment. If, however, the flooding has occurred before we can expect the birth of a living child, we may hope by plugging the vagina, rest, cold, and the usual means of arresting hæmorrhage, to carry on the case to a more advanced period of pregnancy. The advisability of inducing premature labour as a

general rule of practice in cases of unavoidable hæmorrhage, has been recently insisted on by Dr. Greenhalgh.* Although there may be a difference of opinion as to whether the precise means he suggests for this purpose are the best which we could adopt, still there can be little doubt that the principle he advocates is correct when the hæmorrhage occurs after the end of the seventh month. Its constant adoption before that period, however, would generally involve the death of the child, while by temporizing we might hope to ensure the safety of both mother and infant.

IV. *Certain Conditions affecting the Child only.*—In a certain number of cases the operation is indicated by circumstances affecting the life of the child only, and with the view of ensuring its safety we bring on labour before the natural period. Of these, the most common are those cases in which the child dies before the termination of utero-gestation in several successive pregnancies. This is generally the result of defective nutrition of the fœtus, the consequence of fatty, calcareous, or syphilitic degeneration of the placenta, which is thus rendered incapable of performing its functions. The changes in this organ which cause the death of the fœtus seldom commence until a very advanced period of pregnancy, so that if labour be somewhat hastened, we may hope to enable the patient to give birth to a living and healthy child. The previous experience of the mother will indicate the period at which the death of the fœtus has formerly taken place, as she

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* *Lancet*, August 6, 1864.

would then have appreciated a difference in her sensations, a diminution in the vigour of the fœtal movements, a sense of weight and coldness, and similar signs. For some weeks previous to the time at which this change has formerly been felt, we should carefully watch the pulsations of the fœtal heart from day to day, and in most cases the approach of danger will be indicated sufficiently soon to enable us to interfere with success, by tumultuous and irregular pulsation, or a failure in the strength and frequency of the cardiac movements. On the detection of this, or on the mother's feeling that the movements of the child are becoming less strong, we should at once perform the operation. Dr. Simpson has also induced premature labour with success in a patient who twice gave birth to hydrocephalic children. In the third pregnancy, which he terminated before the natural period, the child was well formed and healthy.

Statistics and Dangers.—It is quite unnecessary in the present day to enter into any arguments as to the morality of this operation, or as to the advisability of performing it in all suitable cases. Objections to it on these grounds are among the things of the past, and we need only state briefly the dangers and risks connected with its performance. As regards the mother, it is pretty generally admitted that the danger is not more than that of an ordinary labour at the full period. There are, however, a few circumstances which must be taken into account as qualifying this statement; as, for example, the method employed in exciting uterine action. Thus one or two fatal cases have been

known to occur from rupture after intra-uterine injections, and also after the use of carbonic acid gas. A clumsy or careless operator might also inflict considerable injury on the mother in the passage of dilators, sounds, and the like. It seems only fair to conclude, therefore, that, *cæteris paribus*, the risk to the mother is slightly greater than in ordinary labour, but so little as never to contra-indicate the operation under any circumstances in which it is considered justifiable. Dr. Churchill's statistics show that more than 50 per cent. of the children survived; and considering their immaturity, and the frequency of irregular presentations in premature labour, this is a greater success than we should probably have expected.

METHODS OF OPERATING.—The means by which premature labour may be induced are very numerous. Some of them act indirectly through the maternal system, as the ergot of rye, and oxytoxic agents in general. Others act principally by their power of exciting reflex action, and in most of these the integrity of the ovum is interfered with. Such are the vaginal douche, the separation of the membranes from the uterine walls, dilatation of the os, stimulating enemata, and irritation of the breasts. The former class is now seldom employed in obstetric practice. Of the latter, some offer special advantages in particular cases, but none are equally adapted for all emergencies.

Often a combination of more methods than one will be found most useful. Much will depend on the urgency of the case, and the time which may be allowed to elapse before delivery is completed. It may be laid

down as a safe general rule, that in selecting from the means at our disposal, we should, if rapid delivery is not essential, prefer those which act in a slow and gradual manner, and which bear the greatest resemblance to the ordinary exciting causes of labour at the full period. We shall mention, seriatim, the various methods in use, and discuss briefly the relative advantages and disadvantages of each in particular classes of cases.

I. *Puncture of Membranes.*—This was the first method practised for the induction of premature labour, and was the one recommended by Denman and all the earlier writers who advocated the operation. It is the most certain which can be employed, as the evacuation of the liquor amnii never fails to induce uterine contraction. There are, however, several disadvantages connected with it, which are sufficient to contra-indicate its use in the majority of cases. When the liquor amnii is evacuated, the contracting walls of the uterus press directly on the body of the child, which, being frail and immature, is less able to bear the pressure than at the full period of pregnancy. It therefore involves great risk to the fœtus. Besides, the escape of the water does away with the fluid medium so useful in dilating the os, and should version be necessary, from mal-presentation (a complication more likely to occur than in natural labour), the operation would have to be performed under the most unfavourable circumstances. For these reasons, notwithstanding the facility and certainty of the method, it is not to be recommended when the child is viable, and when we hope to preserve its life.

When the operation has to be performed before the child is viable, that is, before the seventh month, the same objections do not hold; and then it is perhaps the simplest and readiest method we can adopt. The period that elapses between the performance of the operation and the commencement of labour is very uncertain, averaging probably between twelve and thirty hours. The operation itself is most simple, requiring only a quill, stiletted catheter, or other suitable instrument, to be passed up to the os, carefully guarded by the fingers of the left hand previously introduced, and to be pressed against the membranes till perforation is accomplished. Meissner of Leipsic has proposed, as a modification of this plan, that the membranes should be punctured obliquely, three or four inches above the os, so as to admit of a gradual and partial escape of the amniotic fluid, thus lessening the risk to the child from pressure of the uterus. For this purpose he employed a curved silver canula, containing a small trocar, which can be projected after introduction. The risk of injuring the uterus from the use of a sharp instrument would be considerable; but independently of this, we have other and better means at our command, which render the procedure unnecessary. When we require to produce early abortion, it would be well not to attempt to puncture the membranes with a sharp-pointed instrument. The abortion can be induced with equal certainty and greater safety, by passing an ordinary uterine sound through the os, and turning it round once or twice. By this means, the ovum would be destroyed, without any danger of injuring the uterus.

II. *The administration of Ergot of Rye* — either

alone, or combined with borax or cinnamon, has been sometimes resorted to. This practice has been principally advocated by Dr. Ramsbotham : he originally was in the habit of exhibiting scruple doses of the powdered ergot every fourth hour, until delivery took place. Sometimes he found that as many as thirty or forty doses were required to effect the object; occasionally labour commenced after a single dose. Finding that the infantile mortality was very great when this method was followed, he modified it, and administered two or three doses only; and if these proved insufficient, he then punctured the membranes. From the testimony of Dr. Ramsbotham, there can be no doubt that ergot possesses the power of inducing uterine contraction. The risk to the child is, however, quite as great as when the membranes are punctured; for not only is it subject to injurious pressure from the tumultuous and irregular contractions which the ergot produces, but the drug itself, when given in large doses, seems to exert a poisonous influence on the fœtus. For these reasons, it is now seldom employed for the purpose of inducing labour; but when the child is not viable, it may with great propriety be given, as Dr. Ramsbotham suggests, as an auxiliary to other methods.

III. Various methods have been recommended which act indirectly on the uterus, the source of irritation being at some point distant from it. Thus D'Outrepont used frequently repeated abdominal friction and tight bandages. Scanzoni, remembering the intimate connexion between the mammæ and the uterus, and the tendency which irritation of the former has to induce contraction of the latter, recommended the frequent

application of cupping-glasses to the breasts. Dr. Radford and others have employed galvanism as a means of inducing uterine contractions. Stimulating enemata have also been prescribed for the same purpose. All these methods have occasionally proved successful, and, unlike the former plans we have mentioned, they are not attended with any special risk to the child. They are, however, liable to the strong objection of being too uncertain to be relied on in any individual case, besides being irksome both to the patient and practitioner. Any of them may with propriety be used as auxiliaries to other and more certain methods of operating.

IV. Some processes for inducing premature labour act directly on the ovum, by separating the membranes to a greater or less extent from the cavity of the uterus. The first procedure of this kind was recommended by Dr. Hamilton of Edinburgh, and consisted in the gradual separation of the membranes for one or two inches all round the lower segment of the uterus. To reach them the fingers had to be gently insinuated into the interior of the os, which was gradually dilated to a sufficient extent by a series of successive operations repeated at intervals of three or four hours. When this had been accomplished the fore-finger was inserted and swept round between the membranes and the uterus, but it was frequently found necessary to introduce the greater part of the hand to effect the object, and sometimes this even was not sufficient, and a female catheter or other instrument had to be employed for the purpose. The method was generally successful in bringing on labour, although it now and then failed, even in Dr. Hamilton's

hands. It is, however, tedious and painful both to the practitioner and patient, especially when the whole hand has to be passed into the vagina, and there is no means of knowing how long it may be necessary to continue the manœuvres before the desired object is accomplished. For example, there is a case reported by Dr. Moir of Edinburgh,* who prefers this plan to any other, in which the operation was commenced on the 6th of September, and delivery did not take place till the 10th. For these reasons the method has never been much practised. Kiwisch suggested in the year 1836 a means of inducing premature labour, which, from its efficacy and simplicity, has met with much approval. It consists in projecting at intervals a stream of warm or cold water against the os uteri. The action of this method is doubtless complex. Kiwisch himself believed that the relaxation of the soft parts through the imbibition of water was the determining cause of labour. Dr. Simpson, on the other hand, found that it failed to induce uterine action unless the water mechanically separated the membranes from the uterine walls. Besides these effects, it probably to some extent directly induces reflex action by distending the vagina and dilating the os. Kiwisch was in the habit of employing a reservoir of metal, which was fixed at some height on the wall of the apartment. From this a flexible tube descended, and was passed into the vagina, and by this means a steady stream of water was injected. An ordinary Higginson's india-rubber syringe, however, is quite as

* *Edin. Med. Journal*, April, 1864, p. 949.

effective, and renders any more cumbrous and costly apparatus unnecessary. The douche is usually administered twice a day, morning and evening, but it may be used more frequently if we are desirous of hastening its action. It is advisable to use warm and cold water alternately. The patient should lie on her left side, on a bed protected by india-rubber sheeting, with the nates placed near the edge. The tube of the syringe, carefully filled with water to prevent the injection of air, should be guided up to the os, and should, if it be open, be inserted within it. A steady, continuous stream should then be injected for ten or fifteen minutes. While the douche is in operation it is of importance to close the labia with the fingers of the left hand, so that the water may collect in and distend the vagina. The number of douches required varies much in different cases. The largest number Kiwisch himself found it necessary to employ was seventeen, and the smallest four. The average time elapsing before labour sets in is about four days. It is therefore evident that this method is not advisable when rapid delivery is desired. When rapidity is not essential it possesses many advantages, especially its facility of application, and the fact of its being in no way distressing or annoying to the patient, who can pursue her ordinary avocations between the douches. In primiparæ, in whom the os is very high up and difficult to reach, it is peculiarly useful; and in some cases of extreme rachitic deformity it may be, for the same reason, the only method we could employ with safety. The greatest objection to it is that the stream of water

is apt to cause displacement of the child, and that malpresentation is therefore more likely to be met with in premature labour brought on by this than by any other method. It can be readily understood that in the immature state of the fœtus the operation of version, or even a breech or footling presentation, will be more than usually hazardous to it, and that the infantile mortality is likely to be very great when this method is adopted.

Dr. Cohen of Hamburgh has introduced an important modification of this process, which has been considerably practised. It consists in passing a silver or gum-elastic catheter some inches within the os, between the membranes and the uterine wall, and injecting the fluid directly into the cavity of the uterus. He himself employed creosote or tar-water, believing it to be more efficacious, and injected without stopping until the patient complained of a feeling of distension. Others have found the plan equally efficacious when they only employed a small quantity of water, such as seven or eight ounces. Several fatal cases, however, have followed the use of Cohen's method, and it will be easily understood why it is attended with risk; for if a large quantity of water is injected, rupture of the uterus may occur in spite of every precaution to the contrary.

Simpson and Scanzoni have both tried the effect of the injection of carbonic acid gas into the vagina, and found that by this means labour was readily induced. Fatal results have, however, followed its employment, and Simpson has expressed an opinion that the experiment should not be repeated.

Various methods have been suggested which have for their object the separation of the membranes from the walls of the uterus. Dr. Simpson originally induced labour in this way by passing the uterine sound within the os, and up towards the fundus, and when it had been inserted to a sufficient extent, moving it slightly from side to side. He was led to adopt this procedure in the belief that we might thus closely imitate the separation of the decidua, which occurs previous to labour at term. Uterine contractions were induced with certainty and ease by this method, but it was found impossible to foretell what time might elapse between the operation and the commencement of labour, and it had frequently to be performed more than once. Dr. Simpson therefore subsequently modified his procedure by introducing a flexible male catheter, without a stilette, which he allowed to remain in the uterus until contractions were excited. He found that this latter method, which is also much employed in various parts of Germany, answered all his expectations, and he prefers it to any other. He has never failed in inducing labour by this means, and without danger or discomfort to the patient. A similar plan is highly spoken of by Braun of Vienna, who uses catgut bougies about a foot long, which are passed into the uterus between the membranes and the uterine parietes, and allowed to remain there until labour commences and the membranes burst, which they generally do in a period varying between six and twenty hours. Both these methods possess great advantages: they are simple in execution, painless and without risk to the mother, and are not apt to produce displacement of the

child. The principal objection is the possibility of the catheter or bougie separating a portion of the placenta, and giving rise to hæmorrhage; which might, however, be generally avoided by ascertaining the probable position of the placenta by auscultation, and introducing the catheter at a distance from it. There is also some chance of puncturing the membranes while passing the instrument upwards. This accident, indeed, cannot always be avoided, even when the greatest care is taken; but when it occurs the puncture will be at a distance from the os, so that a small portion only of the liquor amnii will be likely to escape, and this can scarcely be considered a serious objection to the operation.

V. The last class of operations which we are called upon to consider have for their object the induction of premature labour by the mechanical dilatation of the os uteri. The method recommended by Dr. Hamilton, as well as some of the others already described, necessarily involves a certain amount of dilatation of the os, in addition to the other objects which they are specially designed to accomplish. Klüge was the first to induce labour by dilatation alone. For this purpose he was in the habit of passing within the os a tent made of compressed sponge, and allowing it to dilate by the imbibition of fluid. If labour was not provoked within twenty-four hours he removed it, and introduced a fresh one of larger dimensions, changing it as often as was necessary until the object was accomplished. Although the operation seldom failed to induce labour, still it occupied an indefinite time, and the irritation produced by a foreign body in the passages was frequently annoying and painful

to the patient. Nor was it always very easy to introduce the tent, especially if the os was high up and difficult to reach. The plan, however, had the advantage of preserving the membranes intact, and thus increasing the chance of safety to the child.

Dr. Keiller of Edinburgh was the first to suggest the use of caoutchouc bags as a means of dilating the os, his instrument being distended by air. Dr. Barnes has since introduced an admirable means of effecting this object by fluid pressure; and his method has the great advantage of not only acting with ease and safety to the mother, but of enabling us to regulate the distending force at will, and to bring on labour within a definite period. We are thus spared the uncertainty and delay which many of the other plans involve, and when rapid delivery is indicated, either on account of the mother or child, we have the power of effecting it. Dr. Barnes's instruments consist of a series of india-rubber bags of various sizes, with a tube attached to each, through which water can be injected by an ordinary Higginson's syringe. They have a small pouch fixed externally, into which a uterine sound can be placed, and by means of which they can be passed with greater ease within the os. When distended with water, the dilators assume somewhat of a fiddle shape, bulging at either extremity, so as to insure their being retained within the os. Dr. Barnes advises us to prepare for their use by first distending the vagina with one of the larger bags. This being done, a dilator is rolled up in the form of a cone and passed within the os by means of the hand or sound. When *in situ*, we commence the dilatation by injecting

water slowly and gradually. The rapidity of distension may vary with the requirements of the case; but, as a general rule, the preliminary stage of dilatation should occupy at least three or four hours, so as to imitate as nearly as possible the course of natural labour. When this is effected, labour will in all probability have commenced; but if pains are absent, there can now be no objection to puncturing the membranes, and, if necessary, completing delivery by turning or forceps, on the same principles which would guide us in labour at term. This process is certainly a great improvement on many of the more uncertain plans formerly practised. The distending power is gentle and equable, and may be used with great advantage in many cases besides those of premature labour, especially in rigid and undilatable os, and as a preparatory measure to turning. The objections to it are the difficulty which is sometimes experienced in passing the dilator when the os is high up or difficult to reach, and the somewhat complicated manœuvres which the operation involves.

In all cases of premature labour we should bear in mind that the child is immature, and that unusual care is likely to be required to rear it successfully. We should therefore be careful to have in readiness all the usual means for resuscitation; and, as the mother is not likely to be able to nurse it at once, a healthy wet-nurse should, when practicable, be in waiting to receive the infant.

SUMMARY.—1. The induction of premature labour is applicable to all cases in which the life of either the mother or child would be endangered by allowing the pregnancy to proceed to the full period.

2. It is employed with great propriety in cases of contracted pelvis, in which there is not sufficient space to admit of the birth of a living child at the full period.

3. When the pelvis ranges between $2\frac{1}{2}$ and $3\frac{1}{4}$ inches in the antero-posterior diameter of the brim, labour should be induced after the child has arrived at a viable age; and in the lesser degrees of contraction the pregnancy should be allowed to proceed as long as is consistent with the birth of a living child, to increase the chance of its being reared successfully.

4. When the contraction exceeds $2\frac{1}{2}$ inches antero-posterior diameter, there is no chance of a living child being born, and abortion should be induced as soon as the existence of pregnancy is positively ascertained.

5. Premature labour should be induced in cases of uncontrollable vomiting connected with pregnancy; and the operation should not be delayed too long, for fear of the patient being reduced to a state of debility which would prevent her rallying from the effects of the delivery.

6. When tumours encroach upon the cavity of the pelvis, premature labour should be induced on the same principles which guide us in the case of osseous deformity.

7. The operation is also justifiable when the patient habitually gives birth to children whose heads are too large or too firmly ossified to pass through the pelvis with safety. Under these circumstances, the natural period of delivery need, as a general rule, only be anticipated by a short space of time.

8. In certain diseases or conditions affecting the mother, the operation should be resorted to as soon as we are convinced that the continuance of pregnancy is dangerous. Chorea, convulsions, mania, disease of the heart or lungs accompanied by excessive dyspnœa, ascites, dropsy of the amnion, accidental or unavoidable hæmorrhage, are the principal affections likely to render necessary a resort to this expedient.

9. In a certain number of cases, the operation is indicated by circumstances endangering the life of the child, especially when the mother, in former pregnancies, has habitually given birth to still-born children. Repeated auscultations and the sensations of the mother will generally indicate the proper time for interference.

10. Puncture of the membranes is the most certain means of inducing premature labour; but it is exceedingly dangerous to the child, and should not be resorted to unless the operation is required before the fœtus has reached a viable age, or unless other means have been tried and found insufficient. When early abortion is required, it is best produced by passing the sound within the cavity of the uterus. Abdominal frictions, the administration of ergot of rye, electricity, and cupping the breasts, are too uncertain to be relied on except as auxiliaries to other methods.

11. Kiwisch's plan of frequently repeated vaginal douches is an easily applied and convenient method of inducing labour, especially when the os is very high up, and difficult to reach. It is, however, uncertain as regards the time which may elapse before labour commences, and is liable to the drawback of occasionally producing malposition of the child.

12. Intra-uterine injections of warm water have occasionally been followed by fatal results, and should be cautiously employed.

13. Separation of the membranes from the uterine parietes by a gum-elastic catheter or catgut bougie, which is allowed to remain in the uterus till labour commences, is an excellent method, easy and painless in application, and safe both to the mother and child.

14. Dr. Barnes's method of dilating the os by fluid pressure is exceedingly valuable, especially when rapid delivery is indicated.

15. Any of the latter methods may be resorted to with propriety; and when labour is difficult to induce, more than one may be employed at the same time.

16. In all cases in which premature labour is induced, means for resuscitating the child should be at hand, and, if possible, a healthy wet-nurse should be in waiting to receive it.

CHAPTER II.

VERSION, OR TURNING.

HISTORY.—Traces of this operation are met with in the writings of the ancients: thus Hippocrates talks of cephalic version, and Celsus brought down the feet, but in dead children only. Aetius recommended podalic version even when the child was alive, and refers to Philomenes as the original discoverer of the method of operating. Cephalic version was, however, almost exclusively practised until the fifteenth century, when Paré, and his pupil Guillemeau, taught the propriety of bringing the feet down first. It was by the latter physician especially, that the steps of the operation were clearly defined; and the French have undoubtedly the merit, both of perfecting the method of performing it, and of establishing the indications which should lead to its use. Indeed, the operation was then much more frequently performed than in later times, since no other means of effecting artificial delivery were known, which did not involve the death of the child; and practitioners doubtless acquired great skill in its performance, and were inclined to overrate its importance, and extend its use to unsuitable cases. An opposite error was fallen into after the discovery of the forceps, which for a time

led to the abandonment of turning in certain conditions for which it is well adapted, and in which it has only of late years been again practised. Cephalic version has, since Paré wrote, been recommended and practised from time to time; but the difficulty of performing it satisfactorily was found to be so great, that it never became an established operation. Dr. Braxton Hicks has quite recently described a method by which it may be accomplished with greater certainty and ease, which will doubtless lead to its revival in certain suitable cases. To this gentleman we are also indebted for perfecting a method of turning without introducing the hand into the cavity of the uterus, which, under favourable circumstances, is not only of easy performance, but deprives the operation of one of its greatest dangers. The possibility of effecting version by external manipulation alone has long been known, and was distinctly referred to and recommended by Dr. John Pechey, so far back as the year 1698.* Since that period it has been strongly advocated by Wigand and his followers; and various authors in this country have referred to the advantage to be derived from external manipulation assisting the hand passed into the interior of the uterus. To Dr. Hicks, however, must belong the undoubted merit of having been the first clearly to point out the value of this method, and to lay down definite rules for its practice.

Object and Nature of the Operation.—Version consists in the artificial substitution of either the cephalic

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* *The Complete Midwife's Practice*, enlarged, 1698, p. 142.

or podalic extremity of the child for some other part originally presenting, and the operation is entirely dependent for its success on the fact that the child in utero is freely movable, and that its position may be artificially altered with facility. As long as the membranes are unruptured, and the fœtus is floating in the surrounding fluid medium, it is liable to constant changes in position, as may be readily demonstrated in the latter months of pregnancy; and the operation under these circumstances may be performed with the greatest facility. After the liquor amnii has escaped there is still, as a rule, no great difficulty in effecting version; but as the body is no longer floating in the surrounding liquid, its rotation must necessarily be attended with some increased risk of injury to the uterus. If the liquor amnii has been long evacuated, and the muscular structure of the uterus is strongly contracted, the fœtus may be so firmly fixed that any attempt at moving it fails, or is attended with such danger to the maternal structures as to be quite unjustifiable.

CASES SUITABLE FOR THE OPERATION.—Version may be required either on account of the mother or child alone, or it may be indicated by some condition imperilling both, and rendering immediate delivery necessary. The cases in which the operation may be indicated are included under the following headings:—

I. *Malposition of the Fœtus*, which is so placed that delivery is impracticable, unless the presentation be altered. The most common case of the kind is when some portion of the upper extremity, or more rarely of

the neck or thorax, is situated at the orifice of the uterus. The presentation may be entirely intra-uterine, or the arm may project into the vagina, but in either case delivery cannot safely be accomplished without artificial assistance. A prompt and early discovery of the condition is here of essential importance. Before the membranes have burst, and when the fœtus is still a floating body, the rectification of the malposition is comparatively simple. After the liquor amnii has escaped, if the shoulder or presenting part is forced into the brim of the pelvis, and if the uterus is tightly contracted round the body of the child, an alteration of its position is necessarily accompanied with considerable risk of injury to the mother, and may be found impracticable. In all cases of transverse presentation it is of importance to ascertain the exact position in which the child lies, as the facility with which version may be accomplished will depend to a considerable extent on our knowledge of the situation of the various portions of the body. Before commencing the operation therefore, careful endeavours should be made to ascertain exactly how the body is placed. Generally it will be found to lie obliquely with regard to the uterus, the head being situated in one or other iliac fossa near the os, with the breech in the opposite direction and on a higher level. The knees generally lie close to the umbilicus of the child, immediately over the os uteri, and at a very short distance from it, so as to be within easy reach of the fingers or hand of the operator passed within the os, especially if the breech is depressed by proper abdominal manipulation. The feet

will usually be found resting on the breech. Should the hand present and lie within reach, it will guide us to a more accurate knowledge of the position, if we bear in mind the simple rule, that the palm is always turned towards the abdomen of the child, the thumb to the head, and the little finger to the feet. We can thus tell whether the fœtus is placed in a dorso-anterior or dorso-posterior position. In these malpresentations it has been the usual practice to bring down the feet, and terminate the labour at once; but if detected sufficiently soon they are well adapted for the performance of cephalic version by external and internal manipulation, since immediate delivery is not usually required, and this procedure would bring them into the category of ordinary head presentations.

II. *In Cases of Accidental or Unavoidable Hæmorrhage*, turning has always been one of the principal methods of treatment. We are advised to introduce the hand as soon as the os is sufficiently dilated to admit it, and then to bring down the feet and complete delivery without delay. The chief object of the operation is the emptying of the uterus, and subsequent separation of the placenta; but, in addition, the body of the child, when drawn through the os, forms of itself a most efficient plug, and effectually prevents further loss of blood during its extraction. There can be no question of the advisability of at once performing the operation in cases of placenta prævia, provided the patient has not lost so much blood as to render the procedure immediately dangerous, and if the os is sufficiently open to admit the hand with safety. Unfortunately these contra-indications very frequently

exist. The statistics of midwifery afford abundant proof of the danger of version, if hæmorrhage has already taken place to a great extent. The patient may be lying pale and blanched, with a rapid and feeble pulse, cold extremities, and all the signs of extreme debility; and in such a case, the shock of emptying the uterus, and the insertion of the operator's hand, might prove amply sufficient to turn the scale against her. It is fortunate that other methods of treatment, which afford the mother a chance of recovery, are then practicable; such as the puncture of the membranes, or the partial or entire separation of the placenta. Into the merits of these methods it is not our object to enter here. What we are anxious to insist on is, that turning should not be resorted to when the patient is reduced to a state of extreme exhaustion. Again, she may be in other respects in a favourable condition for the operation, yet the os uteri may be so rigid and undilated as to render the passage of the hand impossible. This is the more likely to be the case as hæmorrhage from placenta prævia frequently occurs before the term of utero-gestation has arrived, and when the os is still undeveloped and unfitted for delivery. The rule of practice in such cases has been to temporize by puncturing the membranes so as to allow the head to press directly on the placenta, and by plugging the vagina until dilatation has advanced sufficiently to permit the introduction of the hand. We have now a valuable means of hastening the dilatation by Dr. Barnes's fluid dilators, which of themselves form one of the most efficient plugs that can be used. Dr. Hicks's method of turning without introducing the hand

into the interior of the uterus will be found especially valuable in these cases, not only because it admits of version being performed much sooner than formerly, since it is only necessary that the os be sufficiently open to admit one or two fingers, but also because the introduction of the entire hand is likely to be more hazardous in placenta prævia than in any other condition requiring version, from the unusual vascularity of the uterus in the neighbourhood of the os, the result of the abnormal insertion of the placenta.

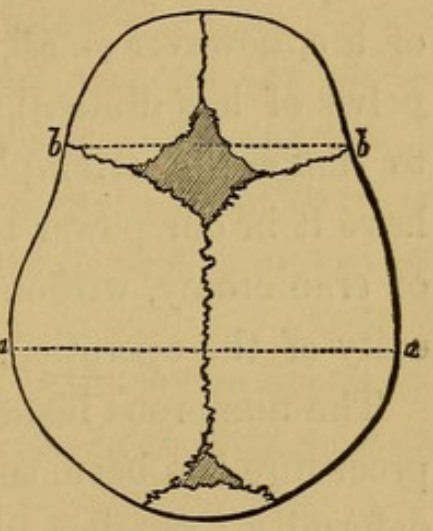
The practice of version in accidental hæmorrhage, although formerly the general rule, is now very properly seldom resorted to until simpler means have been tried, especially puncture of the membranes, and the administration of ergot. The muscular contraction thus induced will usually suffice to arrest the loss of blood; but should it fail to do so, it may be necessary to empty the uterus to induce due contraction. The previous evacuation of the liquor amnii will not be found to interfere with the operation; since the fact of version being required will of itself indicate that the uterine walls are in a state of relaxation; for had they contracted round the body of the child, hæmorrhage would have ceased, and interference would have been unnecessary. As in placenta prævia, it is of the utmost importance not to delay the operation until the patient is in a state of extreme exhaustion, or she may prove unable to bear the shock of delivery.

III. *In Contracted Pelvis.*—Before the invention of the forceps, turning was the only practice which afforded a chance of life to the child, when the pelvis was too

small to admit of delivery by the natural efforts alone. After podalic version was recommended in France by Paré and Guillemeau, it was largely employed in cases of pelvic deformity, and practitioners acquired great skill in its performance. It was also constantly resorted to in this country, until the use of the forceps caused it to fall into disfavour. Dr. Simpson, with his usual talent, recognised the advantages which it offered in certain cases of distortion, as a substitute for craniotomy, and occasionally for the long forceps. His views have been much canvassed, and have met with great opposition; but of late, the tendency has been towards their adoption; and they are based on principles so valid, that it is difficult to see how they can be reasonably objected to. The arguments on which Dr. Simpson bases his proposal for the adoption of turning in pelvic deformity are briefly as follows:—The head of the child is shaped somewhat like a cone, its narrowest portion, the base of the cranium, measuring, on an average, from half to two-thirds of an inch less than the broadest portion, the bi-parietal diameter of the vertex. In ordinary head presentations, the latter part of the skull has to pass first; and in a normal pelvis, there is no doubt a great advantage in the base of the cone being the presenting part, since it amply dilates the passages for the rapid delivery of the rest of the body. When, however, a moderate amount of contraction exists, it is frequently impossible for the base of the cone to pass through the narrowed passage; the vertex becomes fixed in the pelvic brim, and being forced against the obstruction by the recurring pains, is more and more

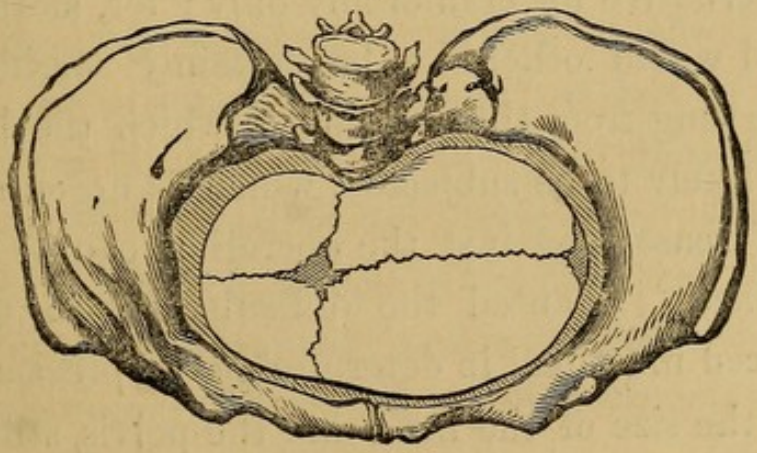
flattened outwards, and hence increased in diameter. Dr. Simpson argues that if, in such a case, the narrower apex of the cone can be brought through the brim first, the remainder of the head can be *drawn* through the contracted portion of the pelvis; and the bones of the fœtal skull being to a certain extent elastic, he believes that the pressure of the pelvic walls will tend to diminish the remaining broader portion of the skull, and flatten it from below upwards, until we gain the precise difference between the bi-mastoid and bi-parietal diameters. Nor is this the only advantage; for the bi-temporal diameter of the vertex (Fig. 1, *b*, *b*) measures, on an average, half an inch less than the bi-parietal (*a*, *a*), which, in head presentations, has to pass first through the contracted brim.

