

22 Other obstetric problems

22.1 Testing for foetal maturity

You can usually obtain the length of gestation from a pelvic examination early in pregnancy, or by an ultrasound scan (38.2,3).

If there is a clinical discrepancy or you have serious reasons to doubt your measurements, the surfactant test is a simple way of estimating the maturity of a foetus. However, if there are developments that suggest to you that the foetus in question will be born or delivered >28wks and <34wks, 2 doses 24h apart of betamethasone 12mg IM to the mother, within 1wk of delivery, is of proven benefit in preventing severe respiratory problems and hence cerebral problems. *N.B. If the mother is a diabetic on insulin, monitor the glucose and increase the dose accordingly.*

If delivery threatens again >1wk after the last injection and gestation is <34wks, you can repeat the treatment *once* more.

There might be situations where the mother is not much at risk but the foetus is (*e.g.* in not-well-controlled diabetes); then it might be useful to do a surfactant test. Unfortunately, the test is least reliable in cases of diabetes. There might be occasionally a reason to do the test if there is intra-uterine growth retardation (IUGR) without high blood pressure and/or proteinuria suggesting that the mother is also at risk.

N.B. If there might be a chance the patient is HIV+ve, then the test is dangerous both for the doctor (patients are known suddenly to push away your hands with the syringe if you penetrate the abdomen and you might get injured) and for the foetus, because:

- (1) the needle with maternal blood in it might prick the foetus,
- (2) the barrier between the 2 circulations in the placenta might become damaged if you hit the placenta,
- (3) the foetal surface becomes exposed to maternal blood after her blood has contaminated the liquor, or
- (4) the procedure ends in prolonged rupture of membranes.

The test is not infallible, *so don't rely on it alone*; use it in conjunction with an estimate of gestation by dates, and an estimate of the foetal size. It is a test for the surfactant which foetal alveolar cells secrete, and which is necessary for the expansion of the foetal lungs immediately after birth. If they don't expand, respiratory distress syndrome will ensue, so the test is a measure of the extent to which this risk exists.

The test normally becomes +ve at 36wks, so it is a good sign that the foetus is mature enough to ripen the cervix and induce labour. Obtaining amniotic fluid is easy and safe providing both foetus and mother are hepatitis B, C and HIV-ve; it is no more painful than an intramuscular injection.

(a) The surfactant test

Rare complications include rupture of the membranes and injury to the foetal head. If the mother is Rhesus-ve, putting a needle through the placenta increases the risk of rhesus immunization.

AMNIOCENTESIS AND THE SURFACTANT TEST

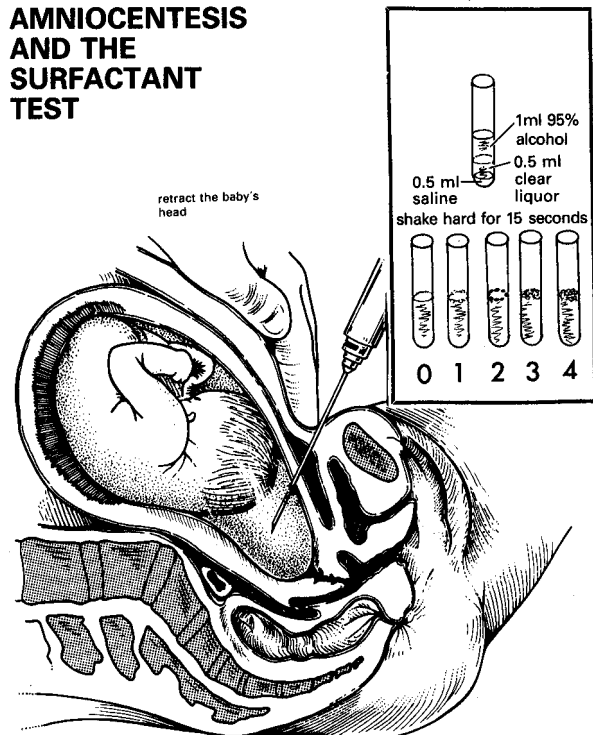


Fig. 22-1 THE SURFACTANT TEST normally becomes +ve at 36wks, so it is a good sign that a foetus is mature enough to deliver.

INDICATIONS

N.B. There should be a legitimate reason for induction, *but not if you would induce the patient anyway, such as in severe gestational hypertension.*

- (1) An elective Caesarean section with uncertain dates.
- (2) Suspected growth retardation (22.13).

You should be able to use ultrasound to localize the placenta, and you should be sure that the mother has a mobile presenting part, showing that she has enough liquor to aspirate. If there is not enough liquor, the foetus is probably mature enough anyway.

ASPIRATION

Take a sterile 10ml syringe and a 10cm long, 1mm diameter needle. You may need a longer one if the mother is obese. Have a 2nd syringe ready in case the 1st sample is blood-stained. Make sure the bladder is empty, so that you don't aspirate urine. There is no need for LA. Prepare the skin over the lower abdomen, preferably with iodine.

In the supine position, the lowest part of the foetus is usually the head: feel it, lift it up out of the pelvis as far as you can, and then hold it there with your left hand. This will allow liquor to swirl around it, and fill the lower segment.

If possible, use ultrasound as a guide. While retracting the foetal head upwards, plunge the needle attached to the syringe into the uterus at right angles to the plane of the lower segment, as near to the head as is reasonable, remembering that you don't want to hit it.

Remember also that the commonest complication is rupture of the membranes due to inserting the needle too low, too close to the cervix.

Alternatively, aspirate at the level of the umbilicus on the side of the foetal limbs. You need to be able to feel the position clearly. There is usually a good pool of liquor there. Injuring the foetus is very unusual.

Withdraw 5-10ml of fluid. Record it as being clear or blood-stained (indicating a traumatic tap), and the vernix, the white cheesy substance that covers a neonate's skin, as being absent, scanty, or plentiful. If you see vernix easily, this is in itself more or less proof of foetal maturity.

If, at an ultrasound scan (38.3), you see vernix floating clearly, a shake test is not needed because the foetus is mature enough. *Don't try the procedure more than twice.*

EQUIPMENT. You need:

- (1) 1ml of clear liquor, uncontaminated by meconium or blood. Only the faintest blood-staining is acceptable. If you cannot avoid blood contamination, centrifuge the liquor hard for 5mins and test the supernatant.
- (2) 95% alcohol.
- (3) Some completely clean glass test-tubes with an internal diameter 8-14mm.
- (4) 'Parafilm' to cover the tubes. Otherwise, use new corks or rubber stoppers. If you don't have these either, a very carefully washed, and even more carefully rinsed, gloved finger is probably better than a used cork or stopper.

METHOD. Take exactly 0.5ml liquor, 0.5ml saline, and 1ml 95% alcohol. Shake the mixture vigorously for exactly 15secs. Then don't move the tube. Wait 15mins before examining it in a good light against a dark background (22-1).

0	No foam
1	An incomplete ring of bubbles peripherally round the meniscus
2	A complete ring of bubbles round the meniscus
3	As above, but foam just covering the whole meniscus
4	Plentiful foam covering the whole meniscus thickly

A score of ≥ 1 means that the lungs are mature.

CAUTION!

- (1) *Avoid contamination with anything greasy.*
- (2) Meconium contaminates and produces a false +ve result, so *don't do the test if there is meconium in the fluid.*
- (3) *Don't shake the tubes a second time.*

(b) Difficulties with the surfactant test

If you aspirate nothing, has your needle entered the amniotic sac? Try again, pushing the needle a little deeper.

If you aspirate blood, it may be foetal or maternal blood. Check the foetal heart $\frac{1}{2}$ hrly for 4h. If the rate rises steadily, the foetus is bleeding. Perform a Caesarean section immediately.

If the uterus becomes hard, and there are other signs of placental abruption, there is bleeding behind the placenta (20.12).

22.2 Inducing labour at term

If labour does not start when you would like it to, you may be able to get it going. If it is progressing, but too slowly, you can speed it up. Distinguish between:

- (1) Priming the cervix which might also result in labour without further interference,
- (2) The attempt to start labour when the cervix is ripe (induction),
- (3) The acceleration of labour (augmentation of contractions) in the active phase with the cervix >3 cm dilated.

Here we are concerned with (1) and (2).

If the continuation of pregnancy would be harmful to a mother or to her foetus, and especially if either of them is in danger of death, the logical solution might seem to be to start labour and deliver the foetus. Unfortunately, this action has its own risks for both, so there are *very few* indications for doing it in a district hospital. The commonest one is probably proven rupture of the membranes (22.4) lasting >24 h, when the mother is near term (>37 wks). This indication is pressing if there are signs of infection (elevated temperature, tachycardia in the foetus).

Prostaglandins given orally or vaginally normally without artificial rupture of the membranes (ARM), or oxytocin IV with ARM, are the most powerful ways of starting labour.

The effects of induction/priming with prostaglandin can be more powerful than anticipated. Whilst you can easily reduce the speed of an IV oxytocin infusion, and immediately reduce its action, you cannot so easily stop the effects of administered prostaglandins. Nonetheless, poorly supervised or inappropriate use of oxytocin might also cause foetal death and uterine rupture. In general, the main disadvantage of the use of oxytocin is that it works best when the membranes have ruptured (artificially or spontaneously) and then you are committed: if it does not work in a reasonable time, you will have to perform a Caesarean section. Apart from that, *oxytocin does not work well with an unripe cervix and early in pregnancy,* even if the membranes have ruptured.

Don't use these methods for minor indications, because:

- (1) priming might result in too strong contractions with foetal distress, damage or death and uterine rupture.
- (2) with ARM you may introduce infection. If labour starts soon, the risk is small, but if it is delayed or prolonged, the risk is large, especially if the foetus is dead. Minimize infection by taking the most careful aseptic precautions if you choose ARM.

N.B. Intra-uterine death is a contraindication to ARM except in cases of abruption when blood loss, not infection, is the overwhelming risk.

- (3) if you try to induce labour too soon:

(a) the foetus will be immature and have less chance of surviving.

(b) labour is unlikely to start, and if it does start, it may be so slow that you have to perform a Caesarean section.

So only induce labour when the balance of risks favours it, and Bishop's inducibility test (see table below) shows that the cervix is ripe, and ready for labour.

(4) inducing labour increases your Caesarean section rate, with all the disadvantages this has (21.1).

(5) rupturing the membranes may cause the cord to prolapse.

(6) the placenta may separate (abruption).

So never induce labour to suit your convenience or the mother's, but only for the soundest of obstetric reasons.

If the cervix is unfavourable, you can also try ripening it, but only of course if the membranes are intact, by inserting the balloon of a Foley catheter into the extra-amniotic space.

(a) Indications for starting labour

(1) Proven rupture of the membranes lasting >24h when the foetus is near term (>37wks), or when associated with a fever which cannot be explained otherwise (malaria, HIV/TB) even <36wks.

(2) Severe pre-eclampsia or the HELLP syndrome (severe liver pain associated with haemolysis, elevated liver enzymes and low platelets). Of course, the nearer the gestation approaches 40wks, the less is to be gained by potential further growth of the foetus. Therefore, continuing the pregnancy while the mother is at some risk from the pre-eclampsia has less merit the further the pregnancy is advanced. On the other hand, an induction which involves ARM increases the chance of Caesarean section, which also is quite a risk then and in future pregnancies.

Low-dose misoprostol (half a tablet, *i.e.* 100µg, dissolved in 20ml water) giving 4ml (= 20µg) orally 3hrly, might be the solution. No ARM is needed. The dose/frequency can be increased if the urgency is high and decreased if the parity is high.

(3) Diabetes.

(4) Abruption (20.12).

(5) Postmaturity (22.5) is an uncertain indication, because the diagnosis is rarely made in district hospital practice. There should be, apart from the gestation of >42wks, very little liquor or a sudden decrease in foetal movements or a bad obstetric history before you try to induce labour for this indication.

If the indication for induction is rupture of membranes, then ARM is of course not needed provided you are sure. Try to abstain from entering the cervix during examinations.

If there is a lot of liquor pouring out, placing 200µg misoprostol in the posterior fornix will probably not help because the active ingredient will be washed out. Use oral, sublingual, or buccal misoprostol or oxytocin IV instead.

BISHOP'S INDUCIBILITY SCORE. Assess the dilatation of the cervix, its length, its consistency, its position in relation to the axis of the vagina, and the height of the foetal head. Add up each individual item: the higher the total score

is, the more likely that induction will succeed. The highest score is 13; a score of ≥ 7 is favourable for induction.

SCORE	0	1	2	3
Dilation (cm)	0	1-2	2-3	3-4
Length (cm)	0	3	2	1
Station of the head	5/5	4/5	3/5	2/5
Consistency	Firm	Medium	Soft	
Position of cervix	Posterior	Middle	Anterior	

Don't confuse the position of the cervix with the position of the presenting part (occipito-anterior OA, occipito-posterior OP, etc.).

Make a poster of this score system and keep it on the Maternity wall.

(b) Ripening the cervix

INDICATIONS

When the cervix is not sufficiently ripe to enable you to rupture the membranes to induce labour. After ripening, labour will often start without any need to rupture the membranes (22.4).

METHODS. There are several ways of ripening a cervix:

(1) **A dinoprostone vaginal tablet (3mg) in the posterior fornix** on the evening before you induce labour. Follow this by another 3mg 6-8h later if labour is not established, and then, if necessary, a further one, to a maximum of 3.

CAUTION!

(i) The tablet must be close to the cervix in the posterior fornix; merely slipping one into the introitus does not work.

(ii) Avoid prostaglandins in multipara ≥ 5 .

N.B. There may be hyperstimulation, so:

(iii) Insist on close overnight observation of mother *and* foetus.

(2) **A dinoprostone 0.5mg (prostaglandin PGE₂) oral tablet in the cervical canal.** Repeat this 6hrly up to 4 doses.

(3) **A misoprostol tablet (200µg) in the posterior fornix.** This is cheap and effective and does not need refrigeration. In many countries it is not registered for induction of labour but is used extensively anyway. It is certainly the drug of choice if the indication is intra-uterine death or severe foetal abnormalities (*e.g.* anencephaly).

The dose depends on the parity, gestation, ripeness of the cervix, urgency and level of monitoring available. *After 30wks, a scarred uterus is a contraindication.*

The *maximum* dose, *if the aim is for a viable foetus*, is 200µg in the posterior fornix for a nullipara with severe pre-eclampsia at about 35wks (introduce it very early in the morning). You can repeat this dose (if absolutely nothing has happened) at the earliest in 6h. If this is not the first delivery, 100µg is better.

N.B. Misoprostol 100µg (½ tablet) dissolved in 20ml water provides 5µg/ml. The 200µg tablets cannot reliably be broken in pieces smaller than a half.

A multipara 4, 42wk pregnant woman, for example, with very little liquor would need only 20µg orally, to be repeated if *nothing* happens 3hrly.

By contrast, if there is an intra-uterine death or severe foetal abnormality at 22wks and there is no scar in the uterus, put 600µg vaginally starting very early in the morning and repeating 4hrly till labour starts. *With a scar, after 13wks, use only 100µg.*

(4) **A Foley catheter in the extra-amniotic space** is useful if you have no prostaglandins. 12-18h before induction, with careful aseptic precautions, and under direct vision, use a Cusco's speculum to insert a Ch16-24 catheter, with a 30-45ml balloon, into the extra-amniotic space. Inflate this with 30-45ml of sterile water, and leave it in place. This is generally 4h faster than using prostaglandins.

CAUTION! Whenever you induce labour, monitor the foetus carefully.

N.B. Don't waste time trying to induce labour if the Bishop's score is <7 and there is an overwhelming indication to deliver: perform an immediate Caesarean section!

(c) Oxytocin to induce labour at term

(Other uses: 21.5)

INDICATIONS

A high risk factor, particularly for the foetus, such as:

- (1) Diabetes.
- (2) Gestational hypertension, especially if there is proteinuria.
- (3) An unstable lie (22.8).
- (4) A confirmed dead foetus (20.4).
- (5) Postmaturity (22.5).
- (6) Twin or triplet pregnancy.

CAUTION! For all these indications, ripen the cervix first, according to the score given above.

(7) Placental abruption with intra-uterine death (20.12): *here there is a vital urgency, so don't wait!*

CONTRAINDICATIONS

(1) Cephalopelvic disproportion (CPD). This diagnosis is difficult to make before labour, however. *Don't give oxytocin to a multipara:* there is too great a risk of uterine rupture, and artificial rupture of membranes will usually suffice to induce labour.

(2) A previous Caesarean section, unless close round-the-clock supervision is possible, and the previous Caesarean section was certainly not for a CPD nor for 'failure to progress'.

(3) Previous myomectomy, uterine perforation or cornual ectopic gestation.

(4) Foetal distress.

(5) Malpresentation.

(6) Grand multiparity.

(7) Placenta praevia.

N.B. Don't use oxytocin for induction/augmentation of labour without rupturing the membranes first. However, in an HIV+ve patient, try not to rupture during induction till late in the 1st stage of labour.

METHOD

Use only low-dose oxytocin as mentioned below under 'protocols on the wall'. Also, as soon as labour is established, try without oxytocin.

Check the foetal lie and presentation, and try to make sure that one nurse stays with the patient all the time. Start *early* in the morning with a dose of 10mIU/min (10 drops/min of 5IU (usually one vial) in 500ml saline where the system gives 10 drops/ml). Monitor her closely and increase the IV rate every 30mins like this: 10 drops/min, 20 drops/min, 40 drops/min, and 60 drops/min. *Have a poster with the detailed protocol on the wall.* Increase the infusion until the uterus is contracting 3-4 times every 10mins. If vaginal examination shows that the cervix is not dilating, increase the infusion to 60 drops/min as long as she has not >5 contractions in 10mins and there are no foetal cardiac decelerations. If this does not work and the foetal heart rate is fine, it is possible *in nullipara* to increase the concentration to 10IU in 500ml and start again at 40 drops/min. *Don't go above 60 drops/min (=120mIU/min) with this concentration.*

N.B. It is not the oxytocin itself which is dangerous but the strength or frequency of the contractions. Therefore high doses without strong, frequent, or continuous contractions are not dangerous in theory, but lack of close supervision to detect these contractions can still damage the foetus or kill mother and/or child.

When the cervix is >5cm, and contractions are good, you may be able to reduce the rate of the infusion. Do this gradually.

If the contractions diminish, increase it again.

If the membranes have not ruptured, and labour has not started by 7pm, stop the infusion and try again in the morning. If the membranes have ruptured, induction must not stop; add antibiotics after 12h with membranes ruptured.

CAUTION!

(1) Higher doses than the above increase the uterine tone between contractions, and so impair the placental circulation. Palpation does not detect this increased tone, unless it is gross. Too much oxytocin will cause prolonged tetanic contractions, and may rupture the uterus (especially in a multipara).

