

More Modern Concepts of Anaesthesia in Childbirth

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Part III

Parts I and II, which appeared in previous issues of this Journal, could very well bring forth the following notes of despair about modern concepts of anaesthesia in childbirth:

“So many different conditions and problems presented by so many different individual patients. So many agents, so many techniques each with its advantages and disadvantages. So many different ‘definite’ indications and contraindications presented by so many different experts for numerous and varied reasons, sometimes physiological, sometimes because of lack of training and sometimes just because of prejudice. So many pages of printed matter to explain and justify the various points of view.”

No wonder the author of the original letter to the editor felt that “natural childbirth” was not the answer to all problems, and that some practical suggestions would be useful. But because of the vastness of the subject, I shall now merely describe the techniques and methods used at the Grace Maternity Hospital, Halifax, N. S., for the various conditions presented by obstetrics, as tabulated in part II.

But first, a warning.

It is always very unwise to pressure a patient into accepting a certain method of treatment against her wish, unless, in your opinion, there is no doubt that her own choice would be harmful. Never impose your will for the sake of convenience. This principle applies particularly when deciding upon the anaesthetic technique you will use. If the patient objects strongly to spinal or conduction anaesthesia, do not force it upon her unless you are convinced that a general anaesthetic will be harmful to her or the infant, either because of conditions present or because of the anaesthetist's lack of training. On the other hand, if she desires spinal anaesthesia, you should be capable of providing her with just that. If you don't, she would never forgive you should there be anything wrong with her child. Not only your reputation would suffer, but that of your whole profession. Understanding, kindness and gentleness are the essence of good obstetrical anaesthesia, plus a certain amount of knowledge and technical ability.

If you should be at the Grace Maternity Hospital when anaesthetics are being administered I am sure that you would wonder why, when so many techniques are available, the same ones are used most of the time. The answer is simple. After considerable study and practice, one finds that a certain technique in his hands provides comparable or better results than other techniques. The tendency is then to continue using the same techniques unless there are definite indications for changing to others. Prejudice and laziness should not influence one's judgment. Thus the reason for continuous study to keep abreast of progress and changes, but not necessarily to agree and accept these changes without question.

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At the Grace Hospital, two techniques are found satisfactory for most of the anaesthesia. These are: conduction anaesthesia, either spinal or lumbar epidural; and general anaesthesia with Pentothal, Anectine, nitrous oxide and oxygen.

I shall now describe the basic techniques used and then refer to others as indicated when going over the list of indications for anaesthesia.

Whenever a patient is to be anaesthetized, regardless of the type of anaesthesia used, the anaesthetist should have all necessary equipment ready for the immediate treatment of any complication. Thus, even when giving a spinal anaesthetic, the anaesthetic machine must be ready, the oxygen cylinder must be open and the machine checked to make sure that artificial respiration can be instituted instantly. Equipment for intubation must be laid out neatly in a definite order on the anaesthetic machine, the laryngoscope checked to make sure that it does function infallibly (avoid the disastrous episodes where the light goes out just as the endotracheal tube is about to be inserted into the trachea, intubation fails, the patient vomits, and then aspirates). Two or three different sizes of endotracheal tubes should be ready with connectors as well as a stilette to assist intubation. The suction must be working at the time of induction. Preferably an intravenous infusion should be started, but of course there is not always time. The various anaesthetic drugs, relaxants and vasopressor agents should be at hand as well as sterile syringes and needles to administer these drugs. Plenty of adhesive tape should be available.

SPINAL ANAESTHESIA

Note—All drugs used in spinal anaesthesia should be sterilized by autoclaving. Sterilization of these drugs by immersion in alcohol or other sterilizing solutions is no longer acceptable, medically or legally.

First, an intravenous infusion of 5% dextrose in water is started. It must be absolutely secure so that movement of the limb will not displace it. Use a special short bevel No. 18 needle introduced into a vein somewhere about the middle of the forearm.