Fig. 1.



As the coarctation is generally in the sacro-pubic diameter, when the child passes footling, the narrowest

Fig. 2.



portion of the vertex passes through the narrowest portion of the brim, while the broader bi-parietal portion lies in the wider space near the borders of the ilium (Fig. 2). Dr. Simpson has brought forward cases in which he has successfully terminated labour by turning, when the antero-posterior diameter of the brim did not measure more than $2\frac{3}{4}$ inches. Most authors fix on $3\frac{1}{4}$ inches as the smallest space through which we can hope to draw the head of a living child by means of the forceps. If by turning we can afford the child a chance of life, however small, by drawing it footling through a pelvis of less dimensions than this, it is surely our duty to make the attempt; for even should it fail, we still have it in our power to resort to the deadly alternative of craniotomy, without in any way increasing the difficulty of the operation.

The numerous instances now on record in which this procedure has been successfully carried out in cases of deformity, ranging upwards from $2\frac{3}{4}$ inches antero-posterior diameter, tend to show, that by version we may fairly hope to save many a fœtal life otherwise doomed to destruction. The objections which have been made to this practice are of little force, when it is considered as an alternative for craniotomy only; for, as the life of the child would otherwise be certainly sacrificed, the danger arising from the pressure to which the head and cord are likely to be subjected, which is urged as one of the chief reasons against the operation, can be of little consequence. Granted the difficulty which the most experienced must feel in determining the precise relation between the size of the head and the pelvis, still it is an

unanswerable argument in favour of turning, that we are not justified in sacrificing the life of the child, provided there is a chance of saving it, however slight, without endangering the life of the mother. That turning is less hazardous to the mother than craniotomy, is abundantly proved by statistics; since one out of every five labours terminated by the latter operation ends fatally, while in the former the average mortality is one in fifteen only. Besides, when turning is resorted to, it is performed as soon as possible; while in craniotomy, the natural repugnance of the practitioner to destroy fœtal life leads to great delay, and exposes the patient to all the risks of a protracted labour. The question as to the relative merits of turning and the long forceps is more difficult to decide. In favour of the former, we have its comparative facility (for it is certainly easier to turn when the membranes are still unruptured, and when the head is not engaged in the brim, than to apply the forceps); its greater safety to the mother (for it is no easy matter to apply the forceps when the head is still above the brim of the pelvis, and many unfortunate cases of severe injury to the maternal passages might be adduced); and the earlier period of labour at which it may be performed. As regards the child, the balance of evidence is certainly in favour of the forceps, although not so much so as might at first be imagined. That there is some risk to the child from the possible detention of the head in the pelvic cavity, and from the pressure to which it, as well as the umbilical cord, is subjected, cannot be doubted; but it is surprising how much compression may be applied to the head without proving

fatal. Dr. Simpson has collected numerous cases to prove that extreme force may be employed, so much as even to cause marked indentation of the skull, without inflicting permanent injury on the child. It is to be remembered also, that this excessive traction, and consequently great pressure on the head, is only likely to be required in the more marked cases of deformity in which the operation replaces craniotomy; and that when it is used instead of the long forceps, so much difficulty is not likely to be met with. Some pressure is also exerted by the forceps, and this in the occipito-frontal diameter of the head, in which it is most likely to be injurious. Pressure on the cord also might, to some extent, be obviated by placing it in the lateral portion of the pelvis, opposite the sacro-iliac synchondrosis, where in such cases there will probably be more space than in a well-formed pelvis. Much will probably depend on the practitioner, and on his skill in the employment of instruments. Should the case be well adapted for the forceps, as regards the dilatation of the os, and the position of the head, it would probably be advisable to make a cautious trial with them before resorting to version. But should we fail in introducing them, or should the os not be sufficiently open to admit them with safety, we have in version an alternative which we should be perfectly justified in resorting to with a fair hope of success.

IV. *Prolapse of the Cord.*—Turning has long been an established method of treating prolapse of the cord, and has received the sanction of some of the highest obstetric authorities. Since, however, it must always be attended with some risk to the mother, it is certain

that we should not be justified in resorting to it except in peculiarly suitable cases, in which there seems a probability of our being able to perform it with ease and safety. Nor should we think of it unless other and simpler means have been tried and found unavailing. If, therefore, we have failed in effecting the replacement of the cord by such measures as returning it within the uterus by one or more fingers during an interval of pain, or by some instrument devised for the purpose, or by the postural treatment more recently recommended by Dr. Thomas, and the weakened pulsations indicate that the life of the child is in jeopardy, the propriety of version may come into consideration. It cannot be required before the rupture of the membranes, since the liquor amnii will preserve it from undue pressure ; nor even when the waters have escaped will it generally be necessary if the pains are frequent and effective, the pelvis roomy, and the soft parts dilatable, since the natural efforts will either terminate labour sufficiently soon to prevent risk, or force the head low enough to admit, if necessary, of delivery by the forceps. But if the head remains above the brim, while we fail in protecting or replacing the cord, no other method of saving the child will be open to us but the performance of turning. If, in such a case, the os is sufficiently open to admit of easy version, either by introducing the hand or by external and internal manipulation, we should be fully justified in resorting to it with a fair prospect of saving the child. Should the os, however, be undilated, or the pelvis contracted, so as to render it probable that there would be consider-

able delay in effecting delivery, it would scarcely be right to subject the mother to the risk of the operation, since the chance of saving the child would be greatly diminished under these unfavourable circumstances.

V. *In certain complications* occurring during labour, such as convulsions, rupture of the uterus, fainting, &c., turning is occasionally practised. In convulsions the performance of version must always be attended with peculiar danger, since the uterus is acting with increased force and energy, and the introduction of the hand within its cavity would, in most cases, prove a fresh source of irritation, and might possibly be productive of very serious consequences. It seldom, however, happens that the indications for artificial delivery are found sufficiently strong to render the operation necessary, since the natural efforts frequently suffice to terminate the labour, or at least bring the head within easy reach of the forceps. Dr. Hicks has pointed out that his method of performing turning is peculiarly applicable in convulsions, since it obviates the necessity for introducing the hand within the uterus; and should delivery be required before the head has entered the cavity of the pelvis, there can be no doubt as to its superiority over the ordinary plan of operating. In rupture of the uterus turning has always been considered one of the principal means of effecting delivery, and there can be no question as to its advisability when the child is still contained within the cavity of the uterus. If, however, it has escaped entirely or in great part into the abdomen, the propriety of passing the hand through the breach in the uterine walls, or of dragging the child through it, seems to be

exceedingly doubtful. The effect of this procedure would be, not only to increase greatly the injury to the uterus by forcibly pulling the child back, but also to expose the abdominal viscera to considerable risk. The operation of gastrotomy would probably afford the patient a much better chance of recovery. Dr. Winckel has recorded a case in which rupture of the uterus occurred twice in the same patient,* and on both occasions the child was removed by abdominal section, the mother making a perfect recovery. No such success has been recorded where the practice usually recommended has been followed, for the patient almost uniformly dies. The subject, however, has as yet received little attention, and further observations are much required. In fainting, great prostration, and similar complications occurring during labour, immediate delivery may be indicated, and turning may be the best mode of effecting it. Regarding these unusual indications for the operation, no general rules can be laid down. Each case may be treated on its own merits; and in the selection of the means to be used we must be guided by a consideration of the state of the patient, the stage of the labour, and the condition of the passages.

Statistics and Dangers of the Operation.—Like other obstetric operations version is sooner and more frequently resorted to abroad than in this country. Thus, according to Dr. Churchill, it is performed in England once in every 259¾ cases, in France in 93½,

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* *Monat. f. Geburt.*, July and October, 1863.

and in Germany in $63\frac{2}{3}$. The results to mother and child are not stated with sufficient accuracy to admit of a comparison between the various countries. Taking all together, Dr. Churchill estimates the maternal mortality as 1 in 16; and the infantile as 1 in 3. These figures, although they cannot of course be taken as indicating the exact risk of the operation, since they do not exclude those cases in which the fatal result more probably arose from the cause which necessitated interference, still conclusively show that it is not free from grave hazards, and must not be undertaken without due reflection.

The principal dangers will be discussed as we proceed. It may suffice to mention here, that those to the mother must vary with the period of labour at which the operation is undertaken. If version is performed early, before the rupture of the membranes, or in favourable cases without the introduction of the hand into the interior of the uterus, the risk must of course be infinitely less than in those more formidable cases in which the waters have long escaped, and the hand and arm have to be passed into an irritable and spasmodically contracted womb. But even in the most unfavourable cases accidents may be avoided if the operator bears constantly in mind that the principal danger consists in laceration of the uterus or vagina from undue force being employed, or from the hand and arm not being introduced in the axis of the passages. A certain number of cases also end fatally from shock or exhaustion, or from subsequent puerperal complications. As regards the child, the mortality, according to Dr. Churchill,

is not much greater than in breech or footling presentations, which he estimates as about 1 in $3\frac{1}{2}$ cases. Nor is there any good reason why it should be so, seeing that cases of turning after the feet are brought through the os are virtually reduced to those of presentation of the inferior extremities; and that the mere version, if effected sufficiently soon, is not likely to add materially to the risk to which the child is exposed.

Description of the Operation. I. *Cephalic Version.*—By this is meant the substitution of the head of the child for a malpresentation, the case afterwards being treated as one of natural labour. From the difficulty of performing cephalic version in the manner usually recommended, it has practically scarcely been attempted, and, with the exception of one or two authors, is generally condemned by our writers on systematic midwifery. Still the operation offers unquestionable advantages in suitable cases, that is, in transverse or neck presentations, in which rapid delivery is not necessary, and in which the only object of interference is the rectification of malposition; for if successful the child is spared the risk of being drawn footling through the pelvis. The objections to cephalic version are based entirely on the difficulty of performance; and undoubtedly to introduce the hand within the uterus, and search for and seize the round and slippery head, afterwards placing it in the brim of the pelvis, could not have been an easy process even under the most favourable circumstances, and must always have been attended by considerable risk to the mother. Velpeau, who strongly advocated the operation, was of opinion that it might be more

easily accomplished by pushing up the presenting part, than by seizing and bringing down the head. Wigand more distinctly pointed out that the head could be brought to a proper position by external manipulation, aided by the fingers of one hand within the vagina. Dr. Hicks has perfected and laid down clear rules for the performance of the operation, which render it easy to accomplish under favourable conditions, and will doubtless cause cephalic version to become a recognised method of treating malposition of the fœtus. The number of cases, however, in which it can be performed must always be limited, since it is necessary that the liquor amnii should be still retained, or only have just escaped ; that the presentation be freely moveable above the brim ; and that the pelvis itself be of full size, so that no difficulty may arise in the subsequent passage of the head. Dr. Hicks does not believe protrusion of the arm to be a contra-indication, advising us to return it carefully within the cavity of the uterus. When, however, protrusion has occurred, the thorax is so constantly pushed down into the pelvis, that replacement can neither be considered safe nor practicable, except under unusually favourable conditions, and podalic version will generally be necessary.

As to the method of performing it, we cannot do better than introduce Dr. Hicks's own words, which describe his method of procedure more concisely and clearly than we could hope to do:—"Introduce the left hand into the vagina, as in podalic version ; place the right hand on the outside of the abdomen, in order to make out the position of the fœtus, and the direction of its head

and feet. Should the shoulder, for instance, present, then push it with one or two fingers in the direction of the feet. At the same time pressure with the other hand should be exerted on the cephalic end of the child. This will bring the head down to the os; then let the head be received upon the tips of the inside fingers. The head will play like a ball between the two hands; it will be under their command, and can be placed in almost any part at will. Let the head then be placed over the os, taking care to rectify any tendency to face presentation. It is as well, if the breech will not rise to the fundus readily after the head is fairly in the os, to withdraw the hand from the vagina, and with it press up the breech from the exterior. The hand which is retaining gently the head from the outside, should continue there for some little time, till the pains have ensured the retention of the child in its new position, by the adaptation of the uterine walls to its form. Should the membranes be perfect, it is advisable to rupture them as soon as the head is at the os uteri; during their flow and after, the head will move easily into its proper position."*

The procedure thus described is so simple, and would occupy so short a time, that there can be no objection to making the attempt at remedying malposition by this means in every suitable case.

Should we fail in our endeavours, we should not be in a worse condition for effecting delivery by podalic version, which can then be proceeded with without withdrawing

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* *On Combined External and Internal Version*, p. 22.

the hand from the vagina, or in any way altering the position of the patient.

II. *Podalic Version.*—The method of performing podalic version varies with the nature of each particular case. In describing the operation, it has been usual to divide the cases into those in which the circumstances are favourable, and the necessary manœuvres easily accomplished, and those in which we are likely to meet with considerable difficulties, and in which the operation of necessity involves increased risk to the mother. This division is eminently practical, since nothing can be more variable than the circumstances under which version may be required; but before describing the steps of the operation, it may be well to consider some general conditions applicable to all cases alike.

Position of the Patient.—In this country, the ordinary position on the left side is usually employed for this as for all other obstetric operations. On the Continent and in America, the patient is placed on her back. The former position is desirable not only as a matter of custom, but because it admits of both the operator's hands being more easily used in concert. In certain difficult cases, where the back of the child is turned towards the spine of the mother, the dorsal decubitus might present some advantages in enabling the hand to pass more easily over the face and body of the child, but scarcely sufficient to counterbalance the awkwardness of operating with the patient lying in a position to which most practitioners are so unaccustomed. The patient should be brought to the side of the bed, across which she should be laid, with her hips

projecting over the edge, the knees being flexed towards the abdomen, and separated from each other by a pillow or by an assistant. Assistants should also be placed so as to restrain the patient if necessary, and prevent her involuntarily starting from the operator, which might not only embarrass his movements, but be the cause of serious injury.

Administration of Chloroform.—Obstetric operations are now seldom performed without the administration of chloroform, and in version it is peculiarly advantageous. There is nothing which tends to facilitate the steps of the process so much as stillness on the part of the patient, and the absence of strong uterine contraction. In difficult cases, when the vagina is very irritable, and the uterus firmly contracted round the body of the child, the induction of complete anæsthesia may enable us to effect version, when without it we should certainly fail. By its use we also entirely do away with the necessity of resorting to the means formerly recommended for suspending inordinate uterine contraction, such as venesection, and the administration of tartar emetic, or a large opiate. To effect this object, however, the inhalation must be carried to its fullest extent, although the patient need not remain deeply anæsthetized beyond the period actually necessary for completing the operation. Given even to a less degree, it is highly valuable in preventing involuntary starting, and should certainly be administered unless there is some evident contra-indication.

Period when the Operation should be undertaken.—The most favourable time for operating is undoubt-

edly when the os is fully dilated, before or immediately after the rupture of the membranes and the discharge of the liquor amnii. The advantage of operating before the waters have escaped cannot be overstated, since we can then make the child rotate with great facility in the fluid medium in which it floats. In the ordinary operation, in which the hand is passed into the cavity of the uterus, it is essential to wait till the os is of sufficient size to admit of the arm being introduced with safety. This may generally be done when it is the size of a crown-piece, especially if it be soft and yielding. In cases of placenta prævia, it will, as a rule, be more easily dilatable than in transverse presentation. Dr. Hicks's method, however, offers the great advantage of enabling us to perform version much sooner than was formerly possible, since it is only necessary that there be sufficient space for the introduction of one or two fingers. Should we not succeed in effecting version by this process, and the state of the patient indicates that rapid delivery is necessary, we have at our command, in Dr. Barnes's fluid dilators, a means of artificially dilating the os uteri, which can be employed with ease and safety. In the more formidable cases of transverse presentation, in which the waters have been long evacuated, and the uterus tightly contracted round the body of the child, the operation should be attempted as soon as possible. No object would be gained by farther delay, and in the administration of chloroform we have a more powerful means of effecting relaxation than in venesection, or any other method requiring a lapse of time to produce its effect.

Choice of Hand to be used.—The practice followed with regard to this point varies considerably, certain accoucheurs always employing the right hand, others the left, and some, one or other according to the position of the child. In favour of the right hand, it is said that most practitioners have more power with it than with the left, and are also able to use it with greater gentleness and delicacy. In transverse presentations, if the abdomen of the child is placed anteriorly, the right hand is said to be the proper one to use on account of the greater facility with which it can be passed over the front of the child. The left hand, however, can be introduced much more easily in the axis of the passages, the back of the hand adapts itself readily to the curve of the sacrum, and even when the child's abdomen lies anteriorly, it can be passed forwards without difficulty so as to seize the feet. These advantages are of themselves sufficient to recommend its use, and very little practice is required to enable the operator to manipulate as freely with it as with the right. If to these we add the important fact that in attempting version by external and internal manipulation, without passing the arm into the cavity of the uterus, we require the right hand to operate on the fœtus through the abdominal walls, we shall have abundant reasons for laying it down as a rule, that the left hand should be employed.

Before passing the hand and arm, they should be freely lubricated with lard or glycerine, with the exception of the palm, which is left untouched to admit of a firm grasp being taken of the fœtal limbs. It is

also advisable to remove the coat, and bare the arm as high as the elbow.

1. *Turning by External and Internal Manipulation without the introduction of the Hand into the Interior of the Uterus.*—To effect podalic version by this method, Dr. Hicks recommends the following process:—First, the position should be made out as accurately as possible: it will generally be easy to determine by abdominal palpation the situation of the breech; and when the head presents, we can generally find to which side of the pelvis the face is turned. The left hand is then to be carefully introduced into the vagina, in the axis of the canal, to a sufficient extent to admit of the fingers passing freely within the cervix. To effect this it is not always necessary to insert the whole hand, three or four fingers being occasionally sufficient.

If the head lies in the first or fourth position, it is to be pushed upwards and to the left; while the other hand, placed externally, depresses the breech towards the right. By this means we act simultaneously on both extremities of the child's body, and easily alter its position. The breech is to be pushed down gently but firmly, by gliding the hand over the surface of the abdominal wall. The head will now have passed out of reach, and the shoulder will have arrived at the os, and will lie at the extremities of the fingers. This is similarly pushed upwards in the same direction as the head, the breech at the same time being still further depressed, when the knee will come within reach of the fingers. The membranes are now ruptured, if still unbroken, and the inferior extremity seized and pulled down. Version

may be facilitated by changing the position of the external hand, and pushing the head upwards, after it has cleared the brim of the pelvis. Occasionally the depression of the breech brings the foot immediately over the os, when it can be seized instead of the knee. These manipulations should always be carried out in the intervals between the pains, and desisted from when they come on; and where they recur with great force and frequency the advantage of chloroform will be particularly apparent. In the second and third positions, when the face is turned towards the left ilium, the steps of the operation should be reversed; the head being pushed upwards and to the right, the breech downwards and to the left. When the position cannot be made out with certainty, it will be well to assume that it is the first, since that is the one most frequently met with; and, even if it be not, no great inconvenience is likely to occur, since the knees will be brought within easy reach of the fingers. If the os is not sufficiently open to admit of delivery being concluded, the lower extremity can be retained in its new position by pressing it with one finger against the pubes until dilatation is sufficiently advanced, or until the uterus has permanently adapted itself to the altered position of the child, which will generally be effected in a short space of time. In transverse presentations the same measures are to be adopted, the shoulder being pressed upwards through the os in the direction of the head, while the breech is depressed from without.

In these cases the latter step alone is frequently sufficient to bring the knees within reach, especially if the membranes are entire; but the version is much facilitated

by pressing the head upwards from without, alternately with depression of the breech. If, however, the waters have escaped, and the uterus is firmly contracted round the body of the child, it will be found impossible to effect an alteration in its position without the introduction of the hand, when the ordinary method of turning must be resorted to. The peculiar advantage of Dr. Hicks's process is, that it in no way interferes with the more general method of performing version, for should we not succeed in the way he recommends, the hand can be passed on without withdrawing it from the vagina, and the feet or knees seized and brought down.

2. *Turning in a favourable case, in which the waters have not escaped, or have only recently done so, where the os is sufficiently dilated, but in which the hand is introduced within the cavity of the uterus.*— The first step, and one of the most important, is the introduction of the hand and arm. The fingers should be pressed together in the form of a cone, the thumb lying between the rest of the fingers, and the hand, thus reduced to the smallest possible dimensions, is to be slowly and carefully passed into the vagina, in the axis of the outlet, during an interval between the pains. It should then be passed onwards in the same cautious manner and with a semi-rotatory motion, until it lies entirely within the vagina, the direction of introduction being gradually changed from the axis of the outlet to that of the brim. If uterine contractions come on, the hand should remain passive until they are over, and it should ever be borne in mind, as one of the fundamental rules in performing version, that we should act only in the absence of pains,

and then with the utmost gentleness—all force and violent pushing being strictly guarded against. The hand, still in the form of a cone, will now have arrived at the os, and if this is sufficiently dilated, it may be passed through at once. If it is not quite open, but dilatable, the points of the fingers should be gently insinuated, and spread out from time to time, so as to press it open sufficiently to permit the rest of the hand to pass. While this is being done, the uterus should be steadied by the unemployed hand placed externally, or by an assistant, to prevent its receding from the operator. If the presentation should not previously have been made out with accuracy, we can now positively ascertain how to pass the hand onwards, so that its palmar surface may correspond with the abdomen of the child. If we have to do with a case of entire placental presentation, the hand should be passed at that point where the placenta seems to be least attached, which can generally be made out before commencing the operation. This will in all cases be better than attempting to perforate its substance, a measure sometimes recommended, but more easily performed in theory than in practice. If the placenta should only partially present, the hand should of course be inserted at its free border. The membranes should now be ruptured—if possible, during the absence of a pain—so as to prevent the waters being forced out. However, the hand and arm in the vagina form a most efficient plug, and the liquor amnii cannot escape in any great quantity. Some practitioners recommend that, before rupturing the membranes, the hand should be passed onwards between them and the uterine walls, until we reach the

situation of the feet. By so doing, however, we run the risk of occasionally forcibly separating the placenta, besides having perhaps to introduce the hand much farther than necessary, since the feet may often be found quite close to the os. As soon as the membranes are perforated, the hand can be passed onwards in the direction of the feet. At this stage of the operation increased care is necessary to avoid anything like force, and should a pain come on, the hand must be kept perfectly flat and still, rather pressing on the body of the child than on the uterus. If the contractions are strong, much inconvenience may be felt from the pressure of the muscular walls, and were we to continue the onward movement at this time, or even to keep the hand bent in the conical form in which we introduced it, we might easily cause rupture and laceration of the parietes. This is not, however, likely to occur in the class of cases we are now considering; for it is chiefly when the waters have long escaped that the introduction of the hand is a matter of difficulty. Valuable assistance may now be given by pressing the breech downwards, which will bring the knees or feet more easily within reach of the internal hand. Having arrived at the knees or feet, they may be seized between the fingers, and drawn downwards in the absence of a pain. This will cause the fœtus to revolve on its axis, the breech will descend, and, at the same time, the ascent of the head may be assisted by the right hand from without. It is a question with many accoucheurs, what part of the inferior extremities should be seized and brought down. Some recommend us to lay hold of both feet,

others prefer to seize one only, while some consider it better to content ourselves with one or both knees. Dr. Simpson has well observed that, in a simple case of turning, before the escape of the waters, it does not much matter which of these plans is followed, since version is then accomplished with the greatest ease by any one of them. The seizure of the knees, however, instead of the feet, offers certain advantages which should not be overlooked. They afford a better hold, the fingers being inserted in the flexure of the ham, and being nearer the spine of the child, traction on them acts more directly on its body, and admits of version being accomplished with greater ease. Any danger of mistaking the knee for the elbow may be obviated by remembering the simple rule, that the salient angle of the former looks towards the head of the child, of the latter towards its feet. Certain advantages may also be gained by bringing down one foot or knee only, instead of both. When one inferior extremity remains flexed on the body of the child, the part which has to pass through the os is larger than when both legs are brought down, and consequently it is more perfectly dilated, and less difficulty is likely to be experienced in the delivery of the rest of the body; so that the risk to the child is materially diminished.

In arm presentations it is advisable to bring down, if possible, the knee farthest from, and opposite to the presenting arm; by this means the body is turned round on its own longitudinal axis, and the presenting arm or shoulder more easily withdrawn from the os. When, however, rapid delivery is necessary

for the sake of the mother, it would be well to lay hold of and bring down both extremities at once, as stronger traction can be made on the two limbs together, and the child can thus be removed sooner than in any other way. Whichever plan be pursued, as soon as the alteration in the position of the child is accomplished, and the lower extremity is brought through the os, the case is converted into a foot or knee presentation; and it comes to be a question whether delivery should now be left to nature or terminated by art. This must depend to a certain extent on the case itself, and on the cause which necessitated version; but generally it will be advisable to finish delivery without unnecessary delay. To accomplish this, downward traction is now made during the pains, and desisted from in the intervals. As the umbilical cord appears, a loop should be drawn down, and if the hands are above the head, they must be disengaged, and brought over the face, in the same manner as is necessary in an ordinary footling presentation. The management of the head after it descends into the cavity of the pelvis must also be conducted as in labours of that description. In placenta prævia it will frequently be very advantageous not to hasten delivery after the feet have passed through the os, for they form of themselves a most efficient plug, and effectually prevent farther loss of blood; while, if the patient has been previously much exhausted, she may have her strength recruited by stimulants, &c., before the completion of delivery.

3. *Turning in unfavourable cases, in which the Membranes have been long ruptured, the Shoulder*

and Arm pressed down into the Pelvis, and the Uterus contracted round the Body of the Child.—The cases included under this heading are frequently most trying to the practitioner. The uterus is firmly and spasmodically contracted round the child, and our attempts to introduce the hand often only make matters worse by inducing more frequent and stronger pains. Even if we succeed in passing the hand and arm, we are likely to meet with much difficulty in causing the body of the child to revolve; for we have no longer the fluid medium present in which it formerly floated and moved with ease, and the arm of the operator may be so cramped and pained by the pressure of the uterine walls as to be rendered almost powerless for the time being. The risk of laceration and rupture is also fearfully increased, and the care necessary to avoid so distressing an accident adds much to the difficulty of the operation. In these perplexing cases various methods have been practised to cause relaxation of the spasmodically contracted uterine fibres, such as copious venesection in the erect attitude until fainting is induced, warm baths, tartar emetic, opiates, and similar depressing agents. None of these, however, are so useful as the free administration of chloroform, which also possesses the advantage of producing its effects at once, and rendering further delay unnecessary.

The hand is to be introduced in the manner and with the precautions described in the former section. If the arm be completely protruded into the vagina, we should pass the hand along it as a guide, and no advantage can be gained by removing or attempting to replace it as is

sometimes recommended. When the os is reached our difficulties commence, and if the shoulder is firmly pressed down into the brim of the pelvis, it may not be easy to insinuate the hand past it. It may be allowable to repress the presenting part a little, but we must be cautious not to do so to any great extent, for fear of pushing the limbs of the child against the contracted uterine parietes, and so causing rupture. It is better to insinuate the hand gently past the obstruction, which can generally be effected by patient and cautious endeavours. Having succeeded in passing the shoulder, the hand is to be pressed forwards in the intervals, being kept perfectly flat and still on the body of the fœtus when the pains come on. It is much safer to press on it than on the uterine walls, which might easily be ruptured by the projecting knuckles. When the hand has advanced sufficiently far it will be better, especially in this class of cases, for the reasons already mentioned, to seize and bring down one knee only, and that the one farthest from and opposite to the presenting shoulder. Even when the knee or foot has been brought through the os, it is not always easy to effect the alteration in the position of the child, for the shoulder is frequently firmly fixed in the pelvic brim, and does not rise towards the fundus of the uterus. Some assistance may even then be derived from pushing the head upwards from without, which of course would raise the shoulder along with it. If this should fail, however, we may effect our object by passing a noose of tape round the limb which has been drawn through the os, and pulling downwards with it in the axis of the brim, while the other hand is passed into

the vagina to displace and push upwards the shoulder. It is evident that we cannot do this as long as the limb is held by the left hand, as there is not room for both hands to be passed into the vagina at the same time. As soon as version is completed the case is reduced to one of footling presentation, and delivery may be terminated in the manner already described.

Should we fail, however, in completing the operation after a cautious trial, no resource is left but the removal of the child by decapitation or evisceration. But this alternative will seldom be found necessary, as with due care we shall often succeed in performing turning even under the most unfavourable circumstances.

SUMMARY.—1. Version consists in the artificial substitution of one portion of the fœtus for another which originally presented, and may be required either on account of the mother alone, the child alone, or both together.

2. It is necessary in all cases of malpresentation of the child in which delivery is impossible without alteration of its position. These include arm, shoulder, and transverse presentations of every description.

3. In these cases an early discovery of the malpresentation is of the greatest importance, since the success of the operation, and the facility with which it may be performed, depend to a great extent on the period at which it is undertaken.

4. In placenta prævia version should be performed as soon as the os is sufficiently dilated, but only if the patient is in a state to bear the shock of the operation with safety. If she is greatly exhausted, puncture of the membranes, or partial or entire separation of the placenta, should be preferred.

5. In accidental hæmorrhage version may be necessary, if puncture of the membranes has failed to bring on sufficient uterine contraction to arrest the hæmorrhage.

6. In cases of pelvic deformity turning may be resorted to as a substitute for craniotomy, when the contraction is not more than $2\frac{3}{4}$ inches in the antero-posterior diameter of the brim. Even if we have doubts of its success, we should give it a fair trial when we know that

the child is living, since craniotomy may still be performed if we fail to effect delivery by version.

7. It may also be used, in certain favourable cases, as a substitute for the long forceps, especially if the os is dilated and the head is freely moveable above the brim. But the forceps will generally be preferred as safer to the child, and may at least be cautiously tried before resorting to version.

8. In prolapse of the cord turning may sometimes be justifiable; it cannot, however, come into consideration before rupture of the membranes. If reposition has been tried and failed, if the head is moveable above the brim, and if the failing pulsations of the cord indicate danger to the child, turning should be performed.

9. It may also be required in certain complications. In convulsions the introduction of the hand is peculiarly dangerous, and it should be avoided unless immediate delivery is very strongly indicated. In rupture of the uterus, turning should be resorted to if the child is still retained in the uterine cavity; but if it has partially or entirely escaped into the abdomen, gastrotomy would probably afford the mother a better chance of recovery.

10. Version is divided into two classes, cephalic and podalic. In the former the head of the child is brought to the os, and the rest of the delivery left to nature; in the latter the feet are brought down and the labour can, if desirable, be terminated without further delay.

11. In performing version the patient should be laid on her left side, lying across the bed with her knees flexed and separated from each other. She should be restrained by assistants to prevent sudden movements.

Unless specially contra-indicated, chloroform should be administered to induce relaxation of all the parts concerned, and to ensure stillness on the part of the patient, which greatly facilitates the necessary manipulations.