(2) In a multipara, reduce the starting dose to 1IU, and reduce or stop the infusion as soon as there are regular contractions.

(3) Assess the uterine contractions carefully. If there is no relaxation between contractions, stop the infusion. If there are >5 contractions per 10mins, reduce the dose.

(4) Oxytocin in high doses (>60mIU/min) has an antidiuretic effect. *So beware of 'water intoxication'* (20.4), especially if 5% dextrose was infused instead of saline or Ringer's lactate.

(5) If delivery has not occurred but contractions are satisfactory and progress is good, you can use up to 2L of a solution of 10IU in 500ml. Greater than this volume, there is a risk of water intoxication, as above. If delivery is not about to happen, consider Caesarean section.

(6) *Don't infuse >3L in 24h without careful review.*

All sorts of different protocols exist for the use of oxytocin: ideally, of course, an infusion pump will give a controlled dosage with limited fluid. You should remember that the sensitivity to oxytocin differs from person to person.

By increasing the dose in steps of ½h, you can find the right dose for a particular woman without losing too much time, remembering that the longer membranes are ruptured, the greater the risk of infection.

Excess oxytocin is characterized by:

- (1) foetal distress,
 - (2) too frequent contraction,
 - (3) pain between contractions,
 - (4) restlessness,
 - (5) vaginal haemorrhage suggesting threatened rupture.
- As oxytocin is metabolized fast in the body, you can slow down or stop the infusion (and put the woman on her left side): the tissue concentration of oxytocin will quickly decrease and the situation will normalize.

Occasionally, the right dose for a particular uterus to dilate is too high a dose for the foetus to endure. At the peak of contraction there is generally no new oxygen available for the foetus. Most foetuses can cope, *but not if their oxygen supply was already marginal*. (Compare this with somebody with severe asthma who is pushed under water for 30secs.) In that case, a Caesarean section is mandatory. However, a foetus with normal reserve oxygen can still get into trouble if the maternal contractions persist too long or are too frequent. This happens more often if labour has not started spontaneously (unripe cervix/uterus) but was induced.

(d) Protocols on the wall

In the absence of an infusion pump, the dose needed in terms of drops/min is inaccurate. There are paediatric IV systems which form such small drops that it takes 60 drops to constitute 1ml but there are also systems (blood giving sets) with 10 drops/ml. This should be indicated on the wrapping of the IV system. It is best to express the oxytocin dose in mIU ($1/1000$ of an IU)/min. Not all of your staff will be able to do the calculations correctly, and perhaps also yourself at 3am! Because of this, put a poster on the wall of your maternity department to give simple instructions for the use of infusion pumps if available, or for the different IV systems available in your unit.

Using **5IU oxytocin/500ml saline**, the dose is, in mIU/min:

System (drops/ml) Flow rate (drops/min)	10	15	20	25	30	35	40
10	10	6.5	5	4	3.5	2.5	1.5
20	20	13	10	8	7	5	3
40	40	26	20	16	14	10	6
60	60	39	30	24	21	15	9

If you use **5IU oxytocin/L saline**, halve the above figures.

If you use **10IU oxytocin/500ml**, double them.

N.B. Never use >20mIU/min with a scarred uterus or para ≥ 4 , and >40mIU/min with para 2-3. An IV system with 20 drops/ml has to run half as fast to deliver the same dose as one running at 40 drops/ml.

Try to have a nationally agreed schedule, adapted to the IV systems you normally have available, as your basic protocol displayed on the wall.

(e) Rupturing the membranes to induce labour

CONTRAINDICATIONS

- (1) A high mobile head: the cord may prolapse.
- (2) A dead foetus (except in abruption): labour will be quick.
- (3) Maternal polyhydramnios: start by withdrawing some amniotic fluid via the abdomen with a needle or cannula, so as to reduce the uterus to a normal size. A sudden release of much fluid can precipitate abruption, and make malpresentations, such as a shoulder presentation, more likely.
- (4) Postmaturity.
- (5) A (potentially) HIV+ve patient: prolonged rupture of membranes is a risk factor for vertical transmission. If the patient is not receiving ARV therapy, then rupture the membranes as late as possible; you may, however, be forced to do so earlier in order to make labour progress.

N.B. She might be a candidate for Caesarean section (instead of induction, to prevent vertical transmission) combined with a tubal ligation, to prevent future vertical transmission, *if her family will thus be complete*.

METHOD (GRADE 1.1)

Make sure the bladder is empty. Check the foetal heart, put the patient into the lithotomy position, and use careful aseptic precautions. Flood the vulva with antiseptic solution. Wearing sterile gloves, do a careful vaginal examination and measure Bishop's score (see above). Spread the labia widely, put 2 fingers into the vagina and then into the cervix. If necessary, stretch it to admit your 2 fingers. Gently sweep the membranes away from the lower segment without rupturing them. Feel carefully for the placenta, or the cord.

If you can feel the placenta (which is unlikely if the head is low), it is a placenta praevia and you have a large risk of antepartum haemorrhage. Perform a Caesarean section if it is type III or IV (20.11, 20-9).

If you can feel the cord presenting through the membranes, leave them intact, turn the lady on her side and repeat the examination in 2h. With luck, the cord will have floated away. If it has not, perform a Caesarean section, but feel again just before you start the operation.

CAUTION! If labour has started, rupture the membranes during a contraction, to minimize the risk of prolapse of the cord and let the liquor come out slowly.

If you cannot feel either the placenta or the cord presenting through the membranes, rupture them with Kocher's forceps. Hold these in your left hand, and guide them through the cervix with your right hand. As you prepare to tear the membranes, ask an assistant to push the presenting part into the pelvis. This will allow the fluid to escape in a controlled way, and will minimize the risk of the cord prolapsing.

Grip the membranes and tear them. If fluid flows, or there is foetal hair in your forceps, you have succeeded. Note the

amount and colour of the amniotic fluid, make sure the cord has not prolapsed, and check the foetal heart.

N.B. Finding meconium-stained liquor at this stage is not an indication for a Caesarean section; it just means, especially if it is fresh thick meconium, that supervision should be even closer if at all possible.

Enlarge the opening with your fingers. Keep them in the vagina until the head has descended against the cervix. Check the foetal heart again. If the mother has a sudden persistent bradycardia:

- (1) She may have the supine hypotensive syndrome, so turn her on her left side.
- (2) The cord may be trapped. *Don't raise the foetal head*, because the cord will probably prolapse further (22.9). Instead, turn the mother on her side and listen again; this usually solves the problem.

If the cord has prolapsed, put the mother in the knee-elbow position, push up the head and prepare for an urgent Caesarean section. If there is a delay, filling the bladder via a catheter with the help of an infusion bag of 500ml fluid will often prevent fatal cord compression. Alternatively, separate the amniotic sac membrane from the cervix (a membrane sweep) at vaginal examination (this releases the prostaglandins) only, and *don't rupture the membranes until she is well advanced in labour*. This can be effective, and there is less risk of infection than when the membranes are ruptured some time before delivery.

N.B. As mentioned above, prolonged rupture of membranes increases the chance of vertical HIV transmission. Still there are indications to perform an ARM. If you use a Kocher's and you push the membranes against the presenting part and then rupture the membranes, you will often catch some hair but also scratch the foetus, increasing the chance of mother-to-child transmission.

N.B. Using misoprostol to prime the cervix/induce labour has a disadvantage in that the medication cannot be controlled as easily as an oxytocin infusion. On the other hand, with misoprostol, the membranes don't need to be ruptured till (very) late in labour, making mother-to-child transmission less likely and making it possible to try again the next day.

On the other hand, failed induction with ruptured membranes soon forces you to perform a Caesarean section especially if an intra-uterine infection develops. Unless the indication for induction is vital, start with a low dose of misoprostol to prevent complications in case of extra sensitivity to this drug. With a low dose, there is of course the risk that you have to repeat the induction (if the cervix has not changed with a somewhat higher dose) the next day.

N.B. If you perform a Caesarean section for prolapsed cord (or nearly every other indication), check the foetal heart just beforehand with the best instrument you have: preferably ultrasound (38.3) or handheld Doppler tool (doptone).

Don't open the abdomen for a dead foetus (21.8)!

22.3 Preterm labour

Strictly speaking, preterm labour is the onset of regular painful contractions <37wks. In practice, you can treat labour between 34-36wks as if it was at term, so that it is only labour <34wks (foetus <2.2kg) that needs managing differently. It may or may not be associated with rupture of the membranes. It is sometimes associated with the use of herbal medicines or abortifacients.

The management of preterm labour is not a success story. *Avoid IV tocolytics:* they are dangerous if not well supervised, especially if there might be a hidden maternal cardiac abnormality. There may be a place for steroids. However, using medication may divert you from the treatment of the cause of the premature labour, which may be antepartum haemorrhage, urinary tract infection, or intra-uterine growth retardation, etc.

In practice, when a mother does start preterm labour, there is little you can do about it. It often stops spontaneously, and 70% of mothers don't deliver within 48h, and start labour normally nearer term. You can try to postpone delivery for at least 48h in order to ripen the foetal lungs with 12mg betamethasone IM od for 2 days. You can also try 20mg nifedipine PO in the 1st hour followed by a maximum of 90mg/day in divided doses. Between 24-30wks, indomethacin 50-100mg (preferably as a suppository) followed by 25mg 4hrly for a maximum of 3 days might help.

If labour starts before 34 completed weeks, and the membranes have not ruptured, assess as follows:

- (1) In the active phase of labour (the cervix is >3cm), try to delay delivery with nifedipine (or indomethacin if at <30wks) in order to gain time to ripen the foetal lungs with steroids.
- (2) In the latent phase of labour (the cervix is <3cm) with regular contractions, look for a possible cause, although you are unlikely to find one. Insist on bed rest, and try to delay delivery as above.

If the contractions are doubtful, consider other common or less common causes of pain:

- (1) urinary tract infection or partially kinked ureters (21.5),
- (2) constipation (12.15), sometimes the result of pica,
- (3) abruption (20.12),
- (4) appendicitis (14.1),
- (5) bowel obstruction (12.2),
- (6) red degeneration of a fibroid
- (7) an extra-uterine gestation (rare, 20.9).

If you have the slightest suspicion, treat with antibiotics; in the next pregnancy use them after 13wks for 1wk.

At delivery, the foetus is at high risk, so control the delivery of the head very carefully. Handle the foetus gently and keep him warm, using the kangaroo method (*i.e.* carrying the preterm infant skin-to-skin next to the mother).

If labour starts before 34 completed weeks, and the membranes have ruptured, see below (22.4).

22.4 Premature rupture of membranes and intra-uterine infection

When labour is normal, regular contractions start and the cervix begins to dilate before the membranes rupture and amniotic fluid escapes. Sometimes, the membranes rupture first, before contractions start, either <37wks (preterm) or at term (prelabour). The risks are:

- (1) intra-uterine infection, which is by far the most important but is usually not common, and
- (2) premature labour.

The advantages of expectant treatment (not inducing labour) are that:

- (1) foetal maturity increases, which is important if gestation is <36wks, and
- (2) the risks of induction are avoided. These are:
 - (a) failure, which means that you will need to perform a Caesarean section, and
 - (b) the side-effects of oxytocin (21.5).

The disadvantage of expectant treatment is the risk of infection (chorio-amnionitis) which may kill the mother and/or the foetus. You can minimize this risk by:

- (1) totally avoiding vaginal examination with your fingers until contractions are well established,
- (2) avoiding speculum examinations as much as possible,
- (3) practising reasonable vulval hygiene,
- (4) observing carefully for signs of infection, inducing labour and treating with antibiotics: you should treat all cases of prematurely ruptured membranes preferably with erythromycin for 1wk.

Intra-uterine infection is such a serious risk when membranes are ruptured for >24h that it far outweighs any benefit that might follow from expectant treatment.

Particularly if puerperal infection is common in your area, aim for delivery within 24h. Fortunately, labour usually starts successfully within this time.

Avoid unnecessary vaginal examinations and teach that:

- (1) The risk of prolapse of the cord is small, but the risk of infection is great.
- (2) Cord prolapse will only physically harm the foetus, but infection will endanger the mother also.
- (3) If the cervix is still closed, as it often is, *vaginal examination certainly does not help* because there cannot be a cord prolapse. *Teach that premature rupture of the membranes means there needs to be a very good indication for vaginal examination!*

(a) Abdominal ultrasound (38.3). Ideally use this: occasionally you might detect a cord prolapse; you can usually rule it out confidently; you may also deduce a simple high tear in the membranes if there is still a lot of liquor.

(b) History

Loss of fluid from the vagina, before the onset of regular painful contractions, is diagnostic. If you are not sure of the dates, or there appears to be a discrepancy, assess the foetal age by ultrasound (38.3). If you cannot do this, estimate the fundal height (22-15).

(c) Examination

Start by separating the labia and asking for a cough: Is liquor discharging from the vagina? Is urine coming from the urethra?

If you don't see any fluid, repeat the examination after a few hours, so as not to miss intermittent loss of liquor from a small leak. Do one clean speculum examination, to make sure that the membranes have ruptured, and that there is really draining of liquor. Make sure that a senior person does this, so that it need not be repeated. Ask the patient to cough: you may see fluid escaping from the cervix. Then:

- (1) observe the dilatation of the cervix, but remember that a vaginal examination is much more reliable than visual inspection,
- (2) feel the degree of cervical effacement,
- (3) confirm the presenting part: you may see it if the cervix is open,
- (4) exclude prolapse of the cord.

CAUTION! Don't do a vaginal examination with ungloved fingers: the risk of infection is too high.

Alternatively, avoid this examination, and merely 'wait and see'. If fluid continues to flow (as shown by checking the pads), the membranes are obviously ruptured.

If you are not quite sure if the fluid that is draining is liquor or urine:

- (1) smell it,
- (2) test its pH (urine and vaginal discharge are acid, amniotic fluid is alkaline),
- (3) leave some to dry on a slide. Look at it under a microscope. Liquor, but not urine or a discharge, will dry as a pattern of ferns (like a bush or tree). If you have not done this test before, try it with some known liquor.

(d) Management

If the diagnosis is confirmed or suspected, admit the patient, provide her with a clean perineal pad or cloth, make sure she keeps the vulva and perineum clean, check the temperature 4hrly, and inspect the liquor daily by visual inspection of the perineal pad and its smell.

If no liquor can be seen escaping >3 days, the diagnosis is not confirmed, so discharge her. 25% of patients stop leaking liquor in 3 days and can be discharged. 75% start spontaneous labour during this time.

If gestation is <28wks, with a live foetus, and there are no signs of infection, the chances of the pregnancy continuing long enough for the foetus to survive are small, but not zero.

If you diagnose an infection, induce labour, and start antibiotics. Labour will usually start soon, and the pregnancy may survive.

If gestation is 28-35wks, treat prophylactically with antibiotics, preferably erythromycin.

N.B. If you use antibiotics before there are signs of infection, they might prevent infection and labour.

Once an obvious infection is established, induction is needed as well as antibiotics as before to prevent spread of this infection. *As long as the foetus is in the uterus, it is too late to expect infection to be cured without evacuating the uterus.*

If the liquor stops draining, don't intervene. If it continues to drain at 48h, induce labour, if the risk of infection is high. Otherwise, wait until the foetus is more mature at 36wks. Culture the amniotic fluid at delivery.

If gestation is at >36wks, induce labour with oxytocin, if labour does not start spontaneously in 24-48h.

CAUTION! Be sure to induce labour if:

- (1) The foetus is dead at any stage of pregnancy.
- (2) There are signs of intra-uterine infection at any stage of pregnancy.
- (3) Gestation is >36wks, and labour has not started spontaneously in 24-48h. Remember the precautions for the use of oxytocin (21.5, 22.2) and use it with extreme caution in the presence of infection. Consider a Caesarean section if the patient wants a tubal ligation.

(e) Diagnosis of intra-uterine infection:

- (1) Foetal tachycardia.
- (2) Maternal pyrexia and tachycardia.
- (3) Uterine tenderness.
- (4) Offensive, blood-stained liquor.

TREATMENT. There is a high risk of septicaemia with development of septic shock. Resuscitate with IV fluids. Treat with broad-spectrum IV antibiotics; *e.g.* chloramphenicol and metronidazole (2.8,9) plus benzylpenicillin against β -haemolytic streptococcal infection in the foetus. Empty the uterus as soon as possible, whatever the duration of pregnancy: it will often empty spontaneously. If it does not, use an oxytocin infusion with great caution, and stop it as soon as there are regular contractions. The foetus usually dies, if it is not already dead when the mother becomes infected.

(f) Difficulties with intra-uterine infection

If gas bubbles emerge from the cervix, or you feel crepitus in the cervix or abdominal wall, this is from gas-producing micro-organisms, which is likely to be GAS GANGRENE (6.24). The uterus and abdominal wall may be distended with gas. Peculiarly, the foetus, which is most often dead, may appear to be crying in the uterus because gas makes it possible to produce sound. Use large doses of penicillin, chloramphenicol, and metronidazole IV, and evacuate the uterus rapidly.

If the infection has spread to the wall of the uterus, perform a hysterectomy to save the mother's life.

22.5 Postmaturity

A foetus >2wks postmature is at increased risk of stillbirth, but there is little evidence that inducing labour before 42wks significantly reduces the perinatal mortality.

The risks of accidental premature induction are considerable:

(1) A mother's dates may be wrong, because she has had no menstrual period since the previous pregnancy, or simply because of breastfeeding, which causes a longer menstrual cycle. Thus, if periods occur every 2 months, conception will occur 6wks after the last period, instead of 2wks. This means that pregnancy is usually less advanced than mothers think.

(2) Many mothers present so late for their first antenatal visit that the size of the uterus or foetus cannot be reliably used to confirm gestational age.

Even ultrasound is of little help after 26wks and cannot reliably differentiate between 38 and 42wks.

If gestation is >42wks, and the dates are certain, admit the patient and ask her to keep a foetal movement chart. If there are any of the risk factors below, induce labour with low-dose misoprostol (22.2) or oxytocin, if the cervix is ripe:

- (1) Nulliparity >30yrs.
- (2) Twin pregnancy: *this is postmature at 40wks so should certainly not be allowed to progress to 42wks.*
- (3) A bad obstetric history.
- (4) Gestational hypertension.
- (5) Markedly reduced foetal movements.
- (6) A cardiotocograph, if available, that is not reassuring.
- (7) No liquor as measured by ultrasound or palpation.
- (8) Gestational diabetes.
- (9) A dead foetus: *don't rupture the membranes.*

N.B. Repeatedly failed induction is sometimes a clue that there is a large extra-uterine gestation (20.9). Other clues are that a gloved finger pushed through the cervix does not palpate membranes or a foetus: a fibroid is assumed to be present, but is in fact the whole uterus!