The technique of spinal anaesthesia will depend upon the reasons for which it is administered. If it is to be used for vaginal delivery, it should be started only after labour is well advanced and the cervix is almost fully dilated. The sitting position is preferred, as it is then easier to limit the level of anaesthesia to below T-10. On the other hand, if it is to be used for caesarian section, then the lateral position is easier on the patient and quite satisfactory, as the level of anaesthesia must reach at least T-6 or T-7; in this case the patient is turned on her side and the head of the table is raised ten degrees. Lumbar puncture is carried out, usually at the

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level of L-3 or L-4, followed by an injection of a mixture of 10 to 14 mgm. of Pontocaine (supplied in 2cc. ampoules containing 20 mgm.) and 10 percent dextrose (supplied in 3cc. ampoules) to render it hyperbaric. One ampoule of each solution is mixed in a 5 cc. syringe and carefully checked; any turbidity, change in color or other than a 5 cc. total volume indicates faulty ampoules or technique and should be discarded. The mixture so obtained contains 4 mgm. of Pontocaine per cc. and it is then easily adjusted to the dosage needed; that is, 2.5 to 3.5 cc.'s (10 to 14 mgm. Pontocaine), depending on the size of the patient.

If the patient is in active labour, care must be taken not to inject the drug during an actual contraction. Straining by the patient with the contraction causes a wave of CSF to flow in a cephalic direction. If the anaesthetic agent is introduced at this time, it will be rapidly propelled towards the head resulting in a very high spinal anaesthetic. Even with the utmost care, patients will often state, towards the end of the operation, that their arms and hands feel numb.

The patient is then turned on her back and the anaesthetic level and the blood pressure are checked. At this time, only a change in sensation indicates the level to which the anaesthesia will eventually rise. If it is not quite high enough, the table is tilted to the horizontal or very slight Trendelenburg position, keeping the head and neck well up on the pillow. Having the patient take a deep breath and hold it for ten seconds will accelerate ascent of the anaesthetic agent. When the sensory change seems to have reached the desired level, the table is quickly levelled and even given a slight head-up position; it is maintained there for the next 15 minutes, after which time the anaesthetic is unlikely to shift. During this time, oxygen should be administered by mask, but often the patient will object.

Blood pressure must be checked continuously, and if a drop below 80 mm. of mercury systolic occurs in a normotensive patient, a vasopressor drug should be used (1 to 2 mgm. of Vasoxyl intravenously has a wonderful effect and can be repeated). Remember that a pressure fall to below 80 mm. of mercury systolic will impair the placental circulation. Also remember that if Vasoxyl or another pressor agent is given at this time, great care must be taken in giving ergometrine or any like substance after the placenta is removed, for these may then cause an extreme rise in blood pressure. I have seen the blood pressure rise beyond the mercury manometer at which time the patient had very severe headache and developed cardiac irregularities. Amyl nitrate under the mask may be used for this condition but this usually disturbs the surgeon.

Frequently a less severe drop in pressure will cause nausea and vomiting. The straining so produced often causes a rise in pressure thereby correcting the symptoms. If the nausea and vomiting persist, reducing the flow of oxygen to the mask to 500 cc.'s per minute and turning off the carbon dioxide absorber will be very helpful. The gradual increase of carbon dioxide in the rebreathing bag is usually quite effective in curing the nausea, probably by producing cerebral vasodilatation.

Sometimes the anaesthetic level is neither sufficiently high nor complete. It is wrong to try to talk the patient into enduring it. A light, general anaesthesia will likely be satisfactory, but this should not be instituted until you are absolutely certain that there will be no further change in the anaesthetic level or in the patient's condition from the spinal anaesthetic. This usually takes about 20 minutes.

EPIDURAL ANAESTHESIA

All preparations used here are exactly the same as for spinal anaesthesia. Caudal or lumbar epidural block are essentially the same, but the lumbar epidural block is preferred because there is less likelihood of contamination and the failure rate, in skilled hands, is lower.