12. The most favourable period for operating is when the os is fully dilated, and the membranes still entire, or when they have only recently ruptured. In some cases version can be accomplished by external and internal manipulation as soon as the os is sufficiently open to admit one or two fingers, and when rapid delivery is indicated dilatation can be effected by Dr. Barnes's fluid dilators.

13. Cephalic version is suitable for cases of transverse or neck presentation in which rapid delivery is not essential. It can only be attempted with a fair prospect of success when the waters have not escaped, and when the fœtus is freely moveable in the uterus.

14. In performing it the left hand should be introduced into the vagina, and with one or two fingers passed through the os, the shoulder or presenting part should be pressed upwards in the opposite direction to that in which the head is lying; at the same time the head should be pushed towards the os by the other hand acting through the abdominal walls. The head will thus descend upon the tips of the fingers, and can be moved between the hands at will. It should be placed over the os, while the membranes are ruptured, and should be gently retained in its new situation by pressure from without, until the uterus has moulded itself to the altered position of the child.

15. In podalic version by external and internal

manipulation, the left hand, the dorsum and fingers being carefully greased, should be passed into the vagina until it reaches the os uteri. It should be introduced in the absence of pain, and in the axis of the vaginal outlet, the direction of introduction being subsequently changed to that of the pelvic brim. The greatest caution is necessary to proceed with gentleness and to use no force. Two or more fingers are then to be inserted within the os, and if the head be found lying in the first or fourth position, it must be pushed upwards and to the left; if in the second or third, upwards and to the right. At the same time the breech is to be depressed through the abdominal wall by a gliding motion of the right hand. As the head passes out of reach, the shoulder is to be pressed upwards and in the same direction.

16. By these manœuvres the knees will generally be brought within reach of the fingers; the membranes should then be ruptured if still unbroken, and the extremities seized and pulled down in the intervals between the pains. The version of the fœtus will be greatly assisted by pushing up the head from without.

17. When the complete introduction of the hand is necessary it is passed into the vagina with the same precautions, and gradually insinuated through the os. If this should not be sufficiently open to admit the hand, it may be gently dilated by the pressure of the fingers, but this should not be attempted until it is at least the size of a crown piece, and at the same time soft and dilatable.

18. The hand may then be passed on towards the inferior extremities, but on the occurrence of a pain it

must be kept perfectly still, and laid flat on the body of the child until the uterus again relaxes.

19. The feet or knees, or one foot or knee, may then be seized and drawn downwards in an interval between the pains. Unless rapid delivery is indicated, it is unnecessary to bring down both extremities. After the child is turned the case must be managed as an ordinary footling presentation, and traction should be made with the pains, and not in their absence.

20. In most cases extraction may be completed without further delay. In some cases of placenta prævia, however, it is advisable not to hasten the termination of the labour, but simply to draw the lower extremity through the os, where it forms an efficient plug, and then to wait until the patient has sufficiently rallied from the loss of blood to bear the shock of delivery.

21. In long standing transverse presentations in which the waters have escaped, and the uterus is spasmodically contracted round the fœtus, the introduction of the hand is peculiarly difficult, and must be effected with increased care for fear of causing rupture of the uterus. It will then generally facilitate version if the knee furthest from and opposite to the presenting part is brought down, as this tends to turn the fœtus on its longitudinal axis and to draw the shoulder out of the brim of the pelvis.

22. If the shoulder will not recede after the leg has been brought down, a noose may be placed round the ankle to retain it in its position, while the shoulder is displaced by the right hand passed into the vagina. Should this fail, no other resource is left but decapitation or evisceration.

CHAPTER III.

THE FORCEPS.

HISTORY. — The first mention of obstetric forceps, having for their object the extraction of a living child, occurs in the writings of the Arabian physicians. Avicenna, who lived A.D. 1000, talks of the forceps as an instrument well known to practitioners; and Albucasis describes two varieties, one straight and the other curved, by which a living child could be extracted, and which seem also to have combined to some extent the properties of the cephalotribe, as he directs us to use them to *crush* the head, should we fail in our efforts at extraction. Whatever may have been the precise nature of this instrument, it seems to have been entirely forgotten, and practitioners were not in possession of any means of effecting delivery in difficult cases which did not of necessity involve the death of the child. Towards the latter end of the seventeenth century, Dr. Paul Chamberlen invented a forceps, which he probably constructed himself, and by the use of which he and his sons acquired great reputation and fortune in the metropolis. It was not, however, till the early part of the next century that the instrument be-

came generally known, as the inventors seem to have kept it secret for their own profit. The forceps constructed by the Chamberlens, the originals of which were discovered at their family seat in the year 1818, differ in no essential respect from the short straight forceps very commonly used in the present day, except that they were fastened by a pivot lock, instead of that now generally employed in this country; and that the handles were of metal forged in a piece with the blade, as they still are in many of the forceps used on the Continent. Since that time numberless modifications have been made in the shape and form of the instrument, few of which, however, have been of real practical value, or have stood the test of experience. The most important is undoubtedly the addition of the pelvic curve, now very generally adopted, the object of which is to adapt the instrument to the axes of the pelvis, and so greatly to diminish the risk of injury to the maternal structures. For this important improvement we are indebted to Levret and Smellie, to whom the idea appears to have occurred simultaneously. To the latter physician we also owe the idea of lengthening the instrument, by which its sphere of action is largely increased.

Description of the Forceps.—The forceps may perhaps be best described as a pair of artificial hands, by which the head of the child may be clasped and drawn through the maternal passages. They consist essentially of two separate blades of a curved form adapted to fit the child's head; a lock, by which the blades are united after introduction; and handles,

which are grasped by the operator, and by means of which our efforts at traction are made. To these are added in certain forceps a second curve edgeways, corresponding to the axes of the pelvis, which has received the name of the pelvic curve. On each of these parts of the instrument the ingenuity of practitioners has been largely exerted, and we are in possession of such a vast number of different forceps, each of which is supposed to have some peculiar advantage over its fellows, that it would be impossible to attempt anything like a comprehensive description of all the varieties. What we desire in the forceps are, facility of introduction, accurate adaptation to the head of the child and the passages of the mother, such a construction of the lock as will enable us to effect an easy junction of the blades, and power as a tractor and, to a slight extent, as a compressor. Unfortunately, the means by which one of these objects is attained frequently of necessity diminishes the value of the instrument in other directions. A perfectly-fitting instrument may prove difficult to introduce; and, on the other hand, there are forceps easy of introduction, whose powers as tractors are comparatively small. We cannot even attempt anything like a description of the various instruments employed by different practitioners. We shall therefore confine ourselves to referring to one or two varieties only, stating, as we proceed, their relative merits and demerits, and the objects for which they are specially adapted.

One of the patterns most generally used in Great Britain is the short straight forceps, commonly called

Denman's forceps. In this instrument the blades are 7 inches long, the handles $4\frac{3}{8}$ inches, the extremities of the blades are exactly one inch apart, while there is a space between them at their widest part of $2\frac{7}{8}$ inches. The blades measure $1\frac{3}{4}$ of an inch at their greatest breadth, and spring with a regular sweep directly from the lock, there being no shank as in some forceps. The blades, as in all forceps, must be formed of the best and most highly tempered steel, to resist the strain to which they are occasionally subjected, and they must be smoothed and rounded on their inner surface to diminish the risk of injury to the scalp of the child. The special advantage claimed for this form of instrument is, that the two halves being precisely similar, no care or forethought is necessary on the part of the practitioner as to which blade should be introduced uppermost—an argument of no great value, as certainly no one should undertake a case of forceps delivery who has not sufficient knowledge of the operation and presence of mind enough to obviate any risk from the introduction of the wrong blade first. On account of the shortness of this instrument, and the want of the second or pelvic curve, it is only adapted for cases in which the head is low down in the pelvis, or actually resting on the perinæum. This question of the addition of a pelvic curve is one on which there has been much difference of opinion. The forceps we are now considering, and all others formed on the same plan, are constructed solely with reference to the grasp of the instrument on the child's head, and without regard to the axes of the maternal passages into which it has to be

passed, and through which it has to be drawn. Consequently, were we to introduce it when the head was lying in any other position than low down in the pelvic cavity, we could not fail to expose the soft parts of the mother to the risk of pressure and contusion, and to render her liable to the occurrence of urinary fistulæ, lacerations, and other accidents of a like nature. Hence we may look on the second curve as essential before the complete descent of the head, although it is not absolutely so after this has taken place. The double curve is now universally used on the Continent and in America, and has been strongly recommended by many of our most eminent obstetricians. The only instance in which a straight blade can possess any superiority is, as we shall see further on, when we find it necessary to rotate the head round a large extent of the pelvis, in which case the circular sweep of a strongly curved instrument might prove injurious. Such cases, however, are of comparatively rare occurrence, and need in no way influence the general employment of the pelvic curve. The certainty with which the position of the handles guides us to a knowledge of the situation of the blade in the straight forceps, has been much talked of as an argument in favour of their employment; but this, like the similarity of the blades, is of little consequence to any who have acquired an exact knowledge of the position of the fœtal head, without which no operation should be attempted.

The short forceps usually employed in Scotland are the invention of the late Dr. Zeigler (Plate I., Fig. 2), and are useful from the facility with which the blades may be intro-

duced in accurate apposition to each other, a point which in practice is of no little value. In general size and appearance they closely resemble Denman's forceps; but the fenestrum of the lower blade is continued down to the lock. In introducing, this is slipped over the handle of the first blade already *in situ*, by which it is guided with great certainty into a proper position, locking itself as it passes on. This instrument has the disadvantage of wanting the pelvic curve; but the facility of introduction has rendered it a great favourite with many who have been in the habit of employing it. The late Dr. Hamilton of Edinburgh used a pair of short forceps with a strong pelvic curve, and with a joint in the handle of the upper blade, which was supposed to facilitate its introduction, by shortening the instrument, and so rendering the depression of the hands in introduction unnecessary, thus obviating the inconvenience of drawing the nates of the patient over the side of the bed. The late Dr. Davis, of University College Hospital, invented a short forceps, accurately adapted to the curvature of the child's head, and with the fenestra much wider than in most patterns, so that the parietal protuberances might project through them to a considerable extent. This instrument seizes a larger portion of the child's head than any other, and fits it so closely that all risk of injuring the scalp is avoided. The greatest objection to it is the difficulty experienced in introducing the unusually broad blade, and the consequent risk to the soft parts of the mother. Dr. Davis has purposely made the handles short to lessen the compressive power of the instrument, a circumstance which renders it difficult for the hand to retain a firm

grasp. These and similar instruments are only adapted for cases in which the head is resting on the perinæum, or is low down in the pelvic cavity; when it is still above the brim, or even high in the pelvis, a longer instrument is essential to enable us to reach it. To meet this indication Smellie invented the long forceps, which, like the shorter instrument, have been very variously modified since his day. The most perfect instrument of the kind employed in this country is probably that known as Simpson's forceps (Plate I., Fig. 1), which combine many excellent points selected from the forceps of various obstetricians, as well as some original additions. The curved portions of the blades are $6\frac{1}{4}$ inches long, with a fenestrum measuring $1\frac{1}{4}$ inch at its widest part. The extremities of the blades are 1 inch asunder when the handles are closed, and 3 inches at their widest part. The object of this somewhat unusual width is to lessen the compressing power of the instrument, without in any way interfering with its powers as a tractor. The pelvic curve is less than in most long forceps, so as to admit of the rotation of the head when necessary, without the risk of injuring the maternal structures. Between the curve of the blade and the lock is a straight portion or shank, measuring $2\frac{3}{8}$ of an inch, which, before joining the lock, is bent at right angles into a knee. This shank is a useful addition to all forceps, and is essential in long forceps, to ensure the junction of the blades beyond the parts of the mother, which might otherwise be caught in the lock and injured. The knees serve the purpose of preventing the blades slipping from each other after they have been united. They also admit of one finger being

introduced above the lock, and used as a means of traction, a provision which is made in some other varieties of long forceps, by having a semicircular bend in each shank. The handles also, which in most British forceps are too small and smooth to afford a firm grasp, are serrated at the edge, and flattened from before backwards, so as to fit more accurately the closed fist. At the extremities near the lock there are a pair of projecting rests, over which the fore and middle fingers may be passed in traction, thus greatly increasing our power over the instrument. They measure $4\frac{1}{2}$ inches from their extremities to the lock, which is of the same pattern as in Denman's and most other English forceps, only somewhat more loose, to admit of lateral motion. Although these and other varieties of the long forceps are specially constructed for application when the head is high in the pelvis, they answer quite as well as the short forceps, indeed in some respects better, when it has descended low down. Having, therefore, selected and accustomed ourselves to the use of a particular pattern, we may with propriety employ it on all occasions, without encumbering ourselves with a number of instruments of various shapes and sizes. The forceps usually employed on the Continent, and to a great extent in America, differ considerably, both in appearance and construction, from those in use in this country. As a rule, they are larger and more powerful instruments, joined by a pivot or button joint, and always possessing the second or pelvic curve. Of late years, however, in some parts of Germany, more especially in Vienna, Simpson's forceps have been much employed.

The French forceps are all more or less modifications of Levret's instrument, the handles being forged in a piece with the blade, and curved at their extremities to serve, when necessary, as blunt hooks. Forceps modelled on this type have never met with much approval from English practitioners, partly from their great size and formidable appearance, and partly from a dread of using so powerful an instrument. The latter objection, however, seems to be based on erroneous reasoning; for, as has been well shown by Dr. Barnes, it is no advantage to work with an instrument deficient in power, and, in consequence, to have to resort to increased muscular effort to supply the defect, should strong traction be requisite. It is not very difficult to use a powerful instrument with as small a degree of force as may seem necessary. Much more valid objections to most foreign instruments may be found in the construction of the lock, which is less easy of adjustment than that used in this country; and in the narrowness of the blades, which are apt to slip unless an amount of compressive force is used which might prove injurious to the child.

Action of the Instrument.—The forceps are generally said to act in three different ways :—

1st. As a tractor.

2nd. As a double lever.

3rd. As a compressor.

It is more especially as a tractor that the instrument is of value, and it is used with the greatest advantage when it is employed merely to supplement the powers of the uterus, which are either insufficient of themselves to

effect delivery, or when from some complication it is necessary to complete it more rapidly than the unaided powers of nature are capable of.

The forceps also are useful to a less extent as a lever, but this action of the instrument seems to have been greatly exaggerated. It is generally described as a lever of the first class, the power being at the handles, the fulcrum at the lock, and the weight at the extremities. There may possibly be some leverage power of this sort when the instrument is first introduced, and the handles held so loosely that one blade is allowed to work on the other. But as ordinarily used, the handles are held with a sufficiently firm grasp to prevent this movement, and then the two blades practically form a single instrument. A little consideration will show that when thus employed the forceps can form only a lever of the second sort, the fulcrum being that portion of the head on which the extremities of the blades rest, the power being at the handles, and the weight between the two. This action is doubtless occasionally of great value in assisting delivery, but it must always be subservient to direct traction.

Regarding the compressive power of the instrument there has been much difference of opinion. The well-known experiments of Baudelocque seem to show that its powers as a compressor are at best extremely limited; but these are possibly open to objection, as having been performed on dead children. We should bear in mind, however, that in cases of protracted labour the head has been already moulded and compressed, and the bones made to overlap each other to their utmost extent, by

the sides of the pelvis; and we can therefore scarcely expect to diminish it much more by the forceps, without employing an amount of force that might seriously endanger the life of the child. In such cases the head has already been lessened as much as possible, and a little extra traction, such as the forceps affords, is sufficient to effect delivery with ease.

It is well to remember also that in most cases of contracted pelvis, the pressure of the forceps is exerted on that portion of the child's head which occupies the most roomy diameter of the pelvis, and that in which there is no want of space. If this pressure does not increase the opposite diameter which is in apposition to the narrowed portion of the pelvis, it at least can do nothing towards lessening it, and diminution of any other part of the child's head is not required. The mere introduction of the forceps may excite increased uterine action through the reflex irritation induced by the presence of a foreign body in the vagina. This has been called the dynamical action of the forceps, but it cannot be looked upon in any other light than that of an occasional accidental result of the employment of the instrument.

CASES IN WHICH THE FORCEPS MAY BE USED.—We have next to take into consideration the various circumstances which call for the use of the forceps. These may conveniently be classed under the following heads:—

I. *Deficient and Irregular Action of the Uterus.*—In this division we include all the cases in which the head or face is presenting, where the maternal passages and

the head of the child are of the normal size, and where there is nothing to delay the termination of the labour but a deficiency or irregularity of uterine action. The most common cases of this sort are those of uterine inertia, in which the pains have originally been strong and effective, but in which—either from inherent weakness, advanced years, frequent child-bearing, inability to overcome the obstruction from a rigid perinæum, or some similar cause—they have become gradually weaker and fewer in number, until at last they either cease entirely or have no effect on the progress of the labour. There are also a number of cases which may be included under this head, in which the pains, though frequent, are, from some peculiar condition, useless and ineffective. Such are cases of uterine neuralgia or rheumatism, irregular action of the fibres, and the like. In all these the forceps may be looked upon as taking the place of the pains, and it is in them that their use is most frequently called for, and their value most typically displayed.

There has been much difference of opinion among accoucheurs as to the circumstances which call for artificial assistance, and the period at which we ought to afford it. In the cases we are considering we may look upon it as an axiom, that the use of the forceps need not be contemplated until the completion of the first stage. As long as the os is not fully dilated, and the liquor amnii has not escaped, the mere prolongation of the labour can have comparatively little influence on either the mother or child. After the second stage has commenced, however, the statistics of

deliveries and practical experience teach us that the risk to both is in direct proportion to the duration of the labour. It is then that the soft parts of the mother are subjected to the irritation resulting from the pressure of the fœtal head, without the intervening fluid medium which, before the escape of the waters, protected them from injury; and it is then also that the body of the child is for the first time directly grasped by the contracting uterus, and that immediate danger to its existence from delay is to be feared. The indications which the risk to the child affords for artificial assistance will be considered under another division; in this we shall confine ourselves to those circumstances which directly concern the mother. It is well, however, to bear in mind, that as we shall find the risk to the child's life to be in direct proportion to the duration of the second stage, the tediousness which is likely to prove injurious to the mother must always at the same time necessarily place the life of the child in jeopardy. As long as the head advances during the pains, and recedes during the intervals, no great danger to the passages need be feared. It is the steady *continuous* pressure, when the head is arrested in the pelvis without either advancing or receding, that is so much to be dreaded. Then, indeed, the length of time which the head has remained impacted cannot fail to become an important element in guiding us to our decision, for the mere contusion to which the soft parts of the mother have been subjected will render them liable to inflammation and sloughing, and a formidable train of subsequent evils. Independently of this, the swelling of the vagina and fœtal scalp

produced by impaction may in time be sufficient to prevent the introduction of the forceps, and thus oblige us to resort to craniotomy, which might have been prevented by a more timely use of the instrument. The two well-known rules which have been so frequently laid down for our guidance in such cases, that we should wait till we can feel an ear, and till the head has rested six hours on the perinæum, have both been productive of much mischief when blindly and injudiciously followed. For not only is the detection of the ear unnecessary to guide us to a knowledge of the true position of the child's head, but the use of the instrument is often urgently called for before the head has descended low enough through the pelvis to admit of the possibility of our touching it. The second rule is still more likely to mislead, for the cases are very numerous in which the state of the mother renders immediate delivery imperatively necessary long before the lapse of six hours, without at all taking into consideration the risk to which such a delay would subject the child. A better rule taken from the mere duration of labour is that given by Dr. Ramsbotham, that instruments will be required if the labour has lasted four-and-twenty hours after the rupture of the membranes, or if the head has become impacted for four hours. Even these periods, however, afford no safe guide, except perhaps as indicating the maximum of delay, and it will frequently be found advisable to interfere long before they have been reached. In the class of cases included under this heading we look upon the operation as taking the place of the natural la-

bour-pains. As soon, therefore, as we are convinced that the natural powers are insufficient to effect delivery, we are justified in resorting to artificial aid. There are certain symptoms described in works on midwifery, indicating exhaustion of the powers of the mother, which it should be our object to anticipate and prevent by a timely use of the instrument. These are chiefly a rapid and hurried pulse, over 100 beats in the minute; anxious countenance, with a dark halo under the eyes; shivering; vomiting, frequently of coffee-coloured matter; coldness of skin with clammy perspiration; the passages becoming hot, swollen, and dry, with an offensive greenish discharge from the vagina; low muttering delirium; and tenderness of the abdomen. It cannot be too strongly borne in mind that the proper aim of the obstetrician should be, not to act after these symptoms have become developed, but so to manage the labour that by a proper interference he should prevent their occurrence. On the other hand, when the pains are steady and not gradually decreasing in force and intensity, and are advancing the head even though slowly, and the state of the mother affords no indication that the system is likely to suffer from the prolongation of the labour, its mere duration will not justify our interfering on her account alone, although, as we shall see under another heading, it may afford a strong indication for delivery on account of the risk to the child.

II. *Disproportion between the Head and the Maternal Passages.*—A want of due proportion between the head of the child and the passages through

which it has to pass may arise from very different sources, and the indications for operative interference will differ accordingly.

Amongst causes referable to the mother we may reckon deformity of the pelvis, either at the brim, cavity, or outlet, and diminution of the calibre of the passages from tumours or cicatrices; while an unusually large and ossified head, or the descent of a hand or arm along with the head, may be looked upon as the principal sources of a want of proportion due to the child.

The most common pelvic deformity requiring the use of the forceps is a narrowing of the antero-posterior diameter of the brim, such as results from rickets in childhood. Here the promontory of the sacrum projects forward, narrowing the diameter from the sacrum to the pubes, while the transverse and oblique diameters are increased rather than diminished. This narrowing of the sacro-pubic diameter may vary much in degree. In some cases the head seems unable to enter the inlet of the pelvis, and remains mobile above it; while in others there is sufficient space to permit the presenting part to become engaged and wedged into the upper strait, but not enough for the completion of delivery without artificial aid. When there is deformity which calls for assistance, the head being still above the brim, we have three methods of practice which have to be considered, namely, turning, the application of the long forceps, and craniotomy. Should the head have already become engaged in the pelvis, turning is excluded.

In any case it is an imperative rule that we are not to contemplate the operation necessarily involving the death of the child, unless we have positively convinced ourselves that delivery is impracticable by either of the other methods. It may be taken for granted that a living child cannot pass through the pelvis, unless the antero-posterior diameter of the brim measures at least $2\frac{3}{4}$ inches. In a pelvis which is contracted to a less extent than this, it may be possible to render such assistance as will allow a living child to pass. If the head is still above the brim, we may be able to introduce the forceps laterally in relation to the sides of the pelvis, and to seize the head in its occipito-frontal diameter, which will be found lying in the transverse diameter of the brim, or between it and the oblique. Although the pains may have proved insufficient to force the head through the narrowed inlet, yet a little extra assistance by means of the forceps may enable us to effect this object without much difficulty. Many obstetricians refer the action in these cases to the compressive powers of the instrument. Even were this power admitted, it could only act by diminishing the occipito-frontal diameter of the head, which is precisely the one that least requires it, as it lies in relation to that diameter of the pelvis which is more than usually long. It is much more probable that the beneficial result arises from its traction power, which pulls the head down to a certain extent, and thus allows its bi-parietal diameter to be compressed and moulded between the promontory of the sacrum and the pubes,

the precise direction in which shortening is required. The alternative operation, when the head is mobile above the brim, is turning, a course of practice followed by Smellie and the older obstetricians, but which had fallen into disuse until its revival by Dr. Simpson, whose able arguments have done much to recommend it to the profession.

The relative merits of the two operations will be found more fully discussed elsewhere (see p. 35); it may suffice to say here, that turning is every day coming more and more into use in such cases. In determining which operation we shall resort to, we must bear in mind that the application of the forceps when the head is above the brim, is no trivial or easy matter; and unless the operation be carefully and skilfully conducted, the introduction of the blades might inflict serious injuries on the soft parts of the mother.

After the head has passed through the brim, and is detained in the cavity, no choice is left us. This happens for the most part when the pelvis is of the masculine, slightly ovate, and funnel-shaped varieties, or when the head of the child is unusually large and firmly ossified, or when a hand or arm descends along with it. In these cases, the want of proportion between the pelvis and head is usually not great, and a little extra traction will very generally suffice to effect delivery, provided the forceps be applied sufficiently early, before the head has been detained long enough in the cavity to give rise to swelling of the soft parts, and so to cause a degree of impaction that might render craniotomy unavoidable. In all such cases, before resorting to the latter distressing

alternative, a cautious trial of the forceps may at least be made. It may happen, however, that the disproportion between the head and the cavity of the pelvis is sufficiently great to fix the head firmly in the bony passages, and so to give rise to the true condition of locked or impacted head. The most frequent cause of this is probably a masculine pelvis, combined with a large or ossified head, which becomes jammed between the tuberosities of the ischia. Such cases are not very commonly met with, as an essential element in their production is that the brim should be wide enough to permit the passage of the head, while the cavity is too narrow to allow it to progress; while the latter condition is generally associated with sufficient deformity of the brim to prevent the descent of the head at all. They must be carefully distinguished from those cases in which the pelvis is diminished in size, and in which the head is arrested but not firmly fixed. These may become cases of impaction from subsequent swelling of the soft parts, but the term is inapplicable as long as there is any movement of the head, or when the finger can be passed between any part of it and the pelvis. When, however, they do occur they are difficult to deal with, for the head being firmly wedged between the contracted sides of the pelvis, the attempt to introduce the blades of the forceps is far from unlikely to seriously damage the maternal structures, which are already subject to the risk of inflammation and sloughing from the continuous pressure of the head. Should auscultation have led us to infer the death of the child, there can be no doubt of the propriety of per-

forating; and even without this assurance we may have to resort to this alternative if we feel convinced that it is unsafe to introduce the forceps, or after the failure of a cautious attempt. In labours obstructed by cicatrices or pelvic tumours, in which the use of the forceps is indicated, it may be advisable to apply them early, not only to draw the child past the obstruction, but to save the mother from the risk of contusion to the tumour or cicatrix, which forms one of the great dangers in these cases.

Under this heading may also be included those cases in which the obstruction is caused by a rigid and unduly resistant perinæum, which does not yield to the pressure of the head. In many cases of this kind, the uterine contraction becomes gradually more and more feeble, and these are subject to the rules of treatment already indicated. Sometimes, however, the pains remain strong and frequent, but on account of the resistance offered by the perinæum, delivery is unduly delayed. This most frequently occurs in primaparæ, and very little assistance is required. All we require to do is to draw the head past the obstruction, so as to allow the natural extension to be effected, and this can often be done with the greatest ease.

III. *Danger to the Child as an Indication for the Use of the Forceps.*—Danger to the infant from a prolonged labour has not been very generally considered an indication for artificial delivery; and yet few obstetricians would deny that it is the duty of the practitioner to use every means which science places at his disposal to ensure the birth of a living child. It may

be admitted as an axiom in operative midwifery, that the safety of the fœtus is a secondary consideration to that of the mother; but, if by any means in our power we can convince ourselves that its life is in jeopardy, even when there is no reason whatever for terminating the labour on account of the mother alone, we believe that we should be justified in employing the forceps, provided the maternal passages are in a condition to admit of their being used with safety. The well-known researches of Dr. Simpson have shown that still-births increase in direct proportion to the length of the labour. It is not, however, till after the rupture of the membranes, and when the head has descended into the cavity of the pelvis, that delay is so hazardous to the infant. It is then that its body is forcibly compressed by the contracting uterus, and that every hour that elapses before delivery is fraught with imminent danger. The necessity of operative interference for the purpose of preserving the child has been ably taught by Dr. Hamilton of Falkirk;* and that gentleman has been able to show an amount of success in his practice unequalled by any British statistics. By a more frequent use of the forceps he has arrived at a fœtal mortality of 1 in 317 cases, and has had in his own practice as many as 731 successive births without losing a single child. The difference between these figures and 1 in 20 or 30, which is about the average in Great Britain, is so startling as to demand our closest consideration. Dr. Hamilton's practice is never to wait more than a quarter of

* *Edin. Med. Journ.*, Oct. 1862.

an hour after an ear can be felt; but, if delivery is not effected in that time, immediately to apply the forceps, which he has been in the habit of using once in every eight cases; nor do his statistics show that the maternal mortality has been in any way increased. It is very possible, and indeed probable, that a less frequent use of the instrument would have served the same purpose, and that Dr. Hamilton may have employed it very often when nature was quite competent to complete the labour with safety both to the mother and child. Allowing this, however, the success of his practice is still such as cannot fail to demand the earnest attention of the profession to the important question whether many fœtal lives might not be saved by a more frequent resort to the forceps than has been usual in this country. It is to be observed that the operation on this ground is not likely to be called for until the head is quite low in the pelvis, for it is only then that danger arises; and it is in these cases that the application of the instrument is comparatively easy, and the risk to the mother very slight. It is fortunate that the practice of auscultation has placed in our hands a means of ascertaining with tolerable certainty when the life of the child is threatened, a means which, unfortunately, is not so much employed in ordinary midwifery practice as its value would indicate. It seldom happens that a child dies in the course of labour without our being able to foretell the occurrence by the changes in the fœtal circulation which invariably precede death. This is a fact which has been conclusively proved by the teachers of the Dublin School of Midwifery, who have ably inculcated the necessity of resorting

to fœtal auscultation; but who have, unfortunately, chiefly employed it as a means of ascertaining that the fatal result has actually taken place, rather than for the more noble purpose of warning us when to interfere so as to prevent it. After the discharge of the liquor amnii there is seldom any difficulty in hearing the pulsations of the fœtal heart, as the intervening medium, which formerly obscured its sounds, has disappeared, and as the uterus is then more closely contracted round the body of the child. Should the circulation be failing, frequent auscultation will enable us to distinguish a gradual diminution in the force and intensity of the pulsations, which at the same time become less frequent. Occasionally, however, the heart's sounds, although less strong, are increased rather than diminished in frequency, and at the same time become distinctly intermittent. Dr. Simpson believes the former change to be due to pressure on the umbilical cord, and the latter to pressure on, or other irritation of, the nervous centres. However this may be, both these changes indicate that the life of the child is endangered. When, therefore, we have convinced ourselves that either of them has occurred, an indication for artificial delivery is afforded, more especially if the head be low down in the pelvis, and the soft parts sufficiently dilated to allow an easy application of the instrument. Whether we should be justified in using the forceps on this account, if the indication should arise when the head was still high in the pelvis, is a more difficult question to answer, as there can be no doubt that the risk to the mother would thereby be increased. But even in this case we believe that the

chance of saving the child would sanction the interference. To acquire the necessary information, frequently-repeated and careful auscultation, whenever there is unusual delay in the second stage, is imperatively called for.

IV. *Complications which may call for the use of the Forceps.*—There are various accidents and complications liable to occur during the course of labour, which may render necessary the application of the forceps. Of these, the most important are convulsions, prolapse of the cord, rupture of the uterus, and hæmorrhage. With regard to any of the circumstances which may render immediate delivery necessary, it is a good practical rule to remember, that we should effect it by the operation which is most easily performed, and least likely to be injurious to the mother or child. If, therefore, the head be still above the brim, and not engaged in the cavity of the pelvis, we shall generally be able to deliver more expeditiously and safely by turning, than by the application of the long forceps. If, however, the complication should occur after the head has become engaged in the pelvis, especially when it is low down in the cavity, we shall have to resort to the forceps.

