shown that the amount of megaloblastic marrow varies from time to time during the disease, but has certainly not shown that there is no such specific change.

There is one other point of difference between pernicious anaemia and all other anaemias which should be mentioned. The occurrence of another severe disease during the course of pernicious anaemia partly or completely obliterates the typical blood picture; this is well illustrated by Weinberg's³ case. The secondary anaemias are intensified by the advent of intercurrent disease.

REFERENCES.

- ¹ Levine, S. A., and Ladd, W. S.: *Johns Hopkins Hosp. Bull.*, 22, 1921.
² Zadek, I.: *Schr. med. Woch.*, vol. 2, 1921. ³ Weinberg: *Deut. Arch. f. klin. Med.*, vol. 126, 1918.

Three Lectures

ON

CONTRACTED PELVIS.

DELIVERED IN THE UNIVERSITY OF LONDON,
FOR ADVANCED STUDENTS,

BY

GIBBON FITZGIBBON, M.D., F.R.C.P.I.,
MASTER, ROTUNDA HOSPITAL.

III.

THE MANAGEMENT AND TREATMENT OF CONTRACTED PELVIS.

THE one and only object in the consideration of contracted pelvis is to obtain that any woman with this complication in pregnancy will be delivered in the safest manner for herself and her infant.

The first fact that must be learned about contracted pelvis is that it does not of itself require treatment. Treatment is only indicated if the contraction is such as to cause arrest in delivery. Unquestionably the safest mode of delivery is by the natural passages as the result of spontaneous labour. If the dimensions of the pelvis preclude the passage of a reasonably moulded head, it becomes necessary to adopt some form of treatment designed to avoid the difficulties bound to arise at the time of delivery, but there is no form of treatment that compares favourably at the time or in after-results with normal spontaneous labour.

In my opinion there are only three methods of delivery in contracted pelvis justified by their results:

1. Spontaneous delivery, which includes forceps after the obstruction is passed, provided excessive moulding is not demanded.
2. Induction of labour, provided the infant is sufficiently developed.
3. Caesarean section.

All other forms of treatment are merely methods of overcoming abnormal difficulty which should not be encountered. Section is not called for before term, and is, therefore, the alternative to spontaneous labour and delivery. Induction is required before term and is the only treatment to be considered during pregnancy. Neither is entitled to enter into competition with spontaneous delivery at term.

Induction of Premature Labour.

Induction of labour should be considered if difficulty in labour is anticipated from contraction of the pelvis or excessive size of the foetus; in both the result is the same.

Induction may be adopted with benefit at any time from the expected date of confinement to four weeks before term. In contracted pelvis the foetus is seldom much above the average size, and induction more than four weeks before term is likely to be inimical to the infant's survival. The average infant is 7 lb. at term, but many are only 6 lb., and the average at the thirty-sixth week is only about 5 lb. The head of such an infant has a biparietal diameter of 3 to 3½ in., and it will take a very marked degree of contraction to interfere with the passage of this.

Except in some rare contractions the transverse diameter of the pelvis will never be reduced sufficiently to prevent lateral movement of so small a head and replacement of the biparietal diameter by a smaller one approaching the bitemporal. The cases that call for induction as early as the end of the thirty-sixth week are extremely rare and chiefly arise from the combination of contraction with large size of the foetus. As pregnancy advances in the last four weeks the foetal head is progressively increasing in size and more particularly in rigidity. At the end of the thirty-eighth week the average weight is about 6 lb. and the biparietal diameter 3½ to 3¾ in.; the infant when born is just as good a life as at term.

If all cases could be seen in time during pregnancy, induction could take the place of section in all except extreme degrees of contraction, but it can never be considered justified in a case capable of delivery spontaneously at term, and, therefore, cannot be adopted as the treatment for contracted pelvis *per se*; it will only be called for in less than 25 per cent. of all cases, and 75 per cent. will end spontaneously at term.

The method of induction which I adopt is the introduction of a soft rubber tube; there is never any difficulty, it is merely a modification of the method with bougies, and I think has the advantage of more certain asepsis. Whatever method is adopted, asepsis is the one essential. The operation can be carried out in private homes, but it is preferable to obtain surroundings more conducive to aseptic technique. The operation should be done with all the care of a vaginal operation, and with this there should be no appreciable difference in morbidity from uncomplicated labour.

