Maternal Health/ Delivery Emergency Care

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Preface

Obstetric care has been the one sector within health care that has lagged behind in the progress that has been recorded in Global Health within the last 3 decades. Whereas child mortality has halved in this period and likewise women's fertility, with the largest increase in life expectancy in human history, maternal mortality globally had remained unchanged at 430 women dying per 100 000 live born (1) until recently when in 2010 this figure had reduced to a Global Maternal Mortality Ratio of 210/100 000 live born with 287 000 maternal deaths that year (11). Women are dying in pregnancy related complications of foreseeable reasons and in foreseeable numbers. Out of the 210 million pregnancies each year about 15% will develop complications and 1.7% will die. However we cannot know beforehand which woman will die in the Peruvian highlands or the slums of Kolkata. These women are not dying of diseases, they are dying because they are women and it is their lot to reproduce and give birth to children. Most who die are illiterate, do not own any land, cannot start a shop and usually cannot decide if and with whom they will become pregnant. This results in 287 000 deaths a year (all but 1% in developing countries) with 85% of these deaths occurring in Sub-Saharan Africa and South Asia (1). There are 50 million injuries and illnesses as a result of pregnancy and delivery. 15 million will have long-term disability (2). The lifetime risk for women in low-income-countries is considerable. In Sierra Leone 1 in 6 will die a maternal death, in Mali 1 in 7, in the whole of Africa 1 in 16, whereas the figure for Asia is 1 in 54, for Latin America 1 in 73 and for Ireland it is 1 in 48 000. The global risk is 1 in 92 (1). The deaths are about equally distributed between Asia and Africa but because of the population difference the risks are much greater in Sub-Saharan Africa. Here the total maternal mortality ratio (MMR) is 500 in 100 000 live births (2010), 220 in South Asia, 200 in Oceania, 150 in South-East Asia, 37 in East Asia and 80/100 000 in Latin America and the Caribbean (11). The highest MMR recorded from one district is found in Ragh in rural Afghanistan at 6500/100 000 live births whereas in Kabul it is 418 (1). The lowest MMR is in Ireland where it is 1/100 000 (1). Two countries in Asia show that the

situation can be radically improved even in a poor country. These are Sri Lanka and Malaysia which, in the first decade after the second world war halved their maternal mortality ratio with a focused programme consuming one quarter of the whole health budget which was only 1.6% of their limited total BNP. Thus investing between 0.25-0.4% of their BNP made a huge leap forward in maternal health (3). In the last two decades several countries have reduced their maternal mortality by 30-70% but from lower initial levels. These are Egypt, Tunisia, Honduras and China (4). In the vision of the Millenium Development Goals launched in 2000, goal 5 is focused on improving maternal health with the target of reducing by three quarters between 1990 and 2015 the maternal mortality ratio. There is a tangible embarrassment that the half-way report did not even quote the estimated MMR's achieved since they were so miserably deficient. All that was quoted was the proportion of deliveries attended by skilled health workers. In all the other targets concrete figures of progress were quoted for each region.
The figures for 2005 (1) when at last released showed that the Global MMR has declined by less than 1% per year (a decline of 5.5% is needed to attain the MDG target). In Sub-Saharan Africa the decline had been 0.1% annually and with the confidence intervals quoted it is doubtful if any decline had occurred. 14 countries have an MMR more than 1000/100 000 and 13 of these are in Sub-Saharan Africa. Afghanistan is the remaining country (1). The latest figures are more optimistic (11) but there are still doubts about validity since estimations are notoriously unreliable from many of the poorest countries with the highest MMR.

The role of emergency physicians

In this section the focus will be on the obstetric emergencies where emergency health workers will be involved. All the 5 main killers within maternal health (fig.1) are emergencies, usually unforeseen for that individual and it is important to understand the reasons behind the complications and the first-line measures to save lives and reduce morbidity. In some settings the medical worker attending to an emergency will have to take the responsibility for the whole sequence of life-saving measures The ”big five” responsible for 73% of all maternal deaths (5, 6) are: bleeding and especially post-partum bleeding (25%), sepsis (15%), eclampsia and hypertensive disorders (12%), unsafe abortion (13%) and obstructed labour (8%). Other direct causes such as ectopic pregnancy, embolism, and anaesthesia-related problems cause 7% and indirect causes such as malaria, anemia and HIV/AIDS cause 20%. The exact proportions of these 5 varies widely so that in the highlands of Ethiopia obstructed labour is the largest cause whereas throughout Africa haemorrhage and especially post-partum haemorrhage is the biggest cause with about one third of maternal deaths resulting. In Latin American countries hypertensive disorders are the most common cause of maternal mortality but in some countries, unsafe abortions are the largest cause (7). In 1987 three UN agencies sponsored the International Safe Motherhood Conference in Nairobi, Kenya with a goal of reducing the Global MMR by 50% by the year 2000. This failed because it concentrated too much on two measures that were shown to be ineffective: antenatal care with screening to identify high-risk pregnancies for hospital delivery, and training of traditional birth attendants (8). In contrast to these failed measures intrapartum-care strategies are the priority focus for reduction of maternal mortality and especially basic emergency obstetric care at the health centre and comprehensive emergency obstetric care at the first referral hospital (9).

The **most important direct health interventions** in countries and communities which will reduce maternal mortality have been found to be:
1. Training of well qualified midwives tutored to have a positive supportive attitude in attending deliveries and to be accessible to even the most remote communities.

2. Transport means to move severe delivery complications to first referral level units

3. Well equipped and staffed first referral units to carry out 6 life-saving skills of:

a. safe anaesthesia

b. operative skills for cesarean section, laparotomy for ruptured uterus, ectopic pregnancy, peritonitis with need for pus removal, repair of ruptured cervix and major vaginal tears, safe evacuation of uterus for incomplete abortions, where appropriate symphysiotomy,

c. manual dexterity to safely deliver twins, breech, use a vacuum extractor, manual removal of placenta, external cephalic version

d. Medical skills to deal with sepsis, hypertensive crises, eclampsia,

e. Blood transfusion with a functioning blood bank with blood screened for HIV, Hepatitis B and C

f. family planning with a wide range of fertility control and capacity for sterilization of both males and females.

Underlying factors of definitive long-term importance are: **obligatory schooling for girls,** literacy classes for women and further training for girls and women. The objective is to **empower women** to take their own initiatives and to establish women's movements and become more independent economically. This has an immense impact on the drive to improve women's health. Improved ante-natal health care has had a limited but disappointingly low impact on maternal mortality (9). Of all maternal deaths 24% occur during the pregnancy (including the 13% due to unsafe abortion), 16% occur during delivery and 61% occur after delivery (10)

References

1. Maternal mortality in 2005: estimates developed by WHO, UNICEF, UNFPA and the World Bank. Geneva: WHO Press 2007.

2. The Johns Hopkins and IFRC Public Health Guide for emergencies. Geneva: IFRC Press. 2000: 11-5

3. Padmanathan I, Liljestrand J, Martins J, et al. Investing in maternal health in Malaysia and Sri Lanka. Washington, DC. World Bank, 2003

4. Liljestrand J, Mödrars överlevnad - en fråga om kvinnors värde. Läkartidningen. 2004; 101 : 478-81

5. Mola G, Thornton J, Breen M, Bullough C, Guillebaud, J, Addo F, Primary Mother Care and Population. Stamford UK: Spiegel Press, 2003: 1.3

6. Royal College of Obstetricians and Gynaecologists. Life saving skills manual. London: RCOG Press, 2007: 1

7. Horton R, Healthy motherhood: an urgent call to action. Lancet. 2006; 368: 1129

8. Starrs AM, Safe motherhood initiative: 20 years and counting. Lancet. 2006; 368: 1130-32

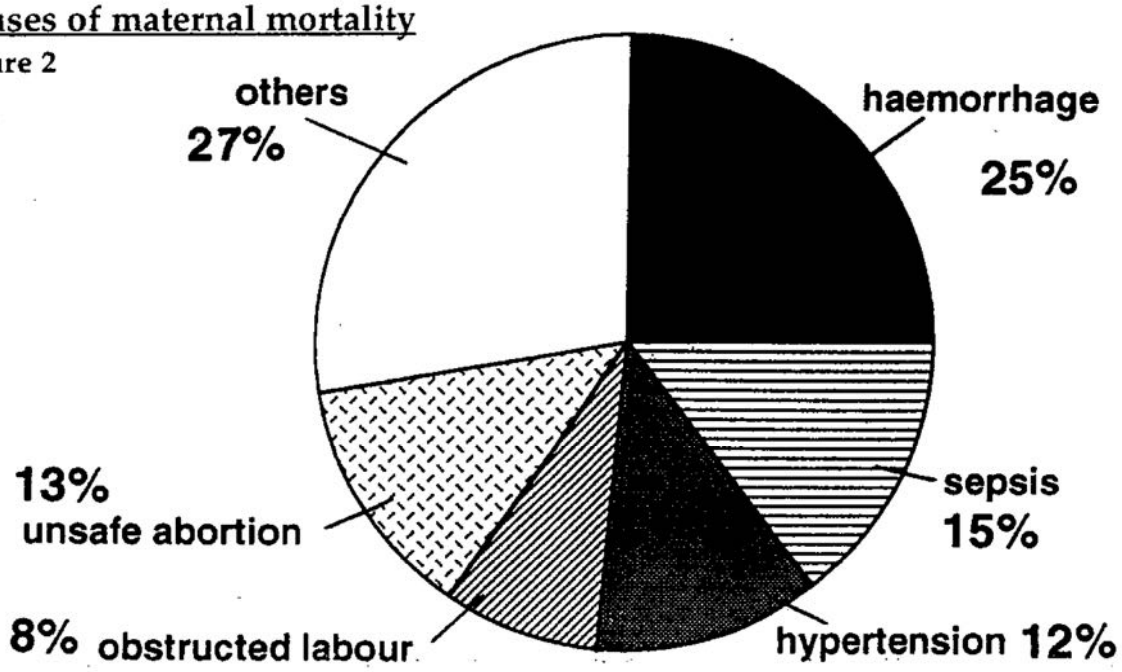
9. Campbell OMR, Graham W, Strategies for reducing maternal mortality: getting what works. Lancet. 2006; 368: 1284-1299

10. de Bernis L, Sherratt DR, et al. Skilled attendants for pregnancy, childbirth and postnatal care. Br Med Bull. 2003; 67: 39-57

11. Trends in Maternal Mortality: 1990-2010 WHO, UNICEF, UNFPA, World Bank. Geneva WHO press 2012.

Causes of maternal mortality

Figure 2



Five main causes of maternal deaths

1 Bleeding
2 Infection
3 Eclampsia
4 Obstructed labour/rupture of the uterus
5 Complications of unsafe abortions

Average interval: onset to death

APH 2 hours PPH 12 hours
6 days
2 days
Obstruction 3 days/Rupture 1d.

Normal Vaginal delivery

Most normal labours and deliveries will occur in settings away from Emergency Medicine centres but the occasional delivery will still occur (usually unexpectedly) in such a centre and it is therefore valuable for emergency physicians to have a description of how to conduct such a labour and delivery. **Introduction** There are five principles that are essential to ensure a safe delivery: Ensure a calm and competent atmosphere with continuity of the assisting staff and, if at all possible, the presence of a near relative or the husband during the labour and delivery. Several studies have shown that the great success of deliveries in the Rotunda Hospital in Dublin, with an extremely low Caesarean section rate, had as much to do with the supportive atmosphere of midwives who were present and supportive during the whole of the labour and delivery as with the Active Management of Labour that was launched there (1, 2). Continuity and empathy are the essential ingredients. Any record keeping during labour that reduces personal contact (e.g. computer use that interferes with personal support by taking the attendant away from the delivering woman) is detrimental to the final outcome of the delivery.

a. Ensure high levels of hygiene of hands, sterile gloves, delivery surface, clean perineum and sterile cutting of the cord.

b. Ensure gentleness in both handling of the woman and the child

c. Establish a "compass" for monitoring the progress of labour with a partogram including a clear *alert* line and *action* line once established labour is diagnosed. The three pillars of monitoring are regular assessment of the cervical dilatation, the descent of the head in relation to the pelvic brim and the foetal heart rate pattern especially immediately after a contraction. Done properly this will eliminate prolonged and fruitless labour that may result in obstructed labour and increase the risk of pueperal sepsis and postpartum bleeding. It will also identify significant foetal distress which

needs correction (3).

d. Involve the delivering woman (and if present her relative) in the process of monitoring the labour and give continuous information of progress in a calm and supportive way.

Normal labour occurs after 37 weeks of gestation resulting in a spontaneous vaginal delivery within 24 hours of regular spontaneous contractions. When active management of labour (1) is realized the length of normal labour is 12 hours. In the mother labour is often heralded by a "show," i.e. a plug of cervical mucus and a little blood as the membranes strip from the os. The membranes may then rupture. The baby's head will engage in the pelvis (in many primipara, but not commonly in Africa, this has already occurred during the last weeks of pregnancy), descend deeper into the pelvis, flex, internally rotate and then rotate back and extend as it emerges from the perineum.

The first stage of labour is from the onset of regular contractions until the cervix is fully dilated. Once the cervix is 3 cms dilated and fully effaced the labour is said to be established and the cervix should then dilate at 1 cm an hour or more.

The second stage of labour is from the full dilatation of the cervix until the baby has been born. This is when the head rotates at the level of the ischial spines so that the occiput lies in the anterior part of the pelvis. The mother will feel a desire to push and will use her abdominal muscles using the Valsalva manoevre to help move the baby.

The third stage of labour is from the birth of the baby until the birth of the placenta and membranes.

Standard procedure During the **first stage** monitor the pattern of foetal heart sounds every 15 minutes (or at least every half hour). N.B. the pattern of response of the foetal heart to contractions is more important than the rate (Fig. 2). The best time to check the foetal heart is immediately after the contraction is over to see if the heart has slowed with returning to a base line and if so, how long this takes (4).

Fig. 2

Grade 1 Normal foetal heart rate 120-160 per min. without any changes during contractions.

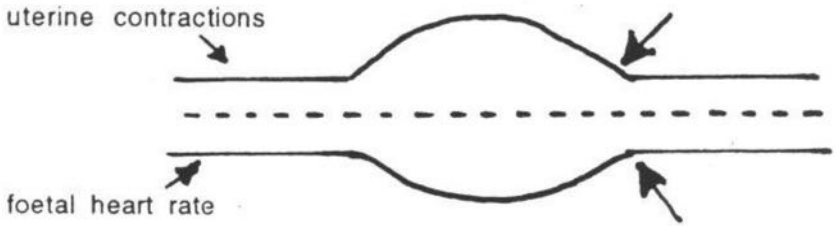
Grade 2 Abnormal base line which is over 160 or between 100-120 per min. but without any changes during or after contractions.

Grade 3 The heart slows early during the contractions but becomes normal again by the end of the contraction.

3a A normal baseline (120-160 per min.)

3b Base line over 160 or between 100-120 per min.)

Fig. 4: grade 3

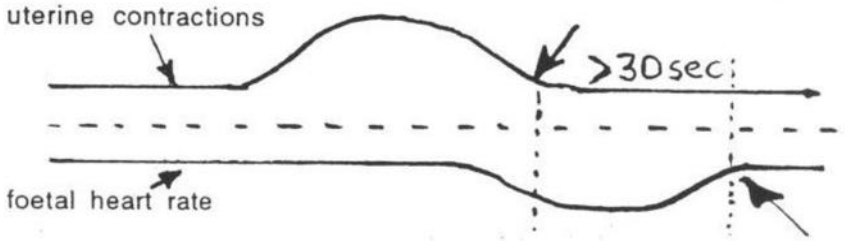


Grade 4 The foetal heart slows late in the contraction and continues to be slow after the contraction is over.

4a Normal base line (unusual)

4b Abnormal base line, which is over 160 or between 100-120/min.

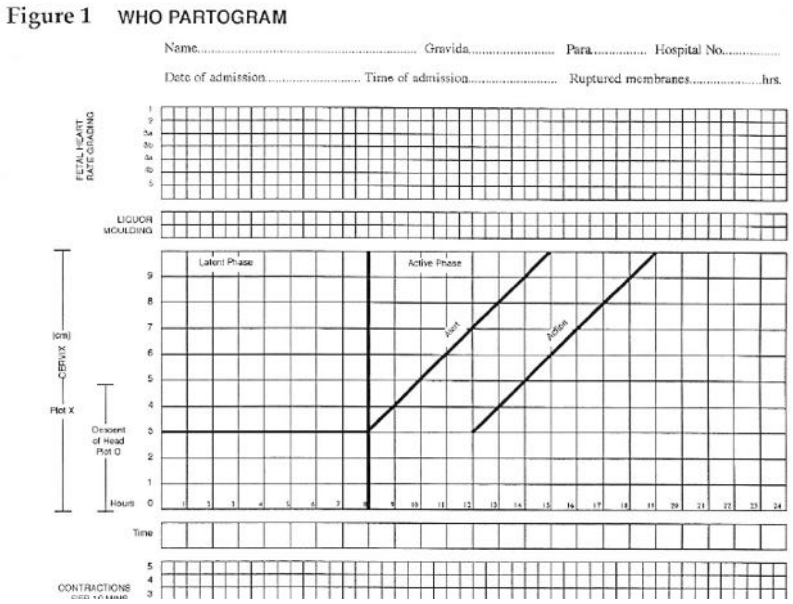
Fig. 5: grade 4



Grade 5 The heart rate remains under 100 per min.. This shows **severe anoxia** and the child is at risk of permanent damage after delivery unless successful action is taken.

Every four hours check the cervical dilatation and record this on the partogram. Since this is the most important assessment of the partogram have a board nearby with holes cut out at the different diameters and always after vaginal examination go to the board to recheck your assessment of the diameter.

Fig 3



During this assessment note also if there is any moulding of the foetal head that is significant (i.e. overlapping of the skull bones). The mother's BP is monitored every half hour since hypertension can sometimes present or worsen during labour (the frequency of this assessment is questioned especially in a setting of limited resources and limited staff when dealing with mothers with a normal BP at admission in labour and who do not develop headache, visual disturbances or other neurological symptoms). Note the colour of the liquor to see if there is meconium staining (may indicate foetal distress). Test the mother's urine for ketones and protein every 4 hours and, if ketones are present, give a dextrose drip to the mother.

The second stage is when the cervix is fully dilated. In the late second stage the head broaches the vulval ring (crowning) the perineum stretches over the head, the anus dilates. Apply pressure over the perineum to give a controlled slow birth which reduces the risk for a precipitate birth with potential intracranial bleeding resulting. It also reduces the risk of perineal tearing. Episiotomy, when it is not absolutely indicated such as in a breech delivery or in a symphysiotomy, often causes more harm than good and many spontaneous tears heal better than do episiotomies with less pain resulting. Routine episiotomies have no place in modern obstetrics (5). Once the head is free hold the head (which is now sideways to the mother) between your hands and first gently pull it down and then as the anterior shoulder is born, if there is no risk of a second baby, ask the assistant to give oxytocin 10 units i.v. Now bring up the baby to ease the posterior shoulder out and then deliver the rest of the body slowly, encouraging the separation of the placenta while the cervix is kept fully open by the body.

The **third stage** is after the baby is born until the placenta and membranes are born. Hold the baby at 20 cms below the introitus and keep it at this level for 30 seconds and then clamp the cord (some would recommend delaying clamping until the cord pulsations have ceased). This will increase the haematocrit of the baby and reduce the volume of the placenta encouraging a quicker third stage. There is even some evidence that clamping with only one clamp and cutting the cord on the mother's side of the clamp, draining the blood out of the placenta into a bowl, also encourages a quicker placental delivery. However make doubly sure that there is not a second twin such that a shared placenta might also be drained of blood. Massage the uterus briskly. Clear away secretions, liquor and blood from the nose and mouth of the baby but if it is breathing normally and has a good colour with normal heart rate do not suck it out routinely as this causes a vagal response that

slows the heart rate and is unhelpful.Lay the child to the breast to get the added intrinsic oxytocin release. This also promotes successful breast-feeding and bonding of mother and child If the placenta is still in place try to deliver it with the Brandt-Andrews method with one hand on the lower abdomen and one grasping the cord using controlled traction. Inspect the placenta to check for completeness. A small missing amount is unlikely to be significant but a larger piece may need to be removed manually. Check the perineum and vagina to see if there are any tears that will be needing repair.Most small tears that are not bleeding will heal spontaneously.

Difficulties

1. If there is significant foetal distress i.e. the foetal heart at the end of a contraction is slowed and takes more than 30 seconds to return to the base-line (Fig. 2)., stop any oxytocin drip temporarily, lie the woman on her left side to get the maximum blood flow through the placenta, give her oxygen at 4 litres per min., give her a dextrose drip (some would also advocate 20 mls of 50% dextrose but this may give problems to the baby after delivery with some increased risk of hypoglycaemia because of the insulin surge), some would advocate i.v. piracetam to promote metabolism in the brain cells that are hypoxic. Wait for 30 minutes to see the effect and if there is no significant improvement plan for the termination of the delivery (the method depends on the level of the head and the dilatation of the cervix: see under obstructed labour).
2. If the rate of cervical dilatation is slower than 1 cm/hr. the alert line is crossed and the position of the foetal head and dimensions of the pelvis should be carefully assessed to see if there is insurmountable cephalo-pelvic disproportion or malpresentation or malposition of the foetus.
3. If the dilatation slows such that it goes over the action line (Fig 3), 4 hours after the alert line, the most important assessment is the level of the head in relation to the brim of the pelvis in fifths above the brim (fig. 14). This is much better than recording how far the presenting part has reached since in populations with reduced pelvic diameters the presenting part may appear at the vulva in extreme cases and yet four fifths of the head is still above the brim (maximum caput and moulding can yield a “banana” shaped head). The level of the head will later be used to decide whether the response to the action that is taken is adequate in overcoming hindrance such that normal vaginal delivery takes place or whether other measures are needed. The action taken at the action line for a primipara is to give adequate pain relief to break off the ineffective uncoordinated uterine action (brought on by an adrenaline rush), and then start oxytocin stimulation to bring back adequate effective uterine contractions again. Allow 6 hours to go by after this action has been taken before the “final decision” is made. Provided no significant foetal distress is found this wait is safe for the baby. At this point the level of the head is the most important measurement. For making the final decision go to the section on obstructed labour for further details.
4. If the placental delivery is delayed infuse 20 mls saline and 10 IU oxytocin into the cord vessels (6) and in most cases the placenta will detach and be delivered by the Brandt-Andrews method with one hand on the lower abdomen and one grasping the cord using controlled traction. In the few cases where this is not successful manual removal of the placenta may be needed (see post-partum haemorrhage).

References

1. O'Driscoll K, Jackson RJA, Gallagher JT. Prevention of prolonged labour. BMJ. 1969;**2:**(655): 477-480.
2. Thornton JG, Lilford RJ, Effects of early augmentation of labour with amniotomy and oxytocin in nulliparous women: a meta-analysis. BJOG. 1998: 189-94 3. Philpott RH, Castle WM,

Cervicographs in the management of labour in primigavida. Journal of Obstetrics and Gynaecology of the British Commonwealth. 1972; 79:592-8
4. Philpott RH, Sapire KE, Axton JHM,, Obstetrics, Family Planning and Paediatrics, 1978 University of Natal Press, Pietermaritzburg
5. Röckner G, Fianu-Jonasson A. Changed pattern in the use of episiotomy in Sweden. Br J Obs Gynae. 1999; 106: 95-101
6. Carroli G, Bergel E. umbilical vein injection for management of retained placenta (Cochrane review). In: The Cochrane Library, Issue 2. Oxford: Update Software, 2006

Now the focus changes from the normal to the abnormal including the other difficulties that may appear during and after the delivery. The focus in this section will be on the big five killers.