Convulsions. — In considering the advisability of terminating the labour during an attack of convulsions, we shall be best guided by a careful consideration of the individual case, bearing in mind the valuable practical rule so well laid down by Dr. Tyler Smith, "that whenever artificial delivery can be effected with less irritation than would be produced by the continuance of the child in the parturient canal, and its expulsion by the natural

process, it is advisable that it should be performed, if the situation of the mother be perilous." It is, however, a question which must invariably require the most anxious consideration. It must be borne in mind, that there are numerous cases of convulsions where the immediate exciting cause is quite independent of the presence of the child in the uterus, and in which the delivery may be safely left to the natural powers, which frequently partake of the morbid muscular activity, and act with greater energy than they would have done had this complication not occurred. However, this action, though powerful, may be discordant and irregular, and artificial aid may be called for. There are also a large number of cases of convulsions in which the direct exciting cause is the presence of the child's head on the soft parts of the mother, especially after it has passed through the os, the principal incident nerves in the chain of reflex actions terminating in convulsions being those which are distributed to the vagina. In these we may reasonably expect that the convulsive paroxysm will abate when we have succeeded, by emptying the uterus, in removing the principal source of irritation. We must remember, however, before deciding on the course to be pursued, that operative interference will be more than usually difficult, on account of the contortions and violent movements of the patient, and that the introduction of the hand for turning, or of the forceps, may act as a fresh source of irritation. Instances are not wanting in which the most violent and fatal paroxysms have been brought on in this way. Having determined that delivery is called for, the situa-

tion of the head will guide us to the operation we should select. When the os is dilated, and the waters have not escaped, or have only recently done so, turning will doubtless be performed with greater ease and safety than the introduction of the long forceps; but when the head is low in the pelvis, the forceps are our only resource, and it is in these cases that the value of anæsthesia will be specially apparent, by its power of controlling the convulsive movements sufficiently to admit of the introduction of the instrument without the risk of laceration and injury to the mother.

Hæmorrhage. — It may be advisable to apply the forceps in either accidental or unavoidable hæmorrhage, especially the former, if the loss of blood continues after the head has engaged in the brim of the pelvis.

Prolapse of the Cord.—In this complication, should the head have descended into the pelvis, and the failing pulsations of the cord indicate danger to the child, the application of the forceps is perfectly justifiable to save its life, provided the soft parts of the mother are in a proper condition for the operation, and the usual means of obviating the necessity for interference, by reposition of the cord and otherwise, have been fairly tried and failed.

Rupture of the Uterus.—When rupture takes place, the presentation generally recedes, in consequence of part of the child escaping through the rent in the walls of the uterus. Should this not occur, however, and the head be within easy reach, speedy delivery should be effected by means of the forceps.

In certain diseases from which the mother may be

suffering at the time of labour,—such as peritonitis, organic diseases of the heart or lungs, &c.—it may be advisable to effect delivery by means of the forceps to save the mother from the pain or danger to which a continuance of the labour might subject her. For these cases no general rules can be laid down, as each must be conducted according to the indications arising at the time.

Hernia.—It may happen that a woman in labour suffers from hernia, or the straining efforts may have produced one at the time. In either case, should the forcing cause great protrusion of the intestine, and we fear the possible strangulation of the mass, we should be quite justified in applying the forceps, provided the head were sufficiently low down in the pelvis.

In *breech* or *footling cases*, in which the head is detained after the birth of the body, the forceps are occasionally necessary to complete the delivery.

Preliminary Precautions.—Before attempting to introduce the forceps there are several points to which we must carefully direct our attention :—

1. Is the os sufficiently dilated to allow the instrument to pass with safety to the maternal structures? It has been laid down as a positive rule by many obstetricians, that no case can be considered suitable for the use of the instrument unless the os has entirely passed out of reach of the finger. Although this direction may be safely accepted for general guidance, we must bear in mind that exceptional cases are occasionally met with in which it may be quite justifiable

to introduce the instrument, although a considerable portion of the os can still be felt. Such are the cases which are every now and then occurring, in which the anterior lip of the os is jammed down in front of the head, and is within reach long after indications for operative interference have arisen. Again, when the head is still above the brim, we may find it necessary to introduce the forceps before the os is dilated to its full extent, and in these instances, indeed, it may be necessary to insert the blades of the instrument a considerable distance within the uterus. Although, therefore, we cannot accept the rule as one to be invariably followed, yet the occurrence of any case in which we may be called to transgress it, will require redoubled care and caution on our part to prevent injury to the soft parts of the mother. It is besides necessary that the perinæum and the rest of the maternal structures should be sufficiently soft and dilatable to permit the head to pass without danger of serious laceration. It seldom happens that they are so rigid as to contra-indicate the introduction of the forceps, and slow and cautious efforts at extraction will very generally effect sufficient dilatation to allow the head to pass with safety.

2. It is imperative for the proper application of the instrument that we should carefully ascertain the exact position of the head, and its relation to the pelvic cavity. Unless we are careful with regard to this point, we run the risk of severely injuring both the mother and the child. In the majority of forceps operations the blades of the instrument are to be passed over the lateral regions of the child's head, and unless we know exactly

at what portion of the pelvis these are situated, we should scarcely be able to reach them with any certainty. To acquire this knowledge it is not necessary that we should be able to feel an ear, although this would undoubtedly facilitate our research ; and when it is within reach, if we bear in mind that the attached portion of the lobe looks towards the face, while its free margin is turned towards the occiput, we shall readily acquire the knowledge we are in search of. When the ear cannot be felt, a careful examination of the sutures and fontanelles will answer every purpose, and it seldom happens that the scalp is so swollen as to obscure these guides. In any doubtful case, rather than operate without a precise knowledge of the position of the head, we should be justified in introducing two or three fingers, or even the whole hand, between the presenting part and the pelvic walls.

3. It is necessary to convince ourselves that the bladder and rectum are both empty. In every case we should introduce the catheter as a matter of precaution, and should we find the bowel loaded, we should clear it out by an enema.

Having satisfied ourselves as to these points, we may now proceed to the operation, but before entering on its description we may premise that in every case it will be found of essential assistance to the operator to place the patient thoroughly under the influence of chloroform, for the double purpose of procuring a stillness that will much facilitate our manœuvres, and of diminishing the shock which the performance of any operation, however trivial, is apt to produce.

DESCRIPTION OF THE OPERATION.—The forceps may have to be applied to the head after it has entered the cavity of the pelvis in any of the four positions, or after it has made the turn and is lying in the antero-posterior diameter of the outlet; or again, it may be necessary to apply them before the head has entered or when it has just engaged in the brim. The principle of application in these two classes of cases differs materially. In the former the forceps, as we have already remarked, are applied in relation to the head; the blades are usually passed over the ears and embrace the parietal protuberances which project through the fenestra of the instrument. In the latter the long diameter of the head lies in the transverse diameter of the brim, or between it and the oblique, so that its bi-parietal diameter is in the antero-posterior diameter of the brim, which in these cases is very generally contracted—hence it would be impossible to insert the forceps in this direction. We are therefore obliged to introduce the blades *not* in relation to the head, but to the sides of the pelvis. The instrument will, when properly applied, be found to lie almost in the oblique diameter of the brim, one blade passing over the occiput and the other between the brow and the temple. By introducing the instrument in this manner it will be found to lie in that diameter in which there is most room. In some parts of the Continent the forceps are introduced in relation to the pelvis, even when the head lies low down in the cavity, and when used on this principle the head is seized as when it is above or at the brim, and not laterally. Dr. Ramsbotham, in his valuable clinical illustrations

of midwifery, states that he is in the habit of using the instrument on this principle because he finds the blades pass more easily within the ilia of the mother than over the ears of the child,* but he still advocates the other plan as safer to the mother. Dr. Barnes also seems to approve of the method.† It seems, however, to be more in accordance with the natural mechanism of parturition to pass the blades over the parietal protuberances, by which means we not only acquire more perfect command over the head, but run less risk of injuring both the mother and child. The operation is generally described as of two distinct kinds, the long and the short forceps operation. We have already attempted to show that this division is unnecessary, and that one properly selected pair of forceps is amply sufficient for every case. We shall therefore take leave to discard these terms in future, and shall describe the varieties of the operation according to the position of the head, and shall first treat of the simplest case—viz., when the head is low down in the cavity, after it has made the turn and is resting on the perinæum. The peculiarities requiring notice in the various obstetric positions, and before the head has entered the brim, will be more briefly noticed in separate sections.

I. *When the Head has made its turn, and is lying in the Antero-posterior Diameter of the Outlet, with*

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* *Medical Times and Gazette*, March, 1862.

† *Trans. Obst. Soc.*, vol. ii. p. 195.

the Face of the Child in the hollow of the Sacrum.—Our first object will be to place the patient in a favourable position for the operation. In this country the ordinary obstetric position on the left side is usually selected, while in America and the Continent the patient is placed on her back, with her thighs widely separated and supported by assistants. Although the latter position is not without its advantages, the custom of placing the patient on her side in all obstetric operations is so universally prevalent in Great Britain, that it would scarcely be feasible to adopt any other, and the position on the back does not possess sufficient advantages to justify us in departing from the usual practice. We must be careful to bring the patient to the edge of the bed, so that we may be able to depress the handle of the forceps in the course of introduction, which we could not do were we to neglect this precaution. The body should lie across the bed, the knees should be raised towards the abdomen, and the thighs separated and supported by an assistant. The blades of the instrument should be separated, and placed in warm water to bring them to the temperature of the body. Before introduction we should carefully smear them with lard or glycerine; and also see that we make no mistake as to which is the upper or which the under blade, a distinction which a careless operator might chance to forget. Before commencing the introduction we should again positively satisfy ourselves as to the position of the head. We shall find the sagittal suture running from before backwards; and, as the head is so low down, there will generally be no difficulty in feeling the ear,

the right ear being towards the right side, with the unattached flap towards the pubes, and the tragus towards the rectum.

We shall usually find it more convenient to introduce the upper blade first. Having inserted two or more fingers of the left hand between the head and the vaginal walls, we retain them there during the introduction of the blade, for the double purpose of saving the maternal structures from injury, and guiding the instrument to the exact position we wish it to occupy. We must then take the upper blade in the right hand, poising it lightly between the fingers and thumb in such a manner that we can at once appreciate any obstruction to its passage, and ascertain exactly how its point is progressing. When it is first introduced into the vagina under the fingers of the left hand, which should be done in an interval between the pains, the handle must be considerably depressed and the blade inserted in the axis of the outlet, but when the head is reached, the handle has to be gradually raised to allow the point to slip over the convexity of the cranium, and the direction of introduction must also be changed to that of the axis of the brim. As the instrument is pushed onwards it is made to progress by a side-to-side wriggling motion, and it is of the utmost importance to bear in mind that the greatest gentleness must always be used. Nothing like force is permissible. If any obstruction, however slight, is felt, we are bound to withdraw the instrument either partially or entirely, and attempt to manœuvre, not force, the point past it. As the instrument is guided on in this way it is made to pass over the convexity of the

cranium, the point being always kept lightly in contact with it, until it finally gains its proper position. When fully inserted, the handle must be elevated towards the pelvis, and given in charge to an assistant, who must hold it steadily in the same position, as it forms a most important guide for the introduction of the second blade. This is passed directly opposite to the first, and is generally somewhat more difficult to insert, in consequence of the space occupied by the other blade. Two fingers of the left hand are introduced directly opposite the first blade, and the instrument is passed along them with exactly the same precautions as to direction and introduction, except that at the commencement the handle has to be elevated instead of depressed. The second blade is passed along the lock of the first, which guides it into position, and thus facilitates locking. The insertion of the instrument must be carried on only during an interval between the pains, and desisted from during their occurrence, otherwise there would be a serious risk of injuring the soft parts of the mother. The handle which was in charge of the assistant is now laid hold of by the operator, and drawn towards the perinæum to meet the second blade and effect their junction. If they have been properly introduced, there should be no difficulty in locking; but should we be unable to join them easily, we must withdraw one or other blade, either partially or entirely, and then re-introduce it with the same precautions as before. We must also assure ourselves that no hairs, or any of the maternal structures, are caught in the lock. When joined, the handles will be in the position of the head, resting on the perinæum

and parallel with the sides of the pelvis. When commencing our efforts at extraction, we lay hold of the handles with the right hand, using only sufficient compression to give us a firm grasp of the head and to keep the instrument from slipping. The left hand may be advantageously used in assisting and supporting the right during our efforts at extraction, and at a later stage of the operation may be employed in supporting the perinæum when stretched by the head of the child. Our efforts at traction must always be made in reference to the pelvis axis, being at first backwards towards the perinæum in the direction of the axis of the brim; as the head descends and the vertex protrudes through the soft parts they must be changed towards that of the outlet. We must extract only during the pains, and if these should be absent we must imitate them by acting at intervals, and relieving the head from the pressure of the blades when not operating. Besides direct traction, we impart to the instrument a waving motion from handle to handle, which brings into operation the power of the instrument as a lever; but this must not be done to any great extent, and must always be subservient to direct traction.

Proceeding thus in a slow and cautious manner, carefully regulating the force according to the exigencies of the case, we shall perceive that the head is beginning to descend, and its progress should be determined from time to time by the fingers of the unemployed hand. As the head descends and is about to emerge, we shall find it necessary to raise the handles of the instrument towards the abdomen of the mother, to prevent the blades

lacerating the perinæum, which in any case is much stretched, so that more than usual care is required to prevent rupture. Some have recommended the forceps to be removed as the head emerges, in order to lessen the risk of this accident; but this will be unnecessary, if we are careful to use our tractive efforts in the proper direction, and in accordance with the axis of the pelvis.

II. *When the Head is in the Pelvis in either the First or Second Position, its long Diameter corresponding to the oblique Diameter of the Pelvis, and the Face looking to one or other Sacro-Iliac Synchondrosis.*—The principal distinction between these cases and the last is that the head has not yet made its turn, and is still in the oblique diameter of the cavity. The sagittal suture is felt running diagonally across the pelvis, and the ears, if within reach of the finger, are situated behind the rami of the pubes, and at a corresponding point on the opposite side. If an ear cannot be felt, we must depend on the sutures and fontanelles to guide us as to the direction in which the forceps must be passed. Usually, however, we shall be able to reach the ear which is situated anteriorly.

The forceps are placed in the opposite oblique diameter to that in which the head is lying, the anterior blade being behind the foramen ovale, and the posterior in front of the opposite ischiatic notch. The rules for introduction and extraction are precisely the same as in the former instance; the only difference being that we have to see to the proper rotation of the face into the hollow of the sacrum, without which delivery would, in most cases, be impossible. This generally gives little

trouble, for so perfect is the mechanical adaptation of the child's head to the cavity through which it has to pass, that the turn will take place without any effort on the part of the operator, just as it does in natural labour, provided only that the traction is sufficiently slow and gradual. Should it not do so, however, we must impart to the head a movement of rotation as we draw it downwards. In the first position this is to be effected by pronating the right wrist, which will cause the face to pass into the hollow of the sacrum from right to left. In the second position the motion must be reversed, and by supinating the wrist, the face will pass from left to right. We know that the proper turn has taken place by seeing that the handles of the forceps come to be in relation to the sides of the pelvis, instead of being placed obliquely as they formerly were. The operation may then be finished in the manner described in the last paragraph.

III. *The Head is in the Pelvis in the Third or Fourth Position, the Occiput being to one or other Sacro-Iliac Synchondrosis, and the Face looking forwards towards the opposite Foramen Ovale.*—When we have to deal with an occipito-posterior position, and have come to the conclusion that delivery by means of the forceps is called for, we have to introduce the instrument precisely as in the cases already described. When, however, we come to extract, we have to consider the very important question, whether it be advisable to impart to the head the movement of rotation which it undergoes in the natural termination of these presentations, and to turn the face back into the hollow of the sacrum. This is the course which we are directed to pursue in most

modern English works on Obstetrics, and it is not stated that any peculiar difficulty is to be expected in effecting the movement, or that it is attended with any unusual risk to the child. Very little reflection, however, will show that there is a great difference between this rotation when effected by the natural powers, and the same movement imparted by means of the forceps. In the former case the whole body of the child turns along with the head; in the latter, the body being tightly grasped by the uterus is not likely to turn so readily, and there must be serious risk of injury to the neck from the twisting to which it is subjected; besides this, the maternal structures must be more than usually liable to injury from the extensive movements of the blades of the instrument. On the Continent and in America, the usual practice in these cases is not to attempt rotation, but to turn the occiput backwards into the hollow of the sacrum, and to bring the face out under the arch of the pubes. This termination of occipito-posterior positions occurs naturally more frequently than is generally believed, and without further drawback than unusual stretching of the perinæum from the bulk of the occiput, necessitating increased care to prevent laceration.

It may therefore be laid down as a rule, that when the face is looking forwards to one or other foramen ovale, we should at least attempt delivery with the occiput posteriorly, before we impart the more hazardous rotation necessary to bring the face into the hollow of the sacrum. This may be done by the forceps alone, or by the vectis, or hand, or both combined, reserving the forceps to terminate the labour,

if necessary, after the head has assumed a more favourable position. Dr. Leishman, in his work on the mechanism of parturition, has expressed his belief, that after the head has entered the brim, artificial rotation is impossible, unless the forehead is pushed up so as to allow the occiput to descend to the floor of the pelvis, as happens in occipito-posterior positions before rotation has taken place; and he considers the forceps an unsuitable instrument to effect the rectification, as its tendency is to pull down the forehead, and render the movement more difficult. He therefore considers the vectis and manual assistance better adapted for effecting our purpose. There is no doubt, however, that the turn may generally be given by the forceps alone. In the third position, when the face is towards the left foramen ovale, we must endeavour to turn it from left to right, as in the natural termination of the labour; and when in the fourth, from right to left; and we must be careful to imitate nature by not imparting the movement until the head is low down on the floor of the pelvis. Failing in this endeavour, it is well to bear in mind the practical suggestion made by Dr. Hamilton of Falkirk, in a valuable paper published in the *Edinburgh Medical Journal*,* that it may be possible, when the head will not rotate in the direction we are endeavouring to make it, to cause it to sweep round the pelvis in the opposite direction. An instance in point is related in which he was enabled to deliver speedily, and with safety to the mother and child, by

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* No. 76, October, 1861.

causing the face to pass round the entire right side of the pelvis, when it had originally looked towards the left foramen ovale. This, of course, would never be attempted unless the ordinary measures had failed; but as the alternative is craniotomy, the possibility of succeeding by this means should be borne in mind. It is when we have to make extensive movements of rotation by means of the forceps, that the second or pelvic curve in the blades is of questionable advantage. Perhaps there would be less risk of injuring the maternal structures, were we to employ in these cases a pair of straight forceps; but the second curve in Simpson's instrument is so slight, that we may safely use it for effecting rotation.

IV. *Application of the Forceps when the Head is above the Brim of the Pelvis.*—This is generally described as the long forceps operation, and there has been much difference of opinion among the medical profession with regard to its advantages and disadvantages. Many obstetricians of note limit the use of the forceps to cases in which the head has passed through the brim of the pelvis, and is detained in the cavity; while others frequently employ the instrument before the head has entered the brim, and even when it is mobile above it. There can be no doubt as to the difficulty and danger of using the forceps when the head is high in the pelvic cavity; and even in contracted pelvis, when the diminution is slight, we have seen that version is often in many respects a preferable operation (see p. 35); while in accidental complications requiring immediate delivery, the head being mobile above the brim, and the soft parts

sufficiently dilated, turning would not only be more easy of performance, but more expeditious and less dangerous to the mother and child. But cases must constantly occur where the latter operation is not applicable, especially when the waters have long escaped and the uterus is firmly contracted round the body of the child. Were we, in such cases, to reject the use of the forceps, we should of necessity require to resort to the painful alternative of craniotomy, even when we knew the child to be still alive. Besides, many of the objections which have been raised against the use of the long forceps are based either on a mistaken idea of the method of application, or on the use of an improper instrument. The earlier obstetricians who recommended the use of the forceps when the head is above the brim, describe them as applied to the sides of the child's head, a position in which they could not be placed without seriously damaging the maternal structures. An instrument has also frequently been used which does not possess the second or pelvic curve, here absolutely essential for adaptation to the axis of the pelvis, or not sufficiently long to grasp the head with facility.

For many valid reasons, we should not attempt in this position to pass the forceps over the sides of the head. The presentation is so high that the fontanelles cannot always be reached, and the scalp is often so much swollen from pressure that they become much obscured, so that we can rarely tell with absolute precision in what direction the head lies. Besides, the use of the instrument is generally indicated in cases of slight deformity of the brim, which most frequently

consists in shortening of the sacro-pubic diameter. It is an invariable rule in obstetrics that the longest diameter of the head adapts itself to the longest diameter of the pelvis, so that in these cases the occipito-frontal diameter of the head lies in the transverse diameter of the brim, or between it and the oblique; hence the sides of the head must be between the sacrum and the pubes. To pass, therefore, the blades over the sides of the head, we should require to insert them in the sacro-pubic diameter of the brim, precisely that in which the obstruction exists; whereas the transverse and oblique diameters of the pelvis are generally unusually long, so as to admit freely of the passage of the instrument without injurious pressure on the soft parts of the mother. Besides, the pressure of the perinæum below would form of itself an obstacle to the passage of the instrument in the antero-posterior diameter. We do not, therefore, attempt to introduce the blades with reference to the position of the head, but insert them solely with reference to the pelvis, and we usually attempt to pass them so that they shall lie at each extremity of the transverse diameter of the brim. Practically speaking, however, it will be found that they seize the head somewhat obliquely, one blade passing over the side of the forehead and the other over the side of the occiput; and therefore the instrument lies, not in the transverse diameter of the brim, but between it and the oblique, and the head will be seized in this manner whether the face looks towards the right or the left ilium. The difficulties and dangers connected with the operation, although doubtless exaggerated by its

opponents, are still sufficient to induce us to hesitate and seriously to consider its necessity before resorting to it. The difficulties arise from the height of the presenting part and the distance which the instrument must pass before it reaches it, the mobility of the head above the brim preventing the accurate application of the blades, and the complicated direction in which they must be passed to correspond with the axes of the pelvis. The dangers, on the other hand, arise from the increased risk of injury to the os uteri from inserting the blades within the cavity of the uterus; while the child has to undergo the risk arising from the prolonged traction so frequently necessary to effect delivery, as well as from the excessive pressure in the occipito-frontal diameter to which the head is not unlikely to be subjected, a direction in which pressure is probably far more injurious than in the bi-parietal diameter. The instrument is to be introduced in the same manner, and with exactly the same precautions, whether the face looks towards the right or left ilium, a point, indeed, which we shall frequently be unable to determine. It is advisable to introduce two or three fingers of the left hand within the right ilium up to the head, and to keep them in this position as a guide for the introduction of the instrument. Indeed, it is questionable whether it would not be better to introduce the whole hand, with the view of diminishing as much as possible the chance of injuring the os uteri, from not passing the instrument properly under its border. It is customary to introduce the upper blade first, and it may be passed up at once between the head and the left hand, bearing carefully

in mind that when we commence the introduction, the blade must enter in the line of the axis of the outlet, and as we proceed the direction must be changed to that of the axis of the brim. Ramsbotham directs the blade to be introduced at first further back towards the sacrum, the handle being turned towards the pubes, until the point approaches the promontory of the sacrum. The handle is then to be carried towards the anus, with the view of causing the blade to sweep round the pelvis, under the protecting fingers, till it reaches its proper position on the head. The object of this somewhat more complicated manœuvre is to avoid the depression of the handle required in direct introduction, which renders it necessary to draw the nates of the patient well over the side of the bed.

The second blade is to be introduced in exactly the same manner opposite the first, and if it has been inserted in a proper direction little difficulty should be experienced in locking them. We must be most careful in effecting this junction to avoid the slightest approach to roughness; for the extremities of the blades are within the cavity of the uterus, and serious injury might easily be inflicted. If difficulty is met with, rather than employ any force we should withdraw one of the blades and re-introduce it in a more favourable direction. If the blades have shanks of sufficient length, there should be no risk of including the soft parts of the mother in the lock, which in a badly-constructed instrument is an accident not unlikely to occur. When junction is effected our efforts at traction must at first be altogether in the axis of the brim, and to effect this the handles must be

well pressed backwards towards the perinæum. As the head descends it will probably of itself, and without much effort on the part of the operator, take the usual turn, and the direction of the tractive force may be gradually altered to that of the axis of the outlet. If the pains are strong and regular, and there is no indication for immediate delivery, we may remove the forceps after the head has been drawn past the obstruction, and leave the conclusion of the case to nature. This course may be especially advisable if the perinæum and soft parts are unusually rigid; but generally it is better to terminate the labour without removing the instrument, after the manner formerly described.

V. *Application of Forceps in Face Presentations, the Face having entered the Pelvic Cavity.*—Before the face has descended into the pelvic cavity, and when it is still mobile above the brim, the application of the forceps can scarcely come into contemplation, for should artificial delivery be indicated, turning will be the best practice to adopt. When the head has become engaged in the cavity we may have occasion to apply the forceps, and in such cases we shall frequently find that the chin still remains towards one or other sacro-iliac synchondrosis, and refuses to rotate forwards under the pubes, as it should do in the natural termination of these presentations. Or the rotation may have already taken place, and the chin be found forwards under the pubes, when delivery by means of the forceps will be by no means difficult. However the face may be situated, the blades are to be introduced over its sides, with precisely the same precautions and in the same

manner as in ordinary head presentations. In forceps with the pelvic curve we should remember to introduce the blades so that their concave edge looks towards the chin, that portion of the face being always brought forwards and delivered under the pubes. For this purpose a forceps with a strong pelvic curve cannot be used with safety when the chin looks backwards. When the chin is forwards all we have to do is to impart to it that amount of movement from right to left, or left to right, which is requisite to turn the long diameter of the face into the antero-posterior diameter of the pelvic outlet. In mento-posterior positions we must not forget that in ordinary cases delivery may be looked upon as impracticable, unless we can bring the chin forward to the anterior portion of the pelvis, and during our efforts at extraction we must endeavour to impart the necessary movement of rotation. We shall usually find that we can effect this without much difficulty. Should we fail, however, no resource is left but endeavouring to bring down the occiput by means of the vectis, so as to convert the case into a vertex presentation, or failing this to perform craniotomy. When we have succeeded in bringing the chin towards the pubes, delivery may be concluded as in an ordinary forceps case, taking special care to prevent laceration of the perinæum. It is well to bear in mind that the face of the child will frequently be found much bruised and lacerated by the pressure of the instrument.

VI. *Application of the Forceps when the Head is retained in the Pelvis, after the Birth of the Body.*— In breech or footling presentations it seldom happens

that we meet with much difficulty in the delivery of the head, especially if both it and the pelvis are of proper size. If any does occur it can very generally be overcome by cautious traction with the hands alone, combined with due attention to the flexion of the chin on the sternum. The cases in which traction proves insufficient are generally those in which there is slight contraction of the pelvis, and then a little assistance by means of the forceps may prove sufficient to effect the birth of the head. The blades are to be introduced, as in other cases, so as to seize the head transversely. If the head be low down in the pelvis, little difficulty is experienced; but if it be high up the operation is by no means so easy, for the vagina is already occupied by the neck of the child, and little room can be obtained for the introduction of the instrument. It will generally be found easiest to pass the blades over the sternal surface of the child, and for this purpose its body must be drawn out of the way in the direction of the occiput, so as to allow as much room as possible for the introduction of the forceps.

When the face looks forwards to one or other foramen ovale, it may be possible to rectify the position and turn it back towards the sacrum, either by the hand alone, or with one blade of the forceps used as a lever. Failing this, after the forceps have been applied, it will probably be better to deliver by bringing the occiput over the perinæum and the face under the arch of the pubes, rather than run the risk of rotating the head round so great a portion of the pelvis by means of the forceps. When the face is towards one or other sacro-iliac syn-

chondrosis it must be turned into the hollow of the sacrum during extraction, as in ordinary head presentations.

VII. *Application of the Forceps in Breech Presentations.*—The late Dr. Hamilton of Edinburgh and other practitioners recommend the application of the forceps to the breech itself when this does not descend, and when it becomes necessary to hasten the termination of the labour. We have, however, more efficient means of effecting the birth of the breech by means of the finger, the fillet, or the blunt hook. The forceps are not constructed to fit this portion of the child, and are exceedingly apt to slip during traction, and thus to cause serious injury to the mother, while a firm hold cannot be obtained without an unsafe amount of pressure. For these reasons obstetricians have generally condemned the application of the forceps to the pelvic extremity of the child.

STATISTICS.—Elaborate statistics as to the frequency of forceps operations in the practice of various physicians, and in different countries, have been drawn up by Dr. Churchill and others. The general result gathered from a great number of cases is, that in British practice they are employed on an average once in two hundred and forty-nine labours; in French, once in one hundred and forty; and in Germany, one in one hundred and six and a-half. No accurate deductions as to the danger of the operation can be made from the number of deaths that followed it, since a large proportion of them must certainly have been caused by circumstances quite independent of the operation itself. As regards the children the number saved, as before stated, is found to be greater when the forceps have been more frequently and earlier

employed; but the statistics are not so full on this point as could be wished.

DANGERS TO THE MOTHER AND CHILD FROM THE USE OF THE FORCEPS.—A formidable catalogue of dangers to both mother and child may be gathered from our standard works on Obstetrics. Among the former the principal are laceration of the uterus, vagina, or perinæum; rupture of varicose veins, giving rise to thrombus; pelvic abscess, resulting from contusion to which the soft parts have been subjected; subsequent inflammation of the uterus or peritoneum; tearing asunder of the joints and symphyses, and even fracture of the pelvic bones. A careful analysis of these, however, would tend to show that the application of the instrument is not so much concerned in their production, as the protraction of the labour and the neglect of the practitioner in not interfering sufficiently soon to prevent the occurrence of the evil consequences which are afterwards attributed to the operation itself. Many of them will be found to arise from contusion, and from the prolonged pressure of the child's head on the soft parts within the pelvis, and the subsequent inflammation and sloughing to which this gives rise. To these causes may be referred with propriety most cases of vesico-vaginal fistula, peritonitis, and metritis following instrumental labour. Lacerations and similar accidents may, and certainly do, often result from an incautious use of the forceps. But if these cases were closely examined, it would be found that the fault lay not in the instrument, but in the hand that used it. Either the blades were inserted without due regard to the axes of the pelvis, or they were pushed

forward with force and violence, or they were employed before the os was sufficiently dilated. Again, an instrument may have been employed that was unsuited for the particular case in which it was used, as a short pair of forceps when the head was high in the pelvis.

It would be manifestly unfair to lay the blame of any of these results upon the forceps themselves, which in the hands of a more judicious and experienced practitioner would have effected the desired object with perfect safety. The instrument is doubtless unsafe in the hands of any who do not understand its use, just as a scalpel or amputating knife would be in the hands of a rash and inexperienced surgeon. The lesson to be learnt from this seems to be clearly, not that these dangers should deter us from the use of the forceps, but that they should induce us to study more carefully the cases in which they are applicable, and the means of using them with safety.

The dangers to the child are principally laceration of the integuments of the scalp and forehead; pressure on the face producing contusion; partial paralysis of the face; fracture or depression of the cranial bones; injury to the brain from undue pressure of the blades, especially when they are applied in the occipito-frontal diameter. Many of these evils result from an improper management of the operation, such as excessive compression, or forcible and ill-directed efforts at extraction, and are therefore not to be considered inherent defects of the instrument. Some also are transitory in their nature, and leave no permanent effect; and the possibility of their occurrence is not to be considered as in any way contra-indicating an operation otherwise called for.

SUMMARY.—1. The essential requisites in a good pair of forceps are, facility of introduction, accuracy of apposition to the child's head, a lock that admits of easy junction, and sufficient power as a tractor and lever.