If cases are properly selected for induction, delivery will be easy and spontaneous; delay may occur on the perineum and need forceps to complete, but this is nothing more than occurs in other normal cases. The infant is well developed, and requires no more care than one born at term; it is able to suckle perfectly, and has as good a prospect of survival as any. There will be a few cases of extreme contraction where induction will be required at or before the thirty-sixth week, and the infant will be so small as to reduce its survival prospect; such cases should be let go to term for section.

The time for induction cannot be fixed from the pelvic dimensions; it must be settled by a careful examination under anaesthesia to estimate when the head has or will reach the limit of size that will pass the brim of the pelvis easily. This can be done practically always with one examination, but if at the time selected the head is found smaller than necessary the operation should be deferred.

I have now to consider the management of cases that have reached term or, as in the majority of cases met with in the present day, are actually in labour. The choice lies between pelvic delivery and section. The condition of contracted pelvis will be suggested in a primipara by the one constant sign—a head free above the brim of the pelvis. In a multipara the history of previous labours will suggest the condition. In either case a careful abdominal examination is required, and all the other external estimates of the size of the pelvis. The majority of cases will show definite evidence that the head will go through, and then only require to be watched. The indications that the proportions are good are exactly the same as I have described in the examination of a case during pregnancy. A small number of cases will show evidence of marked disproportion, such as obliquity of the foetus or uterus in a primipara; this is of less importance in a multipara. Even in a primipara with a marked degree of simple flat pelvis obliquity of the foetus may not be against pelvic delivery. Other causes of signs suggesting marked disproportion must be excluded, such as excess of liquor amnii causing a free head, twins producing marked prominence of the abdomen, and relaxation of the abdominal walls from previous overdistension causing obliquity in a multipara.

In a multipara the mere history of a difficult labour is not sufficient to justify a section. The nature of the difficulty and the result of the labour and the skill or knowledge possessed by the attendant require to be carefully inquired into. A previous section will usually be an

indication, but when the operation was done before or early in labour in a primipara it is far from proof that pelvic delivery will not be safe.

I have related my experience of doing a section without proper investigation. During the past year two patients have delivered themselves spontaneously and rapidly of large infants ($7\frac{1}{2}$ and $8\frac{3}{4}$ lb.), although sections were done in their first pregnancies on account of the degree of contraction and before labour. Unless the indications for section are unquestionable the operation should not be decided upon without first seeing what labour will do, or at least a full examination under anaesthesia. This particularly applies to primiparae, but also to a large number of multiparae.

Caesarean section for contracted pelvis will give better maternal and foetal results than delivery through the pelvis if obstruction exists, but the results from the operation cannot be compared with normal labour. The maternal death rate even in selected cases—that is, when the operation is performed before labour has started—was shown in the last collective analysis to be 1.6 per cent., or more than three times as great as the all out mortality of childbirth, although the cases investigated were collected from well equipped hospitals during ten years when surgical technique had reached its present high standard. The analysis showed another important fact—that the results from section performed early in labour and when infection could be excluded were little worse than before labour, the death rate being practically the same, 1.8 per cent.

With what must be looked upon at present as the inevitable maternal mortality of Caesarean section I consider it essential to avoid performing the operation upon any case capable of safe delivery by the natural passages. If labour is conducted as it should be, if unnecessary interference and examination are avoided, and if the progress is properly watched so as to terminate the attempt at pelvic delivery when it is seen that the difficulty is greater than can be overcome by the natural efforts, Caesarean section can be adopted with complete safety to the mother and infant, while the more important result will be obtained of letting those cases end naturally in which the obstruction is not too great, and these cases constitute over 70 per cent. of the women with an unquestionable degree of contraction.

For these reasons I adopt the practice of giving almost every case a trial of labour; the tables I have shown give the results obtained during an experimental year when I tried various methods of treatment. I fully recognize that several cases were allowed to continue in labour and were terminated by pubiotomy or upper strait forceps which would have given better foetal results from section, but the only alternative with the knowledge at my disposal would have been to adopt section much more frequently and often in cases that terminated naturally and easily.

I will now describe a trial of labour and the observations made during it for guiding treatment.

Trial of Labour.