First Trimester

Here the three most likely complications that emergency health staff will have to deal with are unsafe abortions, spontaneous abortions and extra-uterine pregnancies.

A. Unsafe abortions

Introduction These are often described as septic abortions or illegal abortions with a global incidence of 14 unsafe abortions for each 100 live births resulting in 68 000 abortion-related deaths each year (1, 2). They cause problems in all countries of the world. In many Latin American countries they are the main cause of maternal deaths (2). In India despite the provision for legal termination of pregnancies illegal abortions continue to be a major health challenge. In Sri Lanka with the strong Buddhist views of the majority, this has been uncommon but in recent years the incidence of this problem has been rising. In African countries it has been mainly a problem of the cities previously. In certain cities in Africa up to half of all maternal mortality cases in hospital are caused by illegal abortions. Various methods are used including sticks, leaves and roots, and chemicals all with a high risk of causing life-threatening complications. Chloroquine in high dosage is one of many dangerous abortifacients used. The usual bacteria causing the sepsis are Streptococcus, E.coli, Aerobacter aerogenes, Proteus vulgaris and Clostridium welchii. The patient who presents is often a young primip with fever, rapid pulse, offensive vaginal discharge, and is often tender over the uterus and adnexae. She may present in shock due to bleeding or gram negative septicaemia.

Standard Treatment (3,4,): Rapid i.v infusion of fluid such as Ringer's lactate and/or blood where necessary. Pain relief using e.g. morphine when needed (less hypotensive risk than pethidine). Morphine has an added advantage in reducing venous pressure and thereby bleeding. Antibiotics: e.g. benzyl pencillin 2 mega 4 times/day or ampicillin 1gm 4-hrly initially plus an aminoglycoside such as gentamicin 4 mg/kg daily as a single daily dose plus metronidazole 1 gm. daily after an initial 2 gm dose, or 500 mg 3 times/day i.v or per rectum (1 gm) as crushed tablets or suppository. Change to oral metronidazole as soon as the shock and peritonitis is under control: 400 mg x 3 . A good alternative to gentamicin and metronidazole, especially when resources are very limited, is benzyl penicillin 2 mega 4 times/day plus chloramphenicol 1 gm. 3 times/day i.v until there is clinical improvement; then 500 mg 3 times/day. Here metronidazole is not needed. In those later than the first trimester, after at least 1 hour and if resuscitation is needed 6-8 hours antibiotics, assess whether evacuation is needed (if possible with vacuum aspiration) under cover of oxytocin or a single dose of ergometrine 0.5 mg. This will have to be extremely gentle as often tissues will have been traumatized. If there is peritonitis with an abscess in the pouch of Douglas this can usefully be drained by posterior colpotomy through the posterior fornix and a large bore drain with

a cuff (such as a Foley's catheter that is then blown up when in position) left in place for 24 hours (Fig. 4.)

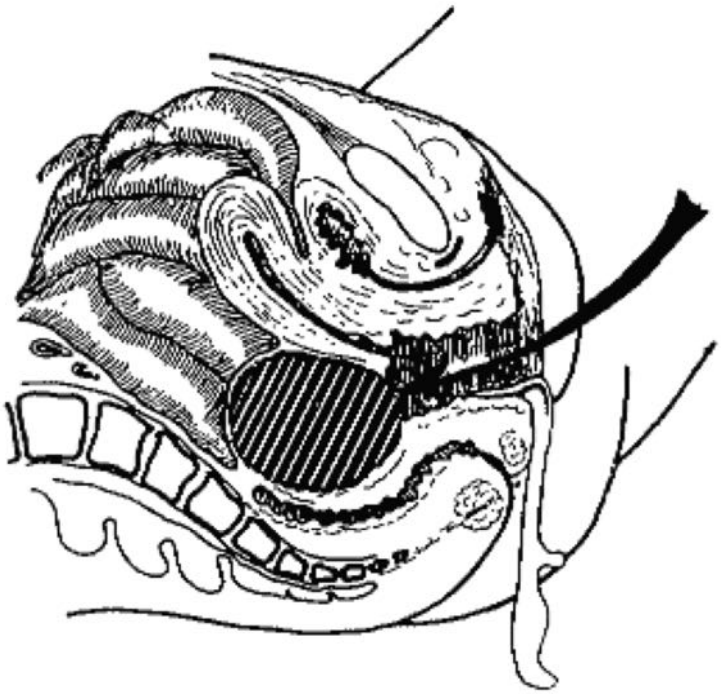


Fig. 4

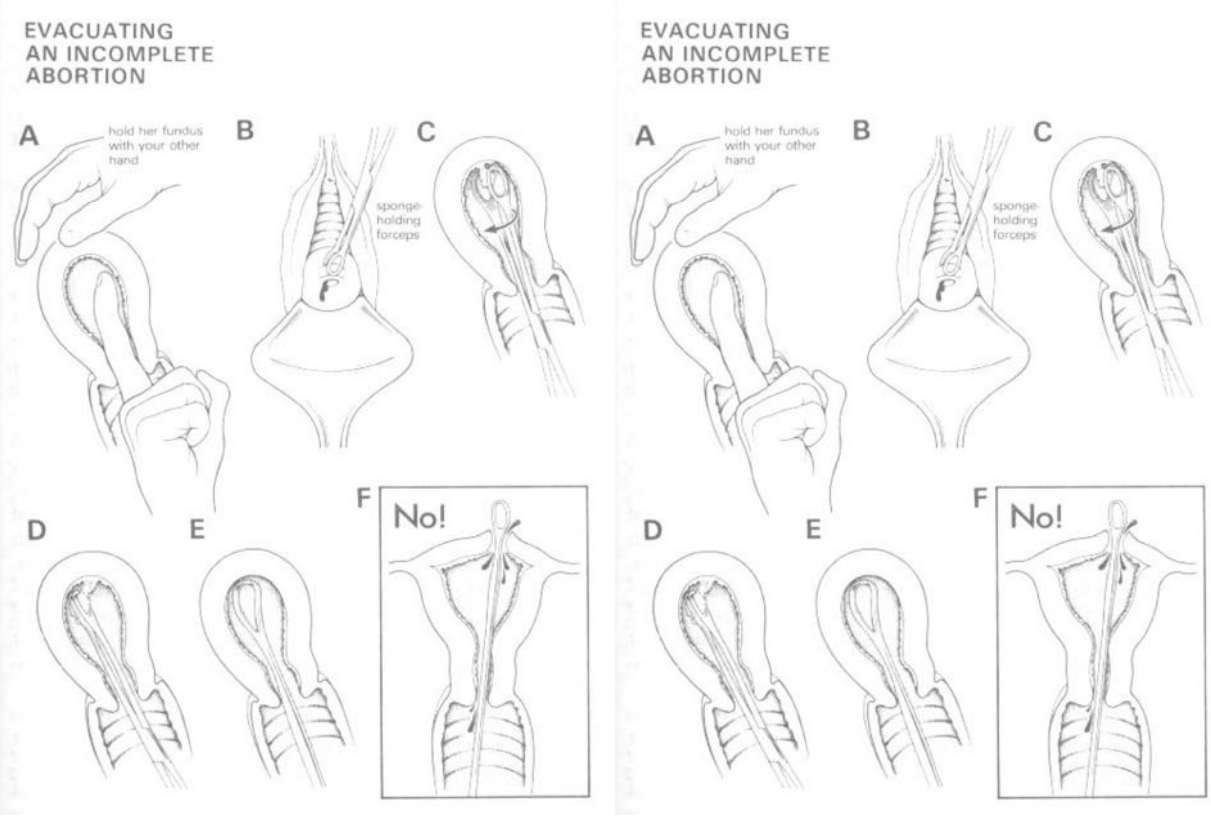
If there is generalized peritonitis with several collections of pus in the abdomen a laparotomy may be needed to clear the pus and assess the amount of damage to the bowel. Anaesthesia for these procedures will depend on the resources and the extent of the procedure needed. In the most peripheral units a combination of morphine 5-10mg + promethazine 25 mg + small dose of ketamine (2mg/kg given over 30 seconds) or as a drip in longer procedures (250 mg in a 500 ml bag of iv fluid at a rate of 40-75 drops/min.) will minimize the risks and the extent of skilled supervision required. Spinal and epidural anaesthesia may cause circulatory collapse because of the gram-negative sepsis and the blood loss. A caudal anaesthetic through the sacral hiatus for low procedures causes less drop in blood pressure especially when lignocaine is combined with adrenaline but it is technically more difficult to learn and the failure rate is high in new beginners. Give antitetanus toxoid to avoid an uncommon but devastating complication.
Problems 1. If renal failure supervenes because of the infection and the length of the shock, dialysis may be needed, where this is available, to save the life of the mother. 2. If foreign material has been inserted into, and left within, the peritoneal cavity this will have to be evacuated with a laparotomy. 3. If the rectum or sigmoid colon has been perforate a temporary colostomy may been needed if local repair is not appropriate.

References
1. AbouZahr C, Global burden of maternal death and disability. Br Med Bull. 2003; 67: 1-11
2. Editorial The Lancet, Making abortion legal, safe, and rare. Lancet. 2007; 370: 291 3. King M, Bewes P, Cairns J, Thornton J, et al. Primary Surgery Non-Trauma. Oxford: Oxford University Press, 1990: 6.6 and 16.2 4. Lawson JB., Harrison KA. and Bergström S. Maternity care in developing countries. London: RCOG Press. 2003: 286-88
5. Clinical guidelines from Royal College of Obstetricians and Gynaecologists: Maternal Morbidity and Mortality - study group statement

Incomplete spontaneous abortion

Introduction Here there is retention of parts of placenta or membranes. Under 12 weeks conservative treatment is enough in 80% and the others need evacuation. If it is not possible to wait and see, early evacuation is justified. Evacuation should be done if possible with vacuum aspiration, otherwise with an ordinary curette. The ideal using an ordinary curette is to use a sharp curette since you can feel the tissues more accurately with this, but with very gentle strokes.

Fig 5



Standard Treatment (1,2)

Anaesthetic: for curettage use pethidine 100 mg + diazepam 10 mg (or promethazine 25mg). Give this i.v slowly and after half the dose see what happens to the BP. Do not give this combination if the patient is shocked or anaemic (in the event of shock or anaemia an alternative method of anaesthesia such as ketamine must be chosen or a very small dose of morphine/diazepam given very carefully intra-venously). Ketamine 1 mg/kg can be added where necessary to pethidine and diazepam but in abortions prior to 12 weeks this is rare. When ketamine is used on its own apart from promethazine 25 mg give it in a dose of 2mg/kg over 30 secs i.v. Paracervical block is another effective method of anaesthesia.

Evacuate as much as possible with the index finger or gently using ring forceps. If a suction aspiration curette is not available use an ordinary curette and continue the gentle curettage until a grating feeling or sound is felt as that of the surface of a cut unripe pear. Curette in a circle going round and then concentrating on the area where remains of the placenta can be felt (Fig. 5). Gentle curettage and giving oxcytocin 10 mg i.v. as soon as most of the contents have been removed will diminish the risk of penetration through the wall of the uterus. After evacuation of the uterus give ergometrine 0.5 mg i.v or i.m. if the bleeding has been considerable or in cases nearing the 12 week margin. Most spontaneous abortions do not need antibiotics.

Problems

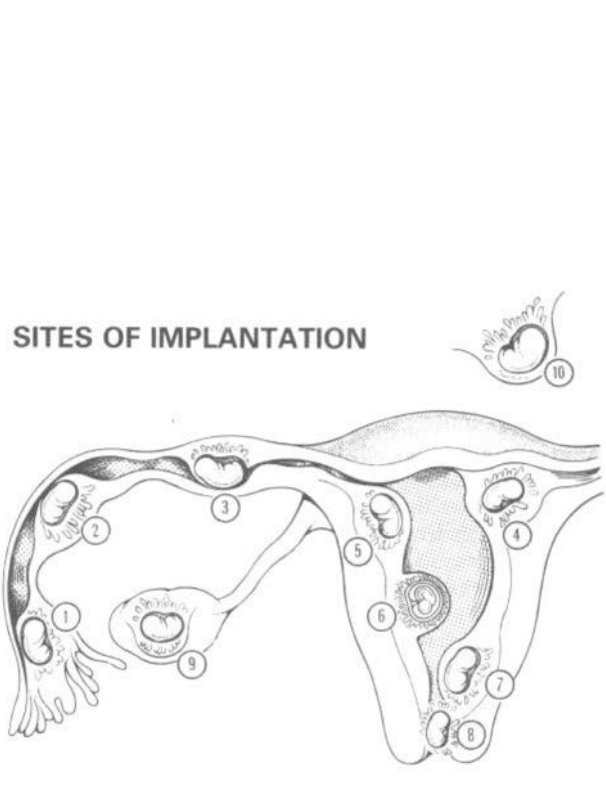
1. If the uterus is perforated during curettage stop curettage immediately, put up i.v fluid, give

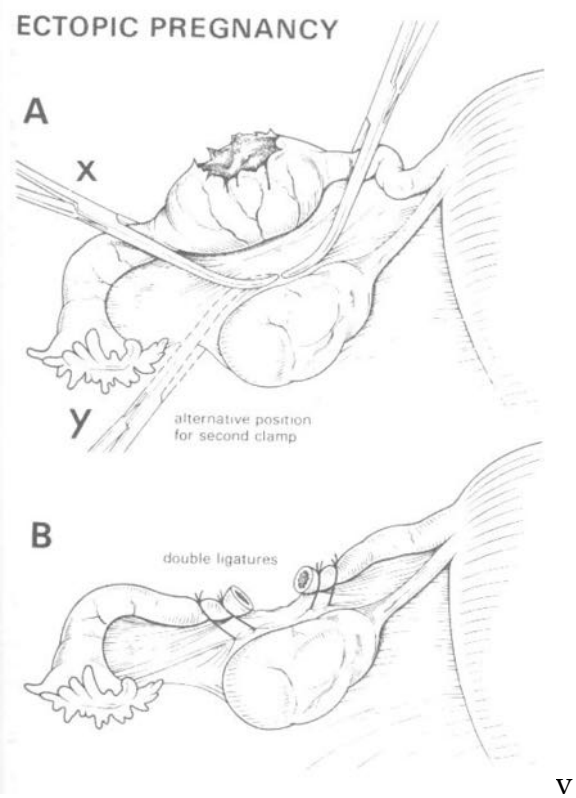
some antibiotic cover such as benzyl penicillin 2 gms 6/hrly and gentamicin 4mg/kg.once daily and wait to see if things settle down spontaneously. In most cases no further actions will be necessary and healing of the uterine wall will take place. Such a patient will need careful supervision at any subsequent pregnancy because of increased risk of rupture of the uterus.
2. If the patient is in shock because of blood loss blood transfusion after initial Ringer's lactate will be needed prior to evacuation.
3. If there are signs of infection (meaning that this could be an unsafe abortion) give e.g. benzyl penicillin 2 mega 4 times/day plus an aminoglycoside such as gentamicin 4 mg/kg daily as a single daily dose plus metronidazole 1 gm. daily after an initial 2 gm dose depending on the extent of the infective signs.

References
1. King M, Bewes P, Cairns J, Thornton J, et al. Primary Surgery Non-Trauma. Oxford: Oxford University Press, 1990: 16.2 2. Royal College of Obstetricians and Gynaecologists. Life Saving Skills Manual - Essential Obstetric and New Born Care. London: RCOG Press, 2007: 95-99

Extrauterine pregnancy

Introduction This is often in the fallopian tube (90%) and symptoms and signs depend on whether or not the pregnancy has ruptured. Once rupture has occurred pain usually occurs before bleeding (in abortion bleeding usually comes before pain). The pain is intensive, one sided, cutting. It is followed in due course by scanty bleeding. Often there is a history of fainting or tendency to faint especially on passing urine and faeces. 80% have missed their period. 75% have bleeding. At examination 70% show a mass either in the adnexae or in the pouch of Douglas. Often in the early stages there is cervical excitation tenderness. Culdocentesis is a useful diagnostic procedure in many but pregnancy testing and ultrasonography where this is available is better. If bleeding into the peritoneal cavity is extensive there will be generalized peritonism with rebound tenderness. Often in this situation there will be blood on aspiration of the peritoneal cavity. NB. Beware of the rare subacute or chronic cases of ectopic bleeding, where there may be little or no pain: “the pale women with ascites.”
Fig. 6





v

Standard Treatment (1, 2)

1. A Laparotomy will be needed after initial resuscitation with Ringer's lactate and blood if necessary.

2. The anaesthesia will depend on the resource level e.g. ketamine 250 mg in a 500 ml bag of iv fluid at a rate of 40-75 drops/min. combined with a small dose of i.v. morphine and promethazine 25 mg iv.

3. Auto-transfusion can be used at laparotomy in order to restore blood circulation. This is often done when the abdomen has been opened using a sterile scoop pouring the liquid blood through a funnel with a sterile gauze as a filter into a donor set (with its own extra filter during subsequent transfusion). Sometimes while resuscitating with Ringer's lactate prior to operation and an obvious extensive intraperitoneal blood loss, a large bore needle can be inserted into the abdominal wall and connected to a donor set collecting enough blood to be given while awaiting blood from the blood bank. After scooping out as much liquid blood as is available for autotransfusion (Fig. 7) and removing large blood clots feel for the uterus and lift this high to see where the ruptured ectopic is sited.

4. Usually the fallopian tube is so damaged so that it cannot be salvaged and so do a salpingectomy clamping with two large clamps on either side of the rupture. If possible use curved clamps which meet underneath the rupture. If feasible preserve the fimbrial ends and ovary. Remove the rupture and suture the tissues (Fig. 6).

Difficulties

1. If you cannot find the tube with the ectopic in it scoop out more blood and clots and then tip the head of the table down in Trendelenberg position to make the blood and clots and gut move away from the pelvis. Feel for the uterus in the midline in the hollow of her sacrum. Pull it into the wound. If it is stuck down with adhesions tear them or cut with scissors. Having found the uterus feel for the affected tube and if it is stuck down with adhesions to her omentum or gut separate

them.

2. If the raw area in her peritoneum oozes after you have removed the ectopic, most will usually stop spontaneously but otherwise compress firmly with a warm pack for 5 mins and if it still continues to ooze close her up with a drain for 24 hours.

3. If, when you have opened her up, you find instead of an ectopic, inflamed tubes with pus pouring from the fimbrial ends don't excise but close her abdomen and give her antibiotics such as benzyl penicillin 2 mega 4 times/day plus an aminoglycoside such as gentamicin 4 mg/kg daily as a single daily dose plus metronidazole 1 gm. daily after an initial 2 gm dose.

References 1. King M, Bewes P, Cairns J, Thornton J, et al. Primary Surgery Non-Trauma. Oxford: Oxford University Press, 1990: 16.6-16.10

2. Lawson JB, Harrison KA, and Bergström S. Maternity care in developing countries. London: RCOG Press. 2003: 291-301 3. Donald I. Practical Obstetric Problems. London: Lloyd-Luke, 1989: 39-40

Second Trimester

Here the two most likely situations that en emergency health worker will meet are late spontaneous abortions and missed abortions.

Late spontaneous abortions

Introduction

Occasionally these can have a mini labour with complete expulsion of both foetus and placenta especially in the later stages of the second trimester but usually there will be placental remains that need to be evacuated.

Standard Treatment (1,2) See details of evacuation under first trimester with the following additions: Over 12 weeks evacuate always under oxcytocin drip unless you are experienced. Add 40 units oxytocin to 500 mls normal saline or Ringer's lactate but watch out for the risk of a drop in BP, tachycardia and even cardiac arrhythmia if this is given fast. Most spontaneous abortions do not need antibiotics.

Problems See under first trimester.

References

1. King M, Bewes P, Cairns J, Thornton J, et al. Primary Surgery Non-Trauma. Oxford: Oxford University Press, 1990: 16.2 2. Royal College of Obstetricians and Gynaecologists. Life Saving Skills Manual - Essential Obstetric and New Born Care. London: RCOG Press, 2007: 95-99

Missed abortion

Introduction The foetus has died but has not been evacuated and the cervix is still closed. After a few weeks the dead foetus is usually expelled and evacuation of the remnants will be needed but if this does not happen some gynaecologists feel that evacuation is needed: **Standard Treatment: Under 12 weeks** evacuate if possible with vacuum aspiration. If this is not available use dilatation and curettage. Between 13-19 weeks try to induce labour. The best method which is now widely used is giving misoprostol vaginally in a dose of 400-600 μg. repeated 6-hourly during 24 hours (1,2). Normally all the products of conception will be evacuated but occasionally an evacuation may be needed at the end of this period. If the mother is more than 20 weeks pregnant the dose should be reduced and at term 25-50μg. to avoid uterine rupture. This drug is cheap and available in many low-income-countries.

Another method is to use prostaglandins but these may not be available. Several methods are used. One method described is to place three 3 mg. tablets (when over 20 weeks reduce dose to one tablet only) of prostaglandin E2 in the posterior vaginal fornix. Keep the patient lying down for one hour after this. Repeat in 6 hours if necessary up to maximum of 4 doses. Oxytocin may be initiated 4 hours after the placement of the last prostaglandin tablet if necessary. Never use oxytocin and prostaglandins simultaneously.
If prostaglandins and misoprostol are not available use the **Chinese method of inducing prostaglandin release**. This consists of a meal of scrambled eggs made with 3 eggs fried in 30 - 50 mls of castor oil. This can even be used for induction of labour in later pregnancy for example in early rupture of the membranes where induction is indicated or in post-maturity. The academic Chinese research institutes have evidence that this induces prostaglandin secretion which initiates labour. In the post-mature the Chinese have found the following results: multipara 70-80% success; primipara 60% success The method can be combined with using a balloon such as a Foley's catheter in the cervix in order to get the unripened cervix to ripen and open up.
References
Chalwa S, A study of efficacy of misoprostol in missed abortion. MJAFI. 2007; 63: 241-2
Gemzell-Danielsson K, Ho PC, et al. Misoprostol to treat missed abortion in the first trimester. IJGO. 2007; 99: S182-S185

Third Trimester, labour and postpartum

This is where the **majority of maternal deaths occur**. Of the "big 5", 4 are in this period. Bleeding is the biggest of the 5 and may be antepartum, intrapartum or postpartum but by far the biggest group is postpartum and this is when the emergency doctor is likely to be involved. Sepsis is the next biggest danger and may begin during labour but is likely to become life-threatening in the postpartum period. This is when the emergency doctor could have a role to play. Pregnancy-induced hypertension and eclampsia are significant threats in certain settings especially in certain coastal areas and have to be dealt with especially if the emergency doctor also has obstetrical responsibility. Obstructed labour is also a major killer especially where delivery services are not available to the remote poor in rural areas such as in Cambodia, the less developed parts of India, Ethiopia, Nigeria, Tanzania, the two Congos, Somalia, Sudan, Liberia, Peru, and Bolivia. The above menacing quartet need to be monitored carefully during delivery and in three of them (sepsis, postpartum bleeding and obstructed labour) the problem can be significantly avoided, when midwives are available, using the partogram monitoring of the labour (1,2,3). This is based on the rate of dilatation of the cervix and the descent of the head in fifths above the brim of the pelvis. It acts as a compass to show the direction in which the labour is pointing and to identify labour that is going wrong early so that early interventions can be initiated. Thereby the total length of the labour is dramatically reduced. This will reduce the risks of all three of these complications. In fact the partogram (Fig. 3), especially if used widely in all delivery units in its more practical form with an *alert* line and an *action* line, has been heralded as the most significant advance in obstetrics in the last generation (Lawson JB, personal communication). Malaria is a bigger threat during pregnancy than in other periods of adult life especially in tropical Africa and may become life-threatening at any stage of the pregnancy.