2. For the majority of forceps operations, it is advisable to use an instrument with the second or pelvic curve, by means of which it is better adapted to the axes of the pelvis.

3. It is advisable to accustom ourselves to the use of one well-constructed instrument, which answers, if sufficiently long, for all forceps operations.

The forceps should be used principally as a tractor, to a less extent as a lever, and slightly, if at all, as a compressor.

4. In cases of deficient uterine action, the forceps may be employed to supplement and take the place of the absent or inefficient pains, and it is in these cases that their value is most apparent.

5. As long as the os is not fully dilated, and the liquor amnii has not escaped, the prolongation of the labour is of comparatively little consequence to the mother, and the use of the forceps cannot come into contemplation.

6. After the second stage has commenced, delay is dangerous to the mother; but no rules for our guidance in the use of the forceps can be deduced from the actual time which has elapsed since the head has entered the pelvis.

7. As long as the head advances and recedes during and between the pains, and there are no constitutional symptoms indicating the propriety of artificial delivery, we need not interfere on the mother's account alone.

8. But we are justified in using the forceps as soon as we are convinced that the natural powers are insufficient to effect delivery, and it is of the highest importance to remember that our object must be to interfere before any symptoms of exhaustion show themselves, and not to wait till they are developed: our aim must always be to anticipate and prevent the occurrence of these symptoms.

9. In slight narrowing of the antero-posterior diameter of the brim, the forceps may be applied; but version is frequently preferable, the application of the forceps when the head is above the brim being a serious and difficult operation not to be lightly undertaken.

10. When there is a want of proportion between the head and the cavity of the pelvis, the forceps should be cautiously applied, with the view of trying whether traction is sufficient to overcome the obstruction; and this should be done sufficiently early, before swelling of the soft parts has arisen and caused impaction.

11. In labours obstructed by tumours or cicatrices, the forceps may suffice to effect delivery, and they should be used early, to prevent prolonged contusion of the obstructing tumour or cicatrix.

12. The life of the child is placed in imminent

jeopardy by prolonged detention of the head in the cavity of the pelvis, and we are justified, on this account alone, in terminating the labour by the forceps, if auscultation informs us that the pulsations of the fœtal heart are failing or intermitting. We may thus interfere for the sake of the child, although there is no indication for delivery on account of the mother, provided the maternal passages are in a fit state for the operation.

13. When immediate delivery is indicated, on account of any accident or complication occurring in the course of labour, it should be effected by the operation which is least likely to be injurious to the mother or child. Hence, as a general rule, turning is the preferable procedure when the head is above the brim of the pelvis; the application of the forceps when it has descended into the cavity.

14. Before attempting to deliver by forceps we should see that the os uteri and other maternal structures are sufficiently dilated to permit the safe introduction of the instrument. In general the os ought to have passed quite out of reach before we operate, but in a few exceptional cases we may be justified in delivering while a portion is still to be felt.

15. It is essential for the safe application of the forceps that we should accurately determine the position of the head, and its relation to the pelvic cavity, before we commence the operation. This may be done either by feeling the ear, or by examining the sutures and fontanelles.

16. The bladder and rectum should both be emptied.

17. Unless there is some special contra-indication, the

patient should be placed thoroughly under the influence of chloroform.

18. The patient should be placed on her left side, lying across the bed, with her nates projecting over the edge and her thighs elevated towards the abdomen, the right knee being raised and supported by an assistant. The blades of the forceps should be placed in warm water, and oiled before they are used.

19. The upper blade of the forceps should generally be introduced first, carefully guarded by two fingers of the left hand placed in contact with the side of the head, in the position in which we wish to apply the instrument.

20. The blade should be poised lightly between the finger and thumb of the right hand, and introduced with the utmost gentleness and deliberation. It must not be pushed directly forwards, but insinuated with a side-to-side motion. It must be passed in the axes of the pelvis, first in that of the outlet, then in that of the brim. The point must be kept lightly in contact with the head and made to glide over it; and if any obstruction is met with it must be withdrawn and re-introduced.

21. The second blade must be introduced opposite to the first, in the same manner and with the same precautions. When it is *in situ* the two handles must be drawn together and locked. If any difficulty is felt in effecting the junction, one blade must be withdrawn and re-introduced in a better position.

22. Our efforts at traction must be made during the pains only, or, if these be absent, at intervals to repre-

sent them. They must be made strictly in reference to the axes of the pelvis, at first in that of the brim, and as the head descends in that of the outlet. Along with the traction we may impart to the instrument a lateral waving motion from handle to handle. We should only employ sufficient compression to keep the instrument from slipping.

23. If the face looks towards one or other sacro-iliac synchondrosis we must see to the necessary turn into the hollow of the sacrum as we extract. If it looks forwards we may first try to deliver with the face under the arch of the pubes, and failing this rotate it into the hollow of the sacrum.

24. As the head distends the perinæum, we must be careful to prevent laceration, and as it emerges the handles of the instrument must be turned up towards the abdomen of the mother.

25. When the head is above the brim, the forceps must be introduced with reference to the anatomy of the pelvis and not of the head. Each blade is passed up, guarded by the left hand, under the lateral portion of the ilium, and seizes the head nearly in its occipito-frontal diameter, and not, as in other cases, in its bi-parietal.

26. In face cases, they must be introduced in the same manner and with the same precautions as in head presentations; but if the chin points backward, it must be rotated under the pubes before delivery is possible.

27. When the head is retained after the birth of the body, the forceps may be applied to effect delivery, provided proper manual traction has failed.

28. The forceps cannot properly be applied to the breech of the child.

29. Dangers from forceps delivery are more generally due to carelessness and ignorance on the part of the practitioner, than to any defect of the instrument itself.

CHAPTER IV.

THE VECTIS, OR LEVER.

HISTORY.—The early history of the vectis has not been satisfactorily made out. We can only trace its origin with certainty to the latter end of the seventeenth century. At that time, Chamberlen, the inventor of the forceps, practised midwifery in Holland, after his compulsory departure from England, in consequence of his active espousal of the cause of James II. He then had intimate relations with Roonhuysen, and it is certain that they were both acquainted with the vectis, and frequently employed it. It is not known whether Chamberlen was the original discoverer of the instrument and communicated it to Roonhuysen, or whether the latter himself invented it. In favour of the former view is the fact, that in the chest containing the instruments of the Chamberlen family, discovered at the beginning of the present century, there were found a pair of levers, bearing evidence, it is said, of originality of design and construction; while, on the other hand, the claims of Roonhuysen are favoured, not only by the strength of the tradition which points to him as the inventor, but by the circumstance mentioned by Churchill, that the secret of the vectis was never communicated

by the Chamberlens to any one in England, while that of the forceps certainly was. At this very time also, the Dutch practitioners were known to make use of some valuable means of aiding delivery. Whatever the true state of the case may be, the instrument was kept a profound secret for more than half a century, being communicated to a few practitioners only, and then on the payment of a large pecuniary consideration. In the year 1753, two philanthropic Dutch physicians, Visscher and Van de Poll, purchased the secret for five hundred livres, and immediately published an account of it for the benefit of mankind. From that time there have been great fluctuations as regards the estimation in which the instrument has been held. Among the Dutch practitioners, as might naturally be expected, it was formerly in high favour, and was used with great frequency.

In England the forceps were at first generally preferred, until, in consequence of many serious accidents arising from their unskilful and injudicious use, they fell somewhat into disrepute, the vectis being advocated in their place. In the time of Denman, the vectis was the favourite instrument in the metropolis. He says, that even those who employed the forceps were "very willing to allow the equal, if not superior, utility and convenience of the vectis." Since that time, however, it again gradually fell into disuse, until in modern practice its employment was almost unknown. Of late years its use has been again revived to a limited extent, and with less ambitious pretensions than its older advocates claimed for it.

DESCRIPTION OF THE INSTRUMENT.—The vectis generally used in the present day is in shape somewhat like a single blade of the ordinary straight forceps. (Plate I., Fig. 3.) In length it measures rather more than twelve inches; of these, seven are occupied by the blade, which springs from a wooden handle, as in the forceps, and has a straight shank at its commencement to facilitate introduction. At the extremity of the shank the blade swells out into a gentle curve, which becomes more sharp and marked as the point is reached. The fenestrum measures two and a quarter inches in length, by rather more than an inch in breadth. The handle should be constructed so as to afford an easy grasp to the operator, and should have one surface flattened to indicate the direction of the point. The entire weight of the instrument should be about seven ounces. The power of the vectis, and the facility of introduction, depend very much on the amount of curvature at the point of the blade. If this is sharp, a firmer hold of the head is taken and greater tractive force is obtained, but the difficulty of introduction is increased. An instrument more nearly straight is easier to apply, and is better adapted for those cases in which we merely wish to remedy malposition, or to effect rotation.

It is for this purpose that the vectis is now most frequently employed, and one blade of the straight forceps effects the object quite as well as an instrument constructed expressly for the purpose. A variety of modifications exists in the shape and size of the vectis, as well as in the material of construction, for which

wood and ivory have been used. The handle has also been occasionally manufactured, for the convenience of carriage, with a hinge close to the commencement of the blade, or with a screw at the point where the blade and handle join.

Action of the Vectis.—The vectis can be used—

1. As a lever of the first or second class.

2. As an antagonist to the fingers of the operator's unemployed hand introduced over the opposite part of the child's head.

3. As a mere tractor and rectifier of malposition.

1. The inventors and early employers of the vectis were in the habit of using it as a lever of the first sort, the power being at the handle, the weight at the child's head, and the fulcrum at some portion of the maternal structures, on which the instrument was allowed to rest. The fulcrum was generally the pubic bones, or the tuberosities of the ischia, which certain operators direct us to prefer in order to diminish the risk of contusion to which the urethra and neighbouring maternal structures might otherwise be subjected. Roonhuysen himself was in the habit of introducing the lever over the face, and then bringing it round the pelvis till it passed over the occiput, using the arch of the pubes as a fulcrum. He employed the instrument in this way to force the head down into the pelvis, and, as it were, to scoop it out of the passages, often elevating the handle so completely in his endeavours that it touched the abdomen of the mother. The immense risk of contusion and laceration to which the maternal structures

must be subjected by this method of operating is so evident, that it seems scarcely necessary to say that any such action is most strongly to be reprehended. The vectis may also be used as a lever of the first class by employing the fingers of the left hand as a fulcrum on which the instrument may work; or after it has been introduced, the right hand of the operator grasping the extremity of the handle may be used as a fulcrum, motion being communicated by the left hand, thus converting it into a lever of the second sort. Here the intention of the operator is to save the soft parts of the mother from any pressure, and if we use the instrument as a lever at all, it should certainly be in one of the two latter ways only, being most careful never to allow any part of it to rest on the maternal structures. The chance of its slipping and severely contusing either the head and face of the child, or the soft parts of the mother, is so great, that most reliable authorities advise us not to employ the instrument; and it was with the view of preventing practitioners from thinking of this power that Dr. Dease of Dublin recommended the name of vectis to be dropped, and that of tractor or extractor to be employed in its place.

2. Occasionally the vectis has been used somewhat after the manner of one blade of the forceps, the fingers of the operator's unemployed hand passed opposite to it representing the other blade. For mere traction this method is in no way superior to its action without the assistance of the other hand. Nor, in most cases, is there sufficient room in the pelvis to dmit of

the hand being introduced in this manner. The left hand may, however, be often advantageously employed to assist rotation and rectification.

3. It is as a simple tractor and rectifier of malposition that the action of the vectis is most beneficially exerted. When it is passed over some portion of the head, and firmly fixed by means of the right hand, we are enabled to draw it downwards by the left hand passed round the handle of the instrument. In this case it acts also to some extent as a lever of the third class, the fulcrum being that portion of the child's head on which the point rests; but this action is not directly sought for. The extractive power of the instrument, as we have already remarked, is in direct proportion to the curvature of the point, in consequence of the firm hold thus acquired over the head. It may be so used to aid the labour-pains, or to overcome slight resistance from an unusually rigid perinæum. For this purpose it is essential that the pains be still present, for the vectis cannot be used, like the forceps, to take the place of absent pains, but only to assist them when inefficient.

Cases in which the Vectis may be used.—1. The vectis has been recommended in all cases in which the short forceps are applicable, provided the pains have not entirely ceased. From what has been already said, it will be seen that it can only be used when there is but a slight impediment to the passage of the head, which the pains are unable to overcome. The advantages which it possesses over the forceps in these cases are the

facility of introduction, and the small space which a single blade occupies. Against this we have to place the limited action of the instrument, the risk of its slipping, and the temptation to make a fulcrum of the maternal structures. For these reasons the universal practice in modern times has been to prefer the forceps as a means of extraction.

2. It has been recommended in cases of very slight contraction of the pelvic brim. Here we are advised to pass the instrument over the occiput, which, being pulled down by our tractive efforts, is placed in the most favourable position for entering the narrowed inlet. The same objections are applicable to the use of the instrument in this case as in those already alluded to, and it is at best extremely doubtful whether sufficient flexion of the head is attainable by this means to justify the employment of this somewhat hazardous procedure.

3. The vectis is most advantageously employed to *rectify* malpositions of the head, and to effect *rotation* in occipito-posterior positions. In certain faulty positions of the head, when labour is delayed in consequence of the want of proper flexion of the chin on the sternum, rectification can frequently be readily effected by downward traction by the vectis passed over the occiput, while at the same time the forehead is pushed up by the fingers of the other hand. This course will most frequently be found useful in occipito-posterior positions, when the head has descended to the floor of the pelvis, and the usual rotation has not taken place. Here, in consequence of delay, the direction of the propulsive

force becomes changed from the occiput to the fore part of the head, the forehead being thus pushed more and more down, until the orbits and even the nose can be felt behind the pubes. In such cases rotation cannot take place as long as the head remains in its faulty position, and if this be rectified by the combined action of the vectis and the finger, the case will probably terminate of itself without further assistance, the occiput turning forward as in natural labour. Should it not do so, however, the movement can be imparted by the lever, aided by the finger of the unemployed hand pushing the forehead towards the proper side of the pelvis. This method of rectification is specially advocated by Dr. West of Alford, who has brought forward numerous cases in which he found it practically useful. In like manner in face presentations, when the chin is unfortunately turned towards one or other sacro-iliac synchondrosis, and does not rotate forwards of itself, it may be possible to rectify the position and effect the necessary rotation.

Description of the Operation.—We are recommended to pass the vectis over various portions of the head. It may be made to act above the mastoid process, or, as Denman advises, passed obliquely over the ear and upwards towards the chin. By others it is passed over the occiput, and it is in this position that we shall have occasion to employ it most frequently as a rectifier of malpositions. Some authors advise us to pass it over the face up to the chin, but this is now very generally objected to on account of the risk of serious injury to the child.

Dr. Ramsbotham tells us that we "shall find it necessary to apply it to the different parts of the cranium, and perhaps the face also, successively, in order to relieve the head from its fixed condition, and favour its descent." We can, however, only determine the situation of application by a consideration of each particular case, and of the object we propose to effect.

Having taken the usual preliminary precautions as to emptying the bladder and rectum, and bringing the nates of the patient well to the edge of the bed, the instrument, previously warmed and greased, is to be taken in the right hand, and held lightly between the thumb and the fore and middle fingers. Two fingers of the left hand should now be passed up to the part of the head over which we wish to place it. Under these, as a guide, the vectis should be passed in the same gentle manner, and with the same precautions as described when treating of the introduction of the forceps. If the point be much curved, considerable difficulty may be experienced in guiding it over the head, and we may find it necessary to depress the handle considerably. Here, as with the forceps, we must ever bear in mind that not the slightest exertion of force is permissible; but that on the occurrence of any obstacle to the onward passage of the instrument, it must be partially or entirely withdrawn, and re-introduced with increased care. If we wish to pass it over the occiput, we may find it easier to guide it to a proper position by first inserting it over the ear, and when it is passed sufficiently high, drawing it round to the exact part to which we wish it applied.

The subsequent steps in the operation will vary according to the object we aim at. Should we wish to bring into operation the action of the instrument as a lever as well as an extractor, one or two fingers of the left hand should be placed at the orifice of the vagina, close to the junction of the handle and blade, and on these as a fulcrum the instrument should act,—or we may make a fulcrum of the right hand firmly grasping the extremity of the handle, and act with the left hand surrounding the instrument.

In either case we should operate only during the pains, and when these occur we should, as Ramsbotham recommends, make a series of "short, steady, firm extractive efforts, following each other in tolerably quick succession; the left hand pressing firmly on the shank during each, so that the point may at the same time compress the head, while the handle remains stationary." Should the instrument slip while we are thus operating, which it is likely to do, we must carefully re-introduce it, and again commence. As the head descends and is about to emerge, the instrument should be withdrawn, and the rest of the delivery left to nature. We cannot too frequently repeat that while thus operating we should never be tempted, by the proximity of the pelvic bones, to employ them as a fulcrum. When we use the vectis simply to remedy malpositions, we should draw down firmly with the right hand during a pain, while the movement of the head is assisted by upward pressure by one or two fingers of the left hand placed near the anterior fontanelle. As soon as the rectification is effected, and the head is placed in a more favour-

able position, the pains will probably prove sufficient to finish the labour, especially as they are generally increased, both in force and frequency, by the irritation resulting from the introduction of the instrument. When we employ the vectis to accomplish rotation, it is to be effected in the same manner by pressure of the instrument, combined with assistance from the fingers of the other hand.

DANGERS OF THE OPERATION.—The dangers to be apprehended from the use of the vectis are, as we have seen already, by no means slight. They consist principally of laceration and contusion of the uterus, vagina, or perinæum, from carelessness in application, or from making a fulcrum of the soft parts of the mother. As regards the child, of laceration and contusion of the face or scalp, or of fracture of the bones of the face or cranium, from excessive pressure applied during extraction. Even in skilful and careful hands these accidents are not always to be avoided, in consequence of the great power of the instrument, and of the difficulty in regulating the force employed. Used, however, as a rectifier of malpositions only, the same risks are not incurred as when we attempt extraction as well.

SUMMARY.—1. The vectis resembles a blade of the forceps, but it is more curved at the point. For most purposes a single blade of the forceps is all that is required.

2. The vectis may be used as a lever of the 1st or 2nd class; as one blade of the forceps, the fingers of the operator representing the other; or as an extractor, and rectifier of malpositions.

3. If the vectis is used as a lever at all, the fulcrum should be the hand of the operator, and never the maternal structures.

4. The vectis is of greatest value when it is used solely as a tractor, and rectifier of malpositions.

5. The vectis may be employed in all short forceps cases; but it is generally used in occipito-posterior positions, when the chin is not sufficiently flexed on the sternum, to effect the flexion, and then, if necessary, to cause rotation.

6. It may be passed over any part of the cranium, but most usually over the mastoid process or occiput.

7. It should be introduced in the same manner as one blade of the forceps, and steady downward traction made during a pain, combined, if necessary, with pressure in the proper direction from the fingers of the other hand.

8. The dangers of the vectis are numerous, consisting principally of contusion and laceration. For this reason, when traction alone is indicated, the forceps are preferable; but where a rectifier is required as well, the vectis is often the more convenient instrument of the two.

CHAPTER V.

THE FILLET AND BLUNT HOOK.

THE fillet is the oldest of obstetric instruments. It was frequently employed before the invention of the forceps, and even in the time of Smellie was much used in the metropolis. It has since deservedly fallen entirely out of favour, and at present its employment in cases of head presentations is seldom advocated. It is made either of a slip of whalebone fixed into a handle, or of a long narrow strip of cloth or silk, which is passed over some prominent portion of the child and used for traction. The objections to the use of the fillet in head presentations are sufficiently obvious. If we tried to place it over the occiput, we should experience some difficulty in passing it up, as the head is likely to be in close apposition with the sides of the pelvis, especially in cases in which extractive force is required. Supposing, however, that we had succeeded in placing it as we wished, we should find it impossible to direct our tractive efforts in the axis of the pelvic outlet, as we should then infallibly pull the instrument off. If we draw in any other direction, we run the risk of injuring the maternal structures, or of changing the position of the head. If we pass it, as is sometimes recommended, over the face, so as to

rest the fillet on the chin, we interfere with the flexion of the chin on the sternum, and might also seriously mutilate the child. It has happened more than once that the head has even been amputated in this way—a memorable instance of this accident being recorded in Merriman's "Synopsis." In breech cases the fillet is sometimes still used when the natural efforts seem insufficient, and immediate delivery is indicated. For this purpose a band of stout linen or tape is employed, measuring from twelve to sixteen inches in length by one in breadth. The extremity of this is rolled up in one hand and guided over the groin of the child with the fingers of the other, and when *in situ* downward traction is made on it during the pains. Some accoucheurs recommend a blunt hook to be used for this purpose, which is introduced and employed in the same manner. There are few cases, however, in which the groin is within reach, in which the finger alone would not answer as well as either of these contrivances. Of the two, the fillet is certainly the least likely to prove injurious to the child, but it is the most difficult to apply. Dr. Ritchie has invented a simple but effective contrivance by which its introduction can be facilitated. It consists of an ordinary piece of stout brass wire bent double, and this being flexible, can be bent into any shape that is desired. With the aid of the fingers of the left hand it is guided, like the blunt hook, over the groin, and the fillet is then passed through the extremity. The wire is now withdrawn, and as it passes out it pulls the fillet along with it into the position we wish it to occupy.

CHAPTER VI.

CÆSAREAN SECTION AND GASTROTOMY.

HISTORY.—The period at which the Cæsarean section was first resorted to is not known with accuracy. It seems, however, to have been practised by the Greeks after the death of the mother; and Pliny mentions that Scipio Africanus and Manlius were born in this way. The name of Cæsar seems to have been given to children so extracted, and afterwards to have been assumed as a family patronymic. These children were dedicated to Apollo, whence arose the practice of things sacred to that god being taken under the special protection of the family of the Cæsars. Many celebrities have been supposed to owe their lives to this operation, amongst the rest Æsculapius, Julius Cæsar, and our own Edward VI. Regarding the two latter, there is conclusive proof that the tradition is without foundation. There is no doubt that the operation was constantly practised on women who had died at an advanced period of pregnancy, and indeed it has at various times been enforced by law. Thus among the Romans it was decreed by Numa, that no pregnant woman should be buried until the fœtus had been removed by abdominal section. The Italian laws also made it necessary, and the operation has always received the strong support of the Roman Catholic

Church. So lately as the middle of the eighteenth century the King of Sicily sentenced to death a physician who had neglected to practise it. The first authentic case in which it was performed on a living woman occurred in 1491. It was afterwards practised by Nufer in 1500; and in 1581 Rousset published his well-known work on the subject, in which a number of successful cases were related.

In English works of that time it is not alluded to, although it was undoubtedly practised on the Continent, and to such an extent that its abuse became almost proverbial. Paré and Guillemeau may be reckoned amongst its opponents; whilst other writers of the period equally strongly upheld it. In this country it has scarcely been performed in a manner which offers even a fair prospect of success. It has been looked upon as nearly certainly fatal to the mother, and has, until quite recently, been almost uniformly resorted to only after the patient has been long in labour, and when she has been already much exhausted. The operation has also been restricted to cases in which even the passage of a mutilated fœtus was impossible, and it has not unfrequently happened that long and fruitless attempts at delivery by craniotomy had been made before the Cæsarean section was employed. On the Continent it is habitually performed in cases of distortion in which it would not be considered applicable in England, and at a much earlier period of labour. This has resulted partly from the greater value which is placed abroad on the life of the child, which leads to the preference of any operation which does not require its destruction, and partly from a different esti-

mate of the comparative danger to the mother of craniotomy and the Cæsarean section. Statistics show that whereas in England it has seldom been performed with success, on the Continent the recoveries are not only numerous, but it has been frequently repeated successfully several times on the same patient. We hope to show that much of the fatality in this country is due to causes entirely distinct from the operation itself; and in the present day, when the practice of ovariotomy has so largely increased our knowledge of abdominal surgery, it is surely reasonable to expect that an operation so nearly similar in its character may be undertaken with a fair prospect of success. Before discussing, however, the statistics and dangers of the operation, it will be well to describe the circumstances under which it is indicated.

I. *Defective Proportion between the Child and the Maternal Passages.*—This is, in by far the greatest number of cases, due either to deformity of the pelvis arising from rickets in early life, or to mollities ossium occurring in a patient who may have been previously well formed, and who may have given birth to children without difficulty. In certain cases, however, the pelvis may be of normal size, but having its cavity occupied by solid tumours of the ovaries, of the uterus itself, or growing from the pelvic walls; or the obstruction may depend on advanced malignant disease. It has been considered essential in these cases, that the amount of obstruction should be so great as to preclude the possibility of even a mutilated fœtus being extracted. The limits which have been fixed on by different accoucheurs

vary somewhat. Thus Churchill, Ramsbotham, and others are of opinion that the Cæsarean section need not be resorted to unless the smallest diameter of the pelvis does not exceed 1½ inches. On the Continent it is constantly practised when the smallest diameter measures from 2 to 2½ inches; and in a case in which the child is positively known to be alive, certain foreign authors recommend it when there is as much as 3 inches antero-posterior diameter. In this country, where the life of the child is most properly considered as always of very secondary importance to the safety of the mother, we cannot fix one limit for the operation when the child is living and another when it is dead. If, however, it can be shown that the danger to the mother from craniotomy in a case of extreme contraction is as great, or greater, than from the Cæsarean section, then the fact of the latter operation affording a prospect of saving the child cannot be overlooked. The lesser limit is beyond controversy: if there be not more than 1½ inches clear space in the pelvis, whether the obstruction arise from osseous deformity or from solid tumour, no other alternative is left. The important question to decide is, which operation should be resorted to when the smallest pelvic diameter ranges from 1½ to 2 or 2½ inches? If craniotomy be employed, many long and wearisome hours may elapse during which the mother is subjected to all the risks of protracted labour under the most unfavourable conditions; the skull has to be broken up and removed piecemeal with great risk of serious injury to the soft parts; and the mother is but too frequently reduced to a state of extreme exhaustion from which she cannot rally. If,

after all, we fail in extracting the child, we must resort to the Cæsarean section under circumstances which almost certainly preclude the possibility of recovery. In a valuable paper published in the *Archives Générales de Médecine*, by M. Pihan-Dufeillay, a careful analysis is made of eighty-eight cases of Cæsarean section occurring between the years 1845 and 1861.* The general conclusions he arrives at we must discuss more fully hereafter, but at present it is important to note, that of five cases in which previous attempts at craniotomy had been made, four proved fatal. Of the cases in which the Cæsarean section was performed under favourable conditions—that is, at an early period of labour before exhaustion had come on—three-fourths recovered. The general mortality of craniotomy is estimated at one in five. This, we must remember, includes all cases alike; those in which no difficulty was experienced, as well as those in which protracted efforts were required. If we had any means of ascertaining the exact result of the latter class of cases separately, there can be little doubt that the mortality would greatly exceed that average, and would therefore be considerably above that which M. Dufeillay fixes on as following the Cæsarean section. A consideration of such facts has led several recent writers in this country to recommend that the latter operation should be preferred in the cases under consideration. Not because they consider craniotomy to be impracticable, but because they believe it to be quite as dangerous to the mother, with the further drawback of necessarily sacrificing the child.

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* *Archiv. Gén. de Méd.*, vol. xviii., 1861, pp. 148 and 304.

Although this doctrine has received the sanction of several of our most eminent accoucheurs, it has not as yet been generally admitted as correct. We believe, however, that if it were carried into practice, we should save many a fœtal life otherwise doomed to destruction, while we should in no way increase the maternal mortality.

II. *In Cases in which a Pregnant Woman has died suddenly.*—This was the indication for which the Cæsarean section was first performed, and it has at all times been constantly employed when a pregnant woman has died at an advanced period of utero-gestation. There is no doubt that a prompt extraction of the child under these circumstances has frequently been the means of saving its life, but not so often as is generally supposed. Thus Dr. Schwartz, in an elaborate enquiry into the value of *post-mortem* Cæsarean section, shows that out of 107 cases in which it was employed not one living child was extracted.* The reason that the want of success has been so great, is doubtless the delay that must necessarily occur before the operation is resorted to; for, independently of the fact that the practitioner is seldom at hand at the moment of death, the very time necessary to assure ourselves that life is actually extinct, will generally be sufficient to cause the death of the fœtus. Considering the intimate relation between the mother and child, we can scarcely expect vitality to remain in the latter more than a quarter, or at the outside half an hour, after it has ceased in the former.

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* *Monat. f. Geburt.*, Supp., vol. 1861, p. 121.

The recorded instances in which a living child was extracted ten, twelve, or even forty hours after death, were most probably cases in which the mother at first fell into a prolonged trance or swoon, during the continuance of which the child must have been removed. A few authentic instances, however, are known, in which there can be no reasonable doubt that the operation was performed successfully several hours after the mother was actually dead. A well-known and interesting example is that of the Princess of Schwartzenburgh, who perished one evening in a fire at Paris, and from whose body a living infant was removed on the morning of the following day. Since, then, there is a chance, however slight, of saving the child's life, we are undoubtedly bound to perform the operation, even when so much time has elapsed as to render the prospect of success extremely small. It might be considered almost superfluous to insist on the absolute necessity of positively assuring ourselves of the mother's death before we commence the necessary incisions; but, unhappily, numerous instances are known in which mistakes in diagnosis have been made, and in which the first steps of the operation have shown that the mother was still alive. To meet every contingency, therefore, we should always operate with the same care and caution as when the mother was living. If death has occurred during labour, we are advised to prefer version; but this can only be resorted to if the passages are in a condition to admit of delivery being accomplished with great rapidity.

III. *After Rupture of the Uterus.*—In a majority of the cases of ruptured uterus, the fœtus escapes partially or entirely into the abdominal cavity. The usual practice recommended under these circumstances is to pass up the hand and remove the child by turning; or if the head is within reach of the perforator, craniotomy is to be employed. Under the head of Version (p. 43) we have already considered the extreme risk which follows this method of procedure, and the almost universal mortality with which it has been accompanied. The alternative operation of gastrotomy has scarcely been sufficiently practised to admit of extensive statistics being drawn up as to its results; but in the few cases in which it has been employed on the Continent and in America, its success has been most encouraging. M. Dufeillay has collected twelve cases of ruptured uterus, occurring between the years 1845 and 1852, in which the operation was performed; and in all of these, with one single exception, it was successful as regards the mother.* Dr. Winckel has since recorded a case in which rupture occurred in two successive labours, the child being removed by gastrotomy on both occasions, the mother making a good recovery;† and several other instances of the same kind are contained in foreign periodicals. If we contrast this with the mortality occurring after the practice usual in this country has been adopted, the balance will be found to be very strongly in favour of the Cæsarean section. Thus in the Reports of the Rotunda Lying-in Hospital, out of sixty cases of rupture,

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* *Op. cit.*, p. 327. † *Monat. f. Geburt.*, July and Oct. 1863.

delivery was effected by turning, the forceps, or craniotomy in fifty-three, the remaining seven being delivered by the natural powers, or dying before the child was extracted. Of these sixty cases, fifty-seven ended fatally; and indeed it is but too well known that death almost invariably follows this accident. The Cæsarean section offers certain advantages which may explain to some extent the success which has followed its use in these cases. When a breach has occurred in the uterine walls, in addition to the immediate shock, there is an escape of blood into the cavity of the peritoneum, which cannot be removed except during the manipulations following the Cæsarean section, and which, if allowed to remain and coagulate, would of itself very probably produce fatal inflammation. Another advantage which the Cæsarean section offers is that it may be delayed until the patient has rallied in some degree from the immediate shock of the rupture, reaction generally occurring within a few hours; whereas delivery by version or craniotomy is usually effected as soon as the existence of rupture is diagnosed, and when the patient is in the worst possible condition for any interference. That this is not an unimportant fact, may be gathered from the details of the cases above-mentioned, which were all operated on at periods varying from eight to twenty-four hours after the rupture had taken place. In performing the Cæsarean section, therefore, in such cases, we should bear this point in mind, and if possible delay interference until the patient has rallied sufficiently to admit of her bearing the farther shock to which she must be subjected. The evidence in favour

of gastrotomy is at least strong enough to justify us in recommending it, although the subject has not yet received sufficient attention to admit of a positive conclusion as to its merits.