Labour is allowed to continue until the pains are well established and it is thought that the cervix will have partially dilated. A vaginal examination is then made, but when the conditions are considered relatively good by abdominal palpation a rectal examination will usually be sufficient at this time. The principal points to be noted are how the cervix is dilating and how the membranes bulge. The head will be too high above the brim to make out more than its application with the sagittal suture in the axis.

In the great majority of cases the cervix will be taken up with the external os dilated to admit two or three fingers. The membranes will be applied to the ring of the os and will not bulge more than normally. These cases may be allowed to continue with a high probability of spontaneous delivery, and rupture of the membranes is unlikely to occur before the cervix has almost or actually reached full dilatation. In a small number of cases the cervix, although dilated to two or three fingers, will not be well taken up and the

membranes may bulge somewhat more than normally; the prognosis is not bad, but the membranes are likely to rupture during the first stage. In a few cases the membranes will be found bulging in a large bag into the vagina with the cervix still projecting as a definite vaginal portion. The prognosis for pelvic delivery in these cases is definitely bad and early rupture of the membranes is certain to occur. These cases might be submitted to section after a fuller examination under anaesthesia, or the membranes might be punctured to see how the head enters the cervix and to avoid the risk of prolapse of the cord or other complication from the rupture of the membranes during a pain. With the exception of the few cases selected for section at this examination the cases are allowed to continue until the membranes rupture.

Examination at Time of Rupture of Membranes.

The majority of cases continue in quiet labour for a reasonable length of time, the cervix reaches full dilatation and the membranes rupture. On palpation the head is found not only to have entered the brim but to have sunk well down, and the next few pains drive it on to the pelvic floor. The difficulty is past, delivery will be easy, and a rectal examination will confirm the facts made out by palpation. If the head has not passed the brim a vaginal examination is made, within half an hour after the membranes rupture, and the following conditions will be found.

1. The cervix may have reached full dilatation or very nearly so; the head will have engaged in the brim as a vertex with the sagittal suture closed or slightly overlapping in the axis of the brim. The head is slightly too large for the brim, but only requires moderate reduction by moulding; this can be safely waited for, and the head will come down to the outlet in a reasonable time. The delay during moulding may produce some secondary inertia before the second stage is completed, or the moulded head may not follow normal mechanism, but delivery can be safely effected with low forceps. Posterior fontanelle presentation may develop, but this facilitates moulding, or the head may come down in the transverse in simple flat pelvis.

2. The membranes may have ruptured when the cervix was only two fingers to half dilated. These are the important cases and include practically all in which there will be difficulty. If the head has entered the brim as a vertex and the cervix is crowning the head—that is, applied in an even ring with the edges of the external os thinned—the prognosis is still good; the early rupture may have been due to obliquity of the uterus from relaxed abdominal walls in a multipara, or a slight excess of liquor amnii in a primipara. Labour is allowed to proceed.

3. When the cervix instead of crowning the head has re-formed a vaginal portion, the head is so much too large for the brim that it cannot come down to take the place of the bag of membranes and continue the dilatation. The head may have become asynclitic or extended into an anterior fontanelle or even brow presentation. The prospect of pelvic delivery is absolutely bad and section is indicated, but there is plenty of time and results will be perfect even if the operation is not performed in less than six hours.

Examination Four Hours After Rupture of Membranes.

A second vaginal examination is required in all cases not delivered within four hours after rupture of the membranes. The conditions at this time may be:

1. When the membranes only ruptured with the cervix almost or actually fully dilated, the head will be past the brim and delivery will be best and safely completed with low forceps; the delay is probably due to falling off of uterine action or failure of mechanism in a moulded head.

2. When the membranes ruptured with the cervix only half or less dilated, the dilatation may have continued well, the cervix will be nearly or actually fully dilated and crowning the head. The head will be synclitic and only moderately moulded, it may have gone into a posterior fontanelle presentation, but delivery is to be expected and

the head will at least pass the brim, when delivery can be completed safely with forceps.