Pregnancy-Induced Hypertension (PIH) and Eclampsia **Introduction**

The incidence of pre-eclampsia is estimated at 3.2% of live births (4) giving a total of over 4 million

cases each year of which 72,000 were fatal; the majority of pre-eclampsia are primipara (75%) or those with a new partner. Recent evidence of immunological disturbance in this condition may lead to a clear understanding of the cause (5).
Definition: a rise in blood pressure of 30mm systolic or 15mm diastolic from the base line blood pressure after the 20th week with return to normal by the sixth postpartum week. If a base line blood pressure is unavailable, then a blood pressure greater than 140/90 on at least two occasions four hours or more apart, with albuminuria (more then 500 mg/L) defines pre-eclampsia (PE). Many will also show oedema of the face and hands. A weight gain more than 2 kilograms a week is a warning bell to check for pre-eclampsia (the normal weight gain is about 0.5 kilograms per week). There is a higher risk of pre-eclampsia with twin pregnancies, essential hypertension, diabetes mellitus and polyhydramnios. Hypertension alone developing close to term (after 37 weeks) has a good prognosis with normal foetal outcome. Early rise in blood pressure before 30-32 weeks has a poor prognosis and early delivery may be essential to save the mother's life. "Dry" pre-eclampsia without oedema has a poor prognosis. With increasing multiparity a diagnosis of PIH or PE may well show another aetiology such as renal disease. Multiparous women who develop PIH or pre-eclampsia are 6-7 times more likely to become hypertensive in later life. N.B. Symptoms of impending eclampsia are: continuous frontal headache, nausea and vomiting, pain in the epigastrium (due to enlargement of the liver), visual disturbances (decreased vision, spots before the eyes, double vision and blindness). The patient is often restless, with a poor urine output and a rapidly increasing weight gain. Blood pressure and proteinuria will successively rise and there may be changes visible in the retina. Hyper-reflexia and muscle twitching may occur. Treat as eclampsia. Severe cases: Admit; decide if the pregnancy must be terminated. Meanwhile rest in hospital. If the blood pressure exceeds 160/100 reduce the blood pressure with methyldopa dose 250 mg times 3 daily or nifedipine (Adelat) or hydralazine, the latter two in more severe hypertension. However there is a risk for the foetus if the blood pressure is reduced too much and a realistic goal may be a diastolic pressure of 90-105. A higher pressure than the ideal is needed to perfuse the placenta. *Do not* use diuretics or angiotensin converting enzyme inhibitors. If the blood pressure goes over 110 diastolic or if the renal function deteriorates the pregnancy must be terminated. Use prostaglandins if available (alt. misoprostol 25-50μg 6 hourly vaginally. Early onset PIH or PE (before 30 weeks) more likely to need early delivery. Deterioration shows as thrombocytopenia, or failing renal and hepatic function.

ECLAMPSIA

Introduction 90% of those who develop eclampsia are primips and it is especially common in an unbooked primip. 20% occur after the delivery (virtually all within 48 hours). In developed countries where antepartum and intrapartum control of hypertension is now good, postpartum cases account for 50 % of eclampsia cases. Of those who develop eclampsia 25% will have a recurrence in a subsequent pregnancy. **Definition:** Generalized convulsions occurring in a person with signs of pre-eclampsia. N.B. In Africa the normal base line blood pressure is often low, for example 90 mm systolic is not unusual and so the warning level blood pressure 140/90 can occur late. In 50% of cases of eclampsia in Africa their blood pressure was normal one week before. The average length of time in Africa from the first symptom (e.g. headache) to death in eclampsia is 48 hours.
Risk for the mothers: Vomiting and aspiration of vomitus, renal failure, cerebral haemorrhage, pulmonary oedema. Eclampsia in Britain led to an MMR in these patients of 22400/100,000 in 1920. The current figure is still 1830/100,000
Risk for the child: There is a perinatal mortality rate of 40% often related to prematurity. Because of

the many risks and the need for a high level of therapy and monitoring some larger centres have established eclampsia units to give best results.

Standard Treatment (6,7,8,9) Early delivery of the patient, if necessary by C/S, is central to achieving control of the situation. Keep the airway clear, nurse the patient on her left side, clean the mouth, nose and throat regularly from secretions. She may need an airway if she is unconscious. Put up side restraints on the bed to prevent the patient falling out of bed, or if these are not available, consider nursing her on a mattress on the floor until her risk for convulsions is minimized. Insert an indwelling catheter, record urine output hourly as well as BP, breathing frequency and presence of knee jerks.

Control convulsions with one of the three following regimes; magnesium sulphate (the best), diazepam, or phenytoin.

Magnesium sulphate is the best treatment.

Intramuscular regime Loading dose: 20 ml of 50% solution (10 gms) given i.m. deeply in the buttocks (10 mls in each buttock) with 1 ml of 2% lignocaine in the same syringe. If possible give a loading dose i.v. of 4 gms slowly over 10-15 minutes. Maintenance dose:
10 ml (5 gms) every 4th hour for 24 hrs after the last fit.

Intravenous regime Loading dose: 20 ml of 20% magnesium sulphate (4 gms) given slowly intravenously over 10-15 mins. gives a more rapid response if she is fitting or has had recurrent fits. Maintenance dose: Infusion with 1 gm/hr until 24 hrs after the last fit avoids the painful i.m. injections. In both regimens monitor the reflexes, the urine output and respiratory rate. If the patellar reflexes are present, the urine output is at least 25 ml per hour and the respiratory rate is at least 12 per minute, continue with magnesium treatment. If patellar reflexes disappear, respiratory rate is less than 12/min. or urine output is less than 30 mls/hr. neutralize mag. sulph. with calcium gluconate 10 ml of a 10% solution over 3 mins. Try to speed up the delivery.

Alternatives to stop convulsions, choose *one* of the following: Diazepam 10 mg i.v. initially + 40 mg in 5% dextrose/water by infusion *or* phenytoin 250 mg. i.v. every 6 hours (the least effective of the alternatives with a slightly higher mortality). Hypertension treatment: if the diastolic blood pressure is over 110 mm, lower the pressure with either hydralazine (Neprosol), 10 mg i.m initially or 3 mg i.v. If this dose needs to be raised beware since a dose of hydralazine >12.5 mg i.m. of 3.5 mg i.v. may result in a sudden drop in BP compromising the safety of the foetus. Bearing this in mind it may be necessary to repeat the dose if the diastolic remains above 110 mm. Alternatives are methyldopa (Aldomet) or nifedipine. Assess whether delivery by vaginal route is possible within a short period otherwise prepare for Caesarian section under epidural. Do not give ergometrine at delivery; give oxytocin 5-10 units i.m. Continue the anti-convulsive therapy for 24-48 hours after the delivery. N.B. Of the patients who survive 5% will develop an acute puerperal psychosis.

In a crisis situation with very limited resources, and parenteral magnesium sulphate unavailable and no possibility of referral, you can **make up 50% magnesium sulphate solution using water for injection and ordinary epsom salts** (which is magnesium sulphate heptahydrate) usually available in every pharmacy in developing countries for treatment of constipation. Mix crystals or powder of Epsom salts with an equal weight of water for injection (i.e. the same number of mls of water as the Epsom salts are in grams). Autoclave this solution and then administer the cooled liquid by i.m. injection as above. This simple alternative can be life-saving in some settings.

References

1. Philpott RH. Graphic records in labour. BMJ 1972; 4:163-165
2. WHO. The partograph: a managerial tool for the prevention of prolonged labour sections I, II, III and IV. Geneva: WHO Press, 1993: WHO/FHE/MSM 93. 8,9,10,11

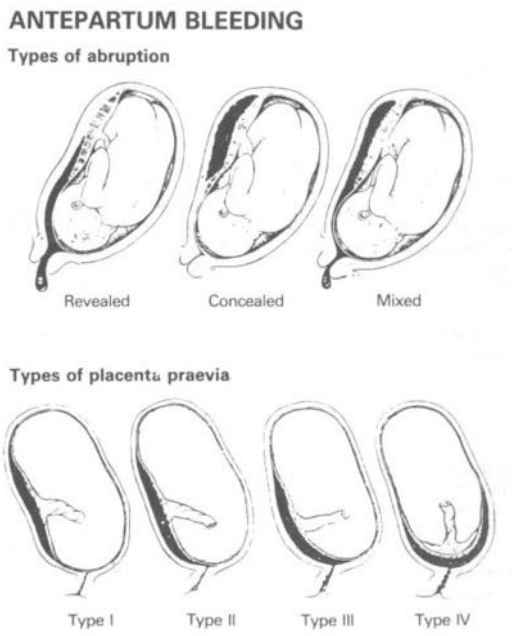
3. WHO. WHO partograph in management of labour. Lancet. 1994; 343: 1399-1404
4. AbouZahr C, Global burden of maternal death and disability. Br Med Bull. 2003; 67: 1-11
5. Noris M, Perico N, Remuzzi G. Mechanisms of disease: pre-eclampsia. Nature clinical nephrology. 2005; 1: 98-114
6. Lawson JB, Harrison KA, and Bergström S. Maternity care in developing countries. London: RCOG Press. 2003: 146-159 7. Donald I. Practical Obstetric Problems. London: Lloyd-Luke, 1989: 297-305
8. Royal College of Obstetricians and Gynaecologists. Life Saving Skills Manual - Essential Obstetric and New Born Care. London: RCOG Press, 2007: 20-24
9. King M, Mola G, et al. Safe motherhood in developing countries. London: Marie Stopes International, 2nd Edition. 2006: 13.3-13.4

Antepartum Haemorrhage (APH)

Introduction Most of these cases will be dealt with at delivery units by obstetricians but in many settings in low-income-countries the emergency doctor will have to act both in emergencies and in obstetric cases. All the causes of APH are associated with a high risk for the baby, especially if it is premature (+ asphyxia + foetal abnormality). Of all the cases where a diagnosis is reached half are due to placenta praevia. All bleeding in the third trimester is said to be placenta praevia until proved otherwise. The other major cause is abruptio placentae (also termed accidental haemorrhage) (Fig. 7). There are number of causes of incidental haemorrhage due to cervical erosion, polyp on the cervix, cancer, varicosities on the vagina or vulva (all of these have bleeding from the mother) and vasa praevia (bleeding from the child). In many cases the cause is never found.

Placenta praevia *Definition:* the placenta is implanted either wholly or partly in the lower uterine segment (the part of the uterus where the overlying peritoneum is not fixed but is loose over the surface of the uterus). At Caesarean section the placental edge is seen within 7.5 cm. (3 in.) of the internal cervical os. The stretching and dilatation of the lower uterine segment during the later weeks of pregnancy causes premature separation of the placenta and subsequent bleeding. In rare cases the first bleed is during labour. Typically the bleeding is symptom-free, unexpected, bright red, without any contractions. The first episode is often minimal and virtually never life threatening; it is rare before week 28 and usually after week 32; it often occurs at night. **Frequency** 1 per 100 - 200 deliveries. It is more common in multipara and those over 35 years of age and in those with a previous Caesarean section. It is also more common in those with a previous placenta praevia and in twin pregnancies. There may be local factors increasing the risk for low implantation of placenta such as fibromyoma. In patients with placenta praevia there is an increased risk for post partum haemorrhage and pueperal sepsis. When examining a person with APH never do a vaginal palpation. On abdominal examination they often have a soft relaxed uterus with the foetal parts easily felt, usually the presenting part is high and 1/3 have a malpresentation (Breech or diagonal presentation). With ultrasound the diagnosis is usually easily established but if this is not available or cannot be read accurately, as in some low-income-country settings, alternative ways of assessment may be necessary

Fig. 7

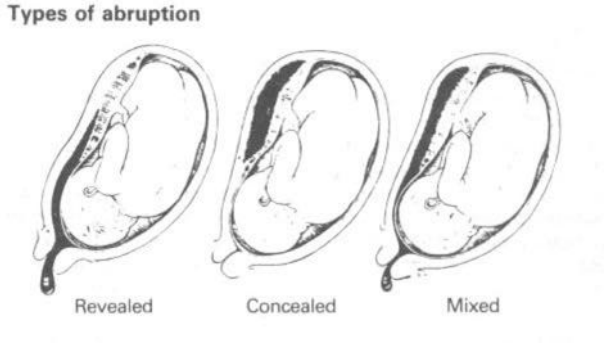


Standard treatment of antepartum bleeding Active Bleeding (hospital treatment) Drip with Ringer's lactate (Hartman's) or normal saline. Group and cross match blood. Where necessary due to the shock or anaemia give a blood transfusion or red cell concentrate. Get ultrasound assessment of the position of the placenta and if placenta praevia is diagnosed see if immediate delivery is called for. If the bleeding slows down and stops and the foetus is still very premature (below 34 weeks), keep her in hospital awaiting some further maturation of the baby. Give her dexamethasone 12 mgms orally or im every 12 hrs for two doses each week until delivery to improve maturation of the foetal lungs and decrease the risk of respiratory distress syndrome. Have everything ready for an immediate C/S if bleeding restarts as this can sometimes be torrential. N.B. Any vaginal bleeding after week 28 is diagnosed as antepartum haemorrhage and vaginal palpation is forbidden except in the operating theatre with everything prepared for Cesarean section (unless there are all the classical signs of abruptio). If the bleeding continues and the patient is more than 36 weeks and ultrasound is not available or cannot be accurately assessed, transfer to the operating theatre for vaginal examination. Vaginal palpation is only carried out in the operating theatre with everything ready for Cesarean section including the anaesthetic, with an assistant scrubbed up and gloved.

How to palpate: push the head into the pelvis and feel in all four vaginal fornices if the placenta comes between the head and the finger. Thereafter pass a finger gently through the cervical os and sweep it around the inside of the lower uterine segment feeling for a mossy, soft, stringy mass. It must be distinguished from blood clot which feels more friable. If this examination leads to massive bleeding the examining finger should be kept within the cervix to act as a temporary plug. This haemorrhage has plenty of volume but little pressure. If this examination shows a placenta praevia type 2, 3 or 4 (Fig. 7) Cesarean section is called for. If it is type 1, the placenta does not reach the inner cervical os even at full dilatation. The membranes should be ruptured and the contractions stimulated with oxytocin. If this does not stop the bleeding Cesarean section is called for. In all patients under 37 weeks with bleeding, if the bleeding stops after the initial measures described above, then continue with conservative measures as described below. Up to 15% of patients with placenta praevia will also have placenta accreta (where the placenta is abnormally adherent to the uterus) with a high risk of mortality. Hysterectomy may occasionally be needed to save the mothers life. If the patient is tender over the uterus, has dark bleeding, no foetal heart sounds, and there is difficulty in feeling the foetal parts, diagnose this as abruptio placentae and treat as such see below.

Abruptio placentae *Definition:* This is partial or complete premature separation of the placenta where it is implanted in the upper uterine segment. It is commoner in older women with concomitant pre-eclampsia (25-50%), or essential hypertension or chronic glomerulonephritis. Perinatal mortality is high above 300/1000 but most die early. *Classification:* **mild:** these form 90 % of cases where up to 1/3 of the placenta has separated; **moderate:** 1/3 to -1/2; **severe:** more than 1/2 of placenta has separated. In the latter cases virtually all of the foetuses die. In the classical cases and especially the more severe cases the bleeding is usually dark (abruptio can occur without any outer bleeding). Bleeding is revealed, concealed or mixed (Fig. 8). The patient may show signs of shock with marked pallor of the conjunctivae, she may be pale, sweaty, with a low blood pressure, a board-like tender uterus that does not relax which is often larger than expected. If the baby is dead expect a blood loss of around 2500 ml and 1/3 will have a coagulopathy. Frequency 1 per 100-200 deliveries.

Fig. 8



Standard treatment of abruptio Give morphine 15 mg i.m. with severe bleeding. This gives pain relief, helps to reduce shock and decreases the bleeding and it often stops. Put in an indwelling catheter in order to measure urine output. Renal failure is a major cause of maternal mortality. Rapid transfusion with Ringer's lactate or normal saline. Blood group and cross match 3 litres. Check for coagulopathy: take 5 ml venous blood from the patient in a glass test tube.Tip this up every 30 seconds. Keep it at body temperature by keeping it under your arm pit. Normal blood will coagulate within 2 minutes. If there is no coagulation after 5 minutes this signifies coagulopathy. Such a patient needs several units of fresh blood or fibrinogen. Give fresh blood if possible under central venous pressure monitoring (5 -12 cm water pressure). Check pulse, blood pressure and urine flow every half hour. If the baby is alive and can be rescued, weigh up possible Cesarean section (if indicated, carry it out immediately) if the patient's condition and the coagulation status allows. Rupture the membranes even in the cases when one decides to carry out a Cesarean section. This reduces the intra-uterine pressure and risk of further separation. If the child has died begin oxytocin stimulation if contractions are not already occurring. Aim to complete the delivery within 6 hours. After the delivery, use active third stage delivery of the placenta with Brant-Andrews method. Give intravenous oxytocin with delivery of the anterior shoulder and a drip with 20 units oxytocin in 5% dextrose water to hold the uterus contracted. Adjust the drip rate depending on the response. Check the inside of the uterus after delivery to exclude a ruptured uterus.

Problems If clotting occurs in the glass tube but then the clot dissolves this could signify increased fibrinolysis. Take a piece of the clot from normal blood which has been allowed to clot and put it in contact with serum from the patient at body temperature. If the clot dissolves after contact with this serum give cyclocapron 1 gram i.v. 3-4 times a day. Check the coagulation every second hour. If there is no hope of delivery within 6 hours weigh up again the necessity of Cesarean section especially if the baby is alive or the cervix is not opening up or coagulopathy occurs after treatment or if the blood pressure is raised. *NB "In Abruptio patients when Cesarean section is possible it is often*

not needed; when it is needed it is often not possible". If the urine flow is less than 30 mls/hr. (preferably 60 mls/hr.) despite transfusion of at least 2 litres of fluid give frusemide 20 mg i.v. slowly. There is a special risk of post-partum haemorrhage if bleeding into the myometrium has caused a couvelaire uterus (a uterus whose texture is weakened to be like wet blotting paper). This does not contract down and shows an atonic picture.

References

3. Lawson JB, Harrison KA, and Bergström S. Maternity care in developing countries. London: RCOG Press. 2003: 164-170 4. Donald I. Practical Obstetric Problems. London: Lloyd-Luke, 1989: 420-478
5. Royal College of Obstetricians and Gynaecologists. Life Saving Skills Manual - Essential Obstetric and New Born Care. London: RCOG Press, 2007: 25-29
6. King M, Mola G, et al. Safe motherhood in developing countries. London: Marie Stopes International, 2nd Edition. 2006: 14.11-14.14

Intrapartum bleeding

Introduction Here again most cases will be dealt with at delivery units by obstetricians but an emergency doctor may also have this responsibility. The most important thing is to look for signs of uterine rupture (1) (placenta praevia and abruptio placenta rarely bleed for the first time during labour).

Impending rupture: a "Bandl's ring" forms between the upper and lower segments. The lower segment becomes thin and ballooned (Fig. 13) and tender even between contractions. The patient becomes restless and anxious with a rapid pulse and irregular respiration.

Actual rupture: pain increases in a crescendo fashion followed by an intense bursting pain and then sometimes a relatively pain-free period. The contractions stop suddenly, the patient soon becomes shocked, pale and transfusion may not improve the condition. Then the whole of the abdomen becomes tender. The baby may become much easier to palpate and its position may change; there may be blood in the urine, no foetal heart sounds are heard, the blood pressure goes down and the pulse goes up. The patient is often alert and may even be talkative despite the shock. After the initial pain-free period there is an increasing generalized abdominal pain. N.B. Sometimes if the rupture occurs very low down in the uterus and the head is stuck in the pelvis it may delay the state of shock by blocking the bleeding from the ruptured site.

Standard Treatment This is by laparotomy and either hysterectomy or suture of the uterine rupture after removal of the baby and placenta. A hysterectomy is the preferred method by most experienced gynaecologists, but suture of the uterus is often easier by those with less experience because it is often a quicker operation and there is less risk of damage to the ureters and blood vessels if the rupture is not too extensive and has kept to the front of the uterus. However this should virtually always be accompanied by tubal ligation because the risks of a second rupture during any subsequent pregnancy are so great. N.B. While trying to sort out the anatomy in an extensive rupture it may be easier if the assistant presses with the thumb on the aorta to stop bleeding temporarily.

Reference

King M, Bewes P, Cairns J, Thornton J, et al. Primary Surgery Non-Trauma. Oxford: Oxford University Press, 1990: 18.3

Post partum haemorrhage (PPH)

Introduction

This is,the most important passage in the whole section on obstetrics and will need to be studied by all emergency physicians as they will have to initiate at least the first life-saving interventions laid out below. In many settings the same doctor will need to carry through the whole sequence of measures. As stated above this is the biggest single cause of maternal deaths of all and must be prevented if possible and treated if maternal mortality is to be reduced. Each year 14 million women suffer severe blood loss during child-birth, mainly post-partum and an estimated 140,000 die as a result, a case fatality rate of 1% (1). *Definition:* This is defined as bleeding more than 500 ml after the delivery of the baby. Of course this volume has to be related to the woman's haematological state before delivery. A severely anaemic woman will get into circulatory trouble well before the 500 ml limit and a woman with an excellent haemoglobin can withstand bleeding of up to a litre without getting into circulatory difficulty. The amount of bleeding can usefully be described in local terms that can be easily understood such as the ”2 Kanga bleeding” of East Africa (2) i.e. enough bleeding after the delivery to soak 2 loin cloths of the standard size that most women wear around their hips. A method that has been very useful in assessing volume in Angola described by Strand (3) is that immediately after the delivery every woman is placed on a ”cholera bed” with a hole in the middle and covered by a plastic sheet with a corresponding hole. A bucket underneath gathers all the blood which can be measured accurately. The three immediate causes are an atonic uterus, trauma or coagulation defects. There are a number of **risk factors** during pregnancy apart from obvious factors such as bleeding disorders. These include:

grand multiparity (having more than 5 children)

any cause of ante partum haemorrhage during this pregnancy.

post partum haemorrhage in any previous delivery.

retained placenta at a previous delivery.

overstretching of the uterus. For example; twins, polyhydramnios, large foetus.

There are further **risk factors during the current delivery:**

prolonged labour with inefficient contractions in the first and second stages of labour (reduced dramatically with the use of the partogram),

precipitate labour,

general anaesthesia, all who have had oxytocin stimulation during delivery,

retained placenta,

instrumental delivery, esp. with forceps, intrauterine infection

Fig. 9

Compression of the abdominal aorta

Preparation

1. Tell the woman (and her support person) what is going to be done, listen to her and respond attentively to her questions and concerns.
2. Provide continual emotional support and reassurance, as feasible.