N.B. *Ultrasound often misses the diagnosis of advanced extra-uterine gestation.*

22.6 The malformed foetus

With most congenital malformations, a foetus is not large or misshapen enough to cause difficulty during labour. The important exceptions are anencephaly and hydrocephalus. If you have the misfortune to find a grossly abnormal conjoined twin, Caesarean section is the method of choice. Omphalocele (33.4) and gastroschisis are, on the other hand, not in themselves indications for Caesarean section.

Anencephaly is complicated in 90% of cases by polyhydramnios; so when you diagnose this, do an ultrasound on the mother to see if the foetus has a brain (38.3). If not, it is usually stillborn, and even when it is born alive, it does not survive >6h. When you have explained the diagnosis to the mother, she may insist that the pregnancy is terminated.

Hydrocephalus is not always easy to diagnose clinically, and is often missed during pregnancy. A common mistake is to misdiagnose a brow presentation (when the head feels big) for hydrocephalus.

If you suspect it, confirm the diagnosis by ultrasound (38.3). Even during labour the diagnosis is easily missed, if you can't feel the widely distended sutures and fontanelles. If the diagnosis is doubtful, wait. If it is obvious, proceed as follows:

(a) Anencephaly

If this is accompanied by (painful) polyhydramnios, drain the mother's amniotic sac with a needle or cannula through the abdominal wall. Sometimes you have to manipulate the foetus through the abdominal wall in longitudinal position while the water is draining. A breech presentation is no problem. Use low doses of misoprostol erring on the side of too little because there is no medical hurry.

If anencephaly is not accompanied by polyhydramnios (10%), pregnancy may rarely be prolonged up to 1yr or more, and make delivery difficult. Misoprostol is the drug of choice also, the dose depending on the parity and possible uterine scarring. If the membranes are ruptured, a higher dose is acceptable because there is now the risk of infection.

(b) Hydrocephalus

If you make the diagnosis during pregnancy, try to measure the size of the foetal head and determine if there is also a spinal deformity. Discuss the problem with parents, explaining the need for a ventriculo-peritoneal shunt or third ventriculostomy and the problems the child may encounter (33.11). *Don't endanger the life of the mother trying to save the foetus!* Try hard to avoid a Caesarean section if you think the chances are that the foetus will die anyway or be severely handicapped. In this case, induce labour without artificial rupture of membranes. If you wish to be sure of saving the foetus and the mother understands that a future pregnancy will almost certainly mean another Caesarean section, prepare for this option.

If you make the diagnosis when labour with a cephalic presentation has been in progress for some time, and the foetal head is more than minimally enlarged, you will have to make it smaller before you can deliver it. Drain the CSF with a lumbar puncture needle (draining the CSF does not kill the foetus!). This is simplest under ultrasound guidance. If you are not sure of the diagnosis, or don't feel you can risk sacrificing the foetus, you may be forced to perform a Caesarean section. However, even then the head may be too large for a routine lower segment Caesarean section.

The alternatives are:

- (1) The best, to drain the head before making the uterine incision;
- (2) 2nd best, to make a transverse, curved incision 4cm higher than normal with the ends near the attachments of the round ligaments;
- (3) 3rd best, to make a vertical incision starting in the midline in the lower segment at the level (2cm lower than the bladder reflection) where you would normally do a lower segment transverse incision.

N.B. Take care that it does not tear further distally because you made the incision in the direction of the fundus too short.

In order to avoid a Caesarean section when there is no cervical dilatation or the foetal head is still very high, it is very easy to drain CSF from the head through the mother's abdominal wall (with an empty bladder) with a thick needle or cannula. The head then collapses, engages and delivers vaginally if the mother is in labour. If she is not, and the membranes are intact, there is no hurry anyway. To perforate the foetal head vaginally, wait until the cervix is >3cm dilated, then drain the cerebrospinal fluid with a large needle or artery forceps between the widely separated skull bones. The collapsed head will slowly settle into the mother's pelvis, and delivery will be simple. In this situation, however, you are committed because the membranes are ruptured and if labour has not started or stops, you might have to perform a Caesarean section on a dead or non-viable foetus. So be sure labour has started before you rupture the membranes.

CAUTION! If possible, perforate the foetal head before the cervix is 5cm dilated, because an over-distended lower segment may rupture if you don't.

If you make the diagnosis during a breech presentation (22.7), the foetus will probably deliver spontaneously as far as the umbilicus. Often you are alerted to the hydrocephalus by seeing clubfeet (32.10) and/or a spina bifida (33.10). Progress will then be arrested as the hydrocephalic head fails to enter the pelvic brim. *Trying to save the foetus is not now your priority!* Draining the CSF is less messy than a craniotomy. If, at this stage, you see the commonly associated meningomyelocele, pass a steel or gum elastic male catheter through the spinal defect into the ventricles, to drain off the CSF.

If there is no spina bifida, you can easily perforate the head at the back very near the neck with a Kocher's or artery forceps. Alternatively, make sure that the bladder is empty, and then tap the aftercoming head abdominally with a large spinal needle.

N.B. Beware of performing a symphysiotomy to deliver a hydrocephalic baby: the symphysis may separate so much that severe urinary stress incontinence may result.

LINDA (17yrs) started labour normally, but did not progress. The district doctor failed to notice that this was because there was a hydrocephalus: she had not seen such a case before. She decided to perform a Caesarean section, but noticed that she could not deliver the foetal head through the lower segment incision. She did not panic but drained the head with the help of the scalpel. The foetus was put on the resuscitation table but not attended to because everybody thought it was dead. Then it started crying. It survived for 6 months, paralyzed from the waist down because of a spina bifida. It dribbled urine continuously and probably died of a urinary tract infection. The mother became psychotic and needed a long period of rehabilitation.

LESSON Remember hydrocephalus as a cause of failure to progress, and consider draining the liquor.

22.7 Breech presentation

If a foetus presents with his buttocks (breech) or his foot, he is about four times more likely to die than if he presents by his vertex. This is so even if you exclude the excess mortality due to the higher rate of prematurity, multiple pregnancy and foetal abnormality that is associated with breech deliveries.

This increased mortality is due to:

- (1) Late diagnosis, in the case of CPD, unless you can perform a swift, skilled symphysiotomy (21.7).
- (2) Lack of time for the head to mould so that there is effectively CPD though this would not have been the case in a cephalic presentation.
- (3) An incompletely dilated cervix (especially with straining before full dilatation, or prematurity).
- (4) The increased risk of cord prolapse.
- (5) Nobody being present to solve the problem of the arms being extended.

The following methods may help prevent breech delivery if you find a breech presentation after 36wks:

(a) The knee-chest position (as if praying like a Muslim, 22-2D) is an alternative to manipulation that might succeed. It is also safer. Ask the mother to spend 10mins tds in this position. This may allow the foetal breech to disimpact from the pelvis, so that it can turn spontaneously.

(b) External cephalic version (ECV)

If you can reduce the number of breeches you deliver, you will reduce the perinatal mortality associated with them. Turning a breech presentation is of little value <34wks in a primipara, or <36wks in a multipara, because many breech presentations spontaneously correct themselves before this. After 36wks, a foetus gradually becomes less mobile, which makes version more difficult. On the other hand, if version does succeed, it is more likely to be permanent.

The risks of ECV include:

- (1) Knotting of the cord.
- (2) Placental abruption.
- (3) Uterine rupture.
- (4) Vertical transmission of HIV.

These risks must be compared not only with the risks of breech delivery but also of Caesarean section.

Unfortunately, ECV is not often done by doctors or by experienced midwives as often as it should be; *it should not be done by inexperienced practitioners*. If your excess perinatal mortality with breech deliveries is >2%, after correcting for prematurity and foetal abnormality (see below), the risks of ECV are worth taking. *Don't attempt it under GA!*

Corrected perinatal mortality for breech deliveries

This should be fairly easy to calculate from your labour ward record books, which should routinely record presentation, birth weight, obvious abnormalities, and live and stillbirths.

- (1) Work out your perinatal mortality for all babies (10-80/1000) excluding breeches, babies <2.5kg, twins, and babies with obvious malformations. The perinatal period lasts (in this case) from the 28th week to the end of the 1st week of life.
- (2) Do the same for breech deliveries only. In many district hospitals, it will be 50-200/1000. Subtract (1) from (2). If the difference is >20/1000, perform ECV.

The problem is of course that the higher the breech-related mortality is, the higher the Caesarean-section-related mortality is likely to be. The reasons for high breech-related mortality usually include absence of permanently available skilled personnel and/or patients arriving too late. These are exactly the same factors which make it very dangerous for women to have a scar on the uterus.

If ECV or the knee-chest position fail, you can deliver a breech:

- (1) Vaginally, by assisted breech delivery.
- (2) Vaginally, by breech extraction.
- (3) Vaginally, adding a symphysiotomy if there is CPD.
- (4) Abdominally, by Caesarean section.

In breech extraction you, rather than the mother, provide the power for expulsion. You exert traction on the legs, groins and pelvis, so it is more dangerous for the foetus than an assisted breech delivery, which is the usual way of delivering a breech. Only do this extraction if there is no alternative (foetal distress) or with the 2nd of twins.

Otherwise IV oxytocin will probably help especially if the foetus is smaller than average. If the foetus is large or normal in size, lack of progress of the buttocks in the second stage *might* predict subsequent CPD (see below).

Perhaps an acceptable approach in nullipara would be to prepare for a Caesarean section at 36-37wks. Administer spinal anaesthesia. Try to turn the foetus. There is then a success rate of 2/3 as opposed to 1/3 without spinal anaesthesia.

If you succeed, cancel surgery. This is without danger in a nullipara, but at higher parity where there *is* a risk of rupture, the mother will not be able to warn you by indicating pain. However, a mother who has previously delivered spontaneously vaginally around term has certainly no indication for an elective Caesarean section for a simple breech presentation.

Judgement is difficult nonetheless, if for example a primipara delivered by vacuum extraction the last time. There could have been borderline CPD, or was it just a tired mother or an impatient doctor, occiput posterior position, or foetal distress? Probably the best would be to try ECV but without spinal anaesthesia.

N.B. Performing an elective Caesarean section for breech presentation without very good reasons is irresponsible, if you cannot guarantee good supervision for trial of scar and access to a Caesarean section for the next delivery.

A liberal Caesarean section rate will reduce your perinatal mortality, but you will have to weigh this against the increased maternal morbidity and mortality that will follow. If the difficulties of vaginal breech delivery worry you, and you are tempted to perform a Caesarean section for all breech presentations, remember the dangers of anaesthesia, bleeding, sepsis, and a scarred uterus. However, if your hospital has not the skill available continuously to perform

a vaginal breech delivery and there is no guarantee of a swift referral to a place with these skills, then you might be forced to perform an elective Caesarean section on a breech presentation at 37wks.

If there is any question of CPD before or during the 2nd stage of labour, have everything ready (including infiltrating the symphysis with LA) for a possible symphysiotomy (21.7), or proceed to Caesarean section.

In communities where the contracted pelvis is common, the risks of a breech delivery are great, so that to be sure all these babies survive, you may have to perform a Caesarean section on all mothers without a proven adequately sized pelvis; and this you can only know if they have delivered vaginally at term successfully beforehand.

N.B. Don't allow a mother with a true conjugate (21.4) of <9cm to deliver a full-term breech vaginally unless you can perform a symphysiotomy!

A foetus with IUGR or prematurity presenting as a breech is a problem. Much depends on the foetal age:

(1) <28wks gestation (<1kg): the chances of life are small, the lower segment is poorly formed, and it is questionable if Caesarean section will be any less traumatic than vaginal delivery.

(2) From 28-32wks (1-1.5kg), the foetus may have a better chance with Caesarean section, especially if it is a footling presentation. However, about 20% have severe abnormalities, and if you don't have ventilators, even the normal ones have a poor chance of surviving. So, in an area of high parity and high perinatal mortality, you should rarely perform a Caesarean section for a premature breech presentation. It is important to dissuade the mother from pushing before full dilatation: *don't leave her alone!*

Symphysiotomy (21.7) is useful in breech delivery for the unbooked patient, who is admitted in the 2nd stage of labour, and when there is no time for a Caesarean section. However, it is not a good idea to make your 1st *unsupervised* symphysiotomy in these circumstances, because if the head is stuck and you have tried everything else, there is then very little time left to deliver an undamaged foetus.

If a breech delivery might end in a symphysiotomy (21.7), it is good practice to infiltrate the symphysis and the skin over it already before it is needed, so as to shorten the time required for the probably necessary subsequent procedure. *Have a catheter and a large size scalpel ready!*

Epidural anaesthesia will prevent a mother bearing down before she is fully dilated, and it will make any manipulations that you have to do in the second stage of a vaginal delivery much easier. An occasional 'stuck breech', and a dead foetus, are more acceptable than a maternal death in most cultures. As your skill and experience and that of your staff improve, so will your successful vaginal deliveries.

EXTERNAL CEPHALIC VERSION is possible at any time >34wks, until labour starts. It is not necessary <34wks. You may not succeed >36wks, but it is still worth trying.

CORRECTING A BREECH PRESENTATION

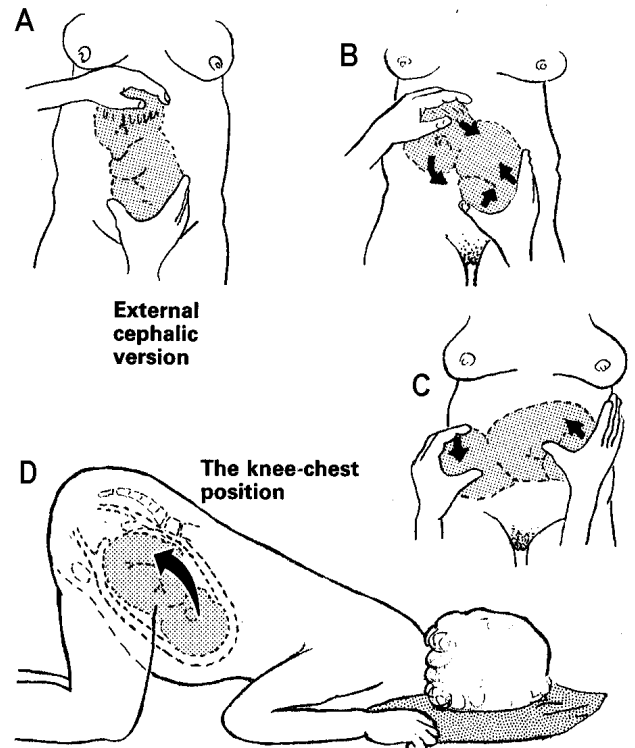


Fig. 22-2 CORRECTING A BREECH PRESENTATION.

A-C, external cephalic version. Flex the foetus between your hands so that you make him do a forward somersault. D, the knee-chest position. Ask the mother to spend 10mins tid like this.

CONTRAINDICATIONS

- (1) Multipara >3.
- (2) Antepartum bleeding in this pregnancy.
- (3) Multiple pregnancy.
- (4) Signs of foetal distress.
- (5) Premature rupture of membranes.
- (6) A previous Caesarean section.
- (7) The need to perform a Caesarean section in this pregnancy for some other reason.
- (8) A detected foetal abnormality.

RELATIVE CONTRAINDICATIONS

- (9) Rh D-ve mother and no anti-D to treat her with. A successful ECV would often prevent more problems than it causes in Rhesus-ve women even when there is no anti-D available. Mortality related to rhesus antibodies seems to be rare in Africa even if allowances are made for the lower prevalence ($\pm 4\%$) of Rh D-ve people.
- (10) HIV+ve mother: mixing of blood during ECV might cause vertical transmission.

N.B. If she uses antiviral medication, the risk is probably very small. If she is not using these drugs and she is planning to breastfeed, then perhaps you should proceed with an ECV because the foetus might become infected anyway and a Caesarean section in an untreated HIV+ve patient has greater risks for the mother (not the foetus). If, on the other hand, she wants a sterilization and/or can give safe alternatives to prolonged breastfeeding, then a Caesarean section will be better.

METHOD (GRADE 1.3)

Explain carefully what you are going to do. Empty the bladder and lie the patient supine tilted a little to one side. Flex the knees somewhat. Make sure your hands are warm and she is comfortable. You may find it helpful to lubricate your hands and the abdomen with glove powder. Find out on which side the foetal back is situated. Count the heart rate. Place one hand below the breech, and your other hand above the head. Flex the foetus between your hands, so that you make him do a forward somersault (turn head over heels). Listen to his heart.

If the heart rate slowed to <100, turn the patient on her side and wait until it is >100. If the heart rate has not started to recover within 2mins, turn the foetus into his original position. His umbilical cord may be tight round his neck.

If a forward somersault fails, try turning him in a backward somersault.

If both fail, rest the mother with the foot of the bed raised. If she is anxious, use diazepam 5mg orally. Try again in an hour. If you fail again, try again at the next visit.

If you succeed, see her again 1wk later to make sure the presentation is still cephalic.

If you cannot turn the foetus by 37wks, manage her as a breech delivery.

INDICATIONS FOR CAESAREAN SECTION

N.B. If the patient has a normal or large pelvis, and the foetus is normal-sized, she will probably deliver vaginally. At vaginal examination, if you cannot touch the sacral promontory easily with your middle finger, which means the diagonal conjugate is >11cm (for a size 7 glove hand), the pelvis is probably large enough. The true conjugate, the narrowest diameter the foetal head must pass, is usually 1.5-2cm smaller.

N.B. *The best assurance of an adequate pelvis is of course a previous uncomplicated vaginal delivery at term, especially if that was a boy, who has on average a somewhat larger head than a girl.*

(a) ANTENATALLY:

- (1) Suspected CPD.
- (2) A large foetus; if he feels as if he is big, that is >3.7kg (fundal height >40cm), regardless of the size of the pelvis.
- (3) A previous Caesarean section.
- (4) Other obstetric hazards, such as placenta praevia, diabetes, gestational hypertension, or APH.
- (5) An elderly primigravida, or if there is a long history of infertility.
- (6) A previous stillbirth, especially if it was associated with a breech or instrumental delivery.
- (7) Postmaturity >42wks.
- (8) Previous operative vaginal deliveries unless certainly unrelated to (borderline) CPD.

(b) DURING LABOUR:

(1) A prolonged first stage with good contractions or failure to dilate fully. *The best approach is to use the partogram and the routine active management of labour: look for failure to progress which is not quickly amenable to the use of oxytocin.*

(2) Arrest at the brim, or delay in the descent of the breech during the 2nd stage.