IV. *In Extra-Uterine Fœtation.*—The cases of misplaced gestation in which gastrotomy has chiefly been proposed and practised are those in which pregnancy goes on to the full period, and are generally of the ventral or ovario-tubal varieties. About the time that delivery should naturally take place, abortive attempts at labour are made, attended with uterine contractions, the expulsion of the decidua, and eventually followed by the death of the fœtus. It has been proposed that the child should then be extracted by gastrotomy, and there is no doubt that by this means its life could frequently be preserved. The results to the mother, however, in the cases in which the operation has been performed have been extremely disastrous; and it is now generally admitted that a better chance of recovery is afforded to her by postponing any operative procedures to a future period. In Dr. Campbell's well-known essay on Extra-Uterine Fœtation, nine cases are mentioned in which gastrotomy was performed before the death of the fœtus, all of which proved fatal.* When nature has indicated the route by which the expulsion of the fœtal remains is to be attempted, especially if suppuration has taken place, and an aperture has formed in the abdominal parietes, we may afford valuable assistance by largely dilating the opening, and extracting the fœtus through

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* *Memoir on Extra-Uterine Fœtation*, p. 150. Edin. 1840.

it. The results of this method of treatment have been highly satisfactory; for of thirteen cases of the kind tabulated by Mr. Hutchinson,* ten recovered perfectly, and only two died in consequence of the operation. When no attempt at pointing or extrusion has been made, and the irritation produced by the retained fœtus seems to imperil the life of the mother, gastrotomy may still be resorted to; but statistics conclusively prove that the chances of recovery are by no means so great; for of sixteen cases operated on under these circumstances, nine proved fatal. The explanation of this variation in result is undoubtedly, that in the former class of cases extensive adhesions had formed between the cyst containing the fœtus and the internal surface of the abdominal walls, thus shutting it off from the peritoneal cavity; while in the latter no adhesions are met with, and there is great risk of decomposing portions of the cyst, or of those parts of its contents that cannot be removed, escaping into the peritoneum. Dr. Braxton Hicks suggests that this danger may to some extent be obviated by sewing "the free lips of the wound in the cyst to the corresponding portion of the abdominal wall, before any attempt is made at the extraction of the fœtus."† I am not aware that this proposal has actually been carried into practice; but it would undoubtedly be advisable to adopt it when operating in a case in which no adhesions are met with. The same object might be accomplished, and probably

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* *Med. Times and Gaz.*, vol. ii. 1860, p. 187.

† *Guy's Hospital Reports.*

more effectually, by making an artificial opening by repeated applications of potassa fusa, which would have the effect of producing adhesion of the cyst to the abdominal parietes.

In the more common class of cases, in which the fœtus is contained in one of the Fallopian tubes, it has been proposed to practise gastrotomy after the occurrence of the rupture which so commonly takes place in the early months of gestation, in the desperate hope of arresting the hæmorrhage by ligature of the Fallopian tube, and such a course might offer a bare chance of success. A far more promising procedure would be to resort to the operation before rupture had taken place, if we should be so fortunate as to make out the diagnosis with sufficient accuracy to satisfy ourselves as to the nature of the case. There seems to be no reason why such a measure should not succeed, since at this time the cyst will not have contracted formidable adhesions to the surrounding parts, and might be removed in its integrity with little more risk to the patient than ovariotomy, while a fatal result is otherwise almost certain. The difficulty in making out the diagnosis, however, must always be very great, although in a favourable case perhaps not insuperable.

Statistics and Dangers.—The number of cases in which the Cæsarean section has been performed is now so great that we are in a position to arrive at some reliable conclusions as to the extent and causes of the mortality that follows it. In Great Britain the operation has been so generally unsuccessful that we cannot be surprised at its having come to be looked upon as

the last and almost hopeless resort. Thus out of fifty-eight cases in which it has been performed in this country, eleven only have recovered, or about nineteen per cent. Nor is this great mortality surprising if we consider the conditions under which the Cæsarean section has been usually resorted to. The patient has been many hours, if not days, in labour; the uterus has been contracting with unusual force and energy to overcome the obstacle to delivery; long-continued and violent attempts have very probably been made to terminate the labour by craniotomy; and the operation is only performed as a last resource when the woman has been reduced to a state of such extreme exhaustion that her chances of recovery, even without the addition of another formidable operation, would be but small. If we remember that in nine cases out of ten all this occurs in a deformed and unhealthy patient, who would at any time be a most unfavourable subject for operation, we shall have reason to wonder, not that the mortality has been so great, but that even this small measure of success has been attained.

The results that have followed the operation, however, on the Continent and in America are very different. There it is not held in such dread, and although possibly sometimes performed in unsuitable cases, it is resorted to as soon as the patient is in labour, and without, as a rule, diminishing the chances of success by fruitless attempts at delivery by other means. The general result has been that on the Continent fifty-seven per cent. of all the cases operated on have recovered, and in America about sixty-six per cent. This difference is

very startling, and is well calculated to teach the lesson that, if the operation is to be employed at all, it should be done without the vacillation and delay which have been so usual in this country. In the paper by M. Pihan-Dufeillay, already alluded to, the dangers of procrastination are very clearly pointed out. He carefully analyses all the cases which he could collect occurring between the years 1845 and 1861. These are eighty-eight in number, fifty of the mothers recovering, and thirty-eight dying. Of all the cases in which the mother was in a state of exhaustion from the length of the previous labour, three only were successful; or, putting the same figures in another way, eighty-one per cent. of the patients whose strength was unimpaired before the operation was commenced recovered, and only nineteen per cent. of those whose strength was worn out by the duration of the previous labour. Again, out of five cases in which unavailing attempts at delivery by craniotomy had been made, four were unsuccessful. Of the thirty-eight fatal cases, as many as six died from causes which could not fairly be attributed to the operation—viz., two from pyæmia, the symptoms of which had shown themselves before the operation was performed; one from capillary bronchitis; one from eclampsia; one from rupture of the transverse colon, apparently the result of general fatty degeneration of the viscera; and one from puerperal fever, which was epidemic at the time of the operation. It may not, perhaps, be considered justifiable to exclude these cases from the general list of failures; but even without doing so, these figures show that when the Cæsarean section has been performed under favourable condi-

tions, three-fourths of the patients have recovered, a result which contrasts favourably with most of the other great operations. At any rate, they justify us in laying it down as an imperative and most important rule, *that the operation should be performed without delay as soon as the diagnosis is made, and the impossibility of delivery by other means determined on,* provided only that labour has actually commenced, and that the pains are sufficiently strong to ensure the subsequent contraction of the uterus. A curious question arises as to whether the successful performance of the Cæsarean section on one occasion diminishes the risk should it be necessary to repeat the operation. There are numerous cases on record in which it has been performed more than once on the same patient; and there are some tolerably authentic instances in which it has been repeated as often as five or six times. In examining these cases it is found that the proportion of mortality in patients who have been already operated on is decidedly less than in those operated on for the first time. From this, some authors have concluded that one successful operation distinctly diminishes the risk in the event of a second being required. In the present state of our knowledge, however, it would be safer to conclude that the fact of a patient having once recovered, only offers a guarantee for future success, insomuch as it shows that her constitution is good, and well calculated to withstand so formidable a procedure.

The causes of death after the Cæsarean section may, speaking generally, be classed under three principal heads—hæmorrhage, peritonitis or metritis, and general

shock to the nervous system. These are pretty much the same as those following ovariotomy; and indeed the resemblance between the two operations is so great, that in performing the Cæsarean section, the experience lately acquired as to the best method of performing ovariotomy, as well as regards the after-treatment, may most properly be taken as a guide.

Hæmorrhage to an alarming extent is a frequent complication, although seldom the direct cause of death. Thus, out of eighty-eight operations the particulars of which have been carefully noted, severe hæmorrhage occurred in fourteen cases, six of which terminated successfully, and in four only could the fatal result be ascribed to the loss of blood. In one of these the source of the hæmorrhage is not mentioned, in another it came from the wound in the abdominal walls, and in the other two from the uterine incision being made directly over the placenta. In neither of the two latter was the hæmorrhage immediately fatal, for the loss of blood was checked by uterine contraction, and only recurred secondarily after many hours had elapsed.

Much may be done to diminish the risk, but with every precaution it must be a source of danger which even the greatest care cannot always prevent. Hæmorrhage from the section of the abdominal wall may be best avoided by making the incision as nearly as possible in the line of the linea alba, so as to avoid wounding the epigastric arteries, and by securing any vessels which may have been divided before proceeding farther with the operation. The principal loss of blood will, however, be met with in dividing the uterus, and this will

be greatest when the incision is near or over the placental site, where the largest vessels are met with. We are recommended to ascertain the situation of the placenta by auscultation, and thus if possible to avoid opening the uterus near its insertion. But it is almost certain that the so-called placental souffle has not its origin in that viscus, and it cannot be depended on as indicating its situation. Besides, if the placenta is attached to the anterior wall of the uterus, a knowledge of its position would not always enable us to avoid opening the uterus in its immediate vicinity. We must, in the event of its lying under the incision, rather hope to control the hæmorrhage by removing it at once from its attachments, and rapidly emptying the uterus. When the child has been removed there may be a large escape of blood, but this will generally be stopped by the contraction of the uterine fibres, in the same manner as after natural labour. Should contraction not take place at once, the uterus may be firmly grasped and kneaded by the hand for the purpose of exciting reflex action. This plan is advocated by Winckel, who has large experience in the operation, which he has performed fifteen times; and by using free compression in this way, and making a point of not closing the abdominal wound until the uterus is firmly contracted, he has never met with any inconvenience from hæmorrhage.

Amongst the most frequent causes of death are peritonitis and metritis. Kayser attributes the fatal result to them in 77 out of 123 unsuccessful cases.* In M. Dufeil-

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* *De Eventu Sectionis Cæsareæ.*

lay's table, they are marked as the cause of death in fourteen out of thirty-eight cases. The division of the peritoneum itself will not account for the frequency of this complication, since the proportion in which it occurs is considerably greater than after ovariotomy, in which the injury to the peritoneum is quite as great, and indeed greater if we take into account the constant existence of adhesions which have to be divided or torn in that operation. The division of the uterus itself must be regarded as one chief source of this danger. Dr. West lays great stress on the unfavourable condition which the muscular fibres of that organ are in after delivery for any reparative action. He believes that the commencing process of involution and fatty degeneration which is going on in the muscular fibres previous to delivery render them peculiarly unfitted to cicatrize, and he points out that on *post-mortem* examinations, the edges of the incision have been found dry, of unhealthy colour, gaping, and showing no tendency to heal. In addition, there is the risk of the lochia escaping into the cavity of the peritoneum, and there decomposing and acting as an unfailing source of irritation. This might be prevented to a great extent by seeing that the os is open before we complete the operation, so as to allow of a free exit into the vagina. The great predisposing cause of these inflammations, however, must be looked for in the condition of the patient. Just as asthenic inflammation in ovariotomy is most frequently met with in those whose general health is most broken down by the long continuance of the disease, so we are fully

justified in assuming that it will be more likely to occur after the Cæsarean section when that operation has been unnecessarily delayed, and when the patient is exhausted by the long continuance of the labour. In proof of this, we find that in the fourteen cases of peritonitis above mentioned, only three occurred when the operation was performed under favourable conditions.

The last great source of danger is the general shock to the nervous system, an inevitable complication in an operation of such magnitude. In Kayser's 123 cases of death, thirty are referred to this cause, and thirteen out of the thirty-eight cases in Dufeillay's table. Of these thirteen, ten were patients noted to be much exhausted, and in three only was the operation undertaken at an early period of labour. It is in predisposing to danger from these nervous complications that we should, *à priori*, be led to expect that vacillation and unnecessary delay would be most hurtful, and that in avoiding them we should afford the patient the best chance of bearing the shock of the procedure. The administration of chloroform will also aid in effecting this object. In addition to these principal sources of danger, a few cases have been lost from accidental complications, which are liable to occur after any serious operation, and which do not necessarily depend on the nature of the procedure.

Besides the danger to the mother, the life of the fœtus is also imperilled; and since the prospect of saving the child is one of the principal reasons why we should prefer the Cæsarean section when we believe the risk to

be pretty equal between it and craniotomy, it cannot be unimportant to determine how so many children are lost. If delay in delivery is dangerous to the mother, it must be vastly more so to the child; and Dr. Simpson long ago clearly proved that the fœtal mortality, in all classes of cases, is in direct proportion to the duration of the labour. When the delay is due to osseous deformity it must be specially injurious, for the recurring pains force the head against the obstruction, which it is unable to overcome, and thus cannot be unattended with risk. There is nothing in the nature of the operation itself which can account for so many children being lost, and if it is undertaken when the child is alive we may almost certainly depend upon extracting it with safety. There is one possible source of danger which is not alluded to in any of our standard works on obstetrics, but which has occasionally proved fatal. As the infant is being removed from the cavity of the uterus, the muscular parietes sometimes contract with great force and rapidity, so as to seize and retain some part of the body during its extraction. This occurred in two of Dr. Radford's cases, and in one of them it is stated that "the child was vigorously alive when first taken hold of, but from the length of time occupied in extracting the head, it became so enfeebled as to show only slight signs of life," and subsequently all attempts at resuscitation failed. In a case published by Mr. Edmunds* something of the same sort occurred, and in one at which the author was present the head was

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* *Lancet*, vol. i. 1861.

caught and so forcibly detained, that a second incision was required to release it. In Dr. Radford's cases* the placenta happened to be immediately under the incision, and he attributes the inordinate and rapid contraction of the uterus to its premature separation. I have elsewhere† ventured to express my belief that this was only a coincidence, because the contraction does not take place until the greater portion of the child's body has been withdrawn, and because numerous cases are recorded in which the uterus was opened directly over the placenta, or in which it was found lying loose and detached, in none of which this accident occurred. The true explanation of the occurrence may, I think, be found in the special irritability of the uterus in different cases, and in the rapidity with which it responds to the stimulus of incision, and of the removal of the fœtus. Irrespective of the risk of portions of the child being caught and detained, rapid contraction is a distinct advantage, since the danger of hæmorrhage is thereby much diminished. I would suggest that serious consequences from the accident might best be avoided by removing when practicable the head and shoulders of the child first, or, as Dr. Radford recommends, employing both hands in extraction, one being placed near the head, the other seizing the feet. Either of these methods seems preferable to the common practice of laying hold of the part that may chance to lie most conveniently near the line of incision. If this point were

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* *Provincial Med. and Surg. Journal*, vol. xv.

† *Lancet*, Nov. 12, 1864.

properly attended to, although the detention of the lower extremities might occasionally occur, it would not be so dangerous as the seizure of the head, and the life of the child would not be imperilled.

DESCRIPTION OF THE OPERATION.—We should, if the case is seen in time, commence the operation towards the conclusion of the first stage of labour, when the membranes are still unruptured, when the os is sufficiently open to admit of a free escape of the lochia, and when the pains are sufficiently strong and frequent to ensure subsequent contraction. After the patient has been placed under the influence of chloroform, she should be removed from her bed and placed on a firm table of convenient height, and in a good light. It has been usually recommended that the temperature of the room should be raised to over 80°, with the view of diminishing risk from exposure of the peritoneum ; but the experience of ovariotomists has shown that this precaution is unnecessary. The nates should project over the edge of the table, and the legs and upper part of the body should be covered with flannel to protect them from cold. Before commencing the incision it is advisable to listen carefully for the uterine souffle, with the view of ascertaining, if possible, the position of the placenta. If this sound is heard very distinctly on the anterior surface of the uterus, we may assume that the placenta is in that position, and can thus regulate our incisions so as to avoid cutting upon it. We cannot, however, rely positively on this sign, and it has frequently happened that operators have, in spite of it, opened the uterus directly over the placental site. The

incision through the abdominal walls should be made as much as possible in the line of the linea alba, so as to avoid wounding the epigastric arteries. On account of deformity, however, the configuration of the abdomen is frequently much altered, and some have advised that the incision should be made oblique or transverse, and on the most prominent part of the abdominal enlargement. The risk of hæmorrhage, however, is then much greater, and the practice is not to be recommended.

The incision, commencing a little above the umbilicus, and terminating about two inches above the pubes (passing to the left of the umbilicus itself), should be about seven or eight inches in length. The skin and muscular structures are now to be carefully divided layer by layer, until the shining surface of the peritoneum is reached, and any bleeding vessels should be seized and secured. A small opening should be made into the cavity of the peritoneum, which may then be laid open along the whole length of the incision upon two fingers of the left hand introduced as a guide. The uterus is now pushed forwards by the hands of an assistant, so as to bring its surface into apposition with the external wound, while at the same time the escape of the intestines is in this manner prevented. If we have reason to believe that the placenta is situated anteriorly, we may incise the uterus to one or other side to avoid it, otherwise the line of incision should be, as nearly as possible, central. Before opening the uterus some operators advise the puncture of the membranes per vaginam, to avoid the chance of the liquor amnii escap-

ing into the abdomen. This may, however, always be prevented by pressing the uterus well forwards, and even when the amniotic fluid has entered the abdominal cavity no evil consequences seem to have followed. The substance of the uterus is now to be divided, in the same cautious way as the abdominal walls, until the membranes are reached, which are to be punctured, and divided on the fingers in the same way as the peritoneum. The incision should be the same length as that of the abdomen, and it should not be made too near the fundus; for not only is that part more vascular than the body or neck of the uterus, but wounds in that situation are more apt to gape, and do not cicatrize so favourably. There is the further advantage in making the incision nearer the neck, that we are thus enabled to remove the child more readily by the head and shoulders when the presentation is natural.

After the uterus is opened, Dr. Winckel recommends the fingers of an assistant to be placed in the two terminal angles of the wound, and that the ends of the incision should thus be hooked up and brought into close apposition with the abdominal opening. By this means he prevents not only the escape of blood and liquor amnii into the cavity of the peritoneum, but the protrusion of the viscera as well. The child should now be carefully removed, the head and shoulders being taken (if possible) out first, the placenta and membranes being afterwards extracted. Should the placenta be unfortunately found immediately under the incision, a considerable loss of blood is likely to take place, which can only be checked by removing it from its detachments, and

concluding the operation as soon as possible. Now that the child and the secundines have been removed, the sooner the uterus contracts to prevent further loss of blood the better. It will usually do so of itself, but should it remain lax and flabby, it should be pressed and stimulated by the hand. We are specially warned against handling the uterus by Ramsbotham and others, but there seems no valid reason why we should restrain hæmorrhage by pressure after a natural labour, and not after the Cæsarean section. The intervention of the abdominal parietes, in the lax condition in which they are found after delivery, can make very little difference between the two cases. We should not think, at any rate, of closing the external wound until we have convinced ourselves that the uterus is firmly and permanently contracted.

Care should also be taken that no part of the intestines become strangulated in the uterine wound, which might possibly occur if due caution were not used. Before closing the abdomen, any extravasated blood may be removed by soft clean sponges dipped in warm water. We should also assure ourselves that the os uteri is open, so as to admit of a free escape of the lochia, for their discharge through the vagina must do much to increase the chances of success. For this purpose we must see that the os is patulous, and also clear away per vaginam any clots that might be blocking it up. Dr. Winckel even thinks that a small strip of lint soaked in oil should be placed in the lower angle of the uterine incision, and carried downwards into the vagina, so as to keep up

a free exit for the discharge. Mr. Spencer Wells and others have suggested that sutures should be employed to close the wound in the uterus, which, however, is so effectually accomplished by contraction as to render artificial means unnecessary. The abdominal wound should be closed from above downwards, either by wire or silk sutures, which should be inserted at intervals of an inch from each other, and passed entirely through the abdominal walls and the peritoneum, at some little distance from the edge of the incision, so as to bring the two surfaces of the peritoneum into contact. By this means we ensure the closure of the peritoneal cavity, the opposed serous surfaces adhering with great rapidity.

It is sometimes recommended that the lower angle of the wound should be left open as a way of escape for the lochia; but this is quite unnecessary if we assure ourselves that the os is sufficiently patulous. Finally, the superficial edges of the wound should be closed by fine sutures, covered by long strips of adhesive plaster placed across the abdomen, and further supported by a flannel bandage. In performing gastrotomy after rupture of the uterus, the same steps should be taken, except that, of course, in this case incision of the uterus is unnecessary. It is advisable, however, to remove with care by sponges the blood which has been extravasated from the edges of the rupture, and which has probably coagulated in the abdominal cavity. If the child has not escaped entirely through the rupture, it may be necessary to make a further incision to admit of its removal; this, at any rate, would be better than any forcible attempts to pull it through the laceration.

Into the subsequent treatment of the case it is unnecessary to enter here at any length, since it must be regulated by general principles, each symptom being met as it arises. It has been customary to administer opiates freely after the operation, but they seem to have a tendency to produce sickness and vomiting, and ought not to be exhibited unless pain or peritonitis indicate that they are required. In fact, the treatment should in no way differ from that usual after ovariotomy, and the principles that should guide us will be best shown by the following quotation from Mr. Spencer Wells's description of that operation: — "The principles of after-treatment are, to secure extreme quiet, comfortable warmth, and perfectly clean linen to the patient; to relieve pain by warm applications to the abdomen, and by opiate enemas; to give stimulants when they are called for by failing pulse, or other signs of exhaustion; to relieve sickness by ice, or iced drinks; and to allow plain, simple, but nourishing food. The catheter must be used every six or eight hours, until the patient can move without pain. The sutures are removed on the third day, unless tympanitic distension of the stomach or intestines endanger re-opening of the wound. In such circumstances they may be left for some days longer. The superficial sutures may remain until union seems quite firm."

SUMMARY—1. The Cæsarean section is required in certain cases of defective proportion between the maternal passages and the child. This is most frequently caused by osseous deformity, but it may also result from the presence of solid tumours of the uterus, ovaries, or growing from the pelvic walls, or from advanced malignant disease.

2. When there is not more than $1\frac{1}{2}$ inches clear space in the pelvis, delivery can be effected by no other means. When there is from $1\frac{1}{2}$ to 2 or $2\frac{1}{2}$ inches in the antero-posterior diameter, delivery may possibly be effected by craniotomy; but the risk of that operation is then so great, that the Cæsarean seems to offer an equal chance of recovery to the mother, without the necessity of sacrificing the child.

3. The Cæsarean section should be resorted to in cases of sudden death at an advanced period of pregnancy, as there is a chance of saving the child. It should in such cases be performed as soon as we are satisfied that life is actually extinct, and with the same precautions as in a living woman.

4. In cases of ruptured uterus, when the child has partially or entirely escaped into the cavity of the abdomen, gastrotomy should be performed. This operation seems to afford the mother a better chance of recovery than the usual practice of version, which necessitates the child being pulled back through the breach in the uterine walls.

5. In cases of extra-uterine fœtation, gastrotomy is

unadvisable at the natural period of delivery. The operation might then save the child, but it has proved extremely fatal to the mother, and a better chance is afforded to her by delaying interference until nature points out the mode by which she attempts the extrusion of the fœtus. If we could clearly make out the diagnosis of a tubular fœtation, gastrotomy would seem to offer the mother a far better chance of safety than delaying until rupture occurs.

6. The statistics of the Cæsarean section conclusively prove that its fatality is greatly increased by vacillation and delay in its performance. Much of the mortality after the operation depends on causes entirely distinct from the procedure itself, since it has too often only been employed as a last resource when the patient has become thoroughly exhausted by the length of her previous labour, or by unavailing efforts at delivery by other means.

7. For these reasons it may be laid down as a most important rule, that the operation should be undertaken without delay as soon as the diagnosis is made, and the impossibility of delivery by other means determined on, provided only that labour has actually commenced, and the pains are sufficiently strong to ensure the subsequent contraction of the uterus.

8. After the administration of chloroform the patient should be removed from her bed, and placed on a firm table in a good light. Before commencing the operation it is advisable to listen carefully for the uterine souffle, with the view of determining the probable situation of the placenta.

9. The incision should be commenced above the umbilicus, and should be carried down to within two inches of the pubes, as much as possible in the line of the linea alba. The skin and muscles should be carefully divided layer by layer until the peritoneum is reached, all bleeding vessels being secured as we proceed. A small opening is then to be made in the peritoneum, which is afterwards divided along the whole length of the wound.

10. At this time the uterus should be carefully pushed forwards by an assistant, so as to bring it into contact with the abdominal wound. By this means the escape of the intestines is best prevented.

11. The uterus is now cautiously divided until the membranes are reached, which are punctured and laid open on one or two fingers of the left hand used as a director. The escape of the liquor amnii into the peritoneum is best avoided by keeping the uterus well pushed forwards.

12. The uterine incision should be of the same length as the abdominal, and should be as nearly as possible central, unless we have reason to believe that the placenta is situated anteriorly, when it may be made more or less on either side to avoid it. The incision should rather be made towards the neck of the uterus, which is less vascular, and not so apt to gape as the fundus.

13. Should the placenta be unfortunately found under the line of the incision, this part of the operation must be hastened, to enable us to detach it as soon as possible.

14. The child should now be carefully extracted, either removing the head or shoulders first, or placing

one hand under the head, and with the other seizing the feet, to avoid serious consequences from the possible detention of portions of the body by the rapidly contracting uterine walls. After the child is removed, the secundines should be separated and also extracted.

15. Before the uterus contracts we should see that the os is open and patulous, to afford a means of escape for the lochia, and if it is not sufficiently so it may be dilated by the fingers.

16. The uterus will probably now contract of itself; but should it not do so, it may be stimulated by the pressure of the hand, in accordance with the practice usual in an ordinary case of post-partum hæmorrhage. We should never think of closing the abdominal wound until we are satisfied that the uterus is firmly and permanently contracted. Any extravasated blood should be gently removed by soft clean sponges dipped in warm water.

17. The abdominal wound may now be closed by interrupted sutures of wire or silk, placed at the distance of an inch from each other, and passing through the entire thickness of the abdominal walls and peritoneum, so as to bring the surfaces of that membrane into apposition. The superficial edges of the wound may afterwards be closed by fine sutures, covered by long strips of adhesive plaster placed across the abdomen, and the whole supported by a broad flannel bandage.

18. In performing gastrotomy after rupture of the uterus, the same steps are necessary, except, of course, the uterine section. Extravasated blood should be carefully removed; and if any portions of the fœtus

are detained in the uterus, it would be better to make a further incision than to drag them forcibly through the laceration.

19. The subsequent treatment of the case must be guided by general principles, each symptom being met as it occurs. The deep sutures should be removed on the third day ; the superficial after adhesion is complete. The treatment should be in every respect similar to that followed after ovariotomy.

CHAPTER VII.

VAGINAL HYSTEROTOMY, INCISIONS, ETC.

UNDER this heading are included all those cases in which, from any cause, the os uteri is either obliterated, or so rigid and undilatable that it is found necessary to resort to artificial means for enlarging it. We may here, also, most conveniently consider the operations sometimes required for the division of bands and cicatrices in the vagina, or for the division of an exceedingly rigid or unyielding perinæum.

I. *Obliterated or Undilatable Os Uteri.*—That the os and cervix uteri may, at the time of labour, be found entirely obliterated, cannot be reasonably questioned. Many cases have doubtless been supposed to be examples of complete obliteration, in which careful investigation shows that there is an aperture, although so small as to be imperceptible except on the most minute examination. Other supposed examples, also, are found to be simply cases of extreme anteversion, the aperture of the os being high, directed back towards the promontory of the sacrum, and out of reach of the finger as usually employed. If the case is referable to the latter class, time and due attention to the position of the patient will generally suffice to overcome the

difficulty. If an aperture, however small, be discovered, it may be possible to effect dilatation without incision, either by relaxing the rigid and undilatable os by the administration of chloroform, venesection, the application of belladonna, opiate enemata, and other similar general measures, or by dilatation of the aperture with the point of the finger until it is of sufficient size to admit the smallest of Dr. Barnes's fluid dilators before referred to, the gentle and equable pressure of which is admirably adapted to overcome the obstacle, the larger sizes being gradually substituted in turn until the cervix is opened up sufficiently to admit of the passage of the presenting part. If, then, an aperture exists, but is rigid and undilatable, such means should be carefully and perseveringly employed, without resorting to any more heroic measures. Since the cases in which the os is entirely closed are rare, we should use every means in our power to assure ourselves that an aperture does not exist, before determining on any operation. For this purpose, in a doubtful case, the whole hand should be introduced into the vagina to explore thoroughly the lower segment of the uterus, and to convince ourselves that the aperture of the cervix is not situated beyond the reach of the finger alone. But even in the more common class of cases, in which an aperture exists, a time may come when the most persevering and careful use of gentler means fails, and when a recourse to operation is absolutely necessary. That incision of the cervix under such circumstances may be practised with safety to the mother is amply proved by the numerous cases in which it has been employed with success;

it is a measure, however, which no one would wish to use unnecessarily, and therefore it need not come into consideration unless the symptoms indicate risk from further prolongation of the labour. When we have convinced ourselves that the os is entirely obliterated, such delay is unnecessary and injurious; and since interference is then essential, we may resort to it as soon as we have positively made our diagnosis as to the true nature of the case. Besides these classes of cases, there are some in which the difficulty depends on malignant disease of the uterus or vagina. The amount of obstruction must guide us as to the course to be pursued. Sometimes the Cæsarean section has been required, but frequently incision of the cervix will suffice to admit of delivery, and of course the less heroic measures will always be preferred.

II. *Extra-Uterine Fœtation.*—When some part of the fœtus projects through the vaginal wall, it has been proposed to make an incision and remove it, either by the forceps or by the introduction of the hand. This procedure seems to have been somewhat more successful than abdominal gastrotomy, probably, as Dr. Campbell suggests, because the fœtal cyst is then directly opened. "In nine cases in which the vaginal incision was practised, three mothers and their infants were preserved in two instances the mother only recovered, on one occasion the child only was preserved, and in three cases both mother and child perished."* In a case mentioned by Cazeaux, in which M. Dubois resorted

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* *Op. cit.*, p. 151.

to this operation, although it was found impossible to remove the child on account of intimate adhesions between its body and the cyst wall, yet a cure followed within two months, by the gradual discharge of the fœtal structures through the aperture in the vagina. Only those cases, however, can be considered suitable for this procedure, in which the head, breech, or some prominent portion of the fœtus projects through the vaginal wall, and seems to lie in such a position as to offer a fair prospect of easy extraction. Even then it seems probable that the mother's safety would, in the majority of cases, be best consulted by waiting until nature clearly indicates the course she is likely to pursue in getting rid of the foreign body, and then affording what assistance may seem necessary.