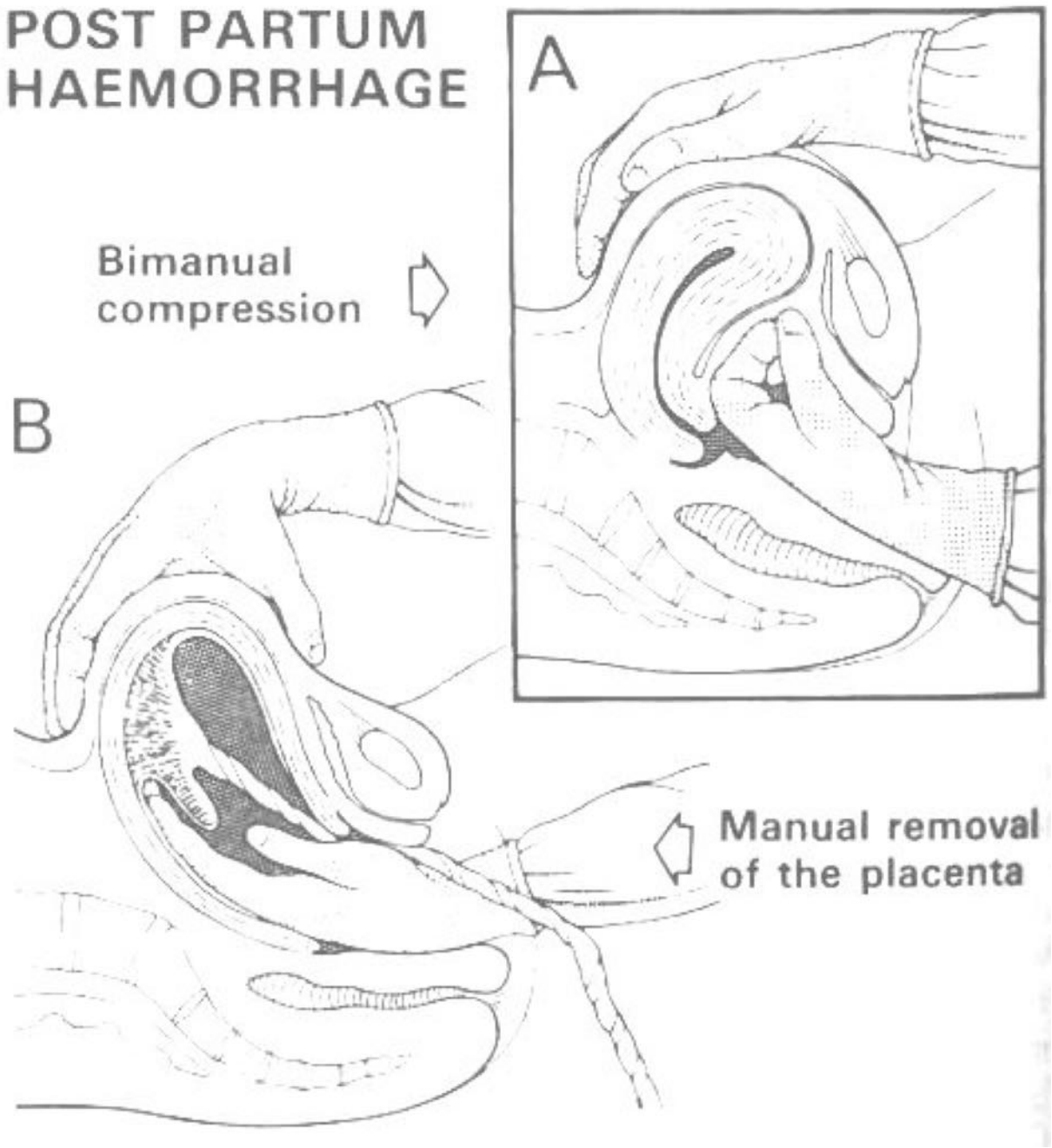
[!] Steps 1 and 2 should be implemented at the same time as the following steps.

Procedure

1. Place a closed fist just above the umbilicus and slightly to the left.
2. Apply downward pressure over the abdominal aorta directly through the abdominal wall.
3. With the other hand, palpate the femoral pulse to check the adequacy of compression:
   - if the pulse is palpable during compression, the pressure is inadequate
   - if the pulse is not palpable during compression, the pressure is adequate.
4. Maintain compression until bleeding is controlled.

Post-procedure

1. Monitor vaginal bleeding and take the woman's vital signs:
   - every 15 minutes for 1 hour
   - then every 30 minutes for 2 hours.
2. Make sure that the uterus is firmly contracted.


POST PARTUM
HAEMORRHAGE
A
Bimanual
compression
B
Manual removal
of the placenta

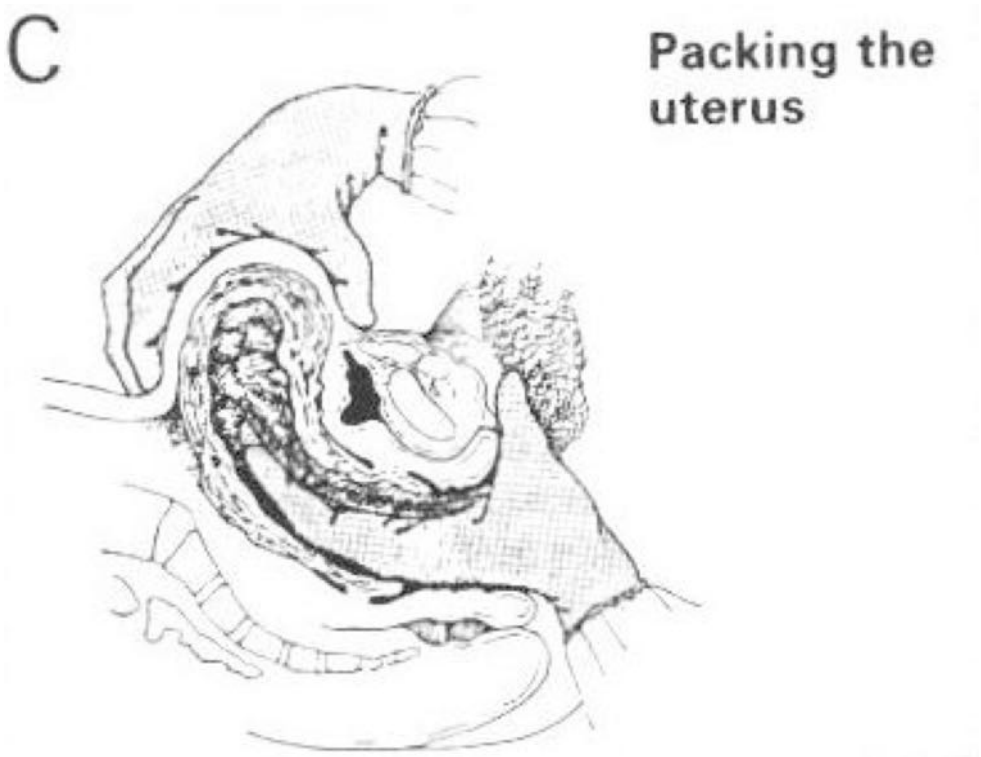
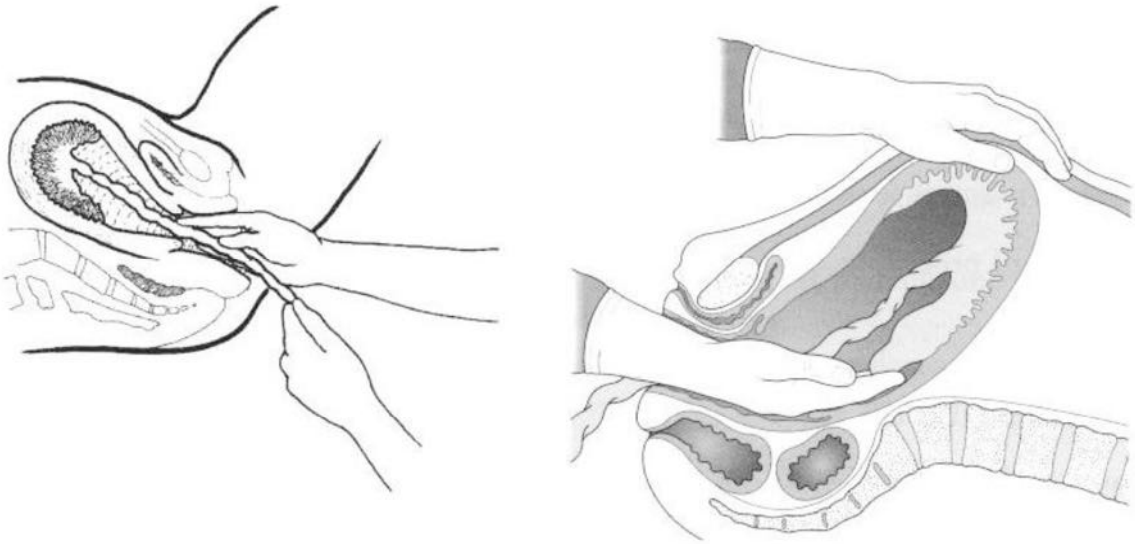


Fig. 10 Further procedures to
Try to stop the bleeding



Brandt-Andrews method of removal of placenta

Standard treatment of all postpartum haemorrhage (4,5,6,7,8,9,10)
Massage the uterus briskly. Give preferably oxytocin 10 units i.v (or ergometrine 0,5 mg) lay the child to the breast or use manual stimulation of the nipples to get the added intrinsic oxytocin release

Inspect the placenta to check for completeness. A small missing amount is unlikely to be significant but a larger piece may need to be removed manually.
If the placenta is still in place try to deliver it with the Brandt-Andrews method with one hand on the lower abdomen and one grasping the cord using controlled traction (Fig 9). If the uterus relaxes after you have taken the above measures keep oxytocin stimulation going with 30-40 units in a litre of Ringer's lactate or in 500 ml 5% dextrose.
Assess if blood transfusion is needed or at least give Ringer's lactate.
Empty the bladder, put the patient into the shock position by raising the foot of the bed.

Therefore measures of **Active Management of the Third stage of Labour** (AMTL) need to be introduced into all delivery units,
giving **oxytocin 10 units iv** routinely after all deliveries (or when the anterior shoulder has been born),
early **clamping of the cord** (but if possible wait 30 seconds with the baby 20 cms below the introitus before clamping) and then
using the **Brant Andrews method of delivering the placenta by controlled traction** on the cord,

brisk **massage of the uterus**, and
early **exploration and manual removal of the placenta** if this is incompletely delivered

These four measures will reduce PPH by up to 66% compared to waiting for a "physiological delivery" of the placenta and membranes (Cochrane). In fact in a prospective study in Angola (11) introducing all four elements of AMTL reduced PPH by 80% and the average blood loss from 447 ml to 239 ml

Difficulties

1. If you fail to remove the placenta infuse saline 20 mls and oxytocin 10 IU into the cord vessels and in most cases the placenta will detach and be delivered by the Brandt-Andrews method with one hand on the lower abdomen and one grasping the cord using controlled traction. If this fails try to manually remove it by inserting two fingers into the cervical canal. If this fails, put her into the lithotomy position. Give analgesia/sedation with a small dose of iv pethidine/valium + 1mg/kg ketamine as necessary. With full aseptic preparation and technique gently insert the hand into the vagina. Steady the uterine fundus with the left hand placed on the abdomen and then rub up a contraction. Gently advance the right hand through the cervix into the uterine cavity following the course of the umbilical cord. Having reached the lower edge of the placenta gently detach it with a sweeping action using the edge of the hand keeping the fingers together to avoid perforating the uterus. The abdominal hand should control the uterus. When the placenta is completely separated it should be removed intact by using the left hand to draw it out alongside the right hand and wrist. After the placenta has been removed, and before removing the right hand, carefully examine the placental bed to feel for placental remains and then explore the uterine cavity for evidence of trauma. Then remove your hand and give oxytocin or ergometrine i.v. Examine the placenta and membranes to ensure that they have been removed intact. If the placenta is firmly adherent (placenta accreta) and bleeding continues a hysterectomy will probably be necessary. If time has elapsed after delivery and the cervix has closed down give a nitroglycerine tablet 0.5 mg under the tongue to relax the cervix. As soon as the cervix has been entered she spits out the tablet so that this will not worsen atony of the uterus. After the procedure give a single dose of benzyl penicillin 2 mega units + gentamicin 4 mg/kg unless there is suspected intra-amnionitis or after a prolonged labour, in which continue treatment as in unsafe abortion above.

2. If there is no improvement in the rate of bleeding use compression of the aorta at the level of the umbilicus (Fig. 9). This is best done by an elevated assistant leaning their whole weight against the aorta using a clenched fist and a straight arm so that they can maintain this position for at least 10 minutes. Check that the pressure is enough to abolish the femoral pulse in the groin.

3. Alternatively use bimanual compression of the uterus with the right fist in the upper vaginal fornix and the left hand behind the uterine fundus (Fig. 10). Compress for 10 minutes. This is much more tiring to carry out than 2. above.

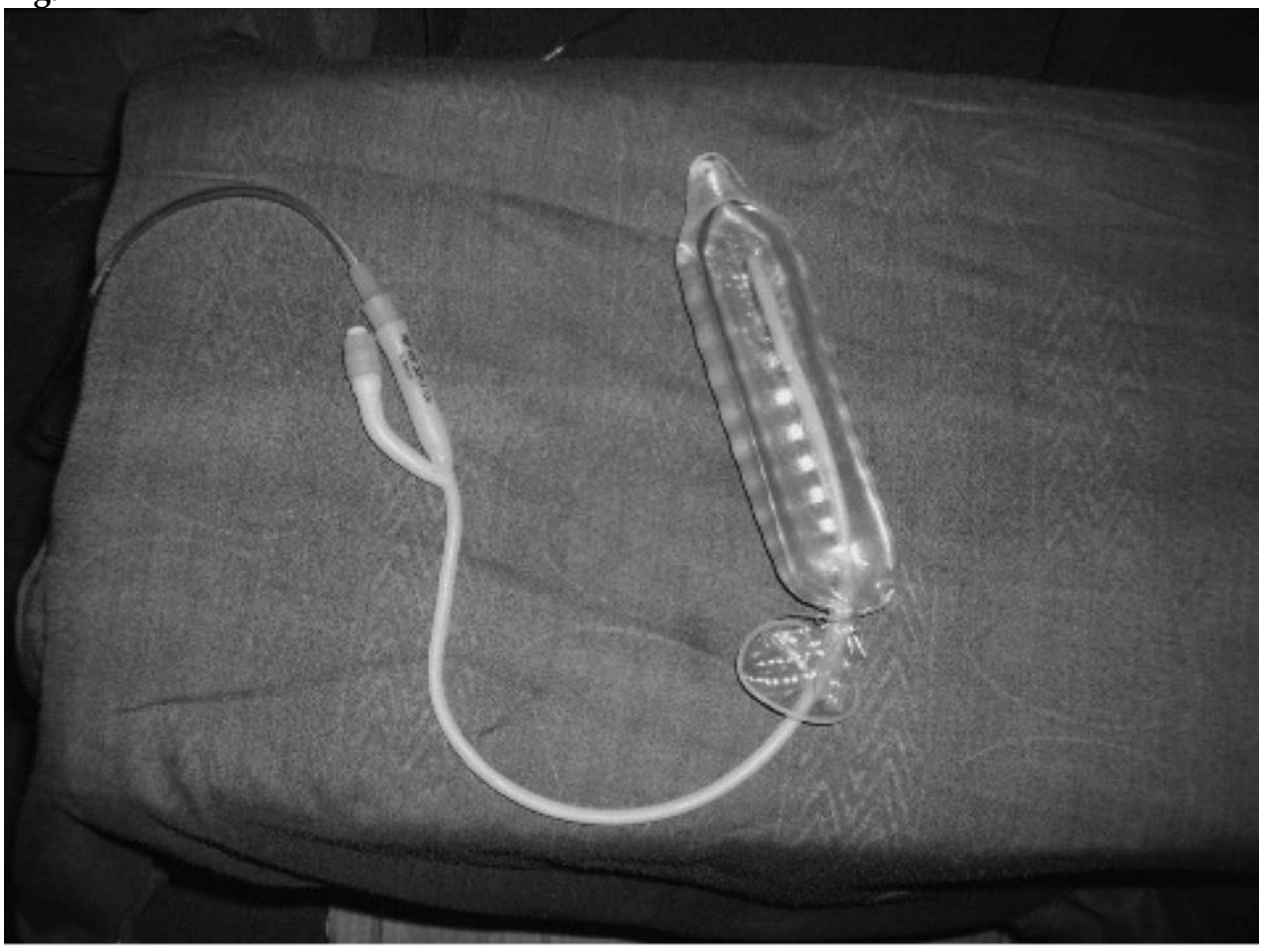
4. If bleeding still continues after one of the above measures, restart aorta compression by an assistant to still the blood flow temporarily and with compression in place inspect the cervix, vagina and gently feel inside the uterus to see if there has been a rupture that needs immediate attention. 5. If no trauma that needs attention is found, use a condom (or one of the vastly more expensive alternatives: a Sengstaken-Blakemore tube or a Rüsch hydrostatic urological balloon or a Bakri balloon) to stop the bleeding.

Condom method for PPH (12) Using a condom has been tested in large scale trials in Bangladesh, Egypt and India and called the Shivkar method after Professor Shivkar from Mumbai, India

1. Put the patient in a lithotomy position.
2. With aseptic precautions prepare a sterile firm rubber catheter or a medium-sized Foley catheter (size 14-18) fitted with a condom where the spermicide has been washed off first with antiseptic solution.
3. Tie the condom onto the catheter near the mouth of the condom by a silk or chromic catgut thread and then insert into the uterus. The inner end of the catheter remains within the condom about 4 cms from its tip (Fig. 11).
4. Connect the outer end of the catheter with a saline set and inflate the condom with 250-500 mL of running normal saline according to when bleeding stops.
5. Observe the bleeding and when it is reduced considerably, stop further inflation. The outer end of the catheter is folded and tied with thread.
6. Maintain uterine contraction by oxytocin drip for at least 6 hours after the procedure. Keep the uterine condom tightly in position by a ribbon gauze pack or another inflated condom placed in the vagina.
7. Maintain inflation of the condom catheter is kept for 12-24 hours (up to 48 hours in extreme cases), depending upon the initial intensity of blood loss, and then deflated gradually over 10-15 minutes and removed.
8. Keep the urinary bladder empty by an indwelling Foley's catheter.
9. Give antibiotics: amoxicillin (500 mg every 6 hrs) plus metronidazole (500 mg every 8 hrs) plus gentamicin (240 mg daily)

Bleeding usually stops within 15 minutes. Seldom does a patient need further intervention. There is virtually no risk of intrauterine infection.

Fig. 11



6. Other measures that can be used are the injection of prostaglandin F2 alpha if available directly into the uterine wall. A very useful alternative is misoprostol 600-800 μg. given rectally. This is a safe, effective, cheap method even in the hands of non-professional traditional birth attendants. However these are seldom needed if the condom method (or equivalent balloon) is used
7. Significant trauma to the cervix is usually at positions 3 or 9 o'clock on the cervix when viewed from below. Inspect and suture with a good light and good assistance using aortic compression by an assistant during the procedure to reduce the bleeding and making it easier to see what you are doing. Good anaesthesia is essential to allow for patient cooperation. This can be with pethidine/ valium and some form of local block.
8. If there is rupture of the uterus this must be dealt with urgently by hysterectomy or local suture of the uterine rupture at laparotomy.
9. If there has been massive bleeding prior to arrival at the emergency unit, or prolonged bleeding despite adequate measures check for coagulopathy: take 5 ml venous blood from the patient in a glass test tube. Tip this up every 30 seconds. Keep it at body temperature by keeping it under your arm pit. Normal blood will coagulate within 2 minutes. If there is no coagulation after 5 minutes this signifies coagulopathy. Such a patient needs several units of fresh blood or fibrinogen.
10. A final rescue measure has been described of mass ligation of the uterine arteries as an alternative to hysterectomy.

Mass ligation of the uterine arteries (5, 14)

Introduction

If the condom method fails tie the uterine artery including some of the myometrium (mass ligation). This is said to be at least 80 % successful in stopping postpartum haemorrhage see above Section. It is much easier than hysterectomy, and is quicker, easier and safer than tying the internal iliac arteries, which needs more dissection, and has more complications.

Don't delay unduly, and don't wait for massive bleeding and shock; the first bleed is rarely fatal, it is repeated bleeding that kills.

ANATOMY: The uterine artery arises from the anterior division of the internal iliac artery and passes over the ureter 2 or 3 cm lateral to the uterus. It gives off an inferior or cervical branch which anastomoses with the vaginal artery. It then turns towards the fundus, runs up the side of the uterus and finally anastomoses with the terminal branch of the ovarian artery in the free edge of the broad ligament. The uterine artery hypertrophies remarkably during pregnancy, whereas the ovarian artery does not, and provides more than 90 % of the blood supply of a pregnant uterus.

Standard procedure

If her abdomen is not already open, make a Joel Cohen transverse or lower midline incision. There is no need to incise her vesicouterine peritoneum as for a Cesarean section, although some surgeons do; nor is there any need to mobilize her bladder, although again some surgeons do.

Stand on her left and raise her uterus upwards and to her left. Take a big curved Mayo's needle with No.1 chromic catgut and pass it through her myometrium from anterior to posterior - 3 cm medial to her right uterine vessels (Fig. 12).

Then pass the needle from posterior to anterior through the avascular area in her broad ligament lateral to her uterine vessels. Tie her uterine artery tightly, distal to its cervical branch. If you tie it loosely, you will merely compress her uterine veins and cause more bleeding. You are not going to divide it, so one tie is enough. Then do the same thing on her left. There is no need to palpate the vessels.

CAUTION! (1) The needle must be big; a small one may end up in her broad ligament and cause a haematoma. (2) When you go from front to back, go through her myometrium. Provide you do this, at whatever level, you cannot injure her ureter. (3) When you come back, go through the bare area of her broad ligament. By doing so: (a) You will again avoid her ureter, and (b) you will avoid the tie going below her uterine artery and so missing it. (4) You can place the tie at various levels. If she is bleeding from the site of a placenta praevia, go from front to back as low as you can (provided you go through myometrium). If she is bleeding from her fundus, you can place the tie higher. (5) Use absorbable suture material. (6) Be sure to include a substantial amount of myometrium in the suture, so as to avoid her ureter and to occlude some of the inferior branches of her uterine artery. (7) Don't use a figure of eight suture.

If you tie her arteries during Caesarean section, place the sutures below the level of the uterine incision under the reflected peritoneal flap.

LIGATURES FOR UTERINE BLEEDING. A, tying the uterine artery after Caesarean section. This is

more often done for other indications; it can be done higher up and you need not reflect the patient's bladder. B, tying the internal iliac artery.