The continuous technique is usually used in obstetrics. A large bore Tuohy needle is inserted into the epidural space and a plastic catheter is inserted. The needle is then withdrawn, the catheter taped in place and the anaesthetic solution injected as required. This technique can only be learned by observation and practice, therefore it shall not be described further here. The greatest danger is the inadvertent puncture of the dura with resultant very high spinal anaesthesia.

GENERAL ANAESTHESIA

Always assume that the stomach is not completely empty. If atropine was not administered previously, it is given intravenously just before starting the anaesthetic. The same preparations are observed.

When the surgeons are ready, a sleep producing dose of Pentothal is given rather quickly. Usually 100 to 200 mgm. of Pentothal is sufficient (5 to 8 cc.'s of 2.5% Pentothal). If possible the patient is made to breathe oxygen while going to sleep, or a few controlled respirations of 100% oxygen are given as soon as the patient is asleep. Two cc.'s of Anectine are then given intravenously and oxygen continued while the effect develops. When muscular relaxation is satisfactory, the patient is intubated smartly with a cuffed tube and the cuff is inflated. Controlled respiration with nitrous oxide and oxygen, 5 litres of each per minute, is then carried out. While this is going on, the blood pressure is checked, surgery starts and the endotracheal tube is secured with adhesive tape. This will usually provide sufficient anaesthesia until the baby is delivered, but if the patient shows signs of moving or awakening, a further 2 or 3 cc.'s of 2.5% Pentothal and another 1 or 2 cc.'s of Anectine will promptly restore quiet and serenity. During this period, I prefer to have the CO₂

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absorber turned off to avoid depleting the carbon dioxide level, as this could depress the infant's respiratory centre.

After delivery of the infant, a more suitable level of anaesthesia is maintained by increasing the concentration of nitrous oxide to 70% and by giving more Pentothal and Anectine as required. Controlled respiration is continued. At this time, I usually administer an intravenous opiate (Demerol, Pantaton or Numorphan). This decreases the amount of Pentothal required and provides satisfactory post-operative analgesia. The patient usually wakes up shortly after the anaesthesia is stopped, often removing the endotracheal tube herself. Before removing the endotracheal tube, however, it is essential to ascertain that no secretions or gastric contents rest in the pharynx ready to be aspirated. Remember that closing of the glottis will be impaired for some time after the tube is removed, thus facilitating aspiration of anything that may be in pharynx. Pharyngeal suction, before the tube is removed, will usually cause the patient to empty her stomach. This in itself is an added safety measure.

There are many other methods for general anaesthesia, but I prefer the above. You will realize that the rapid induction and intubation as described above calls for a certain degree of dexterity in this technique. However, after bitter experience, I feel that intubation is definitely desirable in all cases except the very simple and rapid vaginal deliveries.

Now I would like to go over the list tabulated in Part I and discuss briefly the type of anaesthesia recommended for each individual condition.

I. ELECTIVE ANAESTHESIA

(A) MATERNAL INDICATIONS

(1) *The mother demanding anaesthesia.*

In this case it is carried out as described above, either general anaesthesia, or spinal, or epidural. The choice of method is usually left to the mother or the obstetrician.

(2) *Associated maternal diseases.*

(a) Heart disease.

During pregnancy, cardiac reserve is decreased as a result of the increased cardiac output, blood volume and velocity of blood flow. Such a patient should be supervised throughout pregnancy by a cardiologist and the obstetricians working in co-operation. Heart disease alone is not considered an indication for caesarian section; usually this operation is performed only for obstetrical reasons.

Analgesic techniques for labour progressing in the presence of symptomatic heart disease must be directed towards ensuring continuously adequate oxygenation, good relief from pain and emotional stress, and avoidance of straining.

For the second stage of labour, local analgesia is probably the most desirable, but if anaesthesia is necessary, both epidural block and general anaesthesia can be used satisfactorily. Epidural block is really ideal when properly controlled. There is almost complete relief from pain, and straining is practically eliminated. By increasing the level of the block, controlled lowering of the blood pressure will relieve the heart of the burden of high venous return, which occurs after delivery and is due to the reduction in uterine blood flow and the elimination of the pressure on the vena cava by the full uterus. For this reason ergometrine should be avoided.