(3) A footling presentation (usually with one hip and knee extended): here, a woman can develop an irresistible desire to push before full dilatation, as the foetal feet enter the vagina. This can result in the head being caught behind the undilated cervix. On the other hand, if she can restrain herself till that moment, a multipara with full dilatation can often deliver a foetus in one or two contractions.

(4) Cord presentation or prolapse: this is especially a problem in a frank breech (the feet touching the ears). In a footling breech, the cord is less likely to be compressed even if prolapsed.

(5) Foetal distress before full cervical dilatation.

(6) Prolonged rupture of the membranes with infection, but when labour is not advanced.

N.B. If the membranes have ruptured but there most probably is no CPD, then starting labour with oxytocin and stopping the IV infusion when labour is established, is quite acceptable.

Most additional factors which compromise the wellbeing of a foetus are indications for a Caesarean section. Only for a healthy normal-sized mother with a foetus <3.7kg (as indicated by a fundal height of <40cm), who progresses normally in both stages of labour, should you allow a vaginal delivery.

ASSISTED BREECH DELIVERY (GRADE 1.5)

CAUTION! For breech delivery you need a quiet atmosphere and good communication with the patient. *A crowd of supporters crying "Push!" is not what you want.* Keep calm and explain what is happening. You will need an assistant.

(1) **The 1st stage.** If the cervix dilates at <1cm/h in the active phase, or there are any other signs of delay not quickly remediable by oxytocin, perform a Caesarean section. Until the foetal buttocks are delivered, you can still elect to perform a Caesarean section. If there is any delay before the delivery of the buttocks, go ahead with the Caesarean section.

If extended legs prevent the buttocks coming down, deliver one foot into the vagina by putting two fingers along the foetal inner thigh and pushing it away from the midline (Pinard's manoeuvre).

(2) **The 2nd stage.** A common fault is to try to deliver a breech through an incompletely dilated cervix, which may force the arms to extend and make the head difficult to deliver. Full dilatation may not be easy to diagnose in a breech, so take your time for a proper vaginal examination. Put the mother into the lithotomy position (essential if you effect the Burns-Marshall manoeuvre) when the posterior buttock is distending the perineum. As soon as she wants to bear down, do a vaginal examination to make sure that the cervix is fully dilated.

The breech should advance with every contraction. Infiltrate the perineum with LA, and make an episiotomy in a nullipara, when the buttocks are distending it, and you can see a boy's scrotum (or a girl's labia). Protect the scrotum: you don't want the episiotomy to castrate him! The buttocks and legs will then deliver.

N.B. If the mother could have an HIV infection, it is best not to make an episiotomy or do it as belatedly as possible because the mother's blood will come in contact with the foetal genitals and face and increase the risk of transmission.

When the umbilicus delivers, there is often a temporary halt in descent. Look at the clock. The foetus should be delivered in the next 3mins.

Wait for progress to resume with the next contraction. The shoulders and arms should deliver with a twisting movement, and the head should follow immediately. *Don't touch the baby, or try to disentangle the legs,* until you see the umbilicus. Put your hand on the mother's fundus, observe each contraction, and keep a steady gentle pressure on the foetal head. When the umbilicus appears, disengage the extended legs.

CAUTION! Try to make sure that the foetal back is uppermost. *Never allow the foetal abdomen to face upwards.*

When the scapulae appear (and not before), search for the arms in front of the chest. If, as is usual, the arms are not extended, they will both be in front of the chest. You should be able to deliver one or both of them. If you have difficulty, feel up to the shoulder from the foetal back and from there push down the arm, first one then the other. Allow the body to hang (22-3A). Its own weight will make the head descend through the birth canal. It will have been entering the pelvis, and may now be compressing the cord. Assist its descent with gentle suprapubic pressure. The foetus must be able to breathe in the next 1-2mins.

BURNS-MARSHALL MANOEUVRE

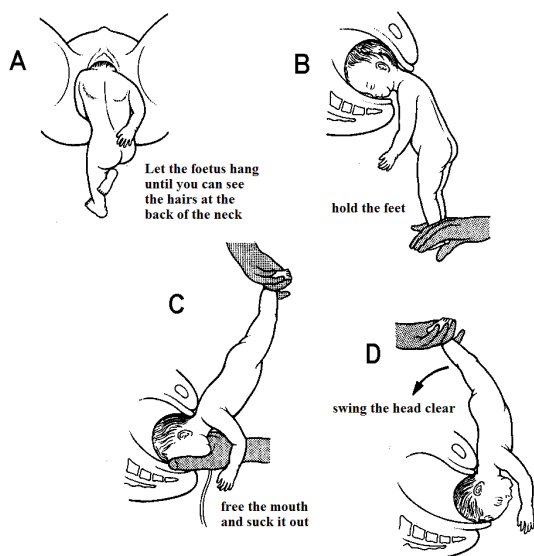


Fig. 22-3 THE BURNS-MARSHALL MANOEUVRE for delivering the head in a breech delivery, if it does not deliver spontaneously. A, allow the body to hang, until you can see the hair at the back of the neck. B, hold the feet. C, swing the feet upwards over the mother's abdomen. Free the mouth and pause while you clean it. D, finish delivery by swinging the baby over the abdomen.

If the head does not immediately deliver spontaneously when the arms are out, try the BURNS-MARSHALL MANOEUVRE (22-3: GRADE 2.1). Wait until you can see the hairs on the back of the neck (22-3A,B), pull the foetus outwards a little and draw him outwards over the pubis. Put the back of the baby on his mother's abdomen. Guard the perineum with your left hand (or get an assistant to do so) and prevent the head from emerging too quickly. As soon as the mouth and nose appear, pause, and ask your assistant to clear the airways and allow the baby to breathe (22-3C). Then, carefully deliver the rest of the head (22-3D).

If you cannot get at least the mouth and nose into fresh air with the Burns-Marshall method: (1) use the MAURICEAU-SMELLIE-VEIT MANOEUVRE, or (2) apply Wrigley (outlet) forceps to the aftercoming head.

TWO MORE METHODS FOR DELIVERING THE HEAD

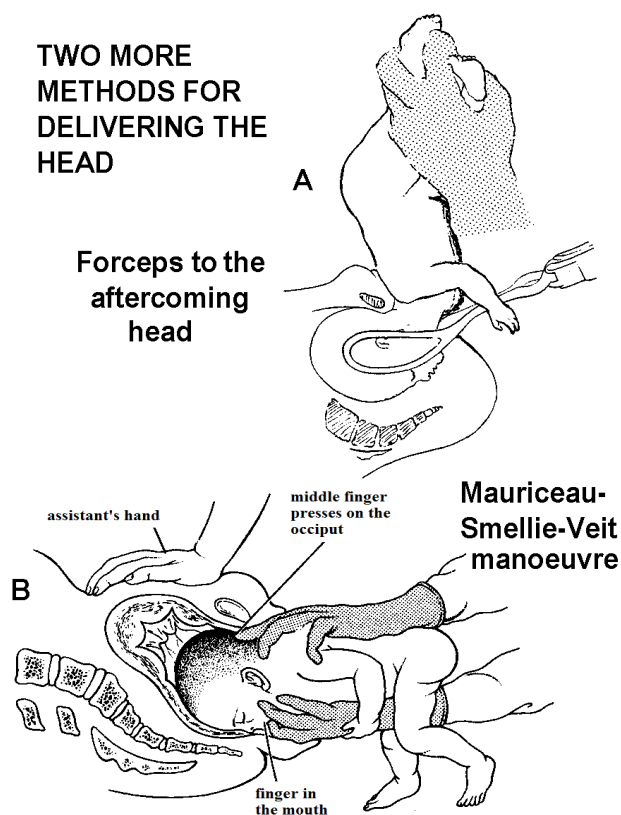


Fig. 22-4 TWO METHODS FOR DELIVERING THE HEAD IN A BREECH PRESENTATION.

A, applying forceps to the aftercoming head. B, using the Mauriceau-Smellie-Veit manoeuvre: Rest the baby's belly and chest on your right forearm; put your right middle finger in the mouth, and your index and ring fingers on the cheek bones. Put your left hand over the back; put your middle finger on the occiput and your index and ring fingers over the shoulders. This will give you some control over the flexion and rotation of the head. Guide the head through the mother's birth canal but *don't pull on the shoulders*. The finger in the mouth is for convenience and orientation only. *Don't apply traction on the jaw!*

N.B. Although 'Mauriceau-Smellie-Veit' is a cumbersome eponym, it is preferred to the alternative, which is 'jaw-shoulder traction', since this suggests, although unintentionally, *traction on the neck, which is very dangerous for the foetus.*

Rest the foetal belly and chest on your right forearm; put your gloved right middle finger in the mouth, and your index and ring fingers on the cheek bones. Put your left hand over the back; put your middle finger on the occiput and your index and ring fingers over the shoulders. This will give you some control over the flexion and rotation of the head. Grip the skull and guide it through the birth canal. Ask the mother to stop pushing. Ask your assistant to put his fist on the foetal head, which is still palpable above the pubis, and to press obliquely downwards in the direction of the coccyx. You will feel a 'plop' indicating that the head has gone into the pelvis, and further delivery should then be easy.

CAUTION! This is a method for getting a grip directly on the head. *NEVER pull on the shoulders:* you can too easily distract the cervical vertebrae and damage the cord.

Early difficulties delivering a breech

CAUTION!

(1) Perform an episiotomy (except in a multipara with a lax outlet) before you do any manipulations, because there is a high risk of a perineal laceration, but lacerations tend to bleed less than early episiotomies, so consider the risk of HIV transmission.

(2) *Don't squeeze the abdomen!*

(3) If the head fails to descend, *don't pull on the neck.*

(4) If the head becomes impacted and the foetus dies, *don't sever the neck, nor be tempted to open the uterus from above.*

If the breech is delayed at the brim, or in mid-cavity, this is probably a warning sign of CPD; perform a Caesarean section. *Don't try to effect a delivery using oxytocin unless you are prepared to make a symphysiotomy.*

If the breech is delayed at the outlet, make sure that the episiotomy is adequate. There may be CPD. If the pelvis feels contracted, or the foetus (or the feet) are large, perform a Caesarean section. If all is otherwise well, continue gentle groin traction, as for breech extraction.

If you have delivered the legs but both shoulders have now stuck above the pelvic brim, the arms are probably extended (22-5A). Normally you can put a finger up the posterior vaginal wall and easily bring them down. If you cannot, they are probably forced into extension. Try LØVSET'S MANOEUVRE (GRADE 2.2). It is a breech extraction for obstruction late in delivery, and should rarely be necessary. The delivery of the shoulders is prevented by two obstructions at different levels: the sacral promontory and the pubis.

The principle of this method is that, by pulling the foetus tightly down, and by turning the body 180°, the shoulder

which was held up above the pubis will turn to pass into the hollow of the sacrum.

The shoulder which was above the sacrum will now be above the pubis. A hand in the posterior vaginal space may ease the arm down. Two further 'unscrewing' half-turns like this, each bringing the shoulders progressively below these obstructions, will deliver the foetus.

Grasp the thighs and pelvis with both hands (if the baby is slippery, use a gauze swab or small towel), your thumbs along the foetal sacrum, your forefingers on the foetal symphysis, and your remaining fingers round the foetal thighs.

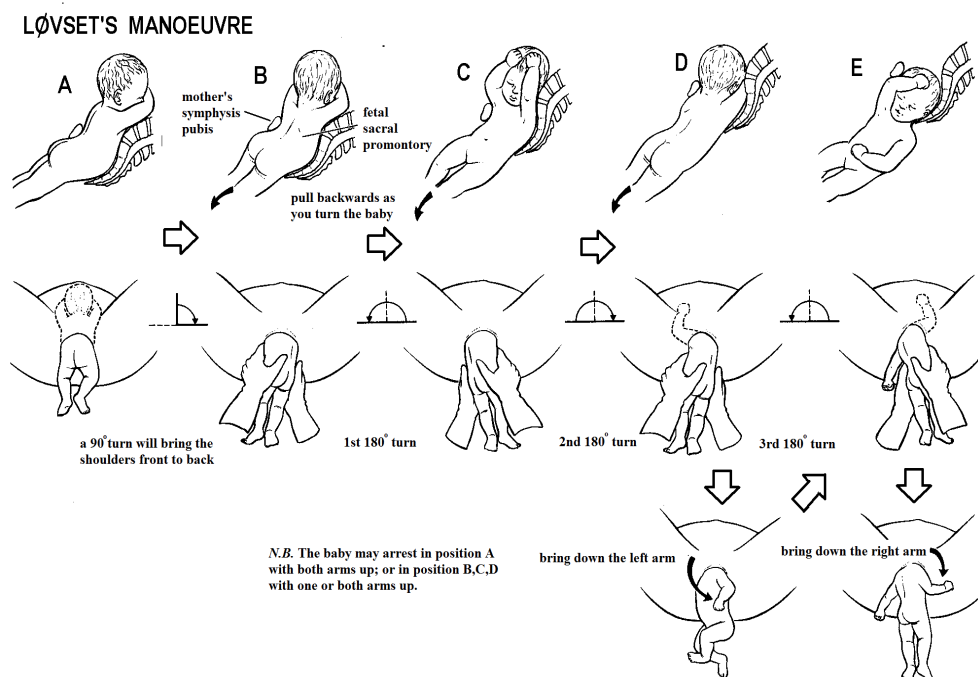


Fig. 22-5 LØVSET'S MANOEUVRE for the delivery of the shoulders in a breech presentation. The bottom row of drawings shows a view from the patient's perineum. The top row shows the same stage viewed from her left. Remember: if you don't know which way to turn the foetus, keep the back anterior, so that it passes under the clitoris. Many practitioners merely wiggle the foetus one way then the other, pull, and try to find an arm, but this is a detailed manoeuvre. Practise it on a model.

If, in the extreme case, the foetus obstructs transversely (22-5A), start by turning the body through 90°, so that the back faces to the left. The left shoulder will then be above the symphysis, and the right shoulder above the sacrum (22-5B). With your 1st 180° turn (22-5C), bring the left shoulder under the sacrum. With your 2nd turn (22-5D), bring the right shoulder under the sacrum. The left arm will now be low enough for you to sweep it gently down. With your 3rd turn (22-5E), bring the right shoulder under the pubis; it will now be low enough for you to bring the right arm down.

CAUTION!

(1) These three 180° turns are in opposite directions, so that the back always passes under the clitoris, and the arm which started posterior always drags across the face. *The belly should never pass under the clitoris.*

(2) In the worst case, you start in 22-5A with both arms extended, so you have to begin with a 90° turn, followed by three 180° turns. If the foetus arrests at a later stage, with only one arm extended, you may only need 2 turns or perhaps only one.

(3) The first 2 turns release the shoulder which was arrested above the symphysis when you started it. The 3rd turn enables you to bring down the right arm.

(4) *Don't squeeze the belly or back:* you may rupture the liver, kidneys, spleen, or adrenals (which are relatively huge in the newborn). If you hold the chest, *take care not to compress the abdomen.*

(5) Remember that the upper part of the birth canal, in which the foetus is stuck, is directed backwards, so start by pulling the foetus dorsally relative to the mother.

If Løvset's manoeuvre fails to deliver the shoulders, it is usually a failure of technique. You may have to be a little firmer, or reach up a little higher to get the arm down. A broken arm will soon heal, so it is no disaster, and is better than letting the foetus die.

Later difficulties delivering a breech

CPD is the most important cause.

If the head is stuck above the brim, you are really in trouble. You may be able to draw it into the pelvis with the Mauriceau-Smellie-Veit manoeuvre. If this fails, the foetus will probably be dead, and the best treatment will be craniotomy (see below).

If the head has entered the pelvis and the Mauriceau-Smellie-Veit manoeuvre fails to deliver it, rotating the head in the pelvis may help. Stop struggling and think: What is the cause? If it is CPD, a quick symphysiotomy (21.7) may save the foetus.

If there is hydrocephalus, see 22.6.

If CPD is the cause or the cervix is not fully dilated, and you cannot deliver the foetus, apply gentle traction, and try to slip the cervix over his head. *If this fails, avoid harming the mother and allow the foetus to die.* While she is still in the lithotomy position, sedate the mother with pethidine 50mg and let the foetus hang for a while. The head will usually mould, or the cervix dilate, so that the foetus delivers in <1h. If this does not happen, traction with a bandage around the foetal legs and 1-3kg infusion bags as weights over the foot of the bed will succeed after some time.

If the above measures fail and CPD is severe, you may have to perform a CRANIOTOMY through the foramen magnum (unpleasant but effective: 21.8). Ask an assistant to pull down the body. Retract the anterior vaginal wall with a Sims' speculum and expose the back of the neck.

Pick up a fold of the skin over the cervical spine with toothed forceps, and incise it transversely. Use curved Mayo's scissors to cut a tunnel under the skin up to the occipital bone, and push scissors into the head. Open the scissors and rotate them a few times to break up the brain compartments, withdrawing the scissors in an open position to enlarge the hole. Pull gently on the neck while the brain gradually escapes. Apply traction if delivery does not occur immediately.

If the dead foetus protrudes from the vulva, examine to feel if the cervix is fully dilated or not. If it is fully dilated, proceed directly to decompress the head with a craniotomy. If it is not fully dilated, apply traction. If this fails, perform a craniotomy.

CAUTION! Don't try to pull the head forcefully through the undilated cervix: you may cause tears which extend into the lower segment.

If the neck has been severed, but the head has retracted into the uterus, it will be difficult to find and remove. Use ultrasound and craniotomy equipment. *Don't leave the head to deliver:* its bones will splinter and perforate the uterus.

If the cord prolapses, manage as you would with a cephalic presentation: perform a Caesarean section, unless the cervix is fully dilated, and delivery is imminent. Cord prolapse is more common with breech deliveries, especially with a footling, but the foetal parts surrounding the cord are softer so that the cord is often not compressed completely.

Other methods for breech delivery

BREECH EXTRACTION uses your pulling forces, rather than the mother's pushing forces. It is a quick way of delivering a small breech, usually a 2nd twin. It may be indicated for:

- (1) Delay with the 2nd twin.
- (2) Foetal distress with the 2nd twin.
- (3) Cord prolapse at full dilatation with a breech.
- (4) A transverse lie in a second twin, following internal version.
- (5) A dead foetus.

METHOD

The mother must be in the lithotomy position. Proceed as for an assisted breech delivery. An episiotomy is usually indicated. Hook the index fingers of each hand into the foetal groins and pull, preferably during a contraction.