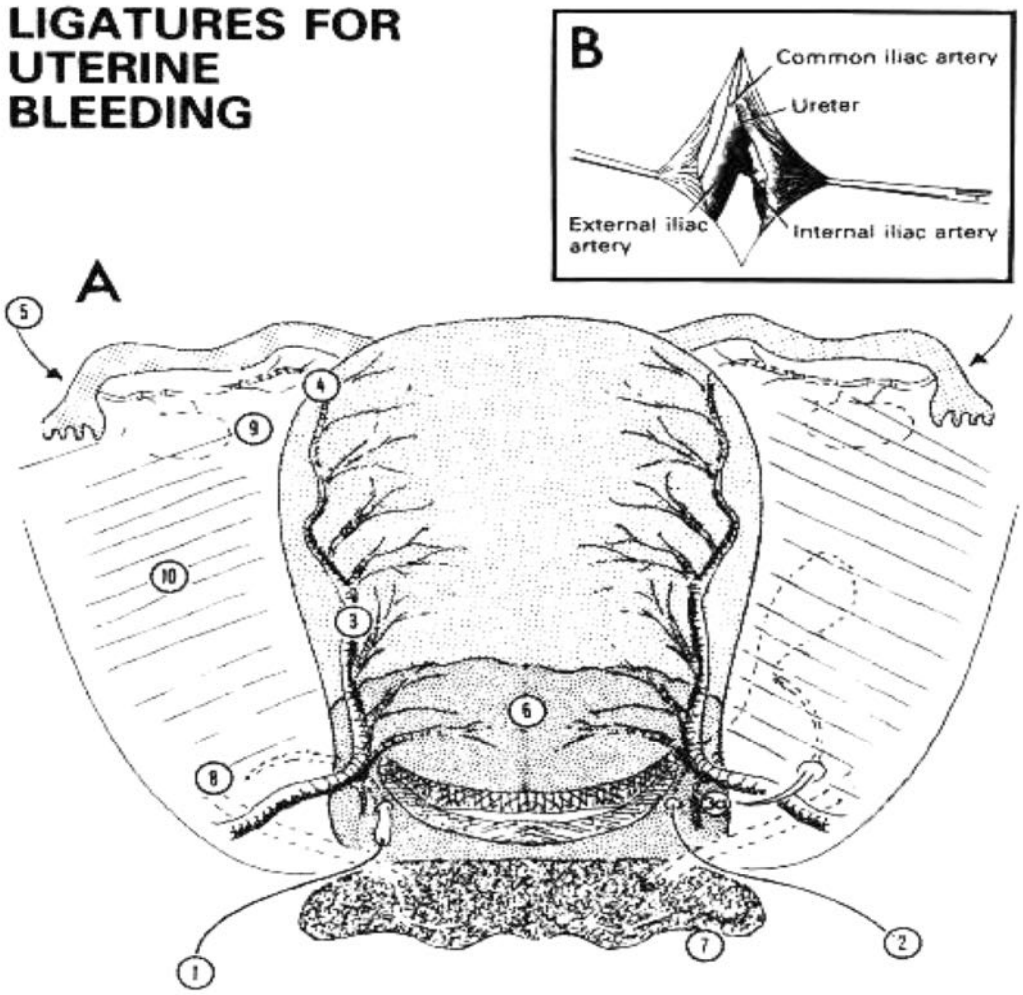
1, passing the needle into the patient's uterus so as to take a substantial bite of uterine muscle and emerge behind her uterus and broad ligament.
2, the second stage of the procedure shown on the other side. The suture has come out of the back of her uterus and the point of the needle is coming back through the bare area in her broad ligament.
3, her uterine artery. 3a, one of the inferior cervical branches of her uterine artery.
4, the anastomosis between her uterine and ovarian arteries.
5, her ovarian artery coming down in her infundibulopelvic ligament.
6, her bladder has been reflected off this part of the uterus.
7, her bladder.
8, her ureter.
9, her ovary.

Her uterus will go pale, show fibrillary contractions, and will usually contract, or at least become firmer. Bleeding will probably stop, even if it remains flabby. Even a couvelaire uterus (showing the haemorrhages of abruption into the uterine wall) will usually stop bleeding.

Compress her ligated uterus with a warm pack to expel any collected blood. Cover it with warm packs and a sterile towel. Flex her thighs, put her knees together, mop out her vagina, and observe her for 10 minutes to see if she continues to bleed. If she has stopped bleeding, close her abdomen.

B, from Chalmers, I et al., 'Effective Care in Pregnancy and Childbirth'. OUP.

Fig 12



Pueperal Sepsis **Introduction** This is the main infectious cause of death relating to pregnancy and delivery and could come to an emergency physician since most occur after delivery. The incidence is estimated at 4-4% of live births affecting 6 million women and resulting in 77,000 deaths with a later impact of infertility affecting 450,000 each year (1). Pueperal infections are caused by endogenous or exogenous bacteria: the commonest being aerobic (group A and B) and anaerobic Streptococci, E. coli, Staphylococcus, non haemolytic Streptococcus and Strep viridans. The presence of an STI such as gonorrhoea and chlamydia makes pueperal sepsis more likely. The most severe form of pueperal sepsis is caused by Group A ″-haemolytic Streptococcus but this is less common today than previously. Occasionally gas-producing organisms such as Clostridium welchii may supervene and show as tissue crepitation in the lower abdominal wall. There is a strong link to unhygienic vaginal manipulations leading to ascending infections through the membranes causing chorio-amnionitis. There is an increased risk of pueperal sepsis with anaemia. The rate of sepsis is 2.5% when the haemoglobin is 120g/L and 25,7% when the haemoglobin is 90g/L. It is also linked to prolonged labour, trauma at the time of delivery and incomplete delivery of membranes or placenta at the third stage. Idiopathic preterm labour linked with asymptomatic genital tract infection (esp. Chlamydia or Group B Streptococci) is also a risk factor for pueperal sepsis. Prolonged labour will almost always be abolished if a partogram is used correctly at the delivery unit. The clinical picture is usually of a woman after the delivery with a pulse > 120/min. and with fever and rigors (these can also be due to urinary tract infections or malaria) Examine the breast, the lungs, the urine and a bloodslide to exclude other common causes of fever. She will usually have pain and tenderness in the lower abdomen especially over the uterus. The uterus will

usually be enlarged or there is failure of the uterus to involute as expected. The vaginal discharge is usually offensive (but not always).

Standard Treatment in established pueperal sepsis (2,3,4,5,6) If possible inspect the placenta and membranes after delivery to make sure that the uterine cavity is completely empty. Antibiotics: e.g. benzyl penicillin 2 mega 4 times/day or ampicillin 1gm 4-hrly initially plus an aminoglycoside such as gentamicin 4 mg/kg daily as a single daily dose plus metronidazole 1 gm. daily after an initial 2 gm dose, or 500 mg 3 times/day i.v or per rectum (1 gm) as crushed tablets or suppository. Change to oral metronidazole as soon as the shock and peritonitis is under control: 400 mg x 3 . Change to oral amoxicillin 750 mg x 3 at the same time. The gentamicin may only be needed for 5 days. A good alternative to gentamicin and metronidazole, especially when resources are very limited, is benzyl pencillin 2 mega 4 times/day plus chloramphenicol 1 gm. 3 times/day i.v until there is clinical improvement; then 500 mg 3 times/day. Here metronidazole is not needed. The above are given for 10 days. Give iv fluids as needed.

Difficulties

1. If there is doubt about the emptiness of the uterus there may be a need for evacuation of the uterus with curettage. If so wait until the antibiotic has been administered for 6 hours and then evacuate using extreme gentleness under oxytocin cover.

2. Give oxcytocin 10 units i.m. (or ergometrine 0.5 mg i . m) if retraction of the bulky uterus does not take place.

3. In a setting of high malaria risk give malaria treatment as an adjunct to the above.

4. If the fever does not go down or if tenderness increases, examine to look for an abscess in the pouch of Douglas or an abscess in the adnexae. Empty any abscess in the pouch of Douglas through a posterior colpotomy using an indwelling Foley´ s catheter to make sure it empties completely after the abscess has been punctured (Fig. 4).

5. If the patient is anemic consider blood transfusion but weigh up the risks of HIV and hepatitis B (even tested blood may be unsafe).

References

1. AbouZahr C, Global burden of maternal death and disability. Br Med Bull. 2003; 67: 1-11 2. Lawson JB, Harrison KA, and Bergström S. Maternity care in developing countries. London: RCOG Press. 2003: 231-236 3. Donald I. Practical Obstetric Problems. London: Lloyd-Luke, 1989: 876-894
4. Royal College of Obstetricians and Gynaecologists. Life Saving Skills Manual - Essential Obstetric and New Born Care. London: RCOG Press, 2007: 62-71
5. King M, Bewes P, Cairns J, Thornton J, et al. Primary Surgery Non-Trauma. Oxford: Oxford University Press, 1990: 6.7, 6.8,
6. King M, Mola G, et al. Safe motherhood in developing countries. London: Marie Stopes International, 2nd Edition. 2006: 25.6

OBSTRUCTED LABOUR

Introduction This is less likely than the other ”big five” causes of maternal mortality to be seen by an emergency physician since most will come to a delivery unit and be seen by obstetricians. However as stated before in many smaller hospitals the emergency physician is sometimes also the obstetrician and so will have to deal with this emergency. It is estimated that obstructed labour

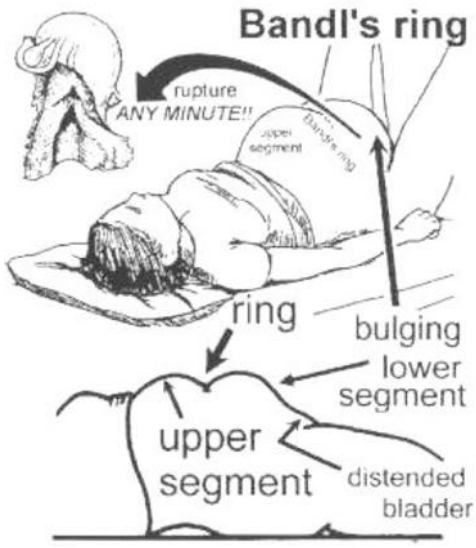
occurs in 4.6% of live births i.e. in 6 million births resulting in 40,000 deaths and 73,000 obstetric fistulae (1). In some settings and countries this is the biggest cause of maternal death of the 5 e.g. in rural parts of Ethiopia and many other rural areas in Sub-Saharan Africa especially with many girls having their first delivery very early when their pelvis is not yet fully grown and when they have had some measure of malnutrition during their childhood.

Definition of obstructed labour: failure to progress in a delivery due to mechanical obstruction despite good contractions (with at least 4 cm dilatation of the cervix). *Causes:* Delivery of the human baby is particularly hazardous because of the large size of the head in relation to the rest of the body. The causes may be due to the foetus, the pelvis, or a combination of the two. The most common reason is cephalopelvic disproportion where there is disproportion between the size of the head and the size of the pelvis. In Africa there is a higher risk of having an android pelvis, which is a heart formed pelvis with "beaking" of the pelvic brim. There may be problems in the baby with the presentation (breech, transverse lie or brow presentation) or the position (occipitoposterior, or mentoposterior in face presentation). However, even the soft tissues are significant with especially the cervix becoming a major hindrance to the progress of labour. There are also differences between a delivery at 38 weeks, when the head is likely to be smaller and more easily moulded, and 42 weeks, when the head is harder and less easily moulded. If the mother's height is under 152 cm she is more likely to have problems. In Africa because of the angle between the pelvic brim and the vertebral column, head engagement before labour (the usual in many European women) is uncommon. Obstructed labour leads to distress which may be maternal or foetal or more seriously a combination of these. Distress of the attending health worker is particularly hazardous for the mother! The response to obstructed labour is so different in primips compared to multips that it is almost as though they are responding as two different species (O'Driscoll from the Rotunda Hospital, Dublin who were amongst the first to introduce early active management of labour) (2). In primipara the dilatation of the cervix often stops at 7-8 cm. In multipara it usually continues to full dilatation.

The results of obstructed labour are also as if there are two species: In primipara if obstructed labour is not managed correctly it may lead to pressure necrosis around the base of the bladder and a fistula between the bladder and the vagina or the rectum and vagina or both, and may also lead to death of the foetus. In multipara the sequence of events is usually rupture the uterus, foetal and then maternal death. In primipara the classical picture is as follows: this is often a young teenage mother who has not had antenatal care. She may have had prolonged labour at home, sometimes for several days. She is tired, anxious, dehydrated and acidotic with fever, rapid pulse but is usually not shocked unless she has hypoglycemia. She often has weak uncoordinated contractions, but sometimes these are strong and painful with poor relaxation between contractions. There is often no amniotic fluid and there are evident signs of foetal distress or absence of foetal heart sounds. It may be difficult to put in a catheter because the bladder is high up and the urine, when obtained, is quite often blood-stained. The vulva and cervix are often swollen, the vagina dry, and if there is any liquor at all it is likely to be meconium-stained and offensive. At vaginal examination the head is often high with marked caput and moulding. In multipara the picture is quite different with the contractions continuing and becoming stronger and stronger despite the obstruction. These lead to an impending or actual uterine rupture. An impending rupture: This often shows as the "3 tumor abdomen" with the lowest swelling due to the large bladder, the middle swelling being due to a thinned-out bulging lower uterine segment and above this a Bandl´s ring (3) with the rest of the uterus as a third tumor above (Fig.13). The round ligaments often feel like guy-ropes on either side of the thin ballooned lower segment. There is often intestinal dilatation, the cervix is

often fully open. There may be a high presenting part.

Fig. 13



Actual rupture: If the head has jammed in the pelvis it can have a tamponade effect with very little bleeding after rupture and no early shock effect. If the child floats up at the time of rupture there can be severe shock early with marked bleeding and marked tenderness.

Standard Treatment of obstructed labour (4,5,6,7,8.9)

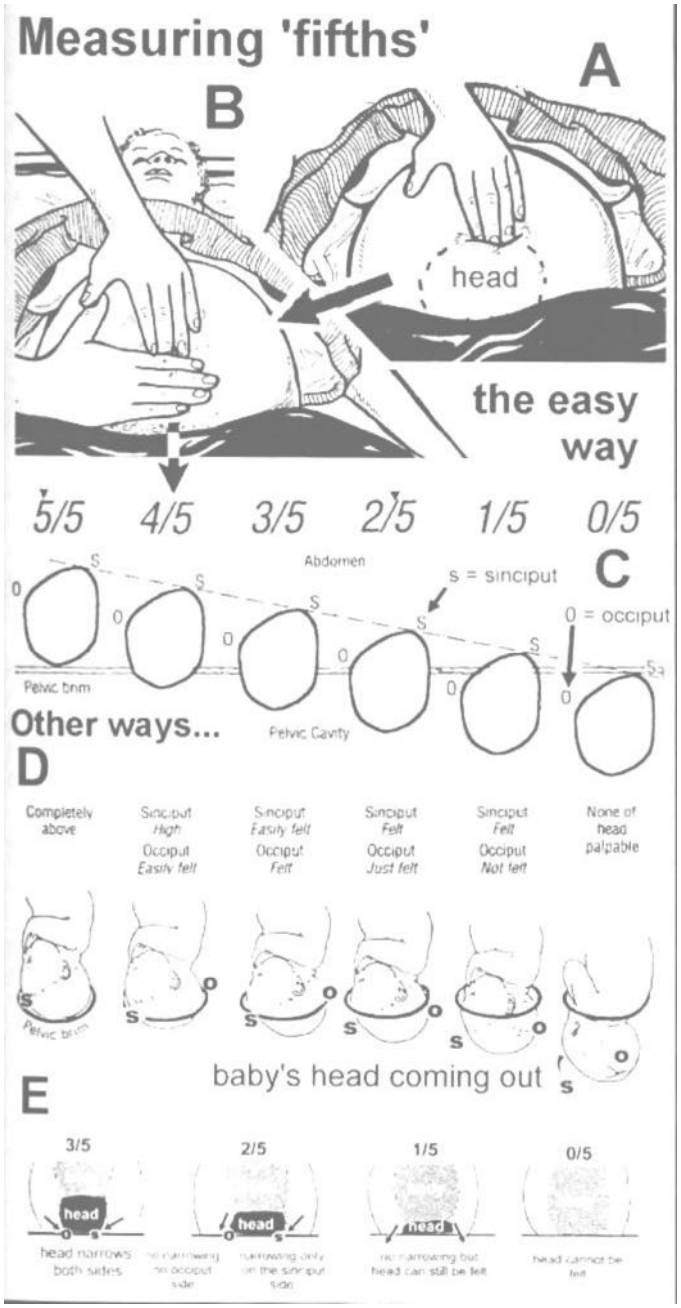
Prevent obstructed labour at all costs by introducing to all delivery units at all levels a practical partogram (4,5,6) incorporating *alert* and *action* lines and train staff to be accurate in their assessments and early in their interventions when this compass shows a wrong direction of the delivery: see normal delivery Make a final decision about the method of delivery 6 hours after crossing the action line and having taken the interventions that follow (provided there is no significant foetal distress that fails to respond to restorative measures within 30 minutes). Base this decision on the level of the position and presentation of the foetus.

If the final decision is for the delivery to be by cesarean section choose the Misgav Ladach method as described in Appendix 1 because of all its advantages When it is a cephalic presentation make the decisions based on the level of the head in relation to the pelvic brim using fifths above the brim:

Fig. 14 ***Method of delivery in relative cephalo-pelvic disproportion with the head presenting, the baby alive and no moulding.*** **Head above the pelvic brim** (Fig. 14) **Best method of delivery**

* 0/5 above Normal delivery without intervention
* 1/5 above Often a normal delivery but may need V. E.
* 2/5 above Vacuum extraction (V. E)
* 3/5 above Symphysiotomy or Cesarean section
* 4/5 above Cesarean section

If there is marked moulding move the treatment to the level 1/5 higher.
If there is significant foetal distress move the treatment to 1/5 higher level.
If there is both severe foetal distress and severe moulding move the treatment to 2/5 higher.



Difficulties

1. If the head is presenting with an occipital position:

If the cervix is not fully dilated and the child is still alive → Cesarean section

If the cervix is fully dilated and there is impending rupture → Cesarean section whether the baby is alive or not.

2. If the baby is dead: Head 1/5, 2/5 or 3/5 above the brim: → Craniotomy and extraction with traction on the opened head using strong volsellum forceps or kochers forceps gripping onto the skull bone (Fig 15). 4/5 above: → Cesarean section despite the baby being dead.

3. Brow presentation → Cesarean section.

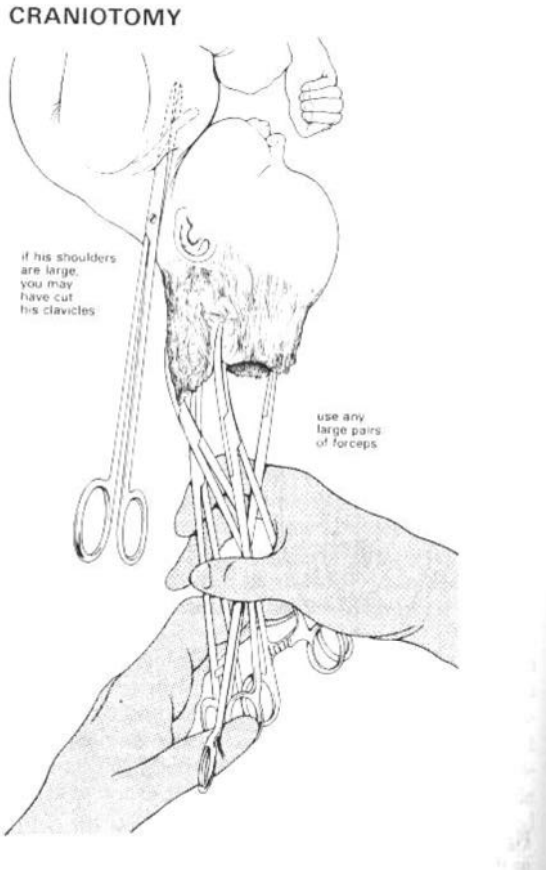
4. Breech presentation with the after-coming head that has jammed in the pelvis: Dead baby → craniotomy via the post fontanelle

Live baby → rapid symphysiotomy or attempt delivery a là Mauriceau-Smellie-Veit method

5. Transverse lie Baby alive → Cesarean section

Baby dead with cervix fully open, no impending rupture → decapitation, leaving the arm attached to the head if possible, and delivery of the head and then the body.

Fig 15



References

1. AbouZahr C, Global burden of maternal death and disability. Br Med Bull. 2003; 67: 1-11
2. O'Driscoll K, Jackson RJA, Gallagher JT. Prevention of prolonged labour. BMJ. 1969;**2:**(655): 477-480.
3. King M, Bewes P, Cairns J, Thornton J, et al. Primary Surgery Non-Trauma. Oxford: Oxford University Press, 1990: 18.3
4. Philpott RH. Graphic records in labour. BMJ 1972; 4:163-165
5. WHO. The partograph: a managerial tool for the prevention of prolonged labour sections I, II, III and IV. Geneva: WHO Press, 1993: WHO/FHE/MSM 93. 8,9,10,11
6. WHO. WHO partograph in management of labour. Lancet. 1994; 343: 1399-1404
7. Lawson JB, Harrison KA, and Bergström S. Maternity care in developing countries. London: RCOG Press. 2003: 201-214
8. King M, Bewes P, Cairns J, Thornton J, et al. Primary Surgery Non-Trauma. Oxford: Oxford University Press, 1990: 18.2-18.5
9. King M, Mola G, et al. Safe motherhood in developing countries. London: Marie Stopes International, 2nd Edition. 2006: 23.1-23.6, 24.3-24.6

Symphysiotomy and its renaissance in obstetrics

Introduction

The modern focus on micro-surgery and minimal invasive procedures in many fields of operative

medical care has its parallel within operative obstetrics in the method of symphysiotomy. Until Cesarean section ceased to be a major threat to the life and health of the mother, symphysiotomy was widely used in most countries around the world. As recently as 1948 Munro Kerr, the father of the lower-segment cesarean section method, praised symphysiotomy as a good method in certain circumstances. The method was abandoned in the 1950's and 60's in Europe not for scientific reasons but on emotional and irrational grounds. The impression was that the method caused long-term morbidity in the mother giving her an unstable pelvic ring and a risk of urinary incontinence. The recent meta-analysis by Kenneth Björklund (1) of all the best studies done on the method from 1900-2000 (5000 operations) examined the evidence of short-term and long-term morbidity. This showed that symphysiotomy is not an obsolete method with significant danger to the long-term health of the mother. In fact it has levels of morbidity generally lower than those of Cesarean section when both are carried out by skilled operators for the right indications. The evidence is impressive enough such that WHO has given its stamp of approval to the renaissance of this method within modern obstetrics.
Even in high-income-countries there are three situations where its return would be appropriate: in severe shoulder dystocia, in the stuck after-coming head of a breech delivery when the usual interventions have failed (a stuck breech delivery still occurs in an unplanned way in all countries even with the acceptance of Cesarean section as the norm for breech delivery), and in the rare cases of those who refuse an abdominal operation.

Of course like all invasive procedures symphysiotomy can cause harm if done wrongly or for the wrong reasons. The skills, when using the method, need to be learned, if possible, by assisting an experienced operator. The indications for the procedure and even more importantly, the contraindications need to be studied carefully. Use the chart on p. 10 to show when this method is best used.

To the classical indication of obstructed labour has been added recently the evidence emerging from research at the Mulago Teaching Hospital in Kampala, Uganda by Kenneth Björklund et al. This research was in a randomized controlled trial comparing the least traumatic method for Cesarean section, the Misgav Ladach method, with the lower midline method. This study, apart from the main end-point, showed that women in the later stages of HIV infection, even with the least traumatic method, had high morbidity which could be life-threatening when subjected to a cesarean section. This was in a unit with excellent operative skills (2).
Thus the advice usually given in high income countries that all women with HIV infection should be delivered by a Cesarean section may need to be turned on its head. In late stage HIV infection, Cesarean section may be contraindicated when there is an alternative such as symphysiotomy. This controversial conclusion may need to be tested in wider studies but there is no doubt that Cesarean section in late stage HIV infection can be a major threat to the life and health of the mother. This may outweigh the advantages in reducing Mother to Child Transmission (MTCT) of HIV. Of course if possible short-term anti-retroviral treatment should be given to mother and child to reduce MTCT.