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General anaesthesia, as described previously, is also perfectly satisfactory for the actual delivery provided that good oxygenation is assured. However, epidural block has the very great advantage of being instituted much earlier thus avoiding, in some cases, all the pain and straining of labour.

(b) Diabetes.

The problems caused by this disease affect mostly the obstetrical management. The risk of intrauterine death is greater, the baby is larger than average and there is a high incidence of pre-eclamptic toxæmia. Therefore, elective caesarian section is frequently decided upon. The anaesthetist must ensure that the patient has received her pre-operative glucose intravenously and that her insulin requirements have been met. The anaesthesia can be either general or spinal as described previously, but due to the rather precarious state of the infant, depressant drugs should be avoided and spinal or epidural anaesthesia is recommended.

(c) Respiratory diseases.

This presents the same problems in obstetrics as in all other surgery. If the condition is of such a degree as to produce anoxia under the stress of labour, oxygen should be administered. If anaesthesia is required, epidural block is ideal in most cases for the same reasons as in heart disease. One could argue its use in the asthmatic patient, but that is a controversial subject I do not wish to discuss here.

(3) *Planned caesarian section.*

These present no particular problem. Either general or spinal anaesthesia may be used. I usually ask the obstetrician what he would prefer, and then inquire of the patient what she would like. Most obstetricians are now not too emphatic on their preference, and as a rule the patient's preference is given priority provided there are no other contraindications.

(4) *Severe toxæmia and eclampsia.*

The care of the toxæmia patient is, of course, the obstetrician's responsibility, and theoretically the anaesthetist's concern is simply the administration of the anaesthetic at the time of delivery, be it vaginal delivery or caesarian section. In either case, one must remember that the mother is most likely already under maximal sedation and fetal depression is likely to occur. Therefore, conduction anaesthesia would seem the most logical. It has the added advantage that it improves uterine blood flow as well as the renal circulation and output, and usually lowers the blood pressure. The latter must be carefully watched and controlled. Frequently, however, the stimulation involved will induce convulsions and the manipulation necessary for instituting conduction anaesthesia seems contraindicated. General anaesthesia as described previously is quite satisfactory provided the quantity of Pentothal is kept extremely small. Such cases require such a small amount to induce sleep that there is no significant increase in fetal depression. If vaginal delivery is decided upon but the patient is not quite ready, epidural anaesthesia is definitely indicated. As mentioned above, it corrects the condition while providing a relatively painless, less stressful labor and adequate anaesthesia for the delivery.

These observations would suggest that the treatment of severe toxæmia, pre-eclampsia and eclampsia by the heavy sedation regime with magnesium sulfate, etc., is not absolutely necessary or at least need not be the only treatment. Two methods of treatment would seem worthwhile adjuncts. Epidural anaesthesia as described above is a most satisfactory method and can be maintained for several days¹. Ganglionic blockade by "Arfonad" drip produces similar and even more reliable results but does require very close observation and control².

(B) MATERNAL AND FETAL INDICATIONS**(1) *Known disproportion.***

These are essentially obstetrical problems where decision must be made as to whether caesarian section is required. In any case, anaesthesia is managed as described previously.

(2) *Primip-breech.*

This is not an indication for anaesthesia but rather an indication to have an anaesthetist in attendance. When the cervix clamps upon the aftercoming head, the baby is usually unable to hold its breath until an anaesthetist is called and arrives.

(C) FETAL INDICATIONS**(1) *Known severe malformation.***

General anaesthesia is indicated, using any technique compatible with the mother's condition.

II. EMERGENCY ANAESTHESIA

This is where the headaches and heartaches occur. Remember that since most of these patients are unprepared for anaesthesia, vomiting is a constant danger.