3. If the cervix has ceased to dilate or has only dilated slightly and has moved back on the presenting part so that the posterior lip is thinned while the anterior lip is elongated and probably thickened, the head may be markedly moulded and may have become a posterior fontanelle presentation or become asynclitic. The passage of the brim, if effected at all, will only be by excessive moulding, and the dilatation of the cervix may never be completed. Spontaneous delivery is not to be expected and forceps will invariably be difficult, resulting in death of the foetus in half the cases. Pubiotomy will produce sufficient room and save the infant, and this is the time for the operation, but unless pubiotomy will be resorted to, in the event of forceps proving difficult, all these cases will be best treated by section, and there is still plenty of time for this to be performed with perfect results. These are essentially the cases in which forceps are applied at present, but fail, and, doing untold damage, render the cases unfit for any subsequent beneficial treatment.

4. The cervix may have re-formed a vaginal portion with the inner os partially closed down and the external os relatively more dilated. The head will be still free above the brim, often asynclitic or extended. The treatment is section, and the only alternative, perforation or pubiotomy, but the disproportion is likely to be too great for good results by the latter.

Cases are no less suitable for section four hours after rupture of the membranes than at the start of labour; the mother and infant are both in good condition and the soft parts undamaged; labour has lasted for only a portion of the normal time for the first stage, and if the fact that pelvic delivery is doubtful has been accepted at the first examination these cases will have been already moved to some place where section can be adopted with safety, and there is plenty of time for all preparations or even to move the case if that has not been done already.

I have now to consider some other methods of treatment. So far I have indicated induction, section, or spontaneous delivery as the best methods of dealing with cases of contracted pelvis, the last to be aimed at always, and replaced by section when not attainable at term or by means of induction. Nevertheless, forceps, version, pubiotomy, and craniotomy are treatments and have occasional places in the management of cases.

Forceps.

Forceps have a very real and essential place in obstetrics, but are capable of doing untold damage. They must be divided into two groups: upper strait and lower strait. The former is more likely to be harmful than beneficial.

When the uterine action fails to make the head engage because it is too big for the brim, or having forced the head into the brim has produced excessive moulding with a large part of the head still above the brim, it is obvious that the uterine action cannot effect delivery, and therefore forceps are not a justifiable means of completing the work.

On the whole, forceps should not be resorted to until the greatest diameter of the head has passed the brim, or at least entered it, and this is never before the cervix is fully dilated and taken up. If this was always accepted, cases of failure with forceps would not occur, and the cases could be treated successfully by other methods. Nobody is justified in applying forceps to a head with the greatest diameter still above the brim unless he is prepared to desist in his efforts at extraction after reasonable traction and resort to pubiotomy.

In those cases where the head has to undergo moulding somewhat in excess of normal it will frequently be forced past the brim successfully by the uterine action, but when this is completed the moulding may interfere with normal mechanism and the uterus may tire with the extra demand made upon it. Forceps are then indicated; they should not be applied while the head is making reasonable advance, but when this ceases it will be better for both mother and infant to complete delivery. A case should never be allowed to continue to the extent of development of maternal distress before being completed; it may not have reached a

stage in which forceps can be used with benefit, and then some other procedure is called for, but if forceps are not contraindicated they should be used. When a case has continued to a stage of severe maternal distress with local indications of obstructed labour, it is probably too late to be benefited by forceps and the obstruction is frequently greater than can be justifiably overcome by forceps.

Foetal distress in itself should not be considered an indication for forceps; it must be absolutely subservient to maternal indications or contraindications. It is most unlikely to develop as a result of labour before forceps may be safely used in a case capable of pelvic delivery. If forceps are applied on account of foetal distress and the maternal condition is not suitable, the infant will practically never be benefited and the maternal tissues may suffer untold damage.

The place of forceps may be summed up as—to complete delivery when the natural forces fail to do so but have overcome the obstruction, and before the vitality of the patient is reduced by useless prolongation of effort.

Version.

My tables only show two cases treated by version. I consider the operation has no place in the treatment of contracted pelvis. The only merit of the operation is that the foetus can be extracted when no other means will effect delivery of a whole infant. After version the head can be brought into the brim and forced to mould when it will not even enter as a vertex, but the reduction in size and damage to the head are as great as if the foetus came head first, to which is added the risk of a difficult breech. If podalic version is ever done it should be the conversion of a breech presentation into a cephalic.

There are a few cases of multiparae where the foetus presents in an oblique or transverse lie, where owing to associated conditions such as pendulous belly the head does not enter the brim or a brow results, also where a face presents and if it was not for the abnormal presentation the head would be able to enter and pass the brim. These cases may be treated by version and bringing down the legs, but the treatment is not directed to the contracted pelvis but to the abnormal presentation.