Indications
As an alternative to Cesarean section in patients who :
oare not likely to limit the number of children to 4
oprobably will not come to hospital for the next delivery

ohave cultural problems accepting Cesarean section in a culture where vaginal delivery is all-important
opresent within minutes of the head getting stuck in a breech delivery with a live baby
oWhen the shoulders get badly stuck after the head has been delivered.
oneed a Cesarean section but because of prolonged labour and intra-amniotic infection have a high risk of subsequent peritonitis.

Rules

1. Do not delay the decision about symphysiotomy when waiting threatens the life of mother and child.
2. The patient must be willing to cooperate.
3. Its main use is in primipara, where its benefits will be seen at every subsequent delivery. There is a somewhat higher frequency of complications in multipara.
4. The best results are when the child weighs 2.7 to 3.6 kg. In a smaller baby there is risk of damage to the child during the delivery. In a large baby there is a risk of causing pelvic instability. A symphysis-fundal height of 30-38 cms. gives a rough estimate of a baby between 2.5-4 kg. (twins and hydramnios excluded).
5. The cervix is at least 8 cm open in a primip or 7 cm in a multip.
6. The head is not more than 3/5 above the brim with minimal moulding or 2/5 above with marked moulding. There should be no overlap of the foetal head when the flat of the hand is placed along the anterior surface of the symphysis pubis and the lower abdominal wall.
7. Where foetal distress is severe a very quick Cesarean section in certain circumstances with good facilities may be less traumatic and safer for the baby. However in the most constrained circumstances getting a section done may be dangerously time consuming.

Standard procedure (3,4,5,6,7,8,9,10) -

Put the patient into a lithotomy position where the knees are fixed such that the angle between the thighs is around 80^0 and absolutely not more then 90^0. The knees are held by two assistants or put into firm leg-supports with non-elastic bandage holding them at 80^0. Stand between the patient's legs.

Catheterize with an indwelling catheter. If you have a choice use a catheter with a firm consistency to make it easier to feel vaginally.

Infiltrate the area of the mon veneris overlying the symphysis pubis with local anaesthetic using 10-15 mls 1% lignocaine, down to and including the periosteum and perichondrium. Infiltrate especially the area approaching the clitoris as this has the richest sensory nerve supply. Use the needle to localize the softer cartilage in the mid-symphysis pubis with your left index finger held vaginally to feel when the needle is almost through. Press your finger against the inside of the symphysis pushing the catheter to your left side. Leave the needle in position to allow it to be a marker for the scalpel.

Infiltrate in preparation for a wide episiotomy.

Cut with a scalpel (if available use a solid scalpel but otherwise use one with a disposable blade) along the needle down to the symphysis, your left index finger pressing on the inside surface as above (Fig.16).

Hold the scalpel at right angles to the symphysis pubis with the cutting edge towards you and only as big a skin incision as is necessary for the scalpel to enter through a stab incision.

When the point reaches the inside edge of the symphysis, cut the middle and lower fibers of the symphysis by swinging the scalpel upwards at an imaginary fulcrum at the upper edge of the

symphysis. Keep exactly to the midline.
Remove the whole scalpel, turn it round with the cutting edge away from you and repeat the procedure incising the upper and middle fibres by swinging the handle of the scalpel down around an imaginary fulcrum again at the upper edge of the symphysis. Don't go beyond the symphysis as the bladder and uterus may be protruding there.
If the symphysis opens adequately i.e. around 1.5-2.5 cms (the breadth of your thumb) you can sometimes leave the fibres of the arcuate ligament intact but often you will need to cut these to get the gap needed.
At delivery make a large episiotomy and use the vacuum extractor to deliver the head as far posteriorly as possible keeping the head well away from the upper part of the vagina and urethra in order to reduce the risk of damage to the base of the bladder (some recommend removal of the catheter during delivery to minimize the danger of tearing the urethra).
Only pull during a contraction. If necessary use an oxytocin drip to get good contractions.
Give oxytocin as you deliver the body. After the delivery of the placenta, check cervix and vagina for tears.
Repair the skin incision over the symphysis with one mattress suture, the episiotomy, and any tears that need repair.
Bring the knees together, have the patient lie on one side with bed rest for 3 days. After 3 days allow the patient to be mobilized at the pace she finds comfortable, if necessary with crutches to give her support.
Remove the catheter immediately after the procedure if there is no complication and no blood in the urine. If there is any blood in the urine leave the indwelling catheter in place (or if you removed it during delivery, replace it) for 5 days.
Give antibiotics such as benzyl pencillin and gentamicin, 2 doses i.v., if possible one dose prior to the procedure and one 2 hours after unless there is evident intrauterine infection when this needs to be longer. Give analgesia as necessary.

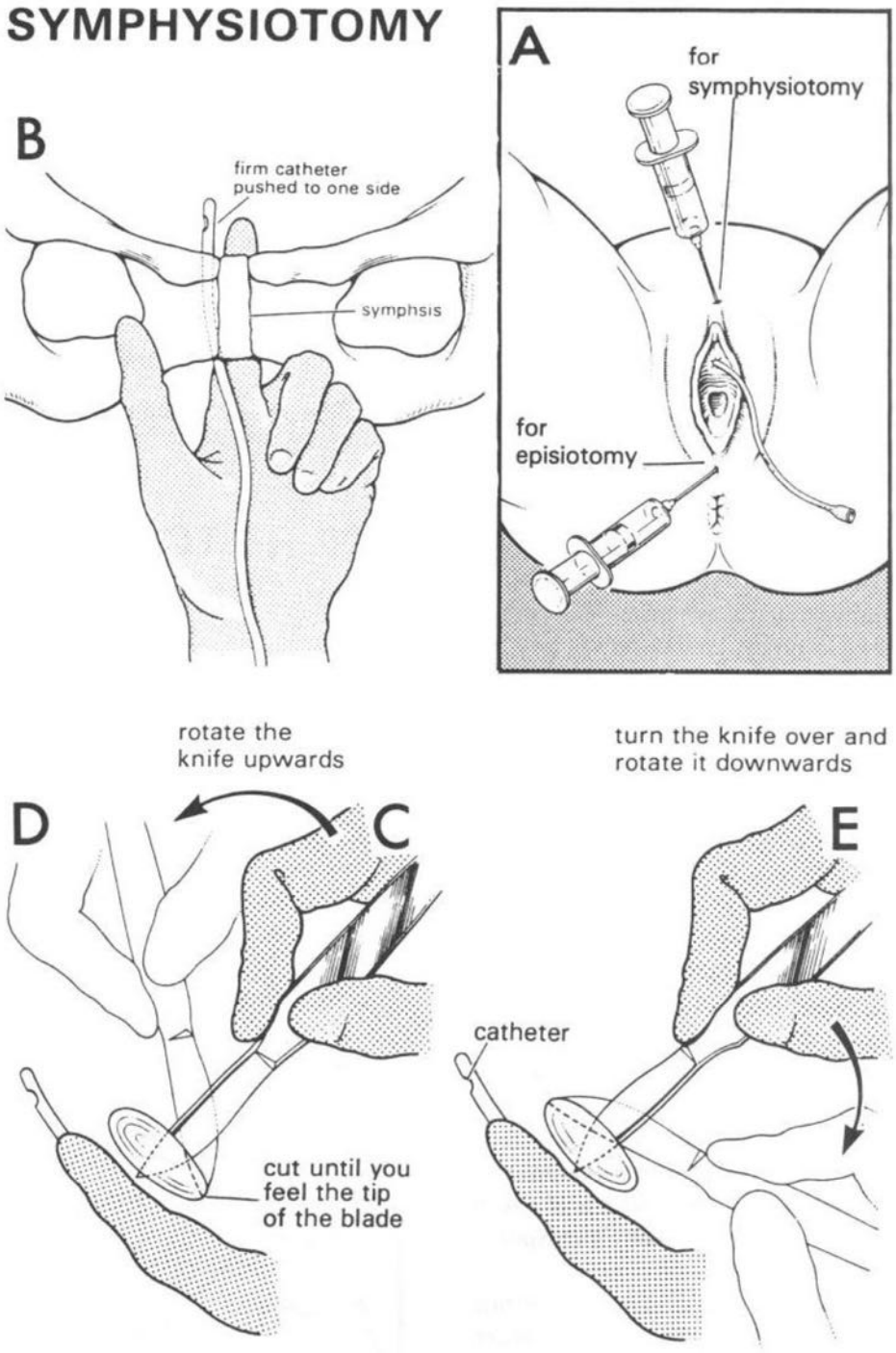
Difficulties

1. ***Controversies over the method.*** It has been said very aptly that the main barriers against symphysiotomy remain in the minds of obstetricians (A.D.H.Browne). When appropriately and correctly used this method is undoubtedly a life-saving procedure for both mother and child as Munro Kerr declared in 1948. The massive meta-analysis by Kenneth Björklund (1) showed how good it was in terms of morbidity and mortality in comparison to Cesarean section. It has, since then, experienced a renaissance especially since the major article in the British Journal of Obstetrics and Gynaecology in 2002 with the accompanying stamp of approval by that journal's editor and the WHO and World Bank gynaecological experts. It is high time that the method was relaunched in 3 situations in high-income-countries:
a. for severe shoulder dystocia where all the usual manoevres have failed to get progress for the delivery
b. in a stuck after-coming head in a breech delivery (this may occur even when Cesarean section is the standard option but a woman may arrive with a breech delivery so far underway that it is impossible to stop). If the head jams and all the usual efforts to disengage it from the pelvis fail, a quick symphysiotomy is life-saving.
c. Occasionally a woman with failure to progress in the delivery refuses a Cesarean delivery and demands (maybe from her background culture) a vaginal delivery. Here a symphysiotomy is a superb alternative in most cases.
2. When the delivering health worker is inexperienced the method takes longer but is usually

quicker than a Cesarean section at this level of expertise. In experienced hands, the time from the point of making the decision until delivery is complete is less than 15 minutes. In a stuck aftercoming head this can be reduced to less than 5 minutes when local anaesthesia has already been given as a precaution during breech delivery in case of getting a stuck head.

3. *Worry about an unstable pelvic ring* after the procedure. Convalescence after a symphysiotomy takes 5-14 days but the patient should be warned against excessive exercise or heavy lifting for 3 months to allow healing to take place. The pelvis springs back to apposition of the symphysis pubis after the baby has been born (remember that the pelvic ring has to be broken at two places to produce an unstable fracture of the pelvis). An unstable pelvis is an extreme rarity after a properly performed symphysiotomy and only occurs when the pelvis has been opened up more than 5 cms. The reason why symphysiotomy is so different to spontaneous symphysiolysis in long-term morbidity has to do with what happens to the sacro-iliac joints. In symphysiotomy the period of separation of the symphysis before the legs are brought together and the woman is laid on her side is short, provided the angle between the thighs is never greater than 80**0**. Thus the risk of long-term instability of the pelvic ring does not parallel what can happen in symphysiolysis. There with separation of the symphysis for much longer periods, walking and lifting pose a risk of strain on the sacro-iliac joints.

Fig 16



4. *Worry about what will happen at the next delivery* after a symphysiotomy. "The real benefit of symphysiotomy is reaped in subsequent pregnancies" Feeney J.K. Each subsequent delivery is easier with the symphysis opening up a little at delivery under the influence of relaxin.
5. *Worry about interference with the bladder neck mechanism* that ensures urinary continence. This is an extreme rarity if the procedure is carried out meticulously with the head being delivered as far back as possible with the help of the vacuum extractor and the episiotomy. Likewise the symphysis must not be opened up more than 4 cms. and preferably a maximum of 3 cms.
6. *Worry about a needle or scalpel-stick injury*. The needle and later the scalpel come down close to the index finger which is pressed on the inner surface of the symphysis pubis. Some have advocated extra layers of protection such as double or triple gloving or even a finger stall of a Kevlar glove under the sterile outer glove. This fear is probably exaggerated except in a careless operator. One

author with vast experience of both Cesarean sections and symphysiotomies puts it thus: “The sensation of the advancing blade is such that I would dare to suggest that the risk is zero and does not warrant three or more levels of barrier protection since this will decrease sensation. The risk of cutting one's finger is much greater when performing a Cesarean section and this is another argument in favour of symphysiotomy when the case is appropriate for its use.”

References

1. Björklund Kenneth. Minimally invasive surgery for obstructed labour: a review of symphysiotomy during the twentieth century (including 500 cases). BJOG. March 2002;109: 236-248 and the accompanying editorial by John Grant and commentary by Jerker Liljestrand.
2. Björklund K, Mutyaba T, Nabunya E, Mirembe F. Incidence of postcesarean infections in relation to HIV status in a setting with limited resources. Acta Obstet Gynecol Scand. 2005; 84: 967-971
3. Gebbie D. Symphysiotomy. Tropical Doctor. April 1974; 2: 69-75
4. Crichton D, Seedat EK. The technique of symphysiotomy. S Afr Med J 1963; 37: 227-231
5. van Roosmalen J. Safe motherhood: cesarean section or symphysiotomy? Am J Obs Gynecol. 1990; 163: 1-4
6. Arie D, Verkuyl A. Think globally, act locally: the case for symphysiotomy. PLoS Med. 2007; 4 (3): e71 0401-0406
7. Lawson JB, Harrison KA, and Bergström S. Maternity care in developing countries. London: RCOG Press. 2003: 198-9
8. King M, Bewes P, Cairns J, Thornton J, et al. Primary Surgery Non-Trauma. Oxford: Oxford University Press, 1990: 18.6
9. King M, Mola G, et al. Safe motherhood in developing countries. London: Marie Stopes International, 2nd Edition. 2006: 24.7
10. Royal College of Obstetricians and Gynaecologists. Life Saving Skills Manual - Essential Obstetric and New Born Care. London: RCOG Press, 2007: 56-60

TWINS AND MULTIPLE PREGNANCY

Introduction

The incidence of twins is 1: 80 with a higher in Africa especially of non-identical twins; triplets 1: 6500

There is increased risk to baby because of prematurity, poor placental function and intra-uterine growth retardation. There is an increased incidence of congenital malformations, malpresentation especially in 2nd twin, cord prolapse especially in 2nd twin. The perinatal mortality of at least one twin is 2-4 times greater than in a normal pregnancy

There is also increased risk to the duo mother/baby with an increased incidence of toxaemia,anaemia, ante-partum haemorrhage, hydramnios, and a significant risk of post-partum haemorrhage

Ante-natal management

There is no evidence that the common recommendation of bed rest if possible from 30-36 weeks at the mother's waiting area next to the hospital is of value. However reduced work load seems logical and being near to a hospital has many advantages.

Give iron and folic acid supplements as early as possible in pregnancy

You may need to use glyceryl trinitrate or terbutaline or similair drug to stop early contractions. Some say that the real value of using these drugs is of winning time to transfer the mother to a

hospital with good neonatal care facilities. If premature labour is threatening from 28-35 weeks give steroids: dexamethasone 12 mg orally or i.m. every 12 hours for two doses each week to stimulate lung maturation in the babies.
Admit the mother if there are any signs of pregnancy-induced hypertension, anaemia, ante-partum haemorrhage or hydramnios.
Admit all multiple pregnancies at 37 weeks
Make decision about whether vaginal or Cesarean section is the best form of delivery. Favouring section will be malpresentations, a previous section, a poor obstetric history, or pregnancy-induced hypertension with intra-uterine growth retardation.

Presentation of foetus Twin 1	**Twin 2**
Vertex	Vertex commonest
Vertex	Breech next commonest
Breech	Vertex
Breech	Breech
Vertex	Transverse

Standard treatment of the First Stage
There may be inefficient uterine contractions with an overstretched uterus. If there is no cepahlo-pelvic disproportion you may give oxytocic stimulation, but use this very carefully as the risk of rupture is considerable.
Ideally in a central hospital there is benefit from an epidural anaesthetic. This gives better blood flow to the uterus, it makes manipulations after delivery of the 1st twin easier if there is malpresentation. However a sudden drop in blood pressure is more likely and needs to be dealt with promptly with i.v. fluids etc. After an epidural there may be a greater need for oxytocic stimulation.
Avoid completely the lithotomy position in the first stage. As far as is practical have the mother up and walking in the early labour and later have her lying on her left side or sitting in a birthing chair.

Standard treatment of the Second Stage (1,2,3,4,5,6)
There are two aims:
1. To deliver the 2nd. twin within 30 mins. of the 1st.
2. To recognise and deal with malpresentation promptly
There must always be an assistant present who can resuscitate the first twin while you prepare for the delivery of the second twin. Delay in dealing with problems of the second delivery may increase the hazards for both mother and baby.
As soon as the first twin has been born, assess the lie and position of the second twin. If it is transverse or oblique, turn it gently to a longitudinal lie (breech is perfectly acceptable). Provided you do this straight away before the membranes have ruptured and before the uterus has started to contract again you should have no problem. However if you have delayed you may need to give sublingual glyceryl trinitrate 0.5 mg to relax the contractions temporarily but get the mother to spit it out as soon as the cervix has been entered (alternatively terbutaline 0.5 mg. i.v. or inhalation of amyl nitrite).
When the child is in a longitudinal lie, do a vaginal examination to identify the presenting part, before the membranes rupture. If the presenting part is high you may have to feel with 4 fingers or even the whole hand.

(a) Cephalic presentation (head first): press the head down into the pelvis and *when you are sure that there is no cord in front of the head*, rupture the membranes and hold the head steady in that position until the first contraction has stabilised this position (you may need to start a dilute oxytocin drip if the contractions take time to return). Await spontaneous delivery.
(b) Breech presentation: If a foot presents, insert the whole hand and grab the foot while the membranes are still intact. Pull the foot down as far as you can and now rupture the membranes. Pull the foot a little further until it is in the vulva. The breech is now in the brim and very little can go wrong. You can now wait for a spontaneous delivery or do a very gentle breech extraction if you are experienced in this.
(c) Shoulder presentation or arm prolapse: Generally this is a clear indication for Cesarean section. However under very special circumstances there may be an alternative. If the uterus is still relaxed, there is plenty of room and the liquor has not all drained away there may be a place for internal podalic version and breech extraction. Put your whole hand inside the uterus (if necessary using glyceryl trinitrate under the tongue or by nasal spray or inhalation of amyl nitrite to get the uterus to relax and especially to get the cervix to remain dilated fully). Gently feel for the foot, identifying it by the heel, and slowly and gently turn the baby to bring the foot right down through the cervix and into the vulva. Then wait either for a spontaneous breech delivery or do a careful breech extraction. The central feature of this procedure is gentleness and taking your time.

Standard treatment of the Third Stage
This is the most dangerous time of the delivery.
There is an added risk of post-partum haemorrhage because of:
the very volume of the double placenta makes delay in its expulsion common
the big area of the placental bed gives a big raw area to achieve haemostasis
the overstretched uterus has more difficulty in contracting down
the large placental site is more likely to encroach onto the lower segment which does not contract down as well.
Be prepared for this complication. Give oxytocin 10 mg. i.v. after delivery of the second twin (provided you have excluded a third baby!). Deliver the placenta by controlled traction, with your left hand just above the symphysis keeping a check on the uterus and your right hand applying gentle traction to the cord (Brant-Andrews method).
The risk for post-partum bleeding is not over until good haemostasis and good contraction has been achieved for 4 hours.

References
1. Philpott RH, Sapire KE, Axton JHM. Obstetrics, Family Planning and Paediatrics, Pietermaritzburg: University of Natal Press, 1978: 33-4
2. Lawson JB, Harrison KA, and Bergström S. Maternity care in developing countries. London: RCOG Press. 2003: 197-8
3. King M, Bewes P, Cairns J, Thornton J, et al. Primary Surgery Non-Trauma. Oxford: Oxford University Press, 1990: 19.11
4. King M, Mola G, et al. Safe motherhood in developing countries. London: Marie Stopes International, 2nd Edition. 2006: 21.7
5. Royal College of Obstetricians and Gynaecologists. Life Saving Skills Manual - Essential Obstetric and New Born Care. London: RCOG Press, 2007: 92-3
6. Donald I. Practical Obstetric Problems. London: Lloyd-Luke, 1989: 359-377

BREECH DELIVERY

Introduction

Breech is the commonest malpresentation. At 20 weeks pregnancy 40% of all babies are breech, at 32 weeks 25%, and at term 3% are breech. Thus one of the commonest causes of breech presentation is prematurity.
There are 3 types of breech presentation: complete when both knees and hips are flexed, frank when both knees are extended and hips are flexed, and footling in which one of the legs is extended and a foot presents. The frank gives the best application to get the cervix to dilate, the footling the worst.
External cephalic version is worthwhile later than 37 weeks and preferably at term. Before this many will turn spontaneously and the efforts will be unnecessary. You are more likely to fail in a primip, if the breech is engaged, and if the foetal head is difficult to palpate. The best results are when version is done at term with the possibility of using tocolysis (relaxation of the uterus with nitroglycerine or terbutaline) when needed. Even after labour has started, if the membranes are intact and the breech has not fixed in the pelvis, version is worthwhile but here most will need tocolysis. Extra hydration by iv fluids may be useful in difficult cases.
In most settings with adequate health care facilities most breech deliveries will be by Cesarean section to reduce the risks of damage to the baby.

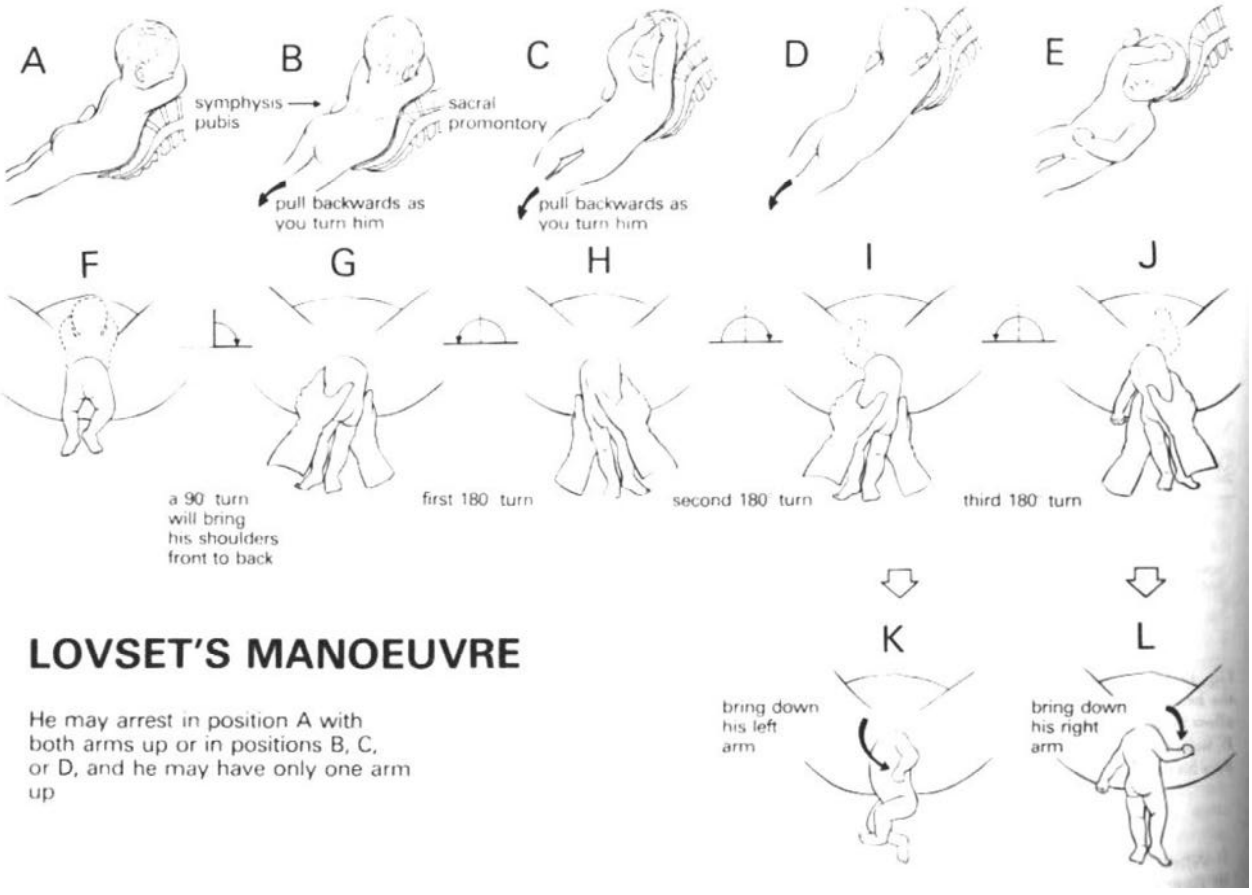
During a vaginal breech delivery there is danger mainly to the baby:
Delivery too early before the cervix is fully dilated. The head can be caught in the undilated cervix.
Delivery of the head too slowly taking more than 10 mins. Anoxia is now a major risk.
Delivery of the head too fast in less than 5 mins. This increases the risk of trauma with cerebral haemorrhage as a possible outcome.
The main danger to the mother is from interfering health workers being too rough in the delivery and causing damage to the cervix etc.