(A) MATERNAL INDICATIONS**(1) *Acute toxæmia and eclampsia occurring after the onset of labor under natural childbirth.***

Whereas in cases of known toxæmia the regimen for its control and treatment can be instituted early and the patient prepared for anaesthesia, acute toxæmia occurring during labor calls for immediate action. Epidural or spinal anaesthesia, because of the time factor and disturbance to the mother, are not practical; therefore, smooth, rapidly induced general anaesthesia as described above seems to be the best.

(2) *Cardiovascular collapse or shock (any type: haemorrhagic, neurogenic, or both, as in some cases of ruptured uterus, pitocin shock, etc.).*

Spinal or epidural anaesthesia is usually considered contraindicated in such cases because of the danger of causing further circulatory failure. I do not agree entirely with this because the peripheral vasodilatation produced usually improves the circulation, aids in the oxygenation of all tissues and prevents the progressive deterioration seen in severe shock³. However, such a technique does involve a fair amount of manipulation which may be detrimental to both mother and fetus. Therefore, very carefully administered general anaesthesia as described above is probably more desirable, but remember that Pentothal can cause marked impairment of the circulation and must be administered very judiciously. In all cases of shock, the uterine circulation may be greatly impaired.

(3) *Loss of emotional control during labor or delivery.*

Management will depend on the stage of labor at which this occurs. Conduction anaesthesia is contraindicated; the mother is not amenable to this method. If it occurs early during labor, sedation and tranquillizers will have to be administered in sufficient dosage to restore control until such time as the cervix is fully dilated and forceps delivery can be carried out. Then general anaesthesia as described

serves very well. But, the infant's status will depend on the degree of sedation administered. In such cases, the fetal depression is usually quite marked; and prolonged resuscitative measures will have to be instituted and very close observation and supportive measures maintained, as for the pulmonary syndrome of the newborn⁴.

If opiates were administered to the mother within two or even three hours of delivery, Lorfan (1 cc.) administered intravenously a few minutes before delivery will be beneficial.

(4) *Manual removal of placenta.*

Two main factors are involved in the management of this condition. (a) Often the patient has had severe haemorrhage and is probably still bleeding. If so, the patient shows signs of severe shock. (b) The uterus (and cervix) has usually contracted and is very tight. Therefore, prompt action must be instituted; the cervix must be relaxed, but the poor condition of the patient must not be aggravated by the anaesthetic. In these cases, Fluothane may be used with advantage to provide relaxation of the uterus⁵. However, this agent should be used as a uterine relaxant and not as a means of providing anaesthesia. Once more, anaesthesia should not be induced with Pentothal (again, intubation is to be recommended) and Fluothane administration should be stopped the moment the operator's hand emerges with the placenta from the uterine cavity. Ergometrine may then be given intravenously but the obstetrician should be advised to keep the uterus under bimanual control during the two or three minutes that it takes for the Fluothane-induced relaxation to be reversed. If it is necessary to continue the anaesthetic to allow a perineal repair to be carried out, then it is strongly urged that a maintenance agent other than Fluothane be used for this part of the operation.

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- (5) *Extensive repair, particularly of tears of the cervix extending into the broad ligaments.*

If the repair is to be carried out immediately after delivery, general anaesthesia can be instituted with little or no disturbance of the patient or of the aseptic environment. If, however, the condition is recognized only after the patient has deteriorated and is in shock, replacement therapy must be instituted as soon as possible, and the management of anaesthesia carried out according to the condition of the patient. Light, general anaesthesia is usually quite satisfactory.

(B) MATERNAL AND FETAL INDICATIONS

(1) *Abnormal presentations.*

These differ from Group I (B) mainly in that they are unexpected, but they are probably the commonest reason for the use of anaesthesia in regions where "natural childbirth" is emphasized. Deep transverse arrest, brow or face presentation and transverse lie with shoulder presentation are usually dealt with by manual or instrumental rotation of the head followed by delivery with forceps. Therefore, the anaesthetist must provide complete relaxation of the pelvic and abdominal musculature as well as some (but not too much) uterine relaxation.