Pubiotomy.

I am one of the very few who perform the operation of pubiotomy; my experience of the operation is that it is easy to perform, safe for the mother, with easy convalescence, and saves the infant. I think it has a distinct place in obstetrics in the present day as a means of reducing disproportion which cannot be otherwise reduced, but I do not consider that any case of contracted pelvis should be allowed to enter and continue in labour with the preconceived intention of being terminated by pubiotomy. In such cases there will have been the indications of excessive obstruction early in labour, and these should be accepted as contraindications to pelvic delivery.

The place of pubiotomy is between upper strait forceps and craniotomy; so long as the former is looked upon as a justifiable means of bringing the head through the pelvic brim, pubiotomy must be accepted as the means of dealing with those cases requiring excessive traction with forceps. If forceps were justified the foetus must be alive and craniotomy is not justified, but neither is vigorous traction.

The cases in which I find pubiotomy a suitable operation are those in which the membranes rupture early but the cervix continues to dilate and actually or almost reaches full dilatation, while the head enters the brim as a vertex with moderate moulding, but then remains without advancing in proportion to the activity of the labour. Secondary uterine inertia may have begun to develop, but there should not be maternal distress, and at this time the foetal condition will be good. The bone should be divided, and then if the cervix is not up the case should be left to continue labour, which will frequently end spontaneously within a couple of hours, or the head will come down to the outlet and be easily delivered by low forceps. If the cervix is fully dilated, or the patient a multipara, delivery

may be completed immediately after dividing the bone, or if the case is only seen after distress has developed delivery may be completed provided the head is brought through slowly to give the soft parts time to stretch.

I have performed the operation eighteen times in four years and effected the delivery of thirteen living infants where the only alternative was craniotomy. Two of the mothers died, being previously infected, and the result would not have been altered by craniotomy; but the child of one of these patients lived.

In my tables I show eight cases; several of these showed bad indications for pelvic delivery with protracted first stages of labour and excessive moulding, so that from my experience in that year I would now perform a section early, rather than carry on with the intention of resorting to pubiotomy. Still, in a subsequent year I have resorted to pubiotomy in four cases where I had no alternative but excessive traction with upper strait forceps or craniotomy, and obtained four living infants.

Craniotomy.

In the majority of instances craniotomy must be looked upon as proof of failure of treatment. There are a certain number of complications which cause the death of the foetus independent of the labour, and when this occurs perforation of the head is indicated if there is disproportion to the pelvis. Unfortunately most of the cases at present requiring the operation could have been treated by some other method if the facts had been recognized earlier and deleterious efforts at delivery avoided. The enormous increase in the number of Caesarean sections performed in recent years, and induction of labour in the last few years, has produced extraordinarily little reduction in the number of craniotomies. In fact, I think the operation is more frequent than twenty-five years ago, when section was only done in about 5 per cent. of its present frequency. I do not think this is due to degeneration of the human race or development of brain. Craniotomy will not be reduced in frequency until all obstetric cases are conducted with careful observation and those found incapable of pelvic delivery submitted to section when the fact is first definitely demonstrated by a trial of labour and without being submitted to futile and harmful efforts to complete delivery through the pelvis.

While preparing these lectures I have completed another year's work in the hospital, and the following table shows the results and frequency of the various operative treatments found necessary:

Method of Delivery.	No. of Cases.	Foetal Deaths.	Cause of Death.
Normal delivery—			
Spontaneous	110	3	Inanition, second and third days.
Low forceps	12	2	1 cerebral haemorrhage; 1 albuminuria.
Low forceps with marked moulding	5	0	
Upper strait forceps	2	0	
Pubiotomy	4	0	
Caesarean section	15	2	1 haemorrhage from cord; 1 no cause.
Induction 37th to 39th week—			
Spontaneous	8	1	No evident cause.
Low forceps	5	0	
Craniotomy	2	2	Foetus dead early in labour.
Prolapse of cord (delivery terminated with low forceps)	2	2	Foetus dead.
Breech easy	3	0	
Face converted vertex, spontaneous (6 para and 8 para)	2	0	
Twins	4	0	
Premature not induced	8	5	
Macerated	2	2	
Total	184	19	

Pelvic Measurements.—External conjugate: average, 7.12 in.; minimum, 6.6 in.; maximum, 7.6 in. Intercristal: average, 10.2 in.; minimum, 8.2 in.; maximum, 11.6 in.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

"VESICALIZATION" OF THE STUMP OF THE CERVIX UTERI.