When the umbilicus appears, hook out the legs by flexing the knees. Do this by applying lateral and dorsal pressure in the popliteal fossae, and by sweeping each leg laterally and downwards. Pull on the pelvis, keeping the back anterior. Pull posteriorly. A common error is to pull the foetus towards you, which is not in the axis of the birth canal. When you see the scapulae, hook out the arms.

N.B. If the arms are not across the chest, perform Løvset's manoeuvre.

Then push the head into the mother's pelvis from above. Then, if necessary, consider applying forceps to the aftercoming head.

The main difficulty is that the arms are more likely to be extended above the head, and the head is more likely to become deflexed. Løvset's manoeuvre and the Mauriceau-Smellie-Veit manoeuvre should solve these problems.

If the foetus is dead:

(1) Pull on the leg(s), if you can reach them, or
 (2) Use a combined breech hook and crotchet (19-1).
 Pass the blunt hook end of this instrument over an extended leg into the groin, and pull on that. If the foetus is macerated, the leg may be pulled off. If this is the case, turn the instrument round and hook the sharp crotchet end over the iliac crest. *Take care not to damage the birth canal!*

If the foetus is dead and its presenting part is high and it is a frank breech so that you cannot get a grip on the legs, then it is often easy to introduce a Foley's catheter with a large balloon in the foetal pelvis via the anus. Inflate the balloon with 30-50ml water and pull. The traction you can apply is considerable because the balloon is caught behind the pelvic bones.

Never do this with a live foetus: you will damage the rectum. A dead retained (perhaps macerated) 2nd twin can be delivered in this way; likewise if the mother cannot push (due to shock, eclampsia, or panic). There is no overwhelming hurry in these cases and if this does not work immediately, traction with a weight on the catheter will.

N.B. USE FORCEPS FOR THE AFTERCOMING HEAD.

Standard obstetric forceps, e.g. Neville Barnes type:

- (1) are not easy to use on the aftercoming head,
 - (2) are liable to be misused if they are in the labour ward at all,
 - (3) create the impression for midwifery students that a breech delivery is something that only doctors can do.
- Outlet forceps (Wrigley's) are not long enough when you really need them. If they will reach the head, they are hardly necessary in a breech delivery.*

22.8 More malpresentations

A transverse lie occurs most frequently in multipara, and in mothers with polyhydramnios. Various causes may be present:

- (1) Twins,
- (2) A major degree of placenta praevia, or CPD,
- (3) A congenital uterine or foetal abnormality,
- (4) Premature rupture of membranes,
- (5) A grossly abnormal pelvic brim,
- (6) A fibroid,
- (7) An ovarian tumour,
- (8) Advanced extra-uterine pregnancy.

When labour is obstructed by a transverse lie, the lower segment of the uterus is particularly vulnerable, so *don't stretch it any more by doing an internal version in advanced labour with a dead foetus:* perform a destructive operation (21.8).

(a) Transverse lie

When ≥ 32 wks pregnant, effect an external cephalic version (ECV, 22.7). This is safe provided there is no antepartum haemorrhage, no hypertension with a diastolic blood pressure of >100 mm Hg, nor twins (22.10). If you fail, try again a week later. For obstructed labour with a transverse lie, see 21.5.

If labour starts with a transverse lie, before 30 wks, or when the foetus feels as if it is $<1\frac{1}{2}$ kg, spontaneous delivery of a 'folded-up' foetus may occur, although this foetus is unlikely to survive. There is also an increased risk of prolapse of the cord.

In the latent phase of labour, when the membranes are still intact and uterine contractions are not strong, effect an ECV to produce a cephalic presentation. If this is successful, and there are no signs of CPD, and the position is still unstable, rupture the membranes while an assistant holds the foetal head over or in the pelvis. If the mother is of low parity, start oxytocin IV. Check the foetal lie and heartbeat every 15 mins, until the head is fixed in the pelvic brim.

If there is a small pelvis with an estimated true conjugate of <9 cm (22.7), perform a Caesarean section.

If the foetus is alive and the active phase of labour has begun with intact or ruptured membranes, and the cervix is <8 cm, perform a Caesarean section.

If the membranes are still intact, and you can feel a leg through the lower segment, you can deliver the foetus through a lower segment transverse incision. But if the membranes have ruptured, and especially if an arm has prolapsed, a de Lee incision (21.9) is better, because you can extend this into the upper segment as necessary.

If the foetus is alive and the cervix is fully dilated or nearly so, perform a Caesarean section.

If the foetus is dead, and the cervix is not yet 8 cm dilated, perform a lower segment Caesarean section.

If the foetus is dead, with an impacted shoulder, and the cervix is >8 cm dilated, and the uterus is not ruptured, perform a destructive operation (21.8).

(b) Brow presentation

You will feel:

- (1) the foetal anterior fontanelle,
- (2) the supra-orbital ridges, and
- (3) the base of the nose.

N.B. Brow presentation is often missed:

- (1) during labour. The head is high, but by the time it descends, the sutures and fontanelles by which it might have been diagnosed have become obscured by caput;
- (2) at Caesarean section, until the typical moulding makes the diagnosis obvious.

Unless the foetus is premature, or the mother's pelvis is enormous, the foetus will not deliver vaginally.

If you diagnose a brow presentation in early labour, the pelvis is large, and the foetus is of normal size, the head may flex, and the foetus may deliver vaginally. You may be able to assist flexion by putting your hand through the cervix, pushing the head up and trying to flex it. But, if you fail to flex the head, if the membranes rupture, if there is no progress, or if there is any sign of obstruction, perform a Caesarean section.

(c) Face presentation

You will feel (1) the foetal eyes, (2) mouth and gums, (3) nose, and (4) chin.

Varieties are ('mento' refers to the chin):

- (1) mento-anterior,
- (2) mento-transverse,
- (3) mento-posterior.

If the pelvis is large and there are no signs of CPD, allow labour to progress. The foetal position is most likely to be mento-lateral, and will probably rotate anteriorly and deliver spontaneously. You may be able to help by turning the foetus with your hand.

If the position remains mento-posterior, perform a Caesarean section.

If the 2nd stage is prolonged and the foetus is in the mento-anterior position, with $<^{2/5}$ of his head above the pelvic brim, make a symphysiotomy (21.7) if CPD is mild, or perform a Caesarean section depending on your experience. Remember that the head moulds less in a face presentation. If CPD is significant, perform a Caesarean section in any case.

CAUTION!

- (1) Remember the possibility of anencephaly. An anencephalic foetus often presents by the face, but usually delivers easily. You should be able to distinguish anencephaly, a face and a breech presentation vaginally, once the cervix is 8cm dilated; feel for the foetal brow and mouth. An ultrasound is useful.
- (2) Use oxytocin with the greatest caution.
- (3) *Never use a vacuum extractor!*

22.9 Prolapse and presentation of the cord

If the cervix is not well applied to the presenting part, the umbilical cord can prolapse when the membranes rupture, especially if the head is high, there is a transverse lie, a breech, a face presentation, or twins.

The cord is said to be presenting when it lies below the presenting part, inside intact membranes. Both prolapse and, to a lesser degree, presentation can obstruct the circulation in the cord, and so endanger foetal life. Other presenting parts press less firmly on the cord than does the head, but *don't let this delay you.*

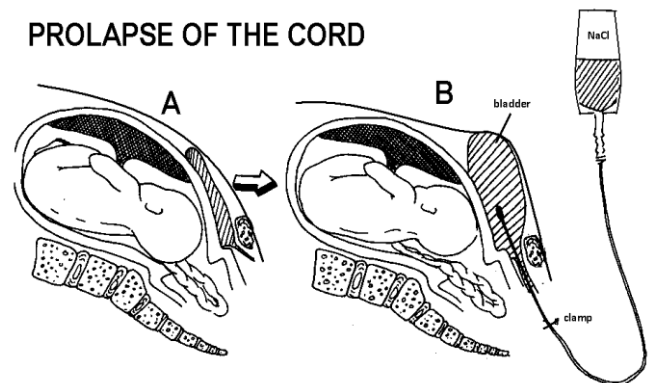


Fig. 22-6 TREATING PROLAPSE OF THE CORD BY FILLING THE BLADDER. A, the head pressing on the cord. B, to free the cord, fill the mother's bladder *via* a catheter, and clamp it.

(a) Prolapse

A routine vaginal examination immediately the membranes rupture spontaneously may diagnose a cord prolapse, but this is *not indicated* if:

- (1) the gestation is <36 wks and there are no contractions,
- (2) the foetal head is well down (not $>^{2/5}$ above the brim),
- (3) the cervix is closed,
- (4) you have not followed the advice in 22.4 on premature membrane rupture.

If you find a prolapsed cord, *don't take your hand out of the vagina!* Instead, push the foetal head (or breech) off the cord.

While you are holding the head, ask an assistant to insert a Foley catheter and fill the bladder with 500ml of saline, and clamp the catheter (22-6B). A full bladder will keep the head away from the cord and may inhibit the contractions of the uterus.

Listen to the foetal heart. It may still be beating, even if you can't feel the cord pulsating. Assess the foetal size, and try to exclude gross congenital abnormalities, particularly hydrocephalus.

N.B. A completely compressed cord, a complete abruption, a uterine rupture or the sudden death of the mother can still be compatible with an undamaged surviving foetus if delivery occurs within 15mins, provided the foetus was in excellent condition initially.

Remove your fingers, and apply a pad to the perineum, so that the cord remains in the vagina. Place mother in the knee-chest position (22-2D), and cover her embarrassing position with a sheet during transport to theatre. Perform a Caesarean section as soon as possible.

There is probably no time for a spinal, and sitting up and curving the back will probably endanger the cord circulation. The best option is probably to use ketamine. *Don't empty the bladder until you are ready to open the parietal peritoneum.* Then simply remove the clamp on the catheter.

Always perform a Caesarean section unless:

- (1) the cervix is fully dilated and the head is only $<2/5$ above the brim and the patient is a primipara (unusual). If so, apply a vacuum extractor;
- (2) prolapse of the cord complicates the delivery of a second twin with a cephalic presentation. If there is no CPD, you can usually apply a vacuum extractor, or effect a breech extraction preceded by internal version if necessary;
- (3) the foetus is dead.

(b) Presentation of the cord

If you feel the cord vaginally when the membranes are intact, observe carefully for foetal heart changes which indicate cord compression. Put the patient into the head-down or knee-chest position, with the foot of the bed raised for 24h. This will nearly always allow the cord to rise above the head. Alternatively, <37 wks, try ECV. Turning the foetus may draw the cord from under the presenting part. Otherwise perform a Caesarean section, unless the foetus is dead or too small to survive.

22.10 Multiple pregnancy

You can deliver most twins vaginally, and only perform a Caesarean section on the same indications as for a singleton pregnancy (21.5). Twins do, however, have problems:

- (1) Labour is more often premature, which puts the foetuses at risk.
- (2) Uterine inertia is more common; this prolongs the 1st and 2nd stages of labour, and makes postpartum haemorrhage more likely.
- (3) Malpresentations are more common, especially with the second twin (22-7).
- (4) Prolapse of the cord is also more common.
- (5) When the 1st twin has been born, the 2nd may suffer as the uterus retracts and constricts the placental site.

As soon as you diagnose twins, plan for:

- (1) Hospital delivery.
- (2) Rest from 32-37wks at the shelters of a hospital. *Rest in itself has no proven benefit* but being near a hospital has. You will in any case have to admit a mother at 34-35wks to the mothers' waiting area.

The patient is more likely to become anaemic, so be sure she is taking iron and folic acid. Watch for gestational hypertension. She should not labour for longer with twins than she would with a single pregnancy.

Use oxytocin in the 1st stage with the greatest care. Oxytocin IV to restart the contractions after the delivery of the 1st twin is prudent and also later to prevent (or treat) postpartum haemorrhage.

HOW TWINS PRESENT

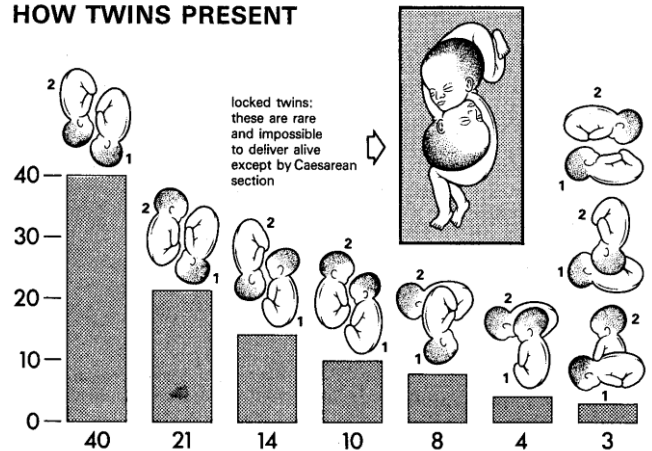


Fig. 22-7 HOW TWINS PRESENT: in 40% of cases both twins are cephalic; in 21% the 2nd twin is a breech; in 14% the 1st twin is a breech; in 10% of cases both twins are breeches. In all remaining cases one or the other twin, or occasionally both, are transverse.

Deliver triplets (or quadruplets) as you would twins. Expect the same problems as with twins, but expect them more often.

(a) Twins 1st stage

As soon as a woman is admitted in labour, determine the lie and presentation of the 1st twin by abdominal palpation. Confirm this by vaginal examination and ultrasound (38.3), and at the same time assess the pelvis. Manage as for a singleton pregnancy and use a partogram.

If there is delay during the active stage, apply the same criteria for the use of oxytocin and performing a Caesarean section. Remember the rare possibility of locked twins.

If the 1st twin is cephalic, or a fully flexed hip-breech, manage the 1st stage as an ordinary trial of labour, unless the foetus is very big, or the pelvis is very contracted.

If the 1st twin has a transverse lie, or is a footling (one or both thighs flexed and one extended at the hip), perform a Caesarean section, unless the foetus is very small ($<1\frac{1}{2}$). In this case, it may slip through an undilated cervix, and there is an increased risk of cord prolapse.

(b) Twins 2nd stage

Find an assistant who will be ready to look after the 1st twin while you deliver the 2nd. Be prepared for an operative delivery of the 2nd twin, and for a postpartum haemorrhage. Insert an IV line, and have oxytocin, misoprostol or ergometrine within easy reach.

Deliver the 1st twin as usual for a cephalic or breech presentation. This is usually no problem although the distended abdomen might interfere with the strength of the forces of expulsion. Oxytocin or a vacuum extraction may help. Nearly immediately after delivery, divide the cord between clamps, and then replace the maternal clamp by a ligature (22.11).

CAUTION! As soon as the 1st twin is born, look at the clock. Deliver the 2nd twin as soon as possible, but without undue hurry: 15mins is a reasonable time.

Feel, or ultrasound (38.3), the abdomen to find the lie, which you can make longitudinal if it is transverse or oblique. Version of a 2nd twin is usually easy, provided you do it without delay, immediately after the 1st twin has been delivered, while the membranes remain intact, and before uterine contractions restart. Then do a vaginal examination to feel how it fits the pelvis. Use 4 fingers or even your whole hand, instead of the usual 2; there will always be room for them immediately after delivery of the 1st twin. The presenting part of the 2nd twin is likely to be high: you may not be able to reach it with 2 fingers or you might just feel small parts through the membranes not being sure what they are. If you have a skilled assistant, ask her to do the abdominal palpation and keep the foetus in a longitudinal lie while you rupture the membranes. At this stage it is good to have an IV oxytocin infusion running because otherwise it may take long for the contractions to resume. Be proactive in rupturing the membranes to avoid the cervix from closing; the presenting part will come down after the stimulus of rupturing the membranes.

If the presenting part comes down, this is a sign of impending success. Sometimes this success has to be clinched by fundal pressure, a vacuum extraction or a breech/delivery extraction but this is bound to be easy.

If the head stays high, increase the speed of the oxytocin infusion and encourage the mother to push. A breech is better than a cephalic presentation if the preventing part stays high. A breech extraction is usually easy.

If you fear the cervix is closing and there is a high head (or a transverse lie), effect an internal version and extraction. It is much easier than you may think.

(Have long gloves ready somewhere for this eventuality.)

N.B. A vacuum extraction with a floppy cervix may be difficult especially if the 1st twin's umbilical cord gets in the way of the cup.

If the cervix closes, the diagnosis is then a retained 2nd twin. Active management with an oxytocin infusion, aiming at rupturing the membranes 3mins after delivery of the 1st twin, will almost always prevent this problem.

N.B. Many Caesarean sections are wrongly performed for retained (originally sometimes unrecognized) twins, often after the 2nd twin has already died. *It is too late to refer a mother for intervention at this stage!*

CAUTION!

(1) Try to know what the presenting part is before you rupture the membranes, although this is not always easy without ultrasound (38.3).

(2) The 2nd twin may be larger than the 1st. If you are motivated, a vaginal delivery will always be quicker than organizing a Caesarean section.

N.B. CPD is unusual with twins.

If ECV fails, don't delay! Rupture the membranes in the labour ward and immediately effect an internal version (see below) and deliver the foetus. Otherwise proceed immediately to a Caesarean section.

N.B. Internal version is dangerous if the membranes have been ruptured for some time.

(c) Twins 3rd stage

Manage this actively to minimize blood loss. Speed up the IV oxytocin infusion with the birth of the anterior shoulder of the 2nd twin, and then deliver the placentas by controlled traction on both cords. If bleeding continues or the uterus is lax, put 800µg misoprostol rectally, massage the uterus and express clots if it rises, till the tablets start working.

(d) Internal version (GRADE 2.2) is often possible without GA. It is kinder however under sedation.

Put the woman into the lithotomy position. Make sure the bladder is empty. Prepare the vulva with antiseptic as usual, and the abdominal wall also. Wait until she is relaxed between contractions, and then put your long-gloved right hand through the fully dilated cervix into the uterus, until you can feel the intact membranes.

Rupture them so you can get a grip on a foot. Palpate the abdomen with your left hand. Search for a foot, which you will recognize by its heel.