Standard treatment of the First Stage in a vaginal breech delivery (1,2,3,4,5,6)
There must be an assistant present to help when things move fast. Choose the most experienced doctor or midwife to carry out the delivery.
Ideally in a central hospital the whole delivery should be carried out under an epidural anaesthetic to simplify quick manoevres and so that the mother doesn't get the push reflex too early before the cervix is fully open. In more peripheral units once labour is established give the mother a dose of pethidine/ diazepam. Keep membranes intact as long as possible.
With partogram monitoring look for delay in the opening of the cervix → action line → Cesarean section

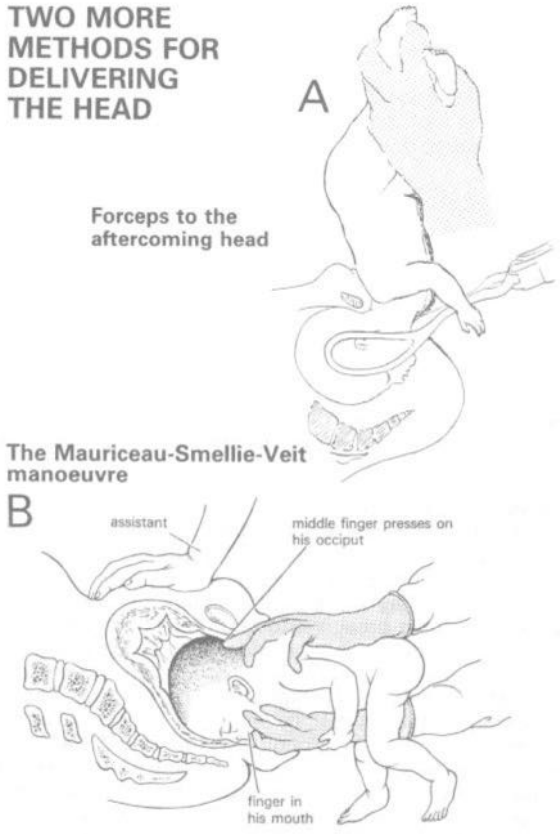
Second Stage Normal breech delivery including Burns Marshall method (Fig. 19).
Don't do anything until the second buttock appears. This will seem to "climb up" the perineum of the mother. Then do a wide episiotomy unless the perineum is roomy.
Don't interfere with the baby until the umbilicus has been born. When this stage has been reached, disengage the extended legs and pull down a loop of cord to give the baby a few more minutes of blood flow.

Position the baby so that it's back is uppermost. Wait until the point of the scapulae are felt, then sweep the arms across the chest and bring them down.
Now the head enters the pelvis and you now check the time and allow the baby up to 5-10 mins. to deliver.
If spontaneous delivery has not occurred let the baby hang by its own weight, while the mother is in the lithotomy position.
Now stand between her outspread legs with your back against her left leg and facing away from her head.
When the nape of the neck appears, use your right hand to grasp the baby's ankles and pull the baby downwards first and then slowly outwards and then bring the baby slowly upwards maintaining your outward pull. The left hand is all this time protecting the perineum and controlling so that the delivery doesn't go too fast. Finally swing the baby across the mother's lower abdomen as you complete the delivery.

Difficulties
1. If the shoulders get stuck or the arms are extended and difficult to bring down, use the Løvset manoevre (Fig. 17): the posterior shoulder will be below the promonory of the sacrum when the anterior scapula is above the symphysis pubis.
Grasp the thighs of the baby with the palmar surface of the fingers of both hands steadying against the sacrum with the thumbs.
Slowly and gently rotate the baby bringing the posterior shoulder to the front. Sweep down the extended arm.
Fig. 17

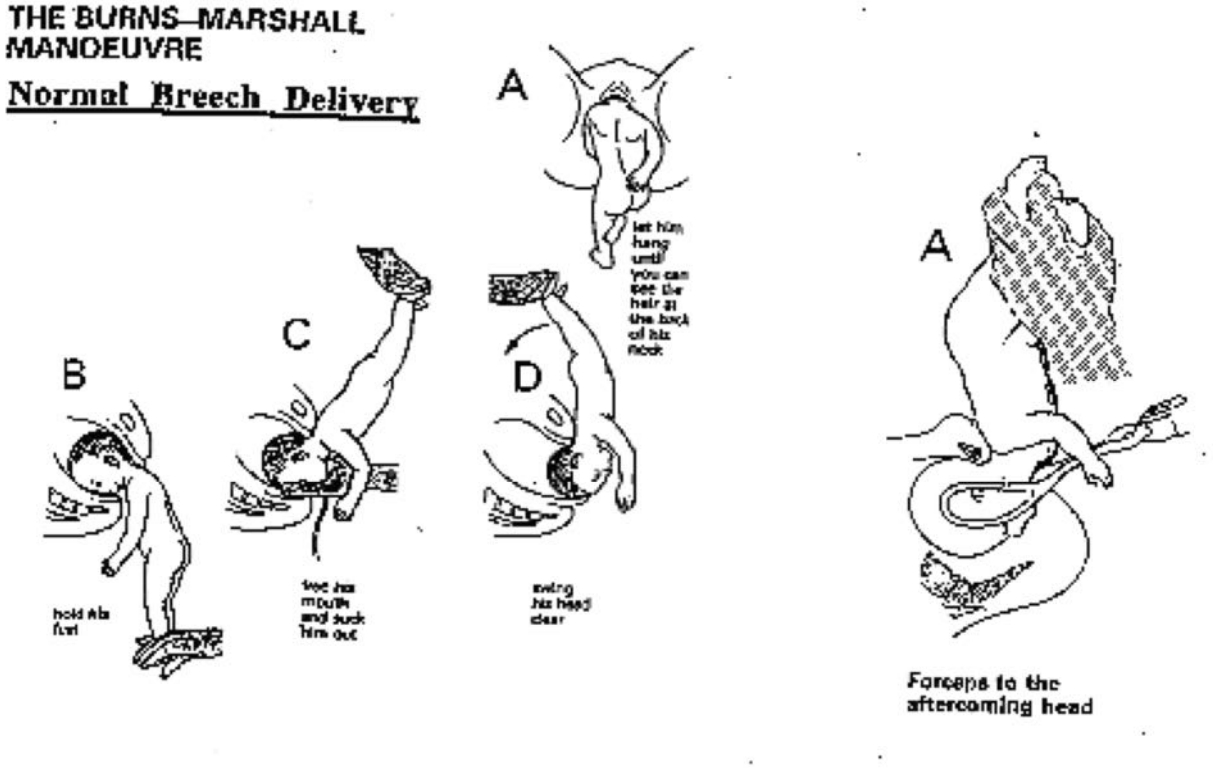


2. If the head gets stuck this is often because it is deflexed. The Mauriceau- Smellie-Veit manoevre (Fig. 18) can be used to flex the head.
The baby straddles the left forearm.
Put the middle finger of the Left hand in the mouth and the index and ring fingers over his shoulders.
Put your right hand over his back; put your middle finger on his occiput and your index and ring fingers over his shoulders.
Now by pressing over the occiput increase flexion. Guide his head through his mother's birth canal.
If necessary have an assistant apply pressure during a contraction only over the fundus of the uterus to help bring the head through.
Another variation is to apply pressure from the index and middle finger through the rectum thereby increasing the flexion of the head. Use a rocking movement and gentle traction to slowly rotate the head and deliver it.
Fig. 18



If the head gets stuck and you are quick at symphysiotomies, you can do a quick symphysiotomy to rescue the baby but you will need to do this within minutes in order to avoid the risks of asphyxia. A valuable preparation is in the first stage to infiltrate the area over the symphysis pubis and the area for an episiotomy in case a symphysiotomy is needed.
Many obstetricians prefer to deliver the head using a Wrigley's forceps (Fig. 18). This gives very good control over the rate of delivery of the head but it requires an anaesthetic.
If the baby is dead and the head is stuck, do a craniotomy through the posterior fontanelle to decrease the skull diameter and deliver the baby.

Fig 19



References

1. Philpott RH, Sapire KE, Axton JHM. Obstetrics, Family Planning and Paediatrics, Pietermaritzburg: University of Natal Press, 1978: 95-6
2. Lawson JB, Harrison KA, and Bergström S. Maternity care in developing countries. London: RCOG Press. 2003: 198
3. King M, Bewes P, Cairns J, Thornton J, et al. Primary Surgery Non-Trauma. Oxford: Oxford University Press, 1990: 19.8
4. King M, Mola G, et al. Safe motherhood in developing countries. London: Marie Stopes International, 2nd Edition. 2006: 21.1
5. Royal College of Obstetricians and Gynaecologists. Life Saving Skills Manual - Essential Obstetric and New Born Care. London: RCOG Press, 2007: 86-91
6. Donald I. Practical Obstetric Problems. London: Lloyd-Luke, 1989: 386-403

Malaria in pregnancy

Introduction Malaria can affect pregnancy severely and all the four types of parasite can cause anaemia. The response of the mother depends on her immune status including her HIV status and her general health before becoming infested with the parasite. The most aggressive parasite, Plasmodium falciparum, can be life-threatening to both the life of the foetus and the mother and could well be seen by an emergency physician. The danger is due to several factors. The mother may already be anaemic before the malaria illness supervenes. Pregnancy reduces the semi-immunity to malaria that most women of a child-bearing age have if they have grown up in a hyperendemic or holoendemic malaria area. This means that the illness may become much more serious with life-threatening complications. Many of the drugs that are used to treat malaria are inappropriate or inadequately studied in pregnancy to use without possible damage to the foetus. Massive sequestration of the parasites in the placenta may make the diagnosis of malaria difficult by microscopy of a single blood smear. The complication of hypoglycaemia both from severe malaria and from its treatment is more likely in pregnancy. Apart

from danger to the life and health of the mother Plasmodium falciparum can cause foetal death or increase the likelihood of low birth weight and pre-term delivery. P.falciparum reduces the birth-weight by, on average, 170 gms and P.vivax by 110 gms. Because of these problems in low-income-countries with a high prevalence of P. falciparum there is a widespread recommendation that Intermittent Presumptive Treatment (also termed Intermittent Preventive Treatment) be used during the pregnancy without blood smears or other diagnostic measures first. The treatment that has been most widely used has been a single dose of three tablets of sulfadoxine/pyrimethamine (SP or Fansidar) on two occasions during the pregnancy (1, 2). This has been shown to reduce anaemia, reduce low-birth-weight and reduce pre-term delivery. Because of the cost and practicality of other combination drugs alternatives have not been adopted on the same scale despite the increasing resistance of the parasite to SP in many countries. However as national policies change for the standard combination treatment of malaria with artemisinine preparations in other situations and abandoning SP as a standard treatment in non-pregnant patients it seems probable that the efficacy of SP will increase again.

Emergency physicians are likely to see the most severely ill pregnant women with malaria. The definition of severe malaria (2) (WHO) includes the following findings once P.falciparum has been shown:

1. Cerebral malaria - unarousable coma not attributable to any other cause in a patient with P.falciparum malaria. This coma should persist for one hour after any generalized convulsion to make the distinction from transient postictal coma. To this has been added (2000) any impairment of consciousness using the Glasgow Coma scale or Blantyre Coma scale.
2. Severe anaemia - normocytic anaemia with a haematocrit <15% or a haemoglobin <5gms/dl and a parasitaemia of > 100 000/⊕l.
3. Renal failure with urine ouput < 400mls in 24 hrs in adults or 12 ml/kg in 24 hrs in children.
4. Pulmonary oedema or adult respiratory distress syndrome (RDS). This is particularly common in pregnant women but rare in children. In RDS the central venous pressure and pulmonary artery occlusion pressure are usually normal with a high cardiac index and low systemic vascular resistance indicating an increase in capillary permeability. The Chest Xray shows increased interstitial shadowing with a normal heart size. In pure pulmonary oedema the picture resembles that in other situations but the condition is often very refractory to correction with diuretics.
5. Hypoglycaemia - defined as a whole blood glucose < 2.2 mmol/l (40mg/dl)
6. Repeated generalized convulsions - more than two observed within 24 hrs.
7. Acidaemia- arterial or capillary pH < 7.35 or base excess > 10 correcting for the fever.
8. Macroscopic haemoglobinuria which is definitely associated with acute malaria infection.
9. Prostration - inability to sit in a child who is normally able to do so or inability to feed in a younger child.
10. Hyperparasitaemia with a level in non-immunes > 4% of RBCs with parasites or > 20% in all situations.

A few comments are worth adding. If the patient has lived continuously for the last 5 years in a hyperendemic or holoendemic area for P.falciparum malaria the diagnosis of severe malaria is likely to be wrong and other causes for severe illness should be sought. In Malawi many of those defined by the above criteria as severe malaria and treated as such, died of another treatable condition that was not suspected. Thus meningitis, sepsis, and pneumonia were often overlooked.

If cerebral malaria is suspected a very careful retinal examination after dilating the pupils in any patient with coma may show the pathognomonic signs of "ghost vessels" (as frost-covered small tree branches) with focal whitening of the vessel, white round patches on the retina with a central dark spot. When these are seen the diagnosis is certain (3). Other signs that are suggestive are retinal haemorrhages, retinal whitening and papilloedema but these may also be found in other conditions. Failure to think of cerebral malaria and delay in starting treatment are more disastrous than in any other cause of coma since every hour's delay is accompanied by increased mortality and the risk of permanent damage. However in most a lumbar puncture will be needed to rule out meningitis but this must never delay the initiation of effective malaria treatment. In cerebral malaria the following signs are often seen: disconjugate gaze, fixed jaw closure and tooth grinding, pouting or a pout reflex, mild neck stiffness but without rigidity, and absent abdominal reflexes with hyperreflexia and a positive Babinski sign. The jaw jerk is often brisk.

Standard treatment of a pregnant patient with malaria (2,4,5,6) Those diagnosed as having P. vivax, P. malariae or P. ovale can all be treated with chloroquine as in the non-pregnant apart from the few places where resistance to chloroquine is widespread and severe. Even where resistance is not a problem combination therapy with additional doxycycline or clindamycin as given below should still be encouraged.

Where chloroquine resistance is a problem treat with amodiaquine in a dose of 30 mg/kg base divided over 3 days together with *either* doxycycline 100mg taken with food once daily for 7 days in the first half of pregnancy *or* clindamycin 10mg/kg twice daily for 7 days in the second half of pregnancy. Where clindamycin is unavailable or too expensive sulfadoxine/pyrimethamine (SP) in a single dose of 3 tablets is an acceptable alternative.

Eradication of the hypnozoite stage in the liver in P. vivax and P.ovale with primaquine will have to wait until after the pregnancy is over. Those diagnosed with P.falciparum, or those in tropical Africa where parasites are seen but the species has not been identified, or those patients who have clinically suspected malaria in this setting (where 95% of all malaria is with P.falciparum and is likely to be chloroquine resistant) can be treated with oral SP (where no severe SP resistance has been shown) if they are clinically relatively unaffected and have semi-immunity to malaria. Those who are more affected but without serious complications should be treated with an oral combination of quinine 10 mg x 3 daily for three days and some other antimalarial which is safe in pregnancy and which clears out the rest of the parasites. Thus doxycycline 100 mg daily is a safe drug in the first 12 weeks of pregnancy (but not later) and can be started at the same time as the quinine and then continued for 7 days (strangely enough WHO has still not changed its policy about the use of doxycycline in early pregnancy but persists in the mistaken belief that its danger from affected developing teeth should be relevant at this stage of pregnancy). Another more expensive alternative to doxycycline as the addition to quinine which is safe throughout pregnancy is clindamycin at a dose of 450 mg x 3 daily for 7 days. Otherwise SP 3 tablets as a single dose can be given as a follow-up treatment after quinine, provided there is not too widespread resistance to SP in the area. In severe malaria with P. falciparum Artemisine Combination Theapy (ACT) is recommended even though there are only limited studies with its use in the first trimester of pregnancy. In the most recent Cochrane review (2007) almost 1000 patients have been included in good studies and treated with ACT but only 150 in the first trimester. No negative effects on the foetus have been found thus far, nor have any case reports of foetal malformations been reported in the very much wider group of pregnant patients treated with ACTs outside of these strict studies. Thus the benefits of ACT treatment in saving the life of the mother and child outweigh any theoretical possible negative effects as yet unknown. In a distant rural setting in many African

countries, when a pregnant woman with severe malaria can swallow without any risk of vomiting, a combination of artemether and lumefantrine (Coartem) can be given orally as 4 tablets x 6 doses over 60 hours. In most cases of severe P. falciparum malaria iv or i.m. treatment is preferable with Artesunate 2.4 mg/kg at 0, 12 h and 24 hrs and thereafter once daily. Alternatively Artemether can be given im 3.2 mg/kg first dose and then 1.6 mg/kg daily until they can go over to the oral treatment with artemether and lumefantrine (Coartem) with at least 7 days treatment if artemisinine alone is used but less if Coartem is used. Now more and more artemisinine is becoming available as artesunate in suppository form (Plasmotrim rectocaps 200) and this is ideal for severe P. falciparum malaria in remote rural areas when the malaria is severe and injectable treatment may not be possible.

Difficulties in Severe malaria with P.falciparum
General treatment
1. Give an effective antimalarial chemotherapy as indicated above. The standard treatment is with artemether (artemisinine derivative) 160 mg (children 1.6 mg/kg) i.m. twice a day for 3-7 days. Combine this with lumefantrine as tablets (Coartem) as soon as the patient is able to swallow. Alternative where an artemisinine injectable or suppository is not available: quinine dihydrochloride 20 mg salt/kg of body weight (loading dose) is given by slow infusion over 4 hours in 5% dextrose saline (5-10 ml/kg related to hydration level). Eight to twelve hours later give a maintenance dose of quinine 10 mg salt/kg in dextrose saline over 4 hours. Repeat this dose every 8-12 hours until oral therapy is possible. Combine this with doxycycline (first half of pregnancy) or clindamycin (second half or pregnancy). **N.B.** A good study shows that i.v. artemisinine reduces mortality of severe malaria by 35% compared to quinine, and suppository treatment with artesunate reduces mortality by 25% compared to quinine.

2. Give good quality nursing care including care of airway, turning every two hours in unconscious patients etc.

3. Prevent and identify early hypoglycaemia by monitoring with dextrostix and giving 5% dextrose infusion as needed. This is especially important in pregnant women and in children under 3 years, and when administering quinine. If patient develops anxiety, sweating, dilatation of pupils, breathlessness or the conscious level suddenly deteriorates often with convulsions and extensor posturing suspect hypoglycaemia. Treat hypoglycaemia with 50% dextrose i.v. 50 ml (children 1 ml/kg) as a bolus and follow with an intravenous infusion of 5-10% glucose.

4. Give meticulous care to fluid and electrolyte balance with input/output charts, following pulse, BP, and urine volume and appearance of urine. If necessary and possible use central-venous pressure monitoring. Aim to keep a pressure of 0-5 cm H_20. Generally give only the amount of fluids needed to keep urine output adequate. Avoid overloading with fluids since once given they are extremely resistant to diuretics in severe malaria. This is particularly important to emphasize for emergency physicians and those working in intensive care units who are used to massive infusions of fluid in those with any signs of shock.

5. Control convulsions by giving diazepam 0.15 mg/kg i.v. or rectally max. 10 mg for adults, or paraldehyde 0.1 ml/kg i.m. If possible avoid phenobarbitone which may increase the respiratory depression of diazepam.

6. Prevent and treat hyperpyrexia by use of tepid sponging, fanning and giving paracetamol 15 mg/kg by mouth, suppository or nasogastric tube (avoid use of aspirin to avoid bleeding complications).

Do not use: steroids, other anti-inflammatory agents, heparin, agents to combat cerebral oedema, low molecular weight dextran, or adrenaline.

7. Several prognostic features give an indication of poor outcome: age under 3 yrs., deep coma, absent corneal reflexes, decerebrate rigidity, retinal haemorrhages, papilloedema or extramacular oedema, peripheral blood pH<7.3, blood glucose < 2.2 mmol/l (<40 mg/dl), hyperparasitaemia (>250 000/μl or >5%), Hb<7.1g/dl.
If possible have daily or twice daily parasite counts to see that the antimalarial chemotherapy is working but remember that in all agents apart from artemisine drugs there will be an initial delay of around 24-48 hours before the parasite count goes down. Follow the level of consciousness using the Glasgow coma scale. If there is rapid deterioration in this level check for hypoglycaemia and treat accordingly.

8. **Severe Anaemia**. This is mainly a threat to life in children 1-3 years old but is also seen in pregnancy. If the haematocrit falls below 15% (or 20% in an adult) or the haemoglobin below 40 g/l treat by a slow transfusion of pathogen-free (tested for HIV, Hepatitis B, syphilis and Hepatitis C) compatible fresh blood or packed cells. During transfusion give to all children and to adults with adequate renal function furosemide 20 mg (children 1-2 mg/kg up to a max. of 20 mg i.v. to avoid fluid overload.

9. **Renal failure**. This is virtually only seen in adults. It is usually oliguric with acute tubular necrosis and is usually reversible. Treat with correction of dehydration by carefully infusing of isotonic saline until venous pressure is between 0-5 cm H_20. If renal function does not restart and blood creatinine rises, start peritoneal or haemodialysis if available.

10. **Malarial haemoglobinuria** ("blackwater fever")
This used to be a major cause of death in non-immunes taking quinine irregularly for prophylaxis or treatment but it still occurs occasionally especially in those with G-6-PD deficiency when given primaquine, or even in semi-immunes who have not been treated with quinine or primaquine. Jaundice is the cardinal sign. The liver is enlarged and tender. The urine is dark red or almost black. Treat with antimalarial chemotherapy if parasitaemia is present and transfuse fresh blood to maintain a haematocrit above 20%. Give furosemide 20 mg i.v. to avoid overload. If renal failure supervenes, peritoneal or haemodialysis may be needed.