Labour has usually been prolonged and perinatal mortality is high because of possible trauma and prolonged hypoxia. This can be decreased by thorough oxygenation, careful anaesthesia and efficient immediate resuscitation of the fetus. Spinal and epidural anaesthesia are contraindicated; they do relax the abdominal wall and perineal structures, but tend to increase the uterine tone and are time consuming. General anaesthesia as described above with light Fluothane of very short duration is recommended. In the case of breech extraction of the head, the most important factor is speed. There is no time for conduction anaesthesia, and in fact there is often no time to use the Pentothal/Anectine sequence. Then, cyclopropane is most useful. In these cases there is little danger of fetal depression by an anaesthetic agent as the circulation through the cord has usually ceased. Therefore, the depth of anaesthesia can quickly be increased sufficiently to produce relaxation of the perineal structures and even of the cervix, enabling rapid extraction of the head. Fluothane may also be used.

(1) *Anomalies of uterine function.*

Placenta previa, abruptio placenta and prolapsed cord are all extreme emergencies where fetal anoxia may suddenly destroy the infant. Reassure the patient, give oxygen and put her in slight Trendelenburg position.

Placenta previa and abruptio placenta are often complicated by severe haemorrhage and maternal hypertension. These emergencies are usually treated by caesarian section. Again spinal and epidural anaesthesia are contraindicated. It is essential that the mother not be disturbed and the uterine tone not increased. General anaesthesia provides the quickest and safest method since it provides maximum oxygenation and the tone of the uterus can be decreased by using Fluothane, if that is desired. Efficient and prolonged resuscitation of the fetus may be necessary.

To these should be added cases of prolonged labor owing to disorders of uterine activity such as hypotonic inertia, hypertonic lower uterine segment inertia and cervical dystortia. These are not usually such dire emergencies provided signs of fetal distress are not present. Treatment is aimed at correcting this disordered uterine activity while allowing labor to progress normally. General anaesthesia is contraindicated as it would stop labor. Similarly, administration of analgesics merely further inhibits labour without altering the etiological factors. In such cases, caudal

or preferably lumbar epidural anaesthesia is definitely indicated⁶. The rationale of this treatment lies in the fact that by inhibiting the lower uterine segment and relaxing the pelvic musculature, the progress of labor is enhanced. Further, the ablation of labor pain increases the effectiveness of the upper uterine segment contractions, and the associated local vasodilation replenishes the impoverished uterine blood flow characteristic of prolonged labor. Such a technique will frequently avoid caesarian section in these cases.

(C) FETAL INDICATIONS

(1) *Fetal distress.*

The management is, of course, the decision of the obstetrician. Usually if the cervix is fully dilated, rapid forceps delivery is carried out; otherwise caesarian section is used. In either case, the anaesthesia must be rapid and not disturb further the precarious balance of the fetus. Oxygen by mask and rapid induction of general anaesthesia again seems to be the most satisfactory method, in spite of the slight depressant effect of the anaesthetic agent.

CONCLUSION

In your original letter you asked for a paper dealing with the more Modern Concepts of Anaesthesiology in Childbirth. I started out to prepare a concise dissertation on the subject, but it soon became apparent that such a vast subject could not be condensed into a nice neat package. As mentioned in the opening lines of Part III, there are too many factors involved. Therefore, I ended up with this prolonged discussion, for which I apologize.

I have attempted to enumerate the obstetrical conditions which necessitate the use of anaesthesia, and to suggest some of the methods to be used. Much of this could be argued about and disagreed with, but I hope that it will indicate to you the scope of the subject; that it will give you some guidance in your decisions when faced with the various problems mentioned; and that it may be a challenge to some of you to tackle and solve these problems, thus improving not only the perinatal mortality rates, but especially perinatal morbidity—I really doubt that those babies with an Apgar rating of 0 are as likely as those with an Apgar rating of 10 to become candidates for high government office (no statistics are available).

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