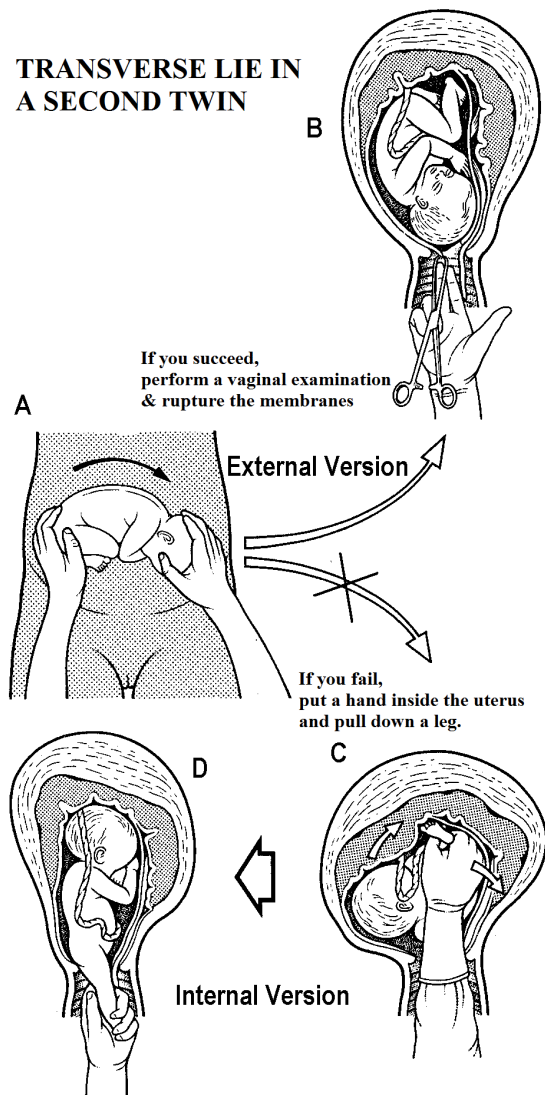


Fig. 22-8. IF THE 2nd TWIN IS TRANSVERSE, first try ECV. If you succeed, rupture the membranes. If you fail, bring down a leg so convert to a breech presentation. This is internal version. C,D, membranes ruptured.

If you find this difficult, work out which way round the foetus is lying, and then feel in the direction of the buttocks. Find a leg and follow this down. Use your other hand if this seems easier. When you have found a foot, bring this down. Hold the ankle between your index and middle finger, with your thumb on the dorsum of the foot. Gently pull the foot, so as to bring one of the legs over the pelvic brim, and down the vagina as far as you can, if possible as far as the vulva. The buttocks and other leg will follow.

At the same time, push the head upwards towards the fundus. Keep pulling on the leg in the direction of the floor. If necessary, squat to do this.

As more of the leg appears, hold it higher along its length. When the anterior buttock appears on the perineum, pull horizontally, and then upwards (breech extraction). When the buttocks are out, deliver the shoulders by Løvset's manoeuvre and the head by the Mauriceau-Smellie-Veit manoeuvre (22.7).

Occasionally, it is enough to pull down a leg into the vagina, and let the patient do the pushing (an assisted breech delivery); but *don't rely on this*, and be ready to assist her if she is uncooperative or exhausted.

CAUTION!

(1) Internal version is only for the 2nd twin with intact or recently ruptured membranes, during a delivery which you have been supervising. *It is not suitable for a retained 2nd twin.*

(2) Make quite sure you bring down a foot, and not a hand! *Don't, in exasperation, bring down any limb! It is not possible for the foetus to hide its feet so well that a committed doctor can't find them.*

(3) If you still don't know what is presenting, *don't waste time waiting for the presenting part to come down.* While you wait, the membranes will probably rupture spontaneously, and the presenting part may be an arm! Once the membranes rupture, labour will commence, and if the head remains high, especially with a transverse lie, the uterus is likely to rupture.

CAESAREAN SECTION is indicated if there is:

- (1) A contracted pelvis with a diagonal conjugate of <11 cm, or a true conjugate <9 cm (21.4, 22.7).
- (2) A major malpresentation of the leading twin, such as a transverse lie, locked twin or footling breech.
- (3) Lack of progress in labour, not amenable to oxytocin after artificial rupture of membranes.
- (4) A 2nd twin with a transverse lie which you cannot correct because the membranes have long been ruptured.
- (5) A uterine scar, e.g. from previous Caesarean section: this is only a relative contraindication to vaginal delivery.

(e) Difficulties with multiple pregnancies

If there is delay in the 1st stage, you can use oxytocin, provided there is no obvious CPD. Rupture the membranes of the 1st twin. Try to deliver the 2nd twin within 15 mins of the 1st, or preferably less.

If, after the delivery of the 1st twin, you feel the head or breech of the 2nd twin, but the cervix is only 7-8 cm dilated, assistance with manual fundal pressure will help very well.

Rupture the membranes and make the patient push. The cervix will dilate again, as soon as the presenting part of the second twin comes down. Contraction of the cervix will not at first delay delivery of the 2nd twin, and is no reason for delaying rupture of the membranes.

If there is heavy bleeding before delivery of the 2nd twin, the placenta of the 1st foetus has probably separated. Deliver the 2nd twin quickly, and then deliver both placentas together.

If either twin is a breech presentation and the patient pushes well and the breech descends well, it will be an assisted breech delivery. If there is foetal distress, delay, or poor pushing, don't hesitate to apply more traction, and turn delivery into a breech extraction (22.7).

22.11 Primary postpartum haemorrhage (PPH)

Postpartum haemorrhage (PPH) is caused by:

- (1) Most importantly, bleeding from the placental site after the placenta is delivered because the uterus fails to contract.
- (2) Retention of all or part of the placenta.
- (3) Lacerations of the genital tract: rupture of the uterus, cervical lacerations, lacerations of the upper vagina, and vulval lacerations, especially near the urethra and clitoris.
- (4) Occasionally, a clotting defect, especially disseminated intravascular coagulation (DIC, 3.5), which produces a fibrinogen deficiency.
- (5) Faulty suturing technique during a Caesarean section.

Aim to stop the bleeding, resuscitate the patient, monitoring her carefully. Alert your anaesthetist. *Act always on the side of caution.* Since bleeding most often occurs from the placental site, your first objective must be to expel the placenta together with any residual clots. If you have achieved this but there is still bleeding, consider the other causes.

Sometimes the only way to keep the uterus contracted (you can feel it) is to massage it. This may need only 15 mins till the misoprostol takes effect, but sometimes 1-2h. This can be quite painful for the patient.

(a) Ergometrine IV or IM will give, as it works, a sustained contraction of the uterus. Therefore *don't use it before delivery of the foetus*. If you do use it before delivery of the placenta, there is more chance (2-3%) of a disconnected placenta being trapped behind the closed cervix. Ergometrine might also cause an eclamptic attack in women with pre-eclampsia, which may be masked by a drop in blood pressure due to bleeding.

Ergometrine can of course be very useful especially for the poorly contracting, empty, bleeding uterus after oxytocin proves ineffective. It is not very stable (especially under the influence of light), so store it in a dark place (*often not done*). Ergometrine kept in labour wards and theatres in a drawer for years will not work. Moreover, it might precipitate vomiting, which is particularly dangerous if the patient is unconscious and not intubated, e.g. if you are using ketamine.

(b) Misoprostol is very useful for incomplete miscarriage, priming the cervix and induction. Overdosing is dangerous after 25wks' gestation, but *it is not a problem in the treatment or prevention of PPH.*

(c) Oxytocin is probably the best drug for PPH in most circumstances. If there is extra risk or oxytocin is not working or unavailable, use misoprostol as well or instead.

For home deliveries by traditional birth attendants (TBAs), PPH is the severest risk. Delivery in a health institution would be better. If that is not feasible and there is some TBA training, the preventive use of misoprostol (3x 0.2mg, *i.e.* 600µg orally, directly after delivery of the foetus) *without* controlled cord traction might save lives and is cost-effective.

In a clinic, misoprostol (800µg rectally) probably should be added prophylactically to the oxytocin if there are extra risks of PPH, or added when oxytocin turns out not to be effective enough. A frequent side-effect is shivering.

(d) DIC (3.5) is probably the commonest cause of a massive PPH when the uterus is empty and is satisfactorily contracted. It is the commonest clotting defect, and is an important and mostly preventable cause of maternal death. It is uncommon after a normal delivery, and is more common after abruption (20.12), an obstructed infected labour (21.4), amniotic fluid embolism, (pre-)eclampsia, sepsis (22.4), or an intra-uterine death (20.4).

Try always to have fresh frozen plasma (FFP) in stock. This has the clotting factors which are practicable for you to stock.

Try to prevent shock by infusing normal saline, FFP and stored blood and by compressing the uterus bimanually or even compressing the aorta against the spine just above the uterine fundus.

In time new clotting factors will be made in the liver, *but this will not help if severe bleeding continues.* So, if bleeding continues, you need to transfuse fresh blood.

But when you are in the above situation you don't know if your management is going to work, so set the collection of fresh blood in motion and also organize the theatre staff in case you have to operate. *This is a major alarm.* Remember there may be a big danger of HIV transmission when you use FFP and more so when you use fresh blood, *so you should use it only when you absolutely have to, but don't hesitate when the indication is clear!*

If your patient has a complete abruption during labour, deliver the foetus as quickly as possible, very preferably, vaginally. Pulling the foetus with the help of a weight, rope and forceps on the skin of its head can save critical time. Stay with the mother because your adequate management in the first 5mins after delivery can easily make the difference between life and death. She might have just enough clotting factors left, but if the uterus takes 10mins to contract properly she will probably lose a critical amount and bleed uncontrollably. Use oxytocin and misoprostol (use it rectally 10mins before the expected time of delivery) and massage the uterus.

N.B. If with a complete abruption, the patient's situation is so very serious that you are thinking of performing a Caesarean section, you will run into problems because the incision will never stop bleeding. If, on the other hand, the situation is not so desperate, you will have time to deliver the foetus vaginally. In other words, if you can perform a Caesarean section, it is not needed; if you do perform one, it won't help you.

If you do have to give fresh blood, you will find it helpful if all your permanent medical, nursing and ancillary staff know their own blood groups, and can be called upon in an emergency. Perhaps there are more people in your town who are prepared to be tested for HIV regularly. You probably need fresh blood only once a year but then its availability may save a life. Occasionally, the husband has the same blood group or has group O Rh-ve. (If the mother is HIV+ve and he also, this added problem would also be removed!)

N.B. Make sure you have access to collection bags with citrate day and night.

(e) Preventing PPH before labour

The following are RISK FACTORS which make it more likely that a woman will have a PPH and so should deliver in hospital.

(i) Identifiable during pregnancy:

- (1) APH in this pregnancy.
- (2) PPH, or a retained placenta, in a previous pregnancy.
- (3) Multiple pregnancy or other cause of extremely distended uterus.
- (4) Combination of previous Caesarean sections and a placenta low on the anterior wall.
- (5) Placenta accreta, percreta or increta.

CONTROLLED CORD TRACTION

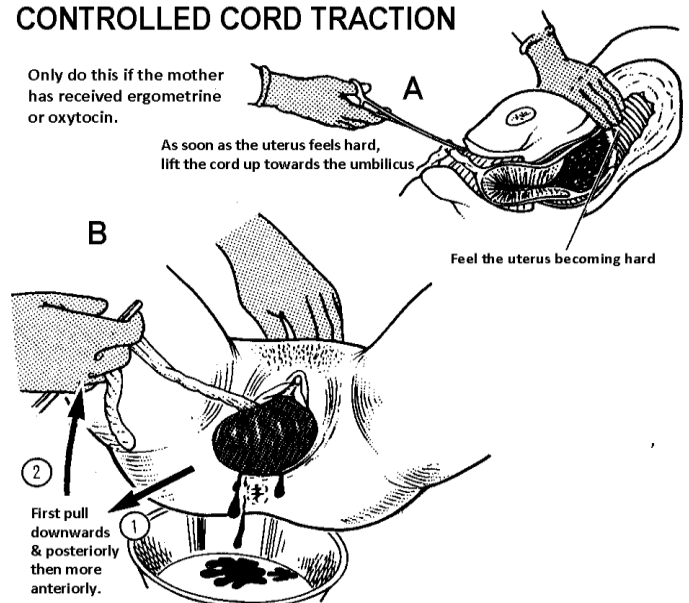


Fig. 22-9 CONTROLLED CORD TRACTION.

As soon as the uterus is contracting firmly from the action of oxytocin or ergometrine, grasp the uterus, push it upwards towards the umbilicus and gently pull on the cord, first downwards and backwards, and then more anteriorly as the cord comes out.

N.B. Grand multiparity (>4 children) is not really a risk factor for PPH, but the consequences of haemorrhage in an older multipara are much worse than with a 1st pregnancy.

(ii) **Identifiable during labour:**

- (1) Prolonged, especially infected, labour.
- (2) Anaesthesia, using ether, halothane or spinal.
- (3) A full bladder.
- (4) Placenta praevia.
- (5) Placental abruption, mainly because this causes a clotting defect, but also because there is already much blood lost in the uterus (concealed bleeding) and there are few clotting factors left to prevent even more loss.
- (6) A clotting defect, especially DIC (3.5).
- (7) Incomplete expulsion of the placenta.

CAUTION! PPH may occur without there being any risk factors: it is best to have an oxytocin infusion running routinely after Caesarean section.

PREVENTING PPH DURING LABOUR

Treat every mother, especially those with risk factors, with 5IU oxytocin IM. (Ergometrine 0.5mg IM is not such a good option because it can cause retention of the placenta (see below) but it is better than nothing.) Oxytocin will work quicker if you use it IV, but there may be nobody around to monitor the patient.

Routinely use oxytocin IM as soon as the foetus is born, *and you are sure there is no twin still in the uterus.* Then (unless the mother is HIV+ve), after 3mins' delay, clamp the cord to increase the foetal iron stores and deliver the placenta by controlled cord traction.

If there is a risk factor for PPH, set up a perfusion of IV saline with a large bore cannula before the patient reaches the 2nd stage. When the foetus and the placenta have been delivered, add 20IU oxytocin IV in 500ml at 30 drops/min for at least 3h. Also, for patients seriously at risk, insert 800µg misoprostol rectally as soon as the placenta is delivered and massage the uterus for a contraction. This is likely to help because it works via different pathways. If misoprostol is not available, use ergometrine 0.5mg IM and massage the uterus.

As soon as the placenta is delivered, check to make sure:

- (1) it is complete and that no lobes have been left behind (see below), and
 - (2) there are no obvious large lacerations in the birth canal.
- Keep the mother in the labour ward, and monitor her for at least 1h, before returning her to the ward. Check that the uterus is well contracted and note any bleeding.

Ideally, you should never apply controlled cord traction before the uterus has hardened under the effect of an oxytocic drug; so, if you don't have any oxytocics, you should not do it. In practice, little harm results if there are already signs of placental separation (lengthening of the cord and hardness of the uterus).

Although it is a very valuable procedure, there is a risk, particularly if you do it incorrectly, that you may invert the uterus.

CAUTION! *Don't squeeze the uterus to try to get the placenta out.* This is very painful.

(f) Controlled cord traction

Unless the mother is HIV+ve, clamp the cord after a delay of 3mins. Then, as soon as the uterus is contracting firmly from the action of oxytocin (or ergometrine), put your left hand on the abdomen, above the pubic symphysis, and turn your palm towards the head. Grasp the uterus. As soon as it feels hard from the effect of the oxytocic, push it upwards towards the umbilicus (deliver the placenta more by pushing the uterus up than by pulling on the cord). Wind 2-3 loops of cord round your index finger and gently pull on the cord, first downwards and backwards, and then more anteriorly as the cord comes out. Very, very rarely you might feel an inversion of the uterus originating at this stage if you pull without a contraction.

RESUSCITATION FOR PPH

As soon as you are called to a patient with PPH, quickly call an assistant: at least 2 people are needed.

Start vigorous resuscitation. What is the state of the peripheral circulation? How much blood has been lost? Is it clotting normally in the receiver used to collect it? It may clot to start with, and then stop clotting later. What has been done so far?

Monitor the volume of blood loss, the warmth of the peripheries, pulse and blood pressure, and the urine output.

If she is still bleeding: is the uterus still contracted? Is the placenta out and complete? Is the bladder empty? Does she have any obvious lacerations of the vulva, vagina or perineum? Could the uterus be ruptured?

If she has stopped bleeding, is the uterus well contracted?

CAUTION! *Make sure that one nurse is allocated solely to observe and monitor this patient, until bleeding has stopped, and her condition is stable.* Poor supervision is an important cause of death in PPH.

(g) PPH with a retained placenta

In low-income countries, retained placenta affects c.0.1% of all deliveries, but has a case fatality rate up to 10%. There are large regional differences: for example, the incidence is very high in Papua New Guinea.

Some placentas are simply trapped (the incarcerated or trapped placenta) behind a closed cervix; the use of ergometrine promotes this situation. Some are adherent to the uterine wall but usually easily separated manually (placenta adherens), and some have grown into the wall in a small area, needing manual or instrumental removal usually in piecemeal fashion though blood loss is controllable. Others are pathologically invading the myometrium (placenta accreta, increta, percreta) over a large area, needing ligation of uterine blood vessels, or even hysterectomy. These last cases are quite rare and mostly seen during Caesarean section because they are often related to more than one previous Caesarean section combined with placenta praevia.

Active management of the 3rd stage limits blood loss and shortens this stage but after 1h the number of retained placentas is similar whether there was active management or not; the same applies to the use of misoprostol.

It seems that the placenta becomes separated by contractions *at the place of the placental insertion*. Using ultrasound (38.3), you can see that the uterus is thin behind an adherent placenta but thick everywhere when the placenta is merely trapped.

If the placenta is retained for <1h, try to make the uterus contract.

(1) If you have not used oxytocin, use it now.
(2) If this fails to stimulate a contraction, gently massage the uterus for a contraction.

(3) Remove the placenta by controlled cord traction, as soon as the uterus is contracting firmly. It should deliver immediately.

(4) You can reduce the need for manual removal by c.20% by the use of intra-umbilical vein oxytocin (50IU in 30ml saline). This will stimulate exactly only that uterine area where a massive contraction is wanted. An even more effective alternative is 30ml saline with 4 misoprostol tablets (800µg) dissolved in it. Cut the cord 5cm in front of the vagina or open a vein in the cord near the introitus with a scalpel and thread a Ch10 gastric tube in the direction of the placenta till you feel resistance. Withdraw it 5cm to allow for branching of the vein and inject the 30ml with either oxytocin or misoprostol (Pipingas technique) while preventing back flow by clamping the cord.

If the placenta is retained for >1h, this is an indication for manual removal. Of course, if there is bleeding (placenta partly separated or incarcerated), something should be done fast, such as manual removal with IV pethidine with diazepam or ketamine in the labour ward.

Before doing a formal manual removal, perform a vaginal examination, and see if the placenta is stuck in the cervix, from which you can remove it quite easily. While preparing to do a manual removal, concentrate on:

- (1) continuing resuscitation,
- (2) keeping the uterus contracted with 20-40IU oxytocin IV, and
- (3) if the oxytocin or misoprostol does not work against bleeding, gently massaging the uterus for a contraction.

(h) Manual removal of the placenta (GRADE 1.5) can be either fairly easy when it is merely trapped behind a closed cervix; rather difficult, needing removal because it is adherent or locally invading the uterus; or impossible (the clinical definition of placenta accreta), when most of or the entire placenta has grown in the uterus.