III. *Bands or Cicatrices in the Vagina, &c.*— Labour is sometimes delayed by rigid cicatrices in the vagina or perinæum, the result of former disease or injury, or one or more firm bands may be met with as a congenital malformation. Very often such abnormal structures yield and dilate under the pressure of the presenting part, and this occurs to a much greater extent than one would *à priori* suppose possible; so that by exercising a little patience we may find that the natural efforts succeed in removing obstacles that at first seemed very formidable. If this should not occur, however, it becomes necessary to divide the obstructing cicatrices or membranes. The persistence of the hymen is occasionally a cause of delay, and this may be included in the present class of cases. Extreme rigidity and firmness of the perinæum may also be a natural occurrence without the existence of any former injury. This

may be present to such an extent that laceration seems inevitable, especially when the pains are strong and forcing. Every means may have been taken in vain to avoid this accident, such as restraining the voluntary efforts, the administration of chloroform, and the like; but if, in spite of these precautions, a laceration seems to be on the point of taking place, we are recommended to make one or more incisions into the resisting structures, not so much with the view of removing the obstacles, as for the purpose of avoiding an extensive rupture, by substituting for it one or more less formidable incisions, which afterwards readily heal. Of the two evils, the latter is undoubtedly the least; but the cases are few in which such a choice is necessary.

DESCRIPTION OF THE OPERATION.—The operative measures required in the above-mentioned cases are very simple in their character. In the event of the os being entirely closed, it may be necessary to make an artificial opening. This will best be done by carefully making a small puncture as nearly as possible in the position of the obliterated cervix. For this purpose we should use a curved, sharp-pointed bistoury, the lower part of which is guarded by lint or plaster to avoid injury to the vagina. After an opening is made it may be enlarged in any direction we may decide upon, using the index-finger of the left hand as a guide, and it would now be advisable to use a blunt-pointed bistoury, for fear of wounding any portion of the child. The direction of the incision in this case should be antero-posterior, as then there is less risk of dividing any of the uterine arteries; but care must be taken not to extend it too far forwards or backwards, in

case either the bladder or rectum might be injured. The opening need not be of great length, for it will subsequently be enlarged by the recurring pains, or, if necessary, this may be done by a fluid dilator. When incisions are required in a rigid and undilatable os, they may be made in the same manner with a guarded blunt-pointed bistoury; or several smaller incisions may be made round the circumference of the cervix, trusting to the labour-pains to effect subsequently sufficient dilatation. Of the two methods the latter is generally preferred, as necessitating less formidable incisions, and in consequence diminishing the risk of hæmorrhage. The loss of blood, however, has been found to be very small, and does not seem ever to have proved excessive. After delivery, especially when a new aperture has been made, it would be advisable to insert a piece of lint soaked in oil between the lips of the wound, to prevent its again becoming agglutinated during the process of cicatrization. The incisions necessary for the division of bands or cicatrices in the vagina must be regulated to a great extent by the nature of the case. As a general rule, however, only a slight division of the most tense and prominent part of the obstruction will be required, the pressure of the presenting part being then sufficient to effect dilatation. When it is found necessary to divide a resistent perinæum, to avoid the occurrence of a more formidable laceration, a slight incision may be made on either side, where the greatest resistance is met with. As in the case of vaginal bands, this need only be of sufficient size to admit of further dilatation by the natural efforts, and extensive incisions are not required.

SUMMARY.—1. Incisions of the os and cervix uteri are required when the os is either found to be entirely obliterated when labour commences, or when it is so rigid and undilatable (either from former cicatrices, malignant disease, or any other cause) that it does not dilate sufficiently to admit of the passage of the child.

2. In the former case the operation should be resorted to as soon as the diagnosis is made; but in the latter simpler means should first be tried, such as the administration of chloroform, the use of Dr. Barnes's fluid dilators, and the like. If these measures fail, incisions should be made as soon as the symptoms indicate that further delay is likely to be injurious to the mother.

3. When some part of the fœtus projects into the vagina in a case of extra-uterine fœtation, the child may be removed by vaginal incision, and the results of the operation seem to be somewhat more favourable than those of abdominal gastrotomy.

4. Cicatrices or bands in the vagina impeding labour may require division; but as a general rule they yield to the pressure of the presenting part. If they do not, slight incisions usually suffice to admit of sufficient dilatation being afterwards effected.

5. If the perinæum is extremely rigid and resisting, and the pains strong and forcing, one or more slight incisions may prevent the occurrence of a more formidable laceration.

6. In the case of complete obliteration of the cervix, a small puncture should be made by a sharp-pointed

bistoury, the blade of which is guarded by lint or plaster. This may afterwards be enlarged in the antero-posterior direction, sufficient dilatation being subsequently effected by the labour-pains or by a fluid dilator. In a rigid os, the object is better accomplished by various small incisions around the circumference of the opening.

7. In the case of vaginal bands or cicatrices, or rigid perinæum, the extent and direction of the incisions must be regulated by the nature of the case; but as a rule they need not be large, the presenting part afterwards acting as an efficient dilator.

CHAPTER VIII.

SYMPHYSEOTOMY AND PUBIOTOMY.

HISTORY.—The operations included under this heading are now so universally condemned as useless and dangerous, that it seems scarcely necessary to do more than allude to them as interesting on account of the exaggerated value which was at one time assigned to them. So lately, however, as the year 1858, a fresh proposal for the performance of pubic section in a somewhat novel manner has been made,* so that the uselessness of the operation does not seem even yet to be everywhere admitted.

Allusions to the possibility of enlarging the cavity of the pelvis by division of the symphysis pubis are met with in some of the older writers, and in the year 1776 Plenck actually performed the operation, subsequent to the Cæsarean section, in a case in which he met with some difficulty in removing the head on account of its impaction in the pelvis, but the idea of extending the process to other cases does not seem to have struck him. In the year 1768 a medical student named Sigault submitted a proposal for the performance of symphyseotomy to the French Academy of Surgery, but his scheme was

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* Cristoforis "On Subperiosteal Pubic Resection."—See *New Syd. Soc. Year Book*, 1859, p. 362.

treated with derision, and for the time forgotten. In the year 1773 he wrote a thesis on the subject, and in 1777 for the first time performed the operation on a woman named Soudiot, being assisted by Alphonse Leroy, who had been from the first a zealous supporter of his views. The case turned out favourably, and from that time the operation was warmly advocated by many distinguished practitioners. So high was the opinion then entertained of the probable advantages of the procedure, that the Academy of Surgery had a medal struck in Sigault's honour, and he came to be regarded as one of the greatest benefactors of the human race. A prolonged and angry discussion raged on the Continent as to the relative merits of the Cæsarean and Sigaultian sections, and the operation was frequently performed with very indifferent success. In London John and William Hunter, along with Denman, made experiments on the dead subject, and on the lower animals, which convinced them that no advantage was to be gained by it, and it seems to have been only once performed in this country.

Nature of the Operation.—The operation is based on the supposition that if the symphysis pubis is divided, the innominate bone will separate to a sufficient extent to admit of a material increase in the cavity of the pelvis. It was supposed to be applicable in cases of contraction in any of the pelvic diameters, whether of the brim, cavity, or outlet; or to cases in which the calibre of the passages was diminished by the presence of solid tumours; or when the head was too bulky to pass without assistance. When the symphysis is divided,

the cut edges of the cartilage separate to a certain extent, and the breach may be still further widened by the pressure of the fœtal head within the cavity of the pelvis. To admit of this, the whole innominate bone must move on the sacrum, the fixed point being the posterior margin of the sacro-iliac synchondrosis, and the structures in front of the articulation must at the same time be put on the stretch, in a degree exactly proportionate to the extent of the movement. It is very generally admitted that the utmost space which can possibly be gained is half an inch, and the cavity of the pelvis cannot be enlarged to this extent without very great risk of lacerating the sacro-iliac ligaments, and the cellular structures immediately in front of the articulation. The greatest gain would be in the oblique diameter, the least in the antero-posterior, which is precisely that in which the obstruction most frequently exists. It is clear that as a substitute for the Cæsarean section the operation is quite useless, as the small increase of half an inch in a case of extreme deformity is not sufficient to permit a living child to pass. The results of the recorded cases equally contra-indicate it as a substitute for craniotomy, since the danger to the mother is vastly greater than in that operation. Forty-nine cases are known in which it has been performed, in these one in three of the mothers died, and one in two of the children. Even of the mothers who recovered, some were hopelessly crippled for life, and others suffered greatly from the effects of injury to the urethra or soft parts. The operation of pubiotomy consists in the simple section of the pubic bones on

either side of the symphysis, or, as M. Cristoforis has quite recently proposed, of re-section of parts of these bones without removing the periosteum. The same objections apply to these procedures, which indeed have scarcely been carried into practice, and are certainly not calculated to find favour with modern practitioners.

The Method of performing the Operation was exceedingly simple. The patient being placed on her back, a catheter was passed into the urethra and kept there to indicate its position, while the symphysis was carefully divided from without inwards. Subsequently it was proposed to divide the cartilage subcutaneously, which would doubtless have been an improvement on the operation. Pubiotomy was accomplished by passing a chain-saw behind the pubic bones with the aid of a long needle, and then dividing them from within outwards.

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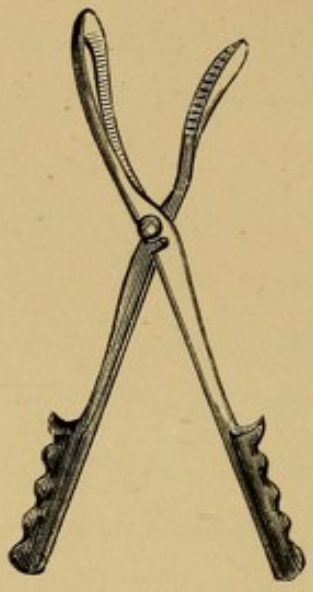

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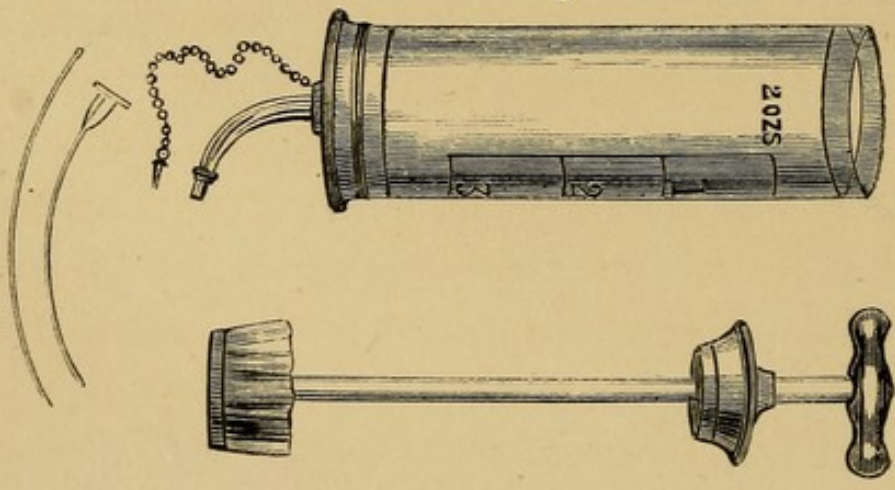

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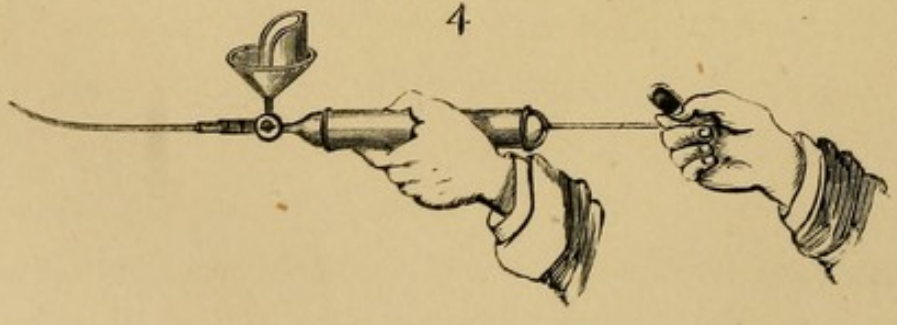

CHAPTER IX.

OPERATIONS INVOLVING THE DESTRUCTION OF THE FŒTUS.

HISTORY.—Operations involving the destruction and mutilation of the child were amongst the first practised in midwifery. Craniotomy was evidently known in the time of Hippocrates, as he mentions a method of extracting the head by means of hooks. Celsus describes a similar operation, and was acquainted with the means of extracting a fœtus in transverse presentations by decapitation; similar procedures were also practised and described by Aetius and others amongst the earliest medical writers. The physicians of the Arabian schools not only employed perforators for opening the head, but were acquainted with instruments for compressing and extracting it at the same time. During the two last centuries a variety of instruments were used for the purpose of extraction in cases in which nature was unable to effect delivery. Several new instruments were also employed for the purpose of opening the head, more especially Sir Fielding Ould's "terebra occulta," and a "ring forceps," the invention of Dr. Simpson of St. Andrews. Smellie used for this purpose a pair of strong scissors, twelve inches in length; and Denman

invented a perforator very similar to the one now most generally employed.

Till the end of the seventeenth century the operation was not considered justifiable in living children; it then came to be discussed whether the life of the child might not be sacrificed to save that of the mother. It was authoritatively ruled by the Theological Faculty of Paris, that the destruction of the child in any case was mortal sin, "Si l'on ne peut tirer l'enfant sans le tuer, on ne peut sans péché mortel le tirer." This dictum of the Roman Catholic Church had great influence on continental midwifery, more especially in France, where, up to a recent date, the leading obstetricians considered craniotomy to be only justifiable after the death of the fœtus has been positively ascertained. In England, as at the present day, the safety of the child was always considered subservient to that of the mother; and craniotomy has been, and it is to be feared is yet, performed with much greater relative frequency than in any other country.

INSTRUMENTS EMPLOYED.—The operation now under consideration may be conveniently divided into two classes: 1st. When the head presents, and requires either to be simply perforated, or afterwards more completely broken up and extracted, an operation which has received various names, but is generally known in this country as "craniotomy," and which may or may not require to be followed by further diminution of the trunk. 2nd. When the arm presents, and turning is impracticable, necessitating one of two procedures, decapitation and the separate extraction of the body and

head, or evisceration. In both these classes similar instruments are employed, and those generally in use at the present time may be first briefly described.

1. *Perforator.*—The object of this instrument is to pierce the skull of the child so as to admit of the brain being broken up, and the cranium being diminished as much as possible in size. Smellie's scissors are still recommended for this purpose by Dr. Ramsbotham, principally because he considers them better adapted for destroying the substance of the brain, and because they may also be used for dividing other parts of the body when decapitation or evisceration is required. Denman's perforator, or some modification of it, has been much more frequently employed. The objection to it was, that it required to have both the handles separated in order to open the blades, and this could not be done by the operator himself. The two most perfect forms of perforators now in use are Naegele's, modified by Young of Edinburgh (Plate I., Fig. 4), and an instrument invented by Blot, principally employed in France. The former is similar in general structure to Denman's original instrument, measuring twelve inches in length, the sharp-pointed portion with external cutting edges being one inch long, with projecting shoulders at its base, to prevent its penetrating too far within the cranium. The handles are so constructed that they open the points when pressed together, and they are separated by a steel rod with a joint at its centre to prevent them opening too soon. By this arrangement the instrument can be manipulated by one hand only. The point should also be slightly curved, to prevent it injuring the operator's

hand during introduction. Blot's perforator has a lance-shaped head, composed of two separate portions, working over each other somewhat like a pair of scissors. The handle is so constructed that the approximation of its two parts separates the extremities, and is superior to Naegele's in simplicity of construction, and in the ease with which it can be worked. A very perfect instrument has lately been manufactured by Matthews, of Carey Street, combining the point of Denman's perforator with the handle of Blot's. (Plate I., Fig. 5.) In some parts of the Continent and in America a perforator is used shaped somewhat like a trephine, but this is vastly more difficult to work, and has the great disadvantage of simply boring a hole in the skull, instead of splitting it up as is done by a sharp-pointed instrument.

2. The instruments for extraction are some form of crotchet and the craniotomy forceps. The crotchet is a sharp-pointed hook of highly-tempered steel, which is to be fixed on some portion of the skull, either internal or external, traction being made by the handle. The crotchet is either straight or curved, the latter form being preferable, as less likely to tear through the bone at the point on which it is fixed, and is either attached to a firm wooden handle or forged in a single piece of metal. (Plate I., Figs. 7 and 8.) A modification of this instrument has been invented by Dr. Oldham, and has received from him the name of the vertebral hook. It consists of a slender hook, measuring, with its handle, about thirteen inches, which is to be passed through the foramen magnum, and fixed in the interior of the vertebral canal, and thus a firm hold for

traction is acquired. The objection to all forms of crotchets is the risk of slipping or breaking through the bone, and so wounding either the soft parts of the mother, or the fingers of the operator placed as a guard. To avoid these accidents, various forms of craniotomy forceps have been invented. These are intended to lay hold of the skull, one blade being introduced within the cranium, and the other externally. They are free from the risk of slipping and injuring the passages, but many practitioners object to them on account of their tendency to crush the bone at the part they grasp, and thus to lose their firm hold. This is most likely to happen when the bone is soft or advanced in decomposition. Some craniotomy forceps are armed with formidable teeth ; others, of simpler construction, depend on their roughened and serrated internal surfaces for firmness of grasp. (Plate I., Fig. 6.)

3. These instruments are adapted only for perforation and subsequent traction. If used at all for breaking up the fœtal skull, they can act only on its summit, leaving untouched the base of the skull, the very part which offers the greatest obstacle to delivery. Various instruments have been invented with the view of enabling us to effect this object; but of these two only are now used, the cranioclast of Dr. Simpson, an instrument of great value, which has scarcely received the attention which it merits; and the cephalotribe, originally invented by Baudelocque, but subsequently altered and improved by various continental obstetricians. The cranioclast (Plate II., Fig. 2) consists of two separate blades fastened by a button-joint, and in general appearance somewhat re-

sembles a pair of craniotomy forceps. Like them it is intended to lay hold of the fœtal skull after perforation, one blade being passed inside, and the other externally. The blades are of a narrow duck-bill shape, sufficiently curved to allow of a firm grasp of the skull being taken, and the upper blade deeply grooved to allow the lower to sink into it, thus giving the instrument great power in fracturing the base of the skull. It need not, however, be necessarily employed for this purpose, for the blades being serrated on their under surface, form as perfect a pair of craniotomy forceps as any in ordinary use, and being provided with it we are spared the necessity of procuring a number of instruments for extraction. The cephalotribe consists essentially of an immensely strong pair of solid forceps, which are intended to lay hold of and crush the fœtal skull; and after this has been effected, they may be employed to extract as well. The original pair, as invented by Baudelocque, was a most formidable instrument, measuring two feet in length, and weighing upwards of four pounds. More recently, however, various modifications have been introduced in its mechanism, and Braun's cephalotribe (Plate II., Fig. 1) is perhaps the lightest and most manageable that has yet been constructed. The cephalotribe, on account of the bulk of its blades, is useless in cases of extreme contraction; while Dr. Simpson's instrument, besides being much less costly, can be employed between both limits within which craniotomy is justifiable.

4. For performing decapitation in cases of arm pre-

sentations in which version is impracticable, we may either employ a curved hook with an internal cutting edge, the invention of the late Dr. Ramsbotham, or a strong pair of long straight scissors. It would be well also to have the obstetric case furnished with a blunt hook of the same form, which might be found useful both in decapitation and evisceration. (Plate I., Fig. 8.)

CASES IN WHICH EMBRYOTOMY MAY BE PERFORMED. —It may perhaps be considered almost superfluous in the present day to insist on the absolute necessity of assuring ourselves that this dreadful operation, involving certainly the destruction of the child, and of necessity placing in considerable jeopardy the life of the mother, is inevitably necessary before we proceed to perform it. When we remember, however, that even the most recent statistics show that it is performed in this country twice as often as in France, and four times as often as in Germany, and that its prevalence is considered on the Continent up to the present day to be the great blot on British midwifery, a word of caution may not be deemed unnecessary. It is scarcely to be expected that the time will ever arrive when craniotomy will be abolished altogether, as an ordinary rule of practice when the fœtus is living and viable. It is, however, sincerely to be hoped that practitioners will come to see that they are morally guilty of the death of the fœtus if they ever perform it without a most careful and anxious consideration of the other possible methods of terminating the case with safety to both mother and child; viz., the induction of premature

labour when deformity is discovered during pregnancy; and the use of turning, or the forceps, when labour has actually commenced. In all cases in which there is the slightest doubt as to the amount of obstruction, a cautious trial of one or other of the latter modes of delivery should also invariably be made before proceeding to the more formidable operation. There can be no doubt that the number of craniotomy cases would be largely diminished, as indeed continental statistics prove, by an increased use of the procedures alluded to.

I. *Want of proper Proportion between the Head and Maternal Passages.*—This may arise either from malformation of the bony structures, the presence of tumours encroaching on the cavity of the pelvis, or from certain morbid conditions of the fœtus causing increased size of the head, especially hydrocephalus. Of these by far the most common is deformity of the pelvis, generally the result of rickets in early life. The contraction may be met with in any of the pelvic diameters, and either at the brim, cavity, or outlet; but most frequently in the antero-posterior diameter of the brim. Obstetric authorities differ considerably as to the precise amount of contraction which will prevent the passage of a living child at term. Thus Clarke and Burns believe that a living child cannot pass through a pelvis in which the antero-posterior diameter at the brim is less than $3\frac{1}{4}$ inches. Ramsbotham fixes the limit at 3 inches, and Osborne and Hamilton at $2\frac{3}{4}$. Since the revival of version in cases of pelvic contraction, we may reasonably hope to terminate labour successfully by that operation when the pelvic diameters are not less than $2\frac{3}{4}$ inches; and

at any rate in such cases a cautious trial would be quite justifiable, as we are not in a worse position for resorting to the more formidable procedure should we fail in the attempt.

The opposite limit to the operation is still more open to discussion. Various authorities have considered it quite possible to extract a mutilated fœtus through a pelvis whose antero-posterior diameter does not exceed $1\frac{1}{2}$ inches, and indeed have succeeded in doing so; but the risk to the mother from the bruising and protracted operation which such extreme deformity involves is so great, that many modern authorities believe the Cæsarean section to be preferable, as affording at least a chance of saving the child, and not being more dangerous to the mother. The tendency in modern practice is certainly against the performance of craniotomy in such cases, and it is now pretty generally admitted that it should not be attempted unless there is at least a clear space of from $1\frac{3}{4}$ to $2\frac{1}{4}$ inches through which the child may be drawn. The same limits may be laid down with regard to tumours encroaching on the cavity of the pelvis; but before operating it should be carefully considered whether the tumour itself might not be dealt with in some other way. Thus we might be able to return it into the cavity of the pelvis, if it were not pressed down in front of the head, or to remove it by excision; and in every case, even when it appears to be quite solid, exploratory punctures should be made to satisfy ourselves that it does not contain fluid, the evacuation of which might diminish it sufficiently to allow the head to pass. In these cases, fortunately far from common, the argu-

ments against craniotomy when the pelvic space is very small are of still greater force. The bruising and mechanical injury to which a tumour of low organization must be subjected in attempting to drag a child past it, must necessarily be exceedingly dangerous; and it is very questionable whether the Cæsarean section would not be, on the whole, safer to the mother, even if the extraction of a mutilated fœtus were not impossible. The improved method of after-treatment which our recent experience in ovariotomy suggests, will doubtless diminish the mortality of that operation, and certain classes of obstructing tumours, especially ovarian, might very properly be removed at the same time, and a radical cure be thus effected.

In cases of hydrocephalus the head may be so large as to prevent the possibility of its passing unless diminished in size. Where this condition is diagnosed, it would certainly be a proper rule of practice, as suggested by Dr. Tyler Smith, to puncture the head with a trocar, rather than open it with the perforator, so as to give the child at least a chance of surviving.

II. *When certain conditions of the Soft Parts exist which are supposed to render the Passage of the Head peculiarly dangerous to the Mother.*—There are many states of the soft parts which have been considered as justifying a resort to craniotomy: among these the most important are swelling and inflammation of the vagina from the length of the previous labour; the presence of bands and cicatrices in the vagina; occlusion and rigidity of the os; and extreme rigidity of the perinæum. It is not too much to say, that with a proper

use of the resources of midwifery, the destruction of the fœtus for any of these conditions might be obviated. The most common of them is undoubtedly swelling of the soft parts causing impaction of the head, an occurrence which ought to be invariably prevented by a timely use of the forceps when labour threatens to be prolonged. Were this comparatively safe operation more frequently and sooner resorted to, such swelling would not be met with, since it is always the result of long-continued pressure of the head in the cavity of the pelvis. Should interference unfortunately be delayed until impaction has actually taken place, doubtless no other resource but sacrificing the child to ensure the safety of the mother would be left; but such cases, it is to be hoped, will every day become more and more uncommon in British practice. Undue rigidity of the os can be overcome by dilatation with Dr. Barnes's fluid bags, or in more serious cases by incision, which would certainly be less perilous to the mother than dragging even a mutilated fœtus through the rigid aperture. In the case of bands and cicatrices in the vagina, incision will generally suffice to remove the obstruction; but even were this not so, in these, as in excessive rigidity of the perinæum, it is better that lacerations should take place than that the child should be killed. The injuries thus inflicted might be subsequently easily remedied by operation, and they would probably not be more hazardous to the mother than craniotomy.

III. *Certain Complications* are considered to justify craniotomy, especially rupture of the uterus, convulsions, and hæmorrhage. In certain cases of this sort very

rapid delivery may be important for the sake of the mother, so that craniotomy may be absolutely necessary. Generally, however, the application of the forceps, or turning, will answer our purpose equally well, especially as we possess in Dr. Barnes's bags a means of dilating the os at pleasure, so as to admit of turning when the natural dilatation has not progressed sufficiently far to allow the introduction of the hand. The performance of craniotomy in a case of rupture of the uterus, when we know that the child is alive, although considered justifiable by most authorities, seems to be a very questionable procedure. We have to do with a complication, which of itself is almost certainly fatal; and supposing it is found unadvisable to deliver by turning or the forceps, it is doubtful whether the performance of the Cæsarean section would materially diminish the chances of recovery. Indeed, in a case in which the forceps could not be employed, the presentation must have receded, and perforation would be equally difficult. In such a case the Cæsarean section appears to be in many respects the preferable alternative (see p. 144).

IV. *Certain Cases in which Version or the Forceps could be employed, but in which Craniotomy is preferred on account of the Death of the Child.*—We are recommended in many obstetric works to perforate the head rather than apply the forceps, when we are convinced that the child has ceased to live. The practice is based on the greater facility with which craniotomy can be performed, and its supposed greater safety to the mother. There is no doubt as to the ease with which a

child can be extracted by means of the perforator and crotchet when the pelvis is not contracted; but it is questionable whether such a procedure is in all cases safer to the mother than the use of the forceps, since we find that one out of every five cases in British practice has proved fatal. In all probability much of this mortality is rather due to the length of time the patient is generally allowed to remain in labour; but the same cause tends likewise to increase the mortality after forceps. The only valid reason, therefore, for using the perforator in such cases is the greater ease with which labour can be terminated by it; against it, on the other hand, we have to consider the extreme difficulty of positively ascertaining the death of the fœtus. Indeed, of the signs usually relied on for this purpose, there are scarcely any which are not open to fallacy, except peeling of the scalp, and disintegration of the cranial bones, which do not take place unless labour has been very unduly prolonged, or unless the child has been dead for a considerable time, and are therefore useless in most instances. Discharge of meconium constantly occurs when the child is still alive; a cold and pulseless prolapsed cord may belong to a twin; and the fœtal heart may become temporarily inaudible, although the child is not dead. If, indeed, we have carefully watched the fœtal heart all through the labour, and heard it become more and more feeble, until at last it stopped altogether, we might be certain of its death; but surely such observations would rather indicate an early recourse to the forceps or version, so as to obviate the fatal result we know to be impending.

V. *In arm presentations*, in which the shoulder has been forced into the pelvis, the waters have been long discharged, and the uterus is so tightly contracted round the body of the child as to render turning impossible, no other resource remains but the extraction of the child either by decapitation or evisceration. It is very fortunate that before such extreme measures are necessary the child has generally perished, so that we can undertake the operation without compunction.

VI. *In certain breech or footling presentations*, or after turning, it may be found impossible to extract the head, and we may find it necessary to diminish its size by perforating behind the ear.

STATISTICS, AND DANGERS TO MOTHER.—The frequency with which craniotomy has been employed varies exceedingly in different countries. Thus we find from Dr. Churchill's statistics that it is performed in Great Britain on an average once in every 210 cases; in France once in $1205\frac{2}{3}$; and in Germany, once in $1944\frac{1}{3}$. So that we have the unenviable pre-eminence of performing it far more frequently than the practitioners of any other country. The mortality among the mothers averages one in five cases, a great part of which, as we have already observed, must depend on the unwillingness of the accoucheur to undertake the operation until it is actually forced on him, thus exposing the patient to the risk of a very prolonged labour. If, therefore, the operation is to be performed at all, and the alternatives of version and the forceps are clearly impossible, there can be no doubt of the importance of prompt and early action. Nothing can possibly be gained by waiting, and the only result

of stopping till the child's death is ascertained, as some practitioners recommend, would be to imperil the life of the mother, without saving that of the child. The dangers to be apprehended as the direct results of the operation are chiefly from bruising and laceration of the vagina. The former frequently results from attempts at extraction without a due regard to the pelvic axes; the latter, from sharp pieces of the cranial bones which the operator neglects to guard properly during extraction. Both of these may be avoided to a great extent by due attention to the rules of the operation.

DESCRIPTION OF THE OPERATIONS.—The first step in craniotomy consists in *perforation*. Two or more fingers of the left hand should be passed up to the head, and placed against the most prominent part of the parietal bone. On these, used as a guide and guard, the perforator should be cautiously introduced until the scalp is reached. Before doing so, however, we must carefully ascertain the exact relation of the os to the presenting part, so as to avoid all risk of injuring it. It is important to fix on a bony part of the skull for puncture, and not on a suture or fontanelle, because our object is to break up the vault of the cranium as much as possible, so as to allow the skull to collapse. When the instrument has reached the point we have selected, it should be made to penetrate the scalp and skull with a semi-rotatory boring motion, and advanced until it has sunk up to the rests, which will oppose its farther progress. Occasionally considerable force will be necessary to effect penetration, more especially if the scalp is swollen by long-continued pressure; and this

stage of the operation will be facilitated by causing an assistant to steady the head by pressure on the abdomen, especially if it is still free above the pelvic brim. We must then press together the handles of the instrument, still retaining the finger of the left hand in its former position, which will have the effect of widely separating the cutting portion, and making an incision through the bones. After this the point should be turned round and again opened at right angles to the former incision, so as to make a free crucial opening. During this process we must be careful in seeing that the head of the perforator is buried in the skull up to the rests, so as to avoid injury to the vagina. The instrument may now be introduced within the skull and moved freely about, so as to thoroughly and completely destroy the brain. Especial care must be taken to reach the medulla oblongata and base of the brain, for if these were not destroyed we might subject ourselves to the distress of extracting a child in whom life was not yet extinct. If this part of the operation is thoroughly performed there will be no necessity for washing out the brain by the injection of warm water, as is sometimes recommended, for the broken-up brain will escape freely through the opening made by the perforator. If there is no necessity for very rapid delivery, and the pains are still present, it may be advisable to wait ten minutes or a quarter of an hour before proceeding to extraction. This delay will allow the skull to collapse and become moulded to the cavity of the pelvis when forced down by the pains, and possibly the natural efforts may prove sufficient to finish the labour in that time; or, at least, the head

will have descended further, and will be in a better position for extraction. It may also be useful to keep one finger of the left hand in the aperture thus made, to prevent the bones collapsing and closing the opening, before we introduce the instrument for extraction.