"VESICALIZATION" seems about the best word to describe the procedure adopted in this case to cure a vesico-vaginal fistula which occurred after subtotal hysterectomy.

The patient, a very stout flabby woman of 61, who had been practically bedridden for a long time, came under treatment for an abdominal swelling which was diagnosed as a uterine fibroid.

Abdominal section on March 30th, 1922, proved the mass to be a fibrocystic tumour of the left ovary, firmly fixed to a normal sized uterus, with many dense adhesions to the transverse and descending colon, the bladder, and other neighbouring parts. The tumour, left tube, and body of the uterus were removed, leaving the right ovary and tube and the cervix. The number and density of the adhesions and the patient's stoutness made the operation very difficult, and silk ligatures were freely used. At first there was little to note in the healing of the wound and the general condition of the patient, but on April 3rd she began to complain of frequent and painful micturition. By April 8th this had become severe, and on April 12th there was a leakage from the vagina of urine, which was alkaline and very irritating. This leakage rapidly increased with much excoriation of the vulva and surrounding skin.

All kinds of treatment were tried to stop the leak and to acidify the urine and cure the irritation, including continuous drainage of the bladder with Cathcart's apparatus, but nothing really helped. Examination under an anaesthetic showed that the urine was escaping through the cervical canal, so a further operation was done on May 26th. There was so much inflammation and thickening of the vaginal fornices that it was impossible to pull the cervix down, peel off the bladder, and proceed on conventional lines. The cervix was therefore most thoroughly scraped out and "rawed" with sharp spoons; during this process a thick knotted silk ligature (evidently the cause of all the trouble) was removed from the cervical canal. The cervix was then firmly stitched up and entirely occluded by six deep stout twenty-day catgut sutures, passed antero-posteriorly. Part of the cervix was therefore "vesicalized" or taken up into the bladder wall.

A self-retaining catheter was passed by the urethra and left in for fourteen days, the bladder being drained continuously. The urine was kept acid with urotropin and acid sodium phosphate and later with cystazol. The vagina was douched with very weak mercury perchloride solution twice a day after the first three days. The stitches were not interfered with, but were allowed to come away of themselves.

I was a little anxious when the catheter was removed, but there was no leak at all, though micturition was rather frequent for a few days. The convalescence was rather prolonged, as the patient's legs and back were very weak from the long period of inaction before the first operation; this was remedied by massage, and she was able to get up a little on June 30th. She left hospital on July 16th, 1922.

On June 2nd, 1923, she reported: "I am pleased to tell you that I have had no bladder trouble at all since my return home. I have full control of the urine and no leakage whatever."

E. OLIVER ASHE, M.D.Lond., F.R.C.S.Eng.,
Senior Surgeon to Kimberley Hospital.

MANOMETRIC METHOD FOR THE ESTIMATION OF UREA.

I DEMONSTRATED to a recent meeting of the Ulster Medical Society a method of estimating urea in urines, based upon the principle that if a gas is liberated within an apparatus of constant volume the resulting increase of pressure is proportional to the amount of gas liberated.

The ordinary hypobromite reaction is utilized to liberate nitrogen from a fixed volume of urine, and is carried out in the usual manner by placing the urine in a small test tube within a bottle containing the reagent, so that by tilting the bottle the urine and reagent can be mixed at will. The bottle is provided with a perforated rubber stopper into which is pressed the stem of a manometer, such as forms part of a sphygmomanometer outfit of the aneroid pattern. The air space within the apparatus has a complex value, being the capacity of the empty bottle *minus* the amounts of caustic soda, bromine, and urine added; *minus* the volume of the glass composing the bromine tube and the urine tube; *minus* the volume of air displaced by the stopper of the bottle; *plus* the air space inside the manometer; *plus* the potential air space in the reagent due to its power of dissolving nitrogen. It is thus not easy to standardize the apparatus so that it shall have a constant air space, but I find that the air space is brought to a sufficiently constant value by