It is usually best done in the labour ward (which must be equipped for anaesthetic resuscitation) 30-60mins postpartum rather than in the theatre, which usually requires moving the patient and will cause delay. *You will need stirrups to maintain a lithotomy position, and a good light.* Before you start, set up IV saline or Ringer's lactate, if necessary with 2 IV lines.

If an infusion of oxytocin IV is already running, stop this just before manual removal to allow the cervix to relax, so that you can get your fingers inside the uterus.

Ketamine is safest; *don't use sedation in a hypotensive patient*. Use aseptic procedures.

Hold the cord in your right hand. Put the tips of the fingers of your left hand together, and introduce it into the upper part of the vagina. If the placenta has stuck in the cervix, grasp it and slowly remove it. Now let go of the cord, and place your right hand on the fundus (over the towel). Prevent the fundus from being pushed up, as you gradually work your way into the uterus with your left hand. Feel for the part of the placenta which has already separated, and push your fingers between it and the wall of the uterus. Gently separate the placenta from the wall of the uterus with a slow sawing movement, with the side of your hand.

CAUTION! All this time keep your right hand pressing on the fundus, so as to bring the uterus as close to your left hand as you can. *If you don't do this, there is a danger you may lacerate the placenta.*

As soon as the placenta has separated, grasp it with your left hand, remove it, and ask your assistant to inspect it. Meanwhile, whether it looks complete or not, explore the uterus for any pieces left behind, and remove them. Only now remove your right hand from the uterus.

Finally, restart the IV oxytocin infusion, and wait for the uterus to contract. As it begins to do this, remove your hand. As you do so, check that the lower segment is intact. Before you finish, make sure that there are no other sites of bleeding; so explore the uterus as described below.

INSPECT THE PLACENTA to see if part of it has been left behind, or a vessel is running off one edge of it. In either case, you must remove the missing piece of placenta. For small pieces left in, suction using a 12mm Karman cannula may be the solution; *don't use a small sharp curette.*

If the bleeding continues, apply **BIMANUAL COMPRESSION** (22-10A). Put your left hand into the upper vagina. Put your right hand on the abdomen, and use it to push the fundus down onto your left hand. Press for at least 5mins, and then review the situation. Continue IV oxytocin 20IU in 500ml and infuse it at a rate that will keep the uterus contracted. Continue for at least 12h, using more IV fluid and oxytocin as necessary, or use 800µg misoprostol 4hrly rectally. Monitor the mother carefully. Treat her with antibiotic prophylaxis. Keep her in hospital for at least 5 days, because of the higher risk of puerperal sepsis, particularly endometritis. Check the Hb level.

(i) PPH after placental expulsion

Failure of the uterus to contract is the most important cause of PPH, so aim for an empty, well-contracted uterus.

Feel the fundus. It should be hard and round, and below the umbilicus. If it is soft and difficult to feel, it may be relaxing. Massage it to make it contract. This may expel

some blood and clots. If the bladder is full, catheterize it. Use misoprostol (or if this is unavailable, ergometrine 0.5mg) in addition to the oxytocin infusion.

Resuscitate with 2 IV infusions of *warmed* saline or Ringer's lactate. To the first, add 20IU oxytocin. Infuse this fast, until the uterus contracts well. Then slow it to 40 drops/min. Continue this for 2h afterwards. Use the second IV infusion to replace the blood lost with 3 times as much saline. Aim for a systolic blood pressure ≥ 100 mm Hg.

Inspect the placenta for missing pieces with great care, if you have not already done so. If a piece is retained, it will have to be removed. If there are any obvious perineal lacerations, suture them.

If bleeding stops, continue to monitor, resuscitate if necessary, and to use IV oxytocin.

If the blood fails to clot normally, try FFP. It needs fine judgement to decide if you need to use blood or even fresh whole blood. Consider any pre-existing anaemia, availability of FFP and blood, the patient's age and fitness, and risks of transfusion in your environment.

N.B. A young fit person can usually handle the loss of 2L blood if the volume is replaced by saline.

If the blood fails to clot in the receiver as it comes from the vagina, there is probably DIC. If necessary, you can confirm this with a bedside clotting test (3.5), but *don't let this delay you!* Infuse 3-4 units FFP rapidly and also infuse the red cells needed: this will probably mean using fresh whole blood. The clotting defect will probably correct itself within 6h of delivery of the placenta, so if you can only keep the patient alive during this period, she will probably live. She might need (peritoneal) dialysis a few days later. These patients are at risk of clotting too much after they have been cured of clotting too little.

In circumstances where it is routine to use heparin during or after operations, you should use it for these women once they stop bleeding. If you normally don't use heparin, early mobilization is important.

If bleeding continues with an empty poorly contracted uterus, despite oxytocin, increase the rate of infusion. If this fails, there may be a piece of placenta left inside, or, much less commonly, a ruptured uterus. An ultrasound (38.3) can help but it is not easy to exclude with confidence a retained part of placenta, so if you are in doubt, suction the uterus. With a ruptured uterus, there will nearly always be blood in the abdomen which you can diagnose by ultrasound (38.21), a bloody abdominal tap, shifting dullness or uterine digital exploration.

If bleeding continues with a contracted uterus, explore the genital tract for lacerations, from the fundus to the clitoris. If you find large lacerations, suture them.

N.B. Repairing cervical lacerations needs good light, an assistant and experience; it might be safer to use a compression pad.

POST-PARTUM HAEMORRHAGE (PPH)

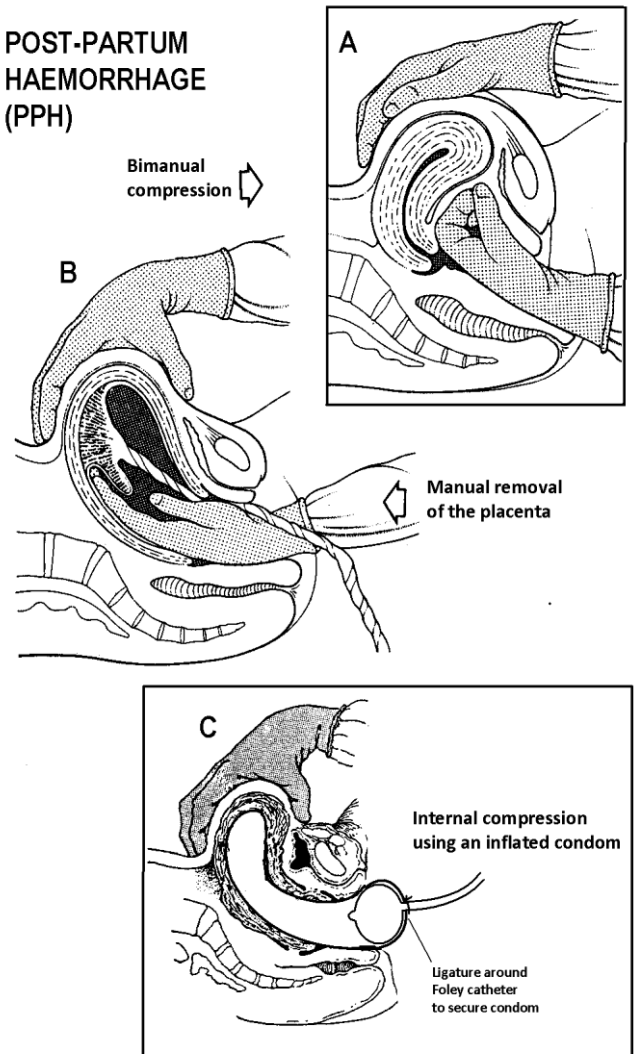


Fig. 22-10 POSTPARTUM HAEMORRHAGE (PPH).

A, bimanual compression of a bleeding uterus between a fist in the vagina and a hand on the abdominal wall. B, manual removal of the placenta. Gently separate it from the wall of the uterus with a *slow* sawing movement with the side of your hand. C, internal uterine compression, best by use of an inflated condom, is only occasionally necessary. Its main use is to control bleeding from the cervix, and it is much less effective in controlling bleeding from the uterus. Much the best way to do this is to use drugs to make it contract.

C, kindly contributed by Robert Lange.

(1) Exploration of the cervix (GRADE 1.1)

METHOD. Use sterile precautions. Catheterize the bladder. Use ketamine. Use the lithotomy position, get a good light, and find a Sims' speculum or one which is wider, and an assistant to help hold it. Wipe out the blood in the vagina with gauze swabs. Look at its walls. Check that the vaginal wall, and the perineal and vulval skin are intact.

To inspect the cervix, use 2 swab-holding forceps. Grasp the front lip of the cervix with one of them. Pull the cervix gently down, and look for lacerations on it. If there are none, use the 2nd forceps to pull down the next portion of cervix, and look at that. Continue round the cervix in this way, looking at every part (22-11).

Then put your hand into the uterus and carefully feel its front, sides, back, and fundus. Feel for a rupture of the uterus (21.17), and for any pieces of adherent placenta.

If there are lacerations on the perineum, vagina, or cervix, suture them. Only suture a cervical laceration if it is causing arterial bleeding. A venous ooze is not a sufficient indication for suturing, which itself can cause new bleeding.

If there are multiple small lacerations rather than one large one which you can easily suture, or there is a steady ooze, pack the vagina.

If there is a retained piece of placenta, use suction. If this fails, scrape it off with your fingers. *Don't persist if you cannot get it all off,* as this will be due to an abnormally adherent placenta.

If you find a rupture of the uterus and bleeding is severe, apply bimanual compression or compress the aorta against the spinal column just above the uterus, until you can get someone to organize for an immediate laparotomy (21.17). *Don't then leave the patient without continuing the compression!*

If bleeding persists despite all other measures when you have used oxytocics properly, sometimes the only way to keep the uterus contracted is to massage it for hours. This can be quite painful for the woman.

(2) Balloon tamponade of the uterus and vagina (GRADE 1.2)

Packing is messy and time-consuming. If there is a steady ooze, blood is scarce, and HIV common, packing may save a mother's life. In practice it is very useful as a near-last resort, before tying the uterine arteries or removing the uterus. It is much less effective in controlling bleeding from the uterus, than from the cervix. Much the best way to do this is to use oxytocin and misoprostol to make the uterus contract.

METHOD. Use sterile precautions. Use the lithotomy position. Pack the uterus and vagina with a condom, attached to tubing or a Foley catheter and filled with 1L water (22-10), or occasionally 2 such condoms. You can use another such condom in the vagina to compress the cervix. This is far more effective and cheaper than using sterile gauze, which you may have difficulty getting through the cervix.

CAUTION!

- (1) Be sure to compress the whole genital tract from the fundus to the introitus.
- (2) *Don't only compress the vagina,* because bleeding will continue invisibly in the uterus, the only sign of which may be increasing hypovolaemic shock.
- (3) If you do use gauze, tie it in one long piece to prevent bits getting lost.

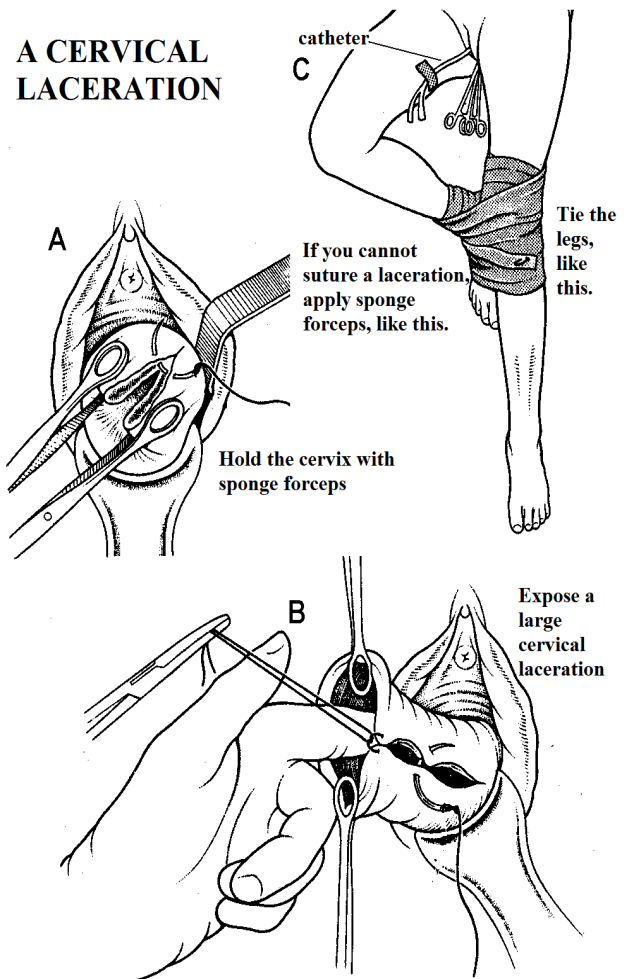


Fig. 22-11 REPAIRING A CERVICAL LACERATION. A, search all round the cervix with ring forceps, until you find the injury. B, suturing a longer laceration. C, if midwives cannot control bleeding they should be asked to apply ring forceps, tie the legs together, and refer the patient like this.

With a balloon inflated in the uterus, it will be difficult to pass urine, so catheterize the bladder.

Continue monitoring and infuse IV fluid or blood as necessary. Remove the compression after 24h.

(j) Difficulties with PPH

If there is severe bleeding and there is going to be some delay, compress the aorta. Stand on the patient's left and feel for the left femoral pulse with your left hand. Clench your right fist and, with your index finger level with the umbilicus and your knuckles in the line of the spine, press gently and firmly through the abdominal wall so as to compress the aorta against the spine. You will feel it pulsating. Press so that you no longer feel any pulsations and obliterate the femoral pulse. If necessary, this method can be kept up for hours, while the patient is referred or while preparations for surgery are being made, changing hands and workers as required. If the legs become numb, allow a little blood to flow through them.

If you cannot get your whole hand through the cervix to perform a manual removal (not uncommon if a lot of ergometrine is used shortly before the manual removal is done, or there has been a long delay), you are in difficulty. Avoid this problem, if you can, by using IV oxytocin, rather than ergometrine, and by discontinuing it just before manual removal. Try to get one or two fingers through the cervix, and push the fundus well down with your other hand. Usually, the cervix relaxes gradually so that, if you are slow and gentle, you can put your whole hand into the uterus.

Long forceps to remove the placenta piecemeal are an option; keep your non-dominant hand on the fundus to prevent perforation: you will feel the forceps.

This method can be combined with suction via a large (12mm) Karman cannula.

If the placenta seems abnormally adherent to the uterus (placenta accreta), remove what you safely can piecemeal, without perforating the uterus, and leave the rest. This is not a problem as long as the uterus contracts sufficiently afterwards to obstruct the blood flow to the relevant areas. *Avoid sharp curettage*: the myometrium might be very thin at the point of adherence and there is a high risk of perforation.

The placenta which you have to leave will be slowly absorbed. There is serious risk from sepsis and secondary postpartum haemorrhage. Continue IV oxytocin for 48h, then stop if all is satisfactory. Treat with prophylactic chloramphenicol and metronidazole. Monitor carefully in hospital.

N.B. Placenta accreta over a large area will often need a hysterectomy; suspect this if there have been several previous Caesarean sections.

If bleeding continues from an empty uterus, despite all the above measures, try infusing oxytocin 40IU in 500ml saline fast IV with repeated doses of ergometrine 0.5mg IV. Try prostaglandins if you have them.

B-LYNCH UTERINE SUTURE (GRADE 3.3)

If you cannot control bleeding despite the measures outlined, open the abdomen as for a Caesarean section. Apply a special type of tourniquet (brace suture) around the uterus: open the visceral peritoneum where the bladder ends and the uterus starts, reflect the peritoneum and push the bladder down bluntly. Insert a #2 long-lasting absorbable suture (22-13) on a large Colt's needle (4-70) 2-3cm lower than where you would normally open the uterus for a Caesarean section.

UTERINE INVERSION

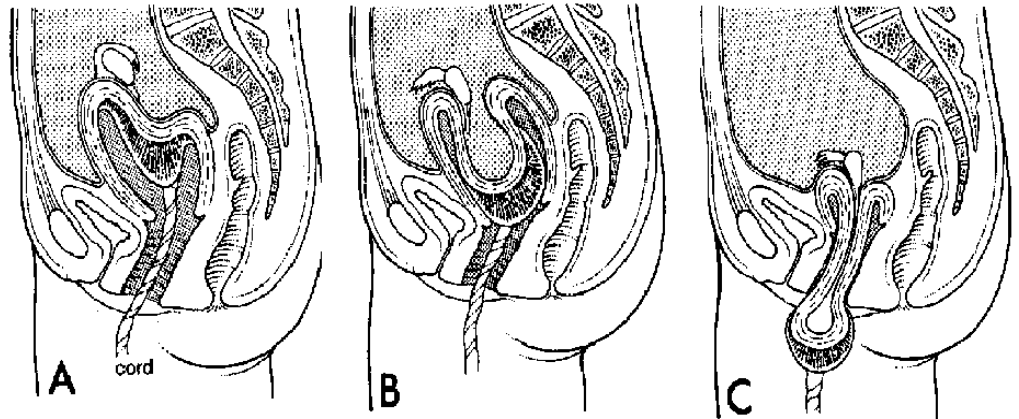


Fig. 22-12 INVERSION OF THE UTERUS.

A,B,C, increasing degrees of inversion. If this happens spontaneously, or as a complication of controlled cord traction, immediately push it back. If there is any delay, replacing it will be much more difficult.

After Bonney V. Gynaecological Surgery Baillière Tindall 2nd ed 1974 Fig 431, permission requested.

Go through the anterior uterine wall 4cm from the lateral margin on the right side. Then loop the suture over the fundus and insert it through the posterior wall across the midline. Ask your assistant to squeeze the uterus and pull the suture tight. Continue with the same suture, looping over the fundus on the left, and pass it again through the anterior uterine wall, and knot it tight. Check if bleeding continues. (Get an assistant to check under the towels.)

If bleeding continues and the condition is deteriorating, make a tourniquet from any rubber sling or catheter and push it as low as possible around the uterus. Push it lower than the fimbria and tie it with a half-knot tight, putting a forceps on the knot. This will give you time to resuscitate the patient, finish essential suturing, and organize subsequent care without further blood loss. It is even possible, if you don't have blood or the right expertise, to refer a patient on with the tourniquet *in situ*.

Certainly, it will make a hysterectomy later a much less bloody and dangerous procedure.

N.B. A tourniquet, put on in this way, stops blood supply to both the uterine *and* the ovarian arteries. This means that the uterus and ovaries will necrose if the tourniquet is left on for >3-6h.