Extraction is usually performed by means of the craniotomy forceps or crotchet. If we select the former they must be carefully introduced up to the aperture in the skull, and one blade passed through it, while the other is fixed on the outside. When we have secured a firm grasp, careful traction should be made downwards and backwards in the first instance, so as to bring down the head in the axis of the brain, and when it has descended as low as the perinæum, we must continue the traction in the direction of the outlet. We should act only with the pains; or, if these be absent, at intervals to represent them. If the skull be sufficiently ossified to admit of a firm hold being taken by this instrument, it will be found easier to use, and safer than the crotchet. Should the bones, however, be so brittle as to break in the grasp of the blades, the latter will be preferable. The crotchet is usually introduced into the interior of the skull, and its point is fixed on some projecting portion of bone which affords a firm hold. We are recommended to fix it on some part of the occipital or temporal bones, or within the foramen magnum, if we can succeed in doing so, with the view of bringing the back of the head down first, and so preserving the flexion of the chin on the sternum, which would be interfered with were the instrument fixed on the frontal bone or behind the

orbits. Having fixed the point, we should ascertain by a preliminary trial that it is likely to hold. We must be careful, as with the forceps, to draw in the direction of the pelvic axes, and one or more fingers of the left hand should be placed upon the outside of the skull, opposite to the point of the instrument, to guard the soft parts of the mother should it penetrate the cranium, as well as to assist our efforts at traction. Should the instrument slip it must be carefully reapplied at a point at which a firmer hold can be secured. If this cannot be obtained in the interior of the skull, it may be allowable to fix the crotchet externally; but in this position it is more likely to injure the mother, and much care will be necessary. If a firm hold cannot be obtained by the crotchet, Dr. Oldham's vertebral hook may occasionally prove serviceable, provided we can succeed in passing it through the foramen magnum, which, however, is not always easily effected. When the pelvic deformity is moderate the head can be brought down very easily; but when we are operating in a case in which the pelvis is much contracted, great difficulty is likely to be experienced, and considerable force and much patience may be required. Indeed, the operation is occasionally so difficult that some have recommended, when there is much distortion, that the case should be left until decomposition has commenced, in order that the decayed and softened head may pass more easily through the pelvis, a practice which cannot but be attended with great danger. When any spiculæ of bone project through the scalp they must be removed with a pair of dressing forceps, and carefully guarded by the fingers of

the left hand to prevent laceration of the vagina. Generally we try to prevent this as much as possible, wishing to preserve the scalp as a guard. In very difficult cases it has been found necessary to break up and remove the entire summit of the cranial vault, so as to diminish as much as possible the size of the head. This cannot be done without danger of laceration, however carefully we may guard the fragments of bone during extraction. Dr. Braxton Hicks has recently pointed out that in cases in which there is considerable deformity in the antero-posterior diameter, delivery may be more easily effected by artificially producing a face presentation, and causing the chin to point anteriorly. This alteration in the presentation he proposes to effect by a small blunt hook fixed externally in the orbit, and he has adduced several cases in which the difficulties experienced were readily overcome in this manner. Dr. Mackenzie has suggested that extraction may best be effected by performing version after the skull has been perforated, believing that in this way all risk of injuring the maternal passages with instruments or spiculæ of bone may be avoided. This practice can only be followed when the head is freely moveable above the pelvic brim, and is therefore inapplicable in a majority of the cases in which the operation is required. Nor does there seem to be any valid reason why perforation should be the first step taken. If the case is suitable for turning at all, surely it would be advisable to give the child the chance of life afforded by version, and if it were found impossible to extract the head, it might subsequently be opened behind the ear, which is quite as easily accomplished and quite as

effectual as perforation in ordinary head presentations. In all these plans, however, the base of the skull remains intact, and this is precisely the part which offers the greatest obstacle to delivery. To remedy this defect Dr. Simpson invented the operation to which he has given the name of *Cranioclasm*. The object of this procedure is to break up the base of the fœtal skull, so as to reduce the head to the smallest possible proportions, an indication which, if successfully accomplished, enables it to be drawn with facility through a smaller opening than is possible with ordinary craniotomy instruments. In operating, the cranioclast is introduced, after perforation, in the same way as the ordinary craniotomy forceps, the lower blade being passed inside the skull, and the upper externally, and, if possible, the occipital bone should be first seized. When in position the blades of the instrument will embrace a portion of the base of the skull, and by a twisting motion of the wrist the included portion can be fractured without the employment of much force. The instrument may then be moved to another part of the skull without removing it from the pelvis, and by a repetition of this manœuvre the entire base may be broken if necessary. When the bones have been fractured as much as may be deemed requisite, traction may be made with the instrument without removing it, the portion of scalp between the blades affording a sufficiently firm grasp for this purpose. The peculiar value of the operation is that the skull can be diminished to the greatest possible extent without removing any of the bones, which are still retained within the

scalp, thus giving the surest protection to the soft parts of the mother. The tedious and dangerous process of removing the entire vault of the cranium in cases of great contraction is thus entirely obviated. This valuable improvement in operative midwifery seems scarcely to have received the attention which its simplicity and effectiveness merit. I can bear testimony to its usefulness, having by this means completed delivery with the greatest ease in a case of labour obstructed by a solid pelvic tumour, in which at the outside there could not have been more than two and a half inches antero-posterior diameter, and in which for upwards of two hours vain attempts had been made to effect the object with the ordinary craniotomy forceps and crotchet. On examining the skull after death the entire occipital bone was fractured even through the foramen magnum, thus destroying the firmest and most resisting part of the cranium.

To effect the same object continental accoucheurs employ the *cephalotribe*, which has scarcely had a fair trial in this country, although it doubtless possesses many advantages over the ordinary craniotomy instruments. There seems little doubt that by it the base of the skull can be effectually crushed, and it can also be afterwards used as an extractor. Here, also, we have the great advantage of preserving the scalp as a covering for the bones. The blades are passed over the head, after perforation, in the same manner as the ordinary forceps, and then approximated by the screw. If necessary, the instrument may be removed and re-introduced, so as to crush the base of the skull in another direction.

It seems evident that the cephalotribe can only be used with advantage when the obstruction is in one diameter only, and when there is sufficient space at the sides of the pelvis for the passage of the blades. Such cases, indeed, form the majority among those in which the destruction of the fœtus is necessary; but still, every now and then the operation will be required when the deformity is too great to admit of the passage of the instrument, or when the pelvis is pretty uniformly obstructed in all its diameters,—as, for example, by a solid tumour forced down in front of the head. It is not easy to see how, in cases of this sort, the blades of even the smallest cephalotribe could be passed with safety. This does not, however, seem to be felt as a difficulty on the Continent, since Pajot recommends its use in place of the Cæsarean section when the antero-posterior diameter of the brim is less than two inches, using it for this purpose, at intervals of three or four hours, to crush the head until the pains expel the mutilated fœtus, but not employing it as a tractor. Dr. Simpson's instrument is certainly free from objection as regards difficulty of introduction, and may also be employed as an ordinary craniotomy forceps if we do not choose to use it for breaking up the cranial bones.

After the head has passed there is seldom much difficulty in effecting the delivery of the body. In cases of extreme contraction, however, we may find it necessary to perforate and evacuate the thorax also, afterwards fixing the crotchet on some portion of the internal surface of the thoracic parietes, and making steady downward traction during the pains. In breech

and footling cases, in which the head is detained in the cavity of the pelvis, it may be necessary to diminish its size before it can pass. This can be easily and effectually done by perforating the skull behind the ear. From the strength of the bone in this situation considerably more force may be required than when we have to penetrate the vault of the cranium.

In arm presentations, in which turning is impracticable, the fœtus must be extracted piecemeal, and we have two methods to select from.

1. *Decapitation.*—In this operation the head of the child is separated from the trunk, which is easily withdrawn by means of the presenting arm, the head remaining in the uterus to be subsequently dealt with. For the purpose of separating the head we must either employ Ramsbotham's hook with an internal cutting edge, or divide the neck with a strong pair of straight scissors. Other instruments have been invented for this purpose, such as Van Huevel's forceps-saw, but are not used in this country. If the former instrument is used, it must be passed up to the neck, carefully guarded by the fingers of the left hand, and insinuated round it. By a steady sawing motion the vertebræ and soft parts of the neck must be divided, the instrument thus cutting its own way out. It is often no easy matter to pass the hook over the neck, and even when in position considerable force may be required to effect the decapitation. Besides this, we have no means of accurately regulating the force applied, and there is some risk of the hook suddenly cutting through the neck, and injuring the soft parts of the mother. A pair of long

straight scissors, similar to Smellie's craniotomy scissors, will effect the object equally well, and with less risk of injuring the vagina. They must be guided to the neck, which is to be divided from below upwards, by a series of cautious snipping movements, until it is quite separated from the body. We are advised by some authors first to pass a blunt hook over the neck, both to pull it down and to guard the maternal structures from the point of the scissors. This may be a useful precaution when practicable, but it is not always easy to pass the hook, and the operation, if carefully performed, may be quite safely concluded without it. When the neck is divided the body can be easily withdrawn by means of the arm, which should be carefully preserved for this purpose, and not first removed as some advise. It remains now to deal with the head which remains in the uterus. Fortunately there is seldom much difficulty in removing this, as the pains will soon force it down into the cavity of the pelvis, when a sharp-pointed crotchet may be introduced into the vertebral canal or mouth, by means of which it may be extracted. Should any difficulty be experienced, the cephalotribe will be found a valuable means of completing the operation, for with it we may seize the head as with a forceps, and crush and withdraw it at the same time. It must be remembered that in these cases the pelvis is usually of normal size, so that the blades can be introduced with facility, and that there is not likely to be any undue obstacle to the passage of the head.

Evisceration consists in the removal of the contents of the fœtal thorax, and, if necessary, of the abdomen also, which will permit the body to collapse, and be

withdrawn doubled up, as in spontaneous evolution. In performing it the fingers of the left hand are introduced as a guide and placed against the thorax, and on these the perforator is to be introduced, and a free incision made through the ribs and intercostal spaces. Through the aperture the perforator may be pushed in and used to break up the viscera, which are to be removed piecemeal with the assistance of the crotchet. This of itself may suffice, and the body may then be removed by traction on the arm. Should this not prove sufficient, the perforator must again be inserted, and passed through the diaphragm into the abdominal cavity, the contents of which must be removed in the same manner as those of the chest. After this the crotchet can be fixed in one of the pelvic bones, and used to draw down the lower part of the child's body. Of the two operations decapitation is the most simple to perform, and may be concluded in less time, provided the pelvis is of full size, so that the head can be easily extracted. In it there is also less risk of bruising and injuring the mother. To perform it with facility, however, it is necessary that the neck should be within easy reach of the finger. If, therefore, the chest of the child is tightly jammed into the pelvis, and the neck cannot be got at without difficulty, evisceration would be the preferable procedure. Practically neither operation will require to be performed on a living child, as the length of the previous labour, and the pressure to which the body must have been subjected before the necessity for either of them arises, must certainly have proved fatal.

SUMMARY.—1. The instruments used in craniotomy are a perforator, a curved or straight crotchet, and a pair of craniotomy forceps. The cranioclast invented by Dr. Simpson is very valuable for breaking up the base of the skull, and forms also an excellent craniotomy forceps.

2. Craniotomy should never be performed unless we are positively certain that no other mode of delivery is practicable, and in cases in which there is the slightest doubt a cautious trial of version or the forceps should at least be made.

3. But if the operation is decided on the sooner it is performed the better, so as to save the mother the risk of a prolonged labour. It is worse than useless to wait for the death of the child.

4. Craniotomy is most frequently required on account of a want of due proportion between the child's head and the passages, arising either from pelvic deformity, obstructing tumours, or undue size of the head.

5. A living child cannot pass through a pelvis having an antero-posterior diameter at the brim of less than $2\frac{3}{4}$ or 3 inches, and even a mutilated child cannot safely be dragged through a pelvis having a diameter of less than two inches. These, then, are the measurements between which the operation may be undertaken.

6. In cases of infantile hydrocephalus the head should be punctured with a trocar rather than opened by the perforator, so as to give the child at least a chance of life.

7. Certain states of the soft parts have been considered to justify craniotomy, especially swelling and inflammation of the vagina, bands and cicatrices in the vagina, and rigid os or perinæum. With a proper use of our appliances the operation ought never to be required in such cases. Swelling and inflammation should be prevented by a timely use of the forceps, but should it unfortunately have occurred no other resource is left. Undue rigidity or cicatrices should rather be treated by fluid dilatation or incision.

8. When we believe the child to be dead craniotomy is recommended as easier and safer than the application of the forceps. It is very questionable whether it is in any degree safer to the mother, and the signs of the child's death are so uncertain that this may be considered an unsafe rule of practice.

9. In arm presentations in which version is impracticable the piecemeal extraction of the child may be required. In footling cases in which the head is detained perforation may also be necessary.

10. In perforating the fingers of the left hand should be passed up to the most dependent portion of the head, and on these as a guide and guard the perforator should be introduced, and pushed through the bone up to the rests. The handles should then be approximated to make an incision through the skull, and the instrument turned round to make a second incision at right angles to the first. Before being opened the head of the perforator should be carefully pushed in as far as the rests, to ensure the safety of the vagina.

11. Through the opening thus made the closed per-

forator should be introduced and moved freely about, so as to break up the brain, special care being taken to destroy its base and the medulla oblongata, with the view of ensuring the death of the child.

12. In cases in which very rapid delivery is not essential, ten minutes or a quarter of an hour may be allowed to elapse, so that the head may collapse and become moulded and compressed by the pelvis.

13. If we extract with the craniotomy forceps we should fix them in some portion of the occipital bone, and draw during a pain downwards and backwards in the direction of the axis of the brim until the head reaches the perinæum, when the direction of traction should be changed to that of the outlet. If the bones are brittle and break in the grasp of the instrument the crotchet should be preferred.

14. The crotchet should be pushed into the interior of the skull, and fixed, if possible, on some portion of the occipital or temporal bones, so that the flexion of the chin may be maintained and the head brought down in the most favourable position. If no hold can be obtained in these situations the point may be fixed behind the orbit, or even on the external surface of the head or face.

15. Traction should be made during the pains, or at intervals to represent them, taking great care to draw at first in the axis of the brim, and afterwards in that of the outlet.

16. As a general rule we should try to keep the scalp entire, so as to protect the vagina from the sharp edges of the cranial bones. In cases of great distortion,

however, we may be obliged to break up the vault of the cranium, removing the pieces of bone by means of dressing forceps, and carefully guarding them with the fingers of the left hand.

17. But the necessity of this troublesome procedure may be obviated by the use of the cranioclast, which is introduced in the same way as the craniotomy forceps, so as to seize the occipital bone, which is broken by a twisting movement of the wrist. The position of the blades may then be altered, and the same manœuvre repeated. In this way the entire base of the skull may be broken up, and extraction effected with comparatively little difficulty.

18. The base of the brain can also be crushed by the cephalotribe, which, however, is not so well adapted for cases of extreme distortion, on account of the breadth of its blades and the difficulty of introduction.

19. In arm cases in which turning is impossible the child may be removed either by *decapitation* or *evisceration*.

20. The former procedure is easiest when the pelvis is of full size and the neck within reach, the latter when the pelvis is contracted or the thorax tightly jammed into its cavity.

21. Decapitation may be effected with a curved sharp hook, or with a pair of scissors of sufficient length. After the neck has been divided the body is easily withdrawn by the arm, and the head removed by a crotchet fixed into the vertebral canal or mouth. The cephalotribe would probably be found very useful for this purpose.

22. Evisceration is performed by perforating the thorax and removing the viscera of the chest and abdomen through the opening, the body being afterwards withdrawn doubled up, either by the arm or by a crotchet fixed in the child's pelvis.

CHAPTER X.

THE TRANSFUSION OF BLOOD.

HISTORY.—The first serious proposals for the performance of this operation do not seem to have been made until the latter half of the seventeenth century. It was first actually performed in France by Denys of Montpelier, although Lower of Oxford had previously made experiments on animals, which satisfied him that it might be undertaken with success. In November 1667, some months after Denys's case, he made a public experiment at Arundel House, in which twelve ounces of sheep's blood were injected into the veins of a healthy man, who is stated to have been very well after the operation, which must, therefore, have proved successful. These nearly simultaneous cases gave rise to a controversy as to priority of invention, which was long carried on with much bitterness.

The idea of resorting to transfusion after severe hæmorrhage does not seem to have been then entertained. It was recommended as a means of treatment in various diseased states, or with the still more extravagant hope of imparting renewed life and vigour to the old and decrepit. The blood of the lower animals only was used; and, under these circumstances, it

is not surprising that the operation, although practised on several occasions, was never established as it might have been had its indications been better understood.

From that time it fell almost entirely into oblivion, although experiments and suggestions as to its applicability were occasionally made, especially by Dr. Harwood, the Professor of Anatomy at Cambridge, who published a thesis on the subject in the year 1785. He, however, never carried his suggestions into practice, and, like his predecessors, only proposed to employ blood taken from the lower animals. In the year 1824, Dr. Blundell published his well-known work entitled "Researches, Physiological and Pathological," which detailed a large number of experiments; and to that distinguished physician belongs the undoubted merit of having brought the subject prominently before the profession, and of pointing out the class of cases in which the operation might be employed with hopes of success. Since the publication of his work, transfusion has been regarded as a legitimate operation under special circumstances; but although it has been frequently performed with great success, and in spite of many excellent monographs on the subject, it has never become so established as a general resource in suitable cases, as the advantages it offers would seem to warrant.

Object and Nature of the Operation.—Transfusion is practically only employed in cases of profuse hæmorrhage in connexion with labour, and the benefits derived from it are probably twofold.—1st. The actual restitution of blood which has been lost; and 2nd. The supply

of a sufficient quantity of blood to the heart to stimulate it to contraction, and thus to enable the circulation to be carried on until fresh blood is formed. The influence of transfusion as a means of restoring blood cannot be great, since the quantity required to produce an effect is occasionally very small indeed, and never sufficient to counterbalance that which has been lost. Its stimulant action is probably of far more importance; and if the operation is performed before the vital energies are entirely exhausted, the effect is most marked, and indeed may be said to be almost unfailing. In the earliest operations the blood used was always that of the lower animals, generally of the sheep. Dr. Blundell believed that the blood of animals of different species could not be employed with success. Dr. Brown-Séquard has since shown that the blood of various animals can be used indiscriminately, provided only certain precautions are taken; and he attributes the failure of Dr. Blundell's experiments on this point, partly to the circumstance that he used too large a quantity, and injected too quickly, and partly to the injected blood being too rich in carbonic acid, and too poor in oxygen, to be employed with safety. He has shown that the success of the operation must depend to a great extent on this point, and that blood containing sufficient carbonic acid to be black proves directly poisonous, unless it is injected in very small quantity, and with great slowness. Although his experiments tend to show that the blood of the lower animals, especially of those in which the corpuscles are of less size than in the man,—as in the sheep,

—can be employed with safety, still the operation of late years has been performed with human blood alone, and for many obvious reasons is likely always to be so. A proposal has been made to use blood from which the fibrine has been removed by whipping, the advantages being that the difficulty experienced from rapid coagulation is thus obviated. Panum has carried out the latest and most extensive series of experiments on this point,* and has arrived at the conclusion that defibrinated blood is in every respect as well suited for the operation as pure blood. Professor Nussbaum has also actually proved in a successful case of transfusion, that such defibrinated blood can be used with good results; but there is at least one serious objection to its employment, and that is the time and the complexity of the manœuvres necessary to prepare it. It is evident that in an operation of this sort everything should be done to simplify the process, and when every moment may be of value all unnecessary delay should be avoided. To defibrinate the blood it is necessary to whip it for several minutes in an open vessel, and afterwards to strain it through a cloth; and when this has been effected, no advantage is gained beyond the prevention of coagulation, a difficulty which can be obviated by other and simpler means. It is possible, however, that under special circumstances such defibrinated blood might be used with advantage; as, for example, when the practitioner had to operate without proper assistance, or without a suitable instrument.

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* *Virchow's Archives*, vol. xxvii.

In such a case he could scarcely attend properly both to the removal of the blood from the emittent and its injection into the recipient, and the previous preparation of the blood in the manner suggested might prove of essential service to him.

THE CASES SUITABLE FOR THE OPERATION are those in which the patient is reduced to an extreme state of exhaustion from hæmorrhage during or after labour or miscarriage, whether this is caused by the repeated losses of placenta prævia, or the more sudden and profuse flooding of post-partum hæmorrhage. The operation will not come into contemplation until other and simpler means have been tried and failed, and when the symptoms indicate that life is on the verge of extinction. If the patient should be deadly pale, with no pulse at the wrist, or with one that is scarcely perceptible; if she be unable to swallow, or vomits incessantly, or lies in an unconscious state; if jactitation, or convulsions, or repeated faintings, should occur; if the respiration be laborious, or very rapid; and if the pupil does not act under the influence of light, it is evident that she is in a condition of extreme danger, and it is under such circumstances that transfusion performed sufficiently soon offers a fair prospect of success.

It does not necessarily follow that because one or other of these symptoms is present, that there is no chance of recovery under ordinary treatment, and patients have often been rescued from an apparently hopeless state by the persevering administration of stimulants, and other modes of treatment. But when two or more of them occur together, the prospect of recovery is much dimi-

nished, and transfusion would be fully justified, especially as it may be shown that a fatal result has never been directly traced to its employment. Indeed, like most other obstetric operations, it is more likely to be postponed until it is too late to be of service, than to be employed too early, and in some of the cases which are reported as unsuccessful, it was not performed until respiration had ceased, and death had actually taken place. The practical rule, therefore, that may be laid down as to the period when transfusion should be resorted to is, that it is justifiable whenever we find the ordinary restoratives have failed to induce reaction, or when, from fainting or vomiting, they cannot be taken in sufficient quantity, and when we are convinced that the patient is in such a stage of exhaustion as to render her chances of recovery small unless some immediate measures are adopted. It has been usually considered essential that the uterus should be firmly contracted before transfusion is employed, to prevent the blood escaping from the uterine sinuses as soon as it is injected. The cases in which this is likely to occur are few; but even if we were to meet with one, it seems doubtful if the operation should not be undertaken. For, as it is the directly stimulant and restorative action of transfusion that seems to be most beneficial, we might fairly hope to temporarily rouse the vital energies so as to admit of other and more successful measures being taken to ensure contraction, especially direct pressure simultaneously through the abdominal wall and vagina.

The operation has also been successfully performed in a case of placenta prævia with the view of restoring

the patient sufficiently to enable her to bear the shock of delivery, and this seems to show that the possibility of the injected blood escaping again from the uterus, need not necessarily act as a contra-indication.

STATISTICS AND DANGERS.—The statistics of transfusion indicate very strongly its value in suitable cases, and it would be difficult to point to any other serious operation in which the results have been equally favourable. Thus, Mr. Soden has tabulated thirty-six cases of puerperal hæmorrhage in which it was employed, in twenty-nine of which the patients were rescued from an apparently hopeless state of exhaustion; while in two out of the seven unsuccessful cases respiration had entirely ceased before transfusion was commenced.* From Professor Martin's more recent statistics we find that, out of fifty-seven cases, forty-three were entirely successful, and seven temporarily so; while in the remaining seven no reaction took place. Against these figures we have to place, as the dangers of the operation, chiefly the risk of injecting air or coagula along with the blood, of overwhelming the action of the heart by injecting the blood too rapidly or in too great quantity, and secondarily of phlebitis. These may be to a great extent obviated by careful attention to the proper performance of the operation, and it does not clearly appear from the recorded cases that they have ever proved fatal. We must also bear in mind that transfusion is seldom or never likely to be attempted until the patient is in a state which would otherwise almost certainly preclude

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* *Med.-Chir. Transactions*, vol. xxxv.

the hope of recovery, and in which, therefore, much more hazardous procedures would be fully justified.

DESCRIPTION OF THE OPERATION.—Much ingenuity has been expended on the invention of apparatus, and it would be quite useless to attempt anything like a comprehensive description of all that have been recommended. The great objection to most of these instruments is their cost and complexity, and as long as a special apparatus is considered essential for the performance of transfusion, the full benefits to be derived from it are not likely to be realized. The necessity for employing it arises suddenly, it may be in a locality in which it is impossible to procure the instrument; and it is unlikely that practitioners will generally be provided with an expensive and special contrivance adapted for an emergency that may never occur in the course of their practice. It would be well, therefore, if it was clearly understood that transfusion may be safely and effectually performed by the simplest means. In many of the successful cases an ordinary syringe was used; in one, in the absence of other instruments, a child's toy-syringe was employed. I have frequently performed transfusion in the lower animals with a common glass urethral syringe; and if to this is added a small canula, with a mouthpiece into which the nozzle of the syringe fits, we have an efficient apparatus costing only a few shillings which I should have no hesitation in employing on the human subject. It by no means follows, however, that a special instrument would not answer better; and of the numerous varieties that are manufactured none seem so efficient and simple as that recommended by Dr.

Graily Hewitt. This consists of a glass syringe holding two fluid ounces (Plate II., Fig. 3), to the lower extremity of which is attached a moveable canula for introduction into the vein. The piston is separate, and the blood is received directly from the vein of the emittent into the cavity of the syringe. Another favourite form of instrument is that used by the late Dr. Waller, consisting of a brass syringe lined with tin, with a long silver tubule attached for introduction into the vein. (Plate II., Fig. 4.) The blood is received into a special funnel-shaped apparatus communicating with the barrel of the syringe. Of the two, Dr. Hewitt's is decidedly the simplest; and there is also an advantage in the syringe being made of glass, which enables the operator to be certain that coagulation has not taken place. The first step of the operation consists in making an aperture in the vein of the recipient, and for this purpose the median cephalic or median basilic is generally chosen. The vein should be laid bare for the space of an inch, and should also be isolated from the surrounding textures, so that a probe may be passed under it, by which pressure may be made to prevent the escape of blood before the injection is commenced. A puncture is now made of sufficient size to admit the nozzle of the syringe, or the canula if one is employed. The blood to be injected should be taken from the arm of a strong and healthy man. The quality cannot be unimportant; and in some of the recorded cases the failure of the operation has been attributed to the fact of the emittent having been a weakly female. The supply from a woman also might prove to be insufficient; and although it has been shown that blood from two or

more persons may be used with safety, yet such a change necessarily leads to delay, and should, if possible, be avoided.

The great practical difficulty arises from coagulation, which is seldom delayed beyond three or four minutes, and sometimes takes place much sooner. It is to avoid this that Nussbaum and others have used defibrinated blood; which, however, for the reasons previously mentioned, does not appear to be generally applicable. Provided we are prepared to proceed with the injection without delay, and do not unnecessarily expose the blood to the action of the air, inconvenience from this source may be prevented. Still it would greatly simplify the process if we were in possession of some easy method of retarding coagulation. For this purpose Dr. Richardson has suggested the cautious addition of liquor ammoniæ, in the proportion of two minims, diluted with twenty minims of water, to each ounce of blood.* The diluted ammonia is placed in a vessel into which the blood is received, and gently stirred as it falls, and by this means coagulation is effectually prevented. Dr. Richardson believes that the addition of this minute quantity of ammonia, instead of proving injurious, would act beneficially by increasing the stimulant quality of the blood. I do not know of any case in which this plan has been carried into execution, but I have employed it in the lower animals with perfect success, and therefore it probably would be equally safe in the human subject. At any rate the suggestion is well

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* *On Coagulation of the Blood*, p. 448.

worth bearing in mind, and in the absence of proper assistance it might materially diminish the difficulties of the operation.

Before filling the syringe, it should be worked with warm water, and every step of the operation should be carefully considered and arranged, so as to avoid either hurry or unnecessary delay. When the barrel of the syringe has been filled with blood, a small quantity should be pressed out of it to expel the air contained in the nozzle, which should then, according to the instrument used, be either introduced directly into the vein, or into the canula previously inserted. We may then commence the injection, and it should be constantly borne in mind that this step of the operation must be conducted with the greatest caution, and the blood introduced very slowly, the effect on the patient being at the same time carefully watched. The injection may be proceeded with until some perceptible effect is produced, which will generally be indicated by a return of the pulsation, first at the heart and subsequently at the wrist, an increase in the temperature of the body, greater depth and frequency of the respirations, and a general appearance of returning animation about the countenance. Sometimes the arms have been thrown about, or spasmodic twitchings of the extremities have taken place, and occasionally well-marked convulsions have preceded the return to consciousness. The quantity of blood required to produce these effects varies greatly, but in the majority of cases has been very small. Occasionally two ounces have proved sufficient, and the average may be taken as ranging between four and six,

although in a few cases between ten and twenty have been used. The practical rule is to proceed very slowly with the injection until some perceptible result is observed. Should embarrassed and frequent respiration supervene, we may suspect that we have been injecting either too great a quantity of blood, or with too much force and rapidity, and the operation should at once be suspended, and not be resumed until the suspicious symptoms have entirely passed away. It may happen that the first effects of the transfusion have been highly satisfactory, but that in the course of time evidence of returning syncope shows itself. This tendency may possibly be prevented by the administration of stimulants and general treatment; but if these fail, there is no reason why a fresh supply of blood should not again be injected, but this should be done before the effects of the first transfusion have entirely past away.

SUMMARY.—1. The transfusion of blood probably acts in a twofold manner: 1, by the actual restitution of blood which has been lost; and 2, by stimulating the heart to contract until fresh blood is formed. Of these actions the latter seems to be the most important.

2. The blood of the lower animals, or blood from which the fibrine has been removed by whipping, may be used with certain precautions, but human blood is preferable and is generally employed.

3. The cases suitable for transfusion are those in which profuse flooding has taken place in connexion with labour or miscarriage, and when life seems to be on the verge of extinction.

4. Among the most prominent symptoms indicating the necessity of transfusion are absence of pulsation, inability to swallow or incessant vomiting, jactitation, convulsions or repeated faintings, rapid or laborious respiration, and dilated and insensible pupil. The occurrence of two or more of these will, in most cases, fully justify the operation.

5. Contraction of the uterus and cessation of hæmorrhage have been considered essential before the operation is undertaken; but this rule seems of doubtful propriety, since transfusion may cause the patient to rally sufficiently to admit of further treatment, even though the uterus remained large and flabby.

6. Transfusion may, if necessary, be safely and effec-

tually performed with an ordinary syringe, although if a special apparatus can be procured it would be preferable.

7. All the details of the operation should be carefully considered and arranged before commencing, and the first step consists in laying bare the vein of the recipient, in which an aperture may then be made, into which the canula is placed if one is used. A probe or thread should previously be passed under the vessel, by means of which pressure may be made to prevent loss of blood until we are ready to proceed with the injection.

8. The blood to be injected should then be drawn from a healthy man, and, if the instrument is suitable, should be directly received into the barrel of the syringe to prevent unnecessary exposure to the air, and thus to retard coagulation.

9. The nozzle of the syringe is next introduced without delay into the vein or canula, care being taken that it contains no air. The injection should be made with extreme care and very slowly, to prevent the possibility of overwhelming the heart by too rapid or forcible introduction of the blood.

10. The patient should be carefully watched during the progress of the injection, which may be continued until symptoms of returning animation show themselves. If rapid or embarrassed respiration supervene, we should at once stop, and not proceed with the injection until all suspicious signs have passed away.

11. On an average from four to six ounces of blood will prove sufficient, but more may be required,

and we must judge of the amount by the effect produced.

12. After the first rally we should freely administer stimulants and employ general treatment, and the operation may be repeated if a relapse seems likely to first occur, but it should be done before the effects of the injection have finally passed away.

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THE END.