If you place the tourniquet so it only stops blood supply in the uterine arteries, sparing the ovarian vessels, this might still control the bleeding without causing the ovaries to necrose.

B-LYNCH SUTURE

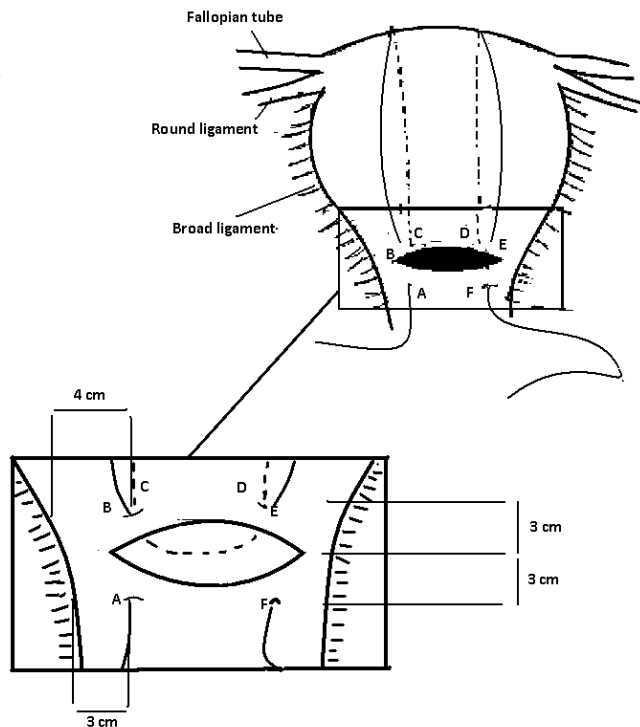


Fig. 22-13 B-LYNCH UTERINE SUTURE.

A, introduce the suture here and exit at B. Loop the suture over the fundus to re-enter the uterine cavity posteriorly at C, directly behind point B. Pull the suture tight, and then pass it through the posterior uterine wall to come out at D. Loop it back over the fundus, and enter the uterine cavity anteriorly again at E, coming out at F. Then tie the suture tight to compress the uterus.

After B-Lynch C et al, *The B-Lynch surgical technique for the control of massive postpartum haemorrhage: an alternative to hysterectomy? Five cases reported. Br J Obs Gyn 1997;104(3):372-5.*

To do this, you have to push your tourniquet through the broad ligament just lateral to the uterus near the cervix from front to back, then go round behind the uterus and do the same on the other side from back to front and tie.

CAUTION! Do it bluntly with a small artery forceps first, and then pull the catheter through, avoiding many distended veins in this area.

Alternatively, control the haemorrhage with the tourniquet, and then formally ligate both uterine arteries (22-14).

UTERINE (& OVARIAN) ARTERY LIGATION (GRADE 3.4)

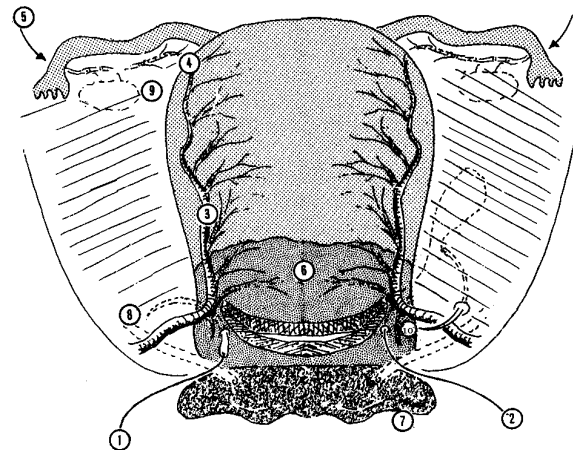


Fig. 22-14 LIGATING THE UTERINE ARTERIES.

First suture on the right side: pass the needle taking a good bite of the uterine muscle through to the back. Following the same procedure, then pass the suture back through the broad ligament on the left side. You can place additional sutures higher up if necessary.

(1) uterine artery. (2) anastomosis between uterine and ovarian arteries. (3) ovarian artery in the infundibulo-pelvic ligament. (4) bladder reflected off the lower uterus. (5) bladder. (6) right ureter. (7) left ureter. (8) right ovary. (9) inferior cervical branch of uterine artery.

22.12 Secondary postpartum (puerperal) haemorrhage

This is vaginal bleeding between 24h and 12wks after delivery, usually between the 6th-14th day, and typically on the 10th. It is usually due to infection, particularly in association with:

- (1) Retained pieces of placenta.
- (2) Obstructed labour, causing necrosis of the cervix and vaginal wall.
- (3) An exposed artery in the endocervix or endometrium.
- (4) Caesarean section and breakdown of the uterine wound (21.14).
- (5) A form of gestational trophoblastic disease (23.10).

If bleeding is mild, observation may be all the patient needs. It is not rare anyway for a woman to have a bloody discharge continuing 2 months after delivery. If she continues to bleed, or has signs of infection, treat her with chloramphenicol and metronidazole, and supply iron supplements.

If bleeding is severe, the patient needs antibiotics, resuscitation, and an ultrasound examination for retained pieces of placenta (38.3). Alert your anaesthetist. Make sure you monitor your patient carefully! Be sure she is well resuscitated before you start evacuating the uterus!

EXPLORING AND EVACUATING A SEPTIC UTERUS IS DIFFICULT

EQUIPMENT Sterilize 2 ring forceps (or swab holders), a Sims' speculum, and a big, blunt curette. If available, a large (12mm) suction curette is best. Add them to the vaginal examination tray.

Start an oxytocin infusion and place 800µg misoprostol rectally, so that you have the best chance of a well-contracted uterus which will also help you avoid a perforation because it is easily felt when hard.

Use aseptic precautions. Clean the vulva with an antiseptic solution. Put the Sims' speculum into the vagina. Ask an assistant to hold it, so that you can see the cervix. Hold the front of the cervix with one ring forceps. Put the other ring forceps into the uterus. Push it in very gently, until it is at the fundus. Feel the size of the uterine cavity. Open the handles, turn the forceps and close them again. Pull out any placenta you have grasped. Do this several times in different parts of the uterus, until nothing more comes out.

Suction-curette the uterus. Scrape it down the anterior wall, then the 2 side walls, and then the posterior wall. If you use a suction curette, rotate it while moving it carefully up and down. Lastly, scrape it across the fundus. *Don't scrape too hard*, or you may harm the uterine lining. It will be harder to move and you feel it scraping when the uterus is empty. If available, an ultrasound (held by an assistant) will be of help.

CAUTION! Emptying a uterus in the puerperium is difficult, and can be dangerous. Its wall is soft, and you can easily perforate it.

Never use a small curette, or any small instrument, because they will make a hole very easily. Work gently and carefully, and don't use a metal sound.

N.B. If you see fat tissue or bowel in your forceps, or clear fluid flows out: *stop at once!* You have perforated the uterus.

If the uterus is empty and severe bleeding continues, tamponade or pack the uterus and vagina (22.11). If this fails, proceed to laparotomy, as for an uncontrollable PPH (21.17, 22-13, 22-14).

22.13 Intra-uterine growth retardation (IUGR)

Most perinatal deaths occur in normally formed, normally grown babies weighing >2.5kg, as the result of birth trauma and asphyxia related to CPD, pre-eclampsia, abruption, cord prolapse, and malpresentation. These deaths are much more preventable than those from prematurity and IUGR.

Babies who are sufficiently small to be classified as being of low birth weight (<2.5kg) may:

- (1) have been born after a pregnancy which was abnormally short, or
- (2) have grown abnormally slowly during a pregnancy of normal length.

These 'small for dates' babies have not grown properly. In low- and middle-income countries, 25% of babies may be of low birth weight, and of these, 70% may have IUGR.

Its causes, in approximate order of frequency, include: malnutrition, placental malaria, HIV disease, gestational hypertension, essential hypertension, recurrent antepartum haemorrhage, sickle cell disease, malformations and chromosome abnormalities, other virus infections, smoking, and alcohol.

There is also an 'idiopathic' group (30% in the developed world) in whom there is no obvious cause, but who are generally considered to be suffering from utero-placental vascular insufficiency. A hungry starving foetus from any of these causes readily dies, particularly during early labour, when his heart suddenly stops.

Because of the overwhelming importance of malnutrition as a cause, 21 of the 22 million low-birth-weight babies who are born each year are in low-income countries. Their chances of dying are 20 times higher than those of other babies. Malnutrition is the most potentially preventable cause.

IUGR is not easy to detect clinically. The risk factors for it, some of which are determined by malnutrition, include:

- (1) IUGR in previous pregnancies.
- (2) Low weight before pregnancy began.
- (3) Low weight gain during pregnancy.
- (4) Multiple pregnancy.
- (5) Smoking.
- (6) HIV disease.

Even so, 30-50% of cases commonly remain undiagnosed. The only way, if you have no ultrasound, of diagnosing IUGR is to encourage your midwives to measure the fundal height as carefully as they can with a tape measure between 20-36wks. If the uterus is 5cm lower than it should be, and there are <10 movements in 12h, you can diagnose IUGR.

Unfortunately, many mothers are unsure of their dates, and most health workers (including doctors) are unable to record the height of the fundus with sufficient accuracy. Even so, it is of little value in multiple pregnancy, polyhydramnios, a transverse lie, or in a very obese mother.

The fundal height chart (22-15) is derived from the UK; check if you have local charts: expect your normal heights to be 3cm less. If low-birth-weight babies are common in your district, you will find many mothers falling below the 10th centile, either because their babies have IUGR or because they are genetically small: the relative importance of these factors is unknown.

If you diagnose IUGR during pregnancy, and decide to deliver a mother before term for other reasons (it is not one of the indications for induction: 22.2), *don't do so before 34wks*. Do the surfactant test (22.1), in case the dates are wrong.

You then have a choice between inducing labour (22.2) and elective Caesarean section (21.10). Babies with IUGR tolerate asphyxia badly.

SYMPHYSIS - FUNDUS MEASUREMENTS

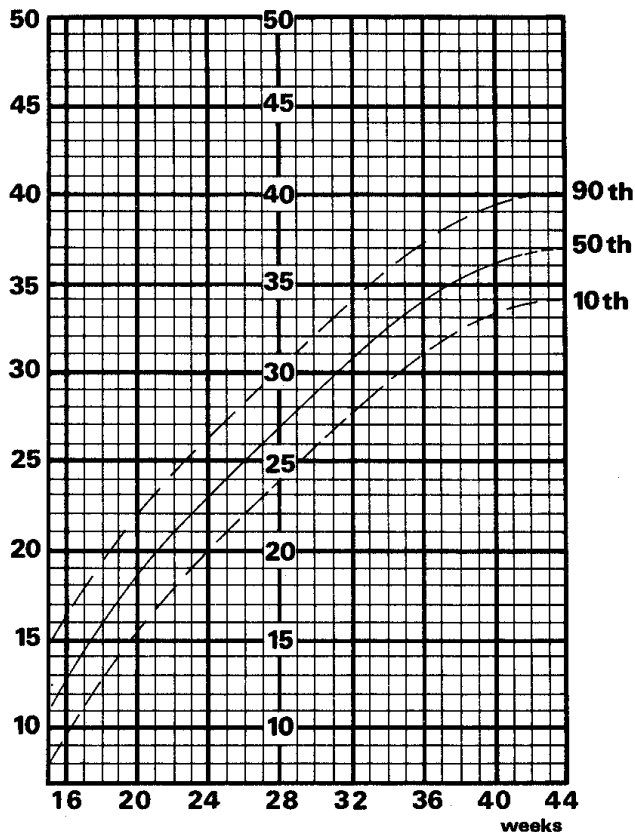


Fig. 22-15 A FUNDAL HEIGHT CHART.

If low-birth-weight babies are common in your district, you will find many mothers falling below the 10th centile, either because their babies have IUGR or because they are genetically small (the relative importance of these factors is unknown).

Babies with IUGR born at term have only a slightly increased risk of a major handicap, such as cerebral palsy or mental retardation. But between 1-30% of them have some minimal cerebral dysfunction, such as problems with speech, language, and learning.

The babies at greatest risk of some major handicap associated with IUGR, particularly cerebral palsy, are:

- (1) The badly asphyxiated foetus with severe IUGR born at or post-term.
- (2) The foetus with IUGR delivered <34wks.

Try to diagnose and deliver babies in the 'window' between 34-36wks if you can. Delivering a foetus whose mother has diabetes presents similar problems in judging the best time for delivery, the main difference being that he is too big rather than too small.

Much of the effort of modern obstetrics is devoted to detecting babies with IUGR, monitoring them, and getting them out into the world at just the right moment, when the risks outside the uterus are less than those inside it. If you can judge the moment of induction successfully, you may increase a child's chance of survival. Because of the enormous progress made in neonatal intensive care in high-technology surroundings, survival without handicap has improved dramatically.

In your case, delivering a foetus too soon might be much more risky. A foetus suspected of having IUGR is often found to be normal or simply premature and vice versa. However, treat the more manageable causes of perinatal mortality, some of which express themselves as IUGR: malaria, gestational hypertension, syphilis, obstructed labour, and poorly managed breech and twin deliveries. HIV however remains a huge challenge.

22.14 Puerperal sepsis

After childbirth a woman's genital tract has a large bare surface, which can become infected. Infection may be limited to the cavity and wall of the uterus, or it may spread beyond to cause peritonitis (10.1), septicaemia, and death, especially when resistance is lowered by a long labour, severe bleeding, or HIV disease. Sometimes the infection may be walled off by bowel and omentum. There may be a pelvic collection of pus in the pouch of Douglas, or there may be pus high in the pelvis or in the lower abdomen.

If sepsis is localized, only the lower abdomen is distended, there is guarding in both iliac fossae, and an ill-defined tender mass arising from the pelvis. There may be hyperactive bowel sounds. Vaginally, there are signs of recent childbirth or miscarriage, and there may be infected lacerations. The cervix is open and tender, painful on movement, and may be drawn up behind the symphysis. The pouch of Douglas may be thickened or swollen, but you cannot feel a fluctuant mass vaginally. The uterus and appendages form a mass which is difficult to define because of their tenderness.

If sepsis is generalized, the patient is weak, with anorexia, fever (perhaps with rigors) and generalized abdominal pain; walking is almost impossible. There may be diarrhoea initially. Usually there is a rapid ready pulse and a low blood pressure. The abdomen is uniformly distended, tympanitic, silent, and acutely tender. There may be a visible mass extending up to the umbilicus; you may have to pass a catheter to make sure that it is not merely a distended bladder.

MANAGEMENT

Resuscitate the patient (10.1). Treat her with chloramphenicol, ampicillin or gentamicin, *and* metronidazole. Monitor her 4-6hrly for signs of spread of infection.

If there is persistent vaginal bleeding and sepsis, there may be retained pieces of placenta. This is a common cause of puerperal sepsis, which will not resolve until the uterus is empty. Resuscitate the patient, administer antibiotics IV and curette the uterus with great care! Use your fingers if you have access or the largest curette which will be less likely to perforate the uterus.

N.B. Curetting a large, soft, infected uterus is dangerous.

PUERPERAL SEPSIS

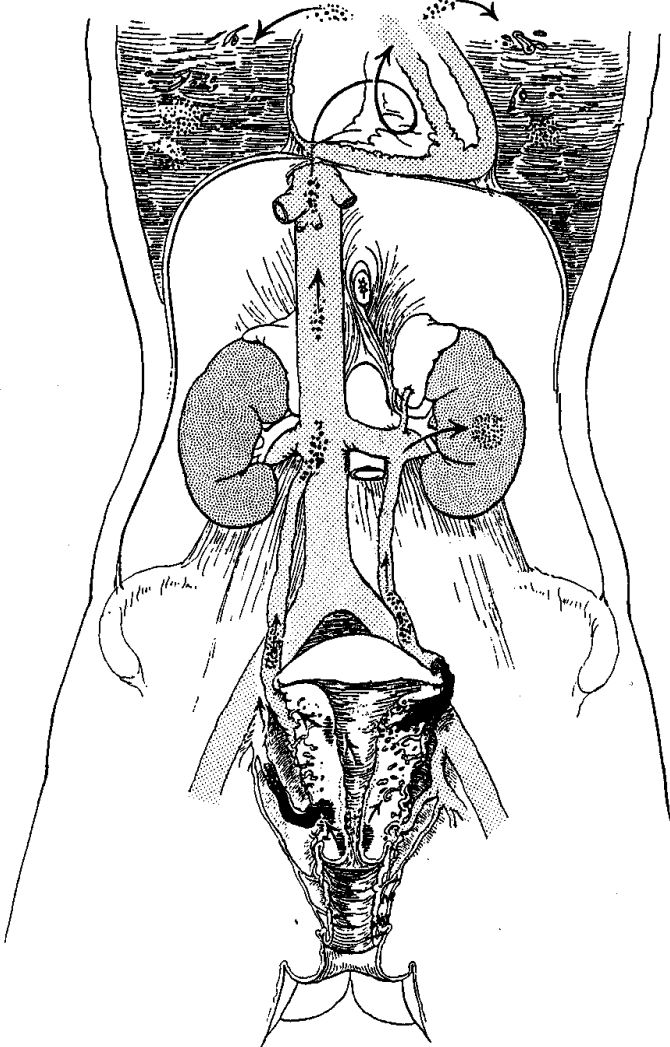


Fig. 22-16 PUERPERAL SEPSIS.
There is septic thrombophlebitis. Septic emboli are spreading through the ovarian and internal iliac veins to cause septicaemia and abscesses in the lungs and kidneys.

If the uterus is enlarged and tender, with a closed cervix as the result of scarring or carcinoma, it may be full of pus (pyometra, 23-9E). This can occur 2wks or more after delivery. Drain pus through the cervix by dilation with Hegar's dilators: Ch10 is usually enough.

If there is a definite swelling at one side of the uterus, this is parametritis.

If there is peritonitis with localizing signs, make a muscle-splitting incision as for an appendectomy in the appropriate iliac fossa. Open the peritoneum, sweep gently with your finger, and insert a sump sucker. Several litres of thin pus may escape. As you enter an abscess cavity, gently free any adhesions and open up all loculi. Lavage the cavity (10.1).

If there is generalized peritonitis, make a midline incision, clear out the pus and wash the abdomen thoroughly. You might have to repeat this (11.10).

If fever recurs after initial improvement, there is more pus somewhere which you should drain, preferably through a midline incision. Perform an ultrasound examination of the abdomen (38.21). If you fail to drain a subphrenic abscess (10.2), or other residual purulent collections, the patient will die.

If the patient recovers from the acute episode, but is left with a mass, she may eventually need a full laparotomy, with the separation of adhesions and the removal of a tubo-ovarian mass (23.1).