11. **Circulatory collapse** ("algid malaria"). Patients may be admitted in a state of shock with systolic BP less than 80 mm Hg in the supine position (less than 50 mm in children) and often with a cold clammy skin, constricted peripheral veins, and a rapid feeble pulse. This picture is associated with a complicating Gram-negative septicaemia. Treat with correction of hypovolaemia with an appropriate plasma expander (fresh blood, plasma or dextran 70). Take a blood culture and start on broad-spectrum antibiotics e.g. combined benzylpenicillin and gentamycin, or clindamycin and ciprofloxacin. Maintain CVP between 0-5 cm H_20. If hypotension persists despite adequate hydration give dopamine through a central line.

12. **Pulmonary oedema or respiratory distress syndrome** (RDS). RDS is a grave complication of severe malaria with a high mortality (over 50%). It must be differentiated from fluid overload which is sometimes fairly easy to correct with furosemide, stopping i.v. fluids, and if necessary venesection of 250 mls blood but in many cases they are very resistant to diuretics probably because of the secretion of an anti-diuretic hormone as a result of severe malaria.
True malarial RDS often follows a period of circulatory collapse (as in "algid malaria") and often appears late as the patient is getting over the parasitaemia. The first indication is increase in the respiratory rate. Hypoxia may cause convulsions and deterioration in conscious level and the patient may die within a few hours. Treat with a high concentration of oxygen, nurse the patient in an upright position, give furosemide 40 mg i.v. and if no response increase to max. 200 mg. If needed ventilate with positive end expiratory pressure (PEEP) ventilation. Circulatory support with dopamine may be needed. The Xray resembles other adult respiratory distress syndrome. There has been discussion about the use of titrated low-dose nitric oxide in the inhaled gas in some well equipped intensive care units but this is highly controversial. Nitric oxide is a physiological mediator in the lung causing vasodilatation and reducing resistance in pulmonary arterioles.

13. **Spontaneous bleeding and disseminated intravascular coagulation**
This is rare in children and occurs in fewer than 10% of adults. It is more common in non-immunes. Treat with transfusion of fresh blood and if prothrombin or partial thromboplastin times give vitamin K 10 mg by slow i.v. injection.

N.B. In pregnancy there is a special danger in non-immunes of complications of hypoglycaemia and pulmonary oedema.
In children with severe malaria, cough is common as are hypoglycaemia, convulsions, a short duration of the illness and a quick recovery from coma after successful treatment.
In adults the duration of the illness before becoming serious is longer and the recovery from coma is also longer. Jaundice is more common and up to 10% may have bleeding/clotting disturbances.

References

1. Challis K, Bique Osman N, Cotiro M, Nordahl G, Dgedge M, Bergstrom S Impact of a double dose of sulfadoxine-pyrimethamine to reduce the prevalence of pregnancy malaria in southern Mocambique. In press. Included in the Doctoral Dissertation 2002 Karolinska Institutet, Stockholm
2. WHO. Malaria in pregnancy. Geneva: WHO Press, 2007: 1-34
3. Beare NAV, Taylor TE, Harding SP, Lewallen S, Molneux ME. Malarial retinopathy: a newly established diagnostic sign in severe malaria. Am J Trop Med Hyg; 75: 790-7
4. WHO (1st Ed. Gilles HM). Management of severe malaria. Geneva: WHO Press, 2nd Ed. 2000.
5. Malaria consortium. Malaria: A handbook for health professionals, Oxford: Macmillan education. 2007: 79-141, 168-183

For further reading

Managing complications in pregnancy and childbirth. Ed. Mathai M., Sanghvi H., Guidotti RJ. 2005 WHO . Geneva
A guide to effective care in pregnancy and childbirth. Enkin M. et al 3rd Edition. 2000. Oxford University Press. Oxford. New York.

Obstetrics in peripheral hospitals. Larsen J., 1998. DEPAM publishing. Durban
Obstetric Problems A practical manual, Driessen, F. 1991 AMREF. Nairobi.
Clinics in Obstetrics and Gynaecology vol. 9. No. 3 December 1982 W.B.Saunders Company Ltd.
Cook G. and Zumla A. Manson's Tropical Diseases. Ed. 21. pp 1205-1295. Saunders 2003. London.
WHO IMPAC Managing Complications in Pregnancy and Childbirth. 2000. WHO/RHR/00.7
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Appendix 1.

The Misgav Ladach Method of Cesarean Section

(name Misgav Ladach means refuge in desperate hours)

Introduction

"Embedded in the name Cesarean section lies an aura of greatness, something elevated above the mundane. This is a name worthy of the operation by which it is possible under certain circumstances to save two lives otherwise destined indisputably for a certain death". These words by the future Professor of Obstetrics and Surgery at Uppsala University, Karl Gustaf Lennander in 1889 show the standing of this operation even at that early stage. Two decades prior to this, the maternal death rate following Cesarean section was estimated at 75%.

When Murdoch Cameron (Glasgow) in 1878 managed to carry out eight consecutive sections without a single maternal death by suturing the uterus (refining the classical uterine incision of Sänger) this was seen as a major breakthrough. Prior to this Porro in Milan (1876) had already introduced the operation of Cesarean section with sub-total amputation of the uterus. This saved the life of the mother but precluded any further pregnancies.

Munro Kerr in Glasgow had modified an operation developed by Krönig (transperitoneal lower segment section with extraperitoneal closure) and in 1911 introduced his method of transverse incision in the lower uterus. He further refined the method and slowly it won international acceptance but it was not until 1949 when the overwhelming majority accepted it as the standard procedure. This occurred at the 12th British Congress of Obstetrics and Gynecology and when there was general assent to his method, Munro Kerr leaped to his feet proclaiming: "Allelujah! The strife is o'er the battle done".

One variation in his method was the use of the lower transverse abdominal incision introduced by Pfannenstiel in 1896 and published in 1900. Because of cosmetic considerations and a decrease in wound hernias, this method has gradually become standard in many developed countries. However it has some disadvantages. It may be too slow for emergency sections. The subaponeurotic dissection of the rectus sheath takes time. It is sometimes accompanied by troublesome bleeding from perforating vessels. Postoperative haematomata and abscess formation are not unknown such that some surgeons routinely drain this space. Since it does not strictly follow Langer's lines it may be accompanied by unsightly guttering when the patient stands erect, if the repair at the end of the operation is not meticulous.

Apart from minor improvements the basic method of Cesarean section has not changed over the last generation. This is undoubtedly due to it being a safe and effective method of delivery of a baby that cannot be delivered vaginally.

Recently some new thinking has led to the launching of a package of refinements put together by Dr. Michael Stark and given the name: the Misgav Ladach method which incorporates fresh ideas from various sources both surgical and gynaecological. The name is from the hospital in Jerusalem where the method has evolved, beginning in 1983.

The new method grew out of an approach to opening the abdomen developed by Professor Joel Cohen for abdominal hysterectomy in 1954 and popularized in his monograph "Abdominal and Vaginal Hysterectomy" in 1972 (1).This method of opening the abdomen has been practised by a number of obstetricians for Cesarean sections following Stark's lead but to this he has added a number of new features which combine to make a package of refinements which had not been previously used. In the Pfannenstiel method the body is perceived as static and the incision cuts its way through with little regard to structural anatomy whereas in the Joel-Cohen incision the anatomical structures are respected and the opening follows the principles of surgical minimalism.

The claimed advantages of the Misgav Ladach method as shown in non-randomized trials are impressive (see below). These claims have now been tested in at least 9 randomized controlled trials (RCT) many of which have now been published. The first was in the Department of Women's and Children's Health at Uppsala University Hospital, Sweden and reported by Elisabeth Darj and Marie-Louise Nordström (7). Other RCTs have been carried out in Dar-es-Salaam -Tanzania (8), Beijing -China (9), Vellore -India (10), Kampala -Uganda (11), Wuhan -China (12), Nairobi -Kenya (13), Magdeburg -Germany (14), Porto -Portugal (15) and a number of other centres around the world. The method in virtually all these trials is found to be significantly quicker to perform than the Pfannenstiel method with a reduced amount of bleeding and diminished postoperative pain.

The recent Cochrane review of the RCTs of the method comparing it with other methods concludes that this is a better method than previous methods and therefore worth recommending. The conclusion was that Joel-Cohen-based CS (Misgav Ladach) compared with Pfannenstiel CS was associated with reduced blood loss, operating time, time to oral intake, fever, duration of postoperative pain, analgesic injections, and time from skin incision to birth of the baby. Misgav-Ladach compared with the traditional method was associated with reduced blood loss, operating time, time to mobilization, and length of postoperative stay for the mother. Joel-Cohen-based methods have advantages compared with Pfannenstiel and traditional (lower midline) CS techniques. (35, 36, 37,38).

Knowledge of the method spread after the FIGO World Congress of Gynecology and Obstetrics in Montreal in September 1994. At the follow-up FIGO Congress in August 1997 in Copenhagen, four presentations showed the advantages of the method. It is already the standard method recommended in a number of countries such as Sweden and Denmark.

Philosophy behind the new method developed by Dr. Michael Stark This method is based on some important philosophical considerations. The first principle is that of surgical minimalism. Only those surgical manoevres that are shown to be necessary will be used and wherever possible the alternative is chosen that is the least disruptive to the tissues. Thus dissection of subcutaneous tissues and suturing of the peritoneum are avoided. There is less cutting and more separation of tissues. The second principle is that of operating in harmony with physiological and anatomical considerations. Thus the level of the skin incision and the level of separation of the recti muscles is chosen carefully to be well away from muscle insertion sites. This means that the least force is needed at separation and the least disruption is likely of blood vessels and nerves which are most vulnerable near the site of muscle fixation. Also the direction of pull when opening is such that vessels and nerves are preserved and the bladder and underlying bowel are not jeopardized. It is a method that has considerable advantages both for high income and low income countries.

Here are the main advantages claimed for the new method: * It causes less bleeding than a traditional Cesarean Section (2,3,4,7,8,9,11,12) and the doctors at the Misgav Ladach Hospital never gave a blood transfusion for an uncomplicated operation. This would be a great saving not least in a setting with a high prevalence of HIV. Less bleeding and less cutting also reduces the risk of the operator sustaining a wound during the operation with the subsequent risk of HIV infection from the patient. * It is a method that is easier to learn and easier to use than the standard methods. * The wound after the operation is stronger than in a lower midline incision and virtually eliminates the risk of a wound hernia which is a major disability in women with a heavy work load. * It is quicker than the traditional method with faster delivery of the infant and shorter overall operating time taking on average 10-15 minutes in skilled hands in an uncomplicated case (7,8,9,11,12,13,14,15). This saves theatre and staff time. The anaesthetic needed can be shorter. * It is the best way of dealing with many of the unexpected complications that can arise during a Cesarean Section in a low-income country. There is great flexibility in modifying the method to deal with unexpected situations. * It causes less infection after the operation and thus reduces the need for antibiotics (8,11,13).

* It causes less febrile reactions during the post-operative period which is a sign of how gentle the operation is with the tissues (4,6). * It allows early ambulation of the patient which reduces complications such as deep vein thrombosis. (4,6,14). * It allows early discharge from hospital thus freeing beds early. * It allows early alimentation and thus removes the need for post-operative starvation and intra-venous fluids (5,13,). * It is the method with the least amount of post-operative pain and thus reduces the need for post-operative analgesia(4,6,13,14). This is important to allow patients to be back soon in full function within the family and community. It also allows breast-feeding to start early. * The scar is less likely to cause keloid formation which is a particular hazard in Africa (17). * There is less danger of peritoneal adhesions, and scar tissue in the subcutaneous tissues thus making a repeat section much easier (4,6). * It requires only 10 instruments and 3 sutures. **There are some theoretical disadvantages in the method:** 1. Because the abdominal scar is slightly higher than a Pfannenstiel incision there may be women who will not like it because they wish to hide the scar even under the skimpiest bikini. This will not be a factor in low-income-countries and the fact that the method has proved very popular in Israel and Italy which are high income countries makes this unlikely to be a major disadvantage. 2. Until it is widely accepted as the standard method there may be some confusion because of introducing a new method. This is always the case in introducing new ideas in medicine and is compounded by the inherent

conservatism of the medical profession. 3. It has only been tried in limited numbers under local anaesthesia alone which is the method used in some units in some poor countries. However the list of advantages so outweighs these theoretical disadvantages (especially in low-income countries) that this method of Cesarean Section should become the standard method in all countries.

Standard procedure The surgeon stands on the right side of the patient if he is right-handed or the left side if left-handed. The abdominal incision is a straight transverse superficial incision in the skin about 3 cm. below the line joining the anterior superior iliac spines. It can be higher if necessary and there are even advantages in going at the same level as the anterior superior iliac spines. It will need to be about 17 cms. in length

Fig 20

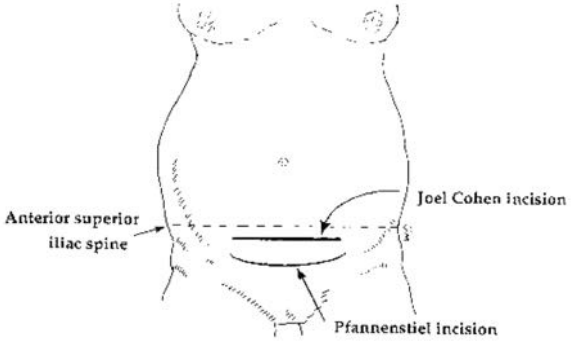

Fig. 1. Level of incision.

1. Identify the midline and pinch three marks in the skin crease, one in the midline and one at either end of your planned incision. Stretch the skin slightly sideways in the direction of the skin crease. Stretching the skin in this way gives less distortion and a straighter incision.
2. Cut through the skin only and not into the subcutaneous tissue in the full length of the incision (17 cms. in length). This shallow incision hardly bleeds at all and never needs haemostasis.
3. Deepen the incision in the midline with the knife in a short transverse cut of about 2-3 cms. through the fat, down to the rectus sheath. Do not attempt any freeing of the subcutaneous tissue. The blood vessels in the subcutaneous tissue and fat are left alone and in the midline there is virtually a bloodless field. Make a small transverse incision in the rectus sheath with the knife.

Fig 21

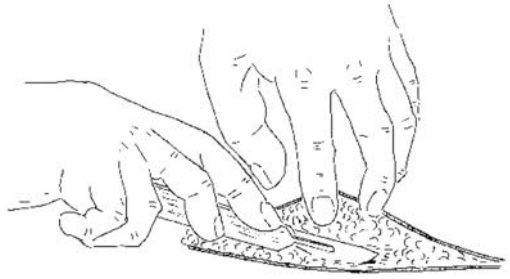

Fig. 2. Incise the rectus sheath.

4. **Enlarge the transverse incision bilaterally** underneath the fat and subcutaneous tissue without disturbing them. Place the tip of a partly open pair of scissors (supported underneath by your left index finger) with one blade under the cut sheath and one blade above. Push the scissors along the direction of the fibres in a transverse direction following the curvature of the body as you go

further out. Do this away from you and then towards you.

Fig 22

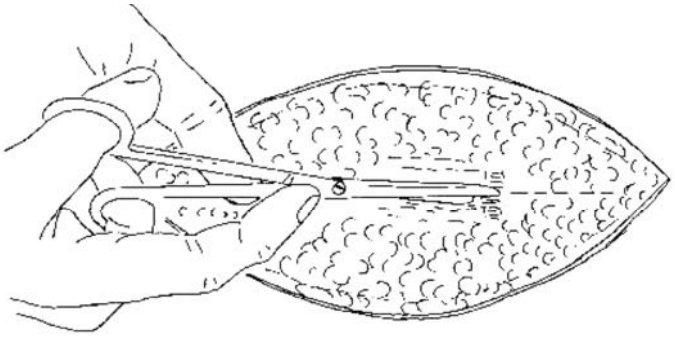

Fig. 3. Split the rectus sheath.

At this level the rectus muscle does not need separation from the overlying sheath and it is above the level of the pyramidalis muscle.

5. Gently separate the fascial borders caudally and cranially, using the fingers to make room for the next step

Fig. 23.

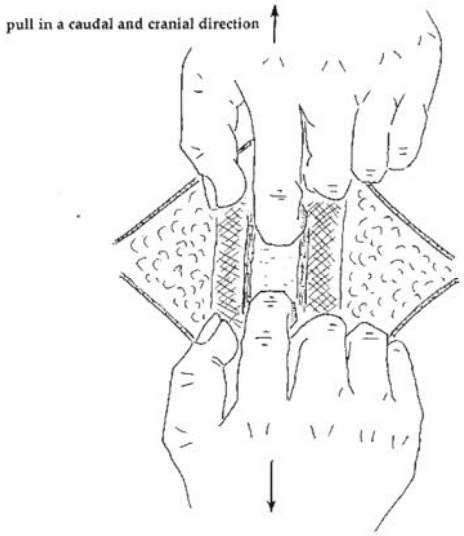

Fig. 4. Open up the rectus sheath.

This makes an oval opening that exposes the rectus muscle underneath.

6. Pull the rectus muscles apart. Both surgeon and assistant push their index and middle fingers in the midline between the rectus muscles, encircling the whole muscle bellies and then pull with smooth, balanced and increasing force. It is often necessary for both to place their other index and middle fingers over the two that are in the gap in order to get the force needed to make a big enough hole. Do not be afraid of pulling quite hard, and sometimes you will almost lift the patient from the table at this point

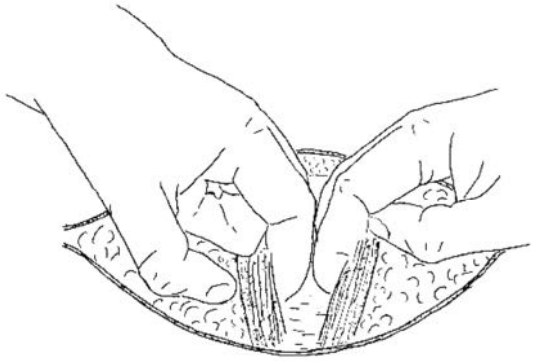

Fig 24. Separate the rectus muscles

Now you have all the big vessels and nerves well tucked under the protective layer of subcutaneous tissue.

7. Stretch the parietal peritoneum open in a transverse way, using your index fingers to stretch the tissues until a small hole is made. Enlarge this hole by stretching it with your two index fingers in a caudal and cranial direction simultaneously.

Fig 25

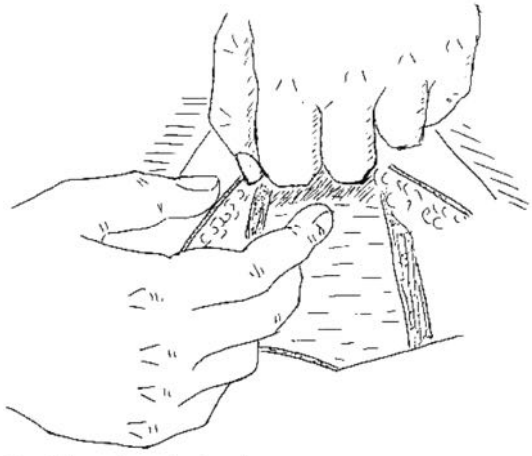

Fig. 6. Open the parietal peritoneum.

This opening can be made as high as is easily accessible since it will not be sutured. The opening of the peritoneum will be transverse and thus save the bladder from injury. Using the fingers to open and enlarge saves the underlying bowel from injury. **8. Identify the lower segment of the uterus*** and the upper limit of the bladder. *This is defined as that part of the uterus which lies below the level at which the peritoneum on the anterior surface of the uterus ceases to be intimately applied to the uterus and is reflected via the uterovesical fold on to the dome of the bladder.

9. Make a transverse superficial incision through the visceral peritoneum 1 cm. above the bladder limit with the scalpel. Avoid blood vessels and go out far enough on either side (about 10-12 cms in total) so that the head and baby can be delivered through the hole. Use a mobile retractor (such as Fritsch or Doyen's) to give good visibility with the assistant following your movement as you cut with the scalpel. The exact level is not so critical and it is unwise to go so far down so that the

opening in the uterus is restricted out to the sides.

10. Push the visceral peritoneum and bladder down using two fingers. Fingers are less traumatic and more sensitive than a swab or instrument and cannot go through the bladder.

11. Make a small transverse incision in the lower uterine segment with a scalpel or using your right index finger make a hole until the membranes bulge through. Often the membranes break and amniotic fluid pours out at this stage.

12. Stretch the hole transversely to either side using your right thumb mainly to steady and your left index finger to separate the uterine muscle fibres. Open more to the right than the left since the uterus is usually rotated towards the right. If a bigger hole is needed for a mal-presentation or a large baby, then the uterine cut can be turned slightly upwards with scissors. The thumb is broader than the index finger and is less likely to damage the vessels on the left side of the uterus.

13. Place two fingers below the head and release the vacuum between the head and the lower uterine wall if labour is already established. The assistant now pushes on the fundus of the uterus in order to bring the baby down and your fingers guide the head out of the uterine opening. Two fingers take less room than a whole hand and thus are less likely to cause a widening tear in the uterus. Alternatively you can deliver the head guiding with a single blade of forceps placed behind the head. This takes up minimal space.

14. Manually remove the placenta after delivering the baby, by placing your whole hand inside the uterine cavity and gently freeing the placenta from its bed. At this point the anaesthetist may give 10 units oxytocin (this is commonly not necessary). The manual removal makes the third stage of the delivery much quicker and often in the same movement the uterus is brought out of the abdomen (otherwise follow next section 16.) Oxytocin or ergometrine use is not always necessary as massage of the uterus is so effective in stopping bleeding from the placental bed.

15. Bring the upper uterus out of the abdominal wound by placing your whole hand behind the uterus.

16. Massage the uterus to stimulate contraction, and if there is vigorous bleeding from the placental bed, squeeze the uterus between your palms Some gynaecologists prefer to let the uterus remain inside the abdominal cavity especially if local anaesthesia is used since the action of bringing out the uterus may be painful and may cause vomiting.

17. Clean out the inside of the uterus with a towel to remove any remnants of membranes and further stimulate contraction and retraction of the uterus.

18. Grasp the centre of the caudal part of the cut uterine edge with a non-traumatic clamp such as Green-Armytage or Babcock clamp. Dilate the cervix with a thick Hegar's dilator if she is not in labour (some gynaecologists question this step in a community with a high incidence of genital infections since in theory it could spread bacteria from the vagina to the uterus).

19. Repair the cut uterine wall with a one-layer repair using a continuous locked stitch. Start at the lower edge of the cut nearest yourself and use a long length of chromic catgut No.1 on a round-bodied needle with a large diameter. Take big enough bites from the lower to the upper edge to get secure haemostasis but being careful on the lower edge to keep well away from the bladder .

Fig 26

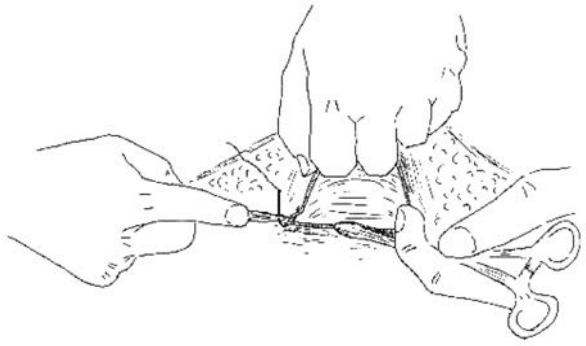

Fig. 7. Suture the uterus.

In special circumstances where the lower segment is especially thin or fragile or where it is especially thick there may be a need for a second layer but this is uncommon. Closure in a single layer not only saves time but also gives less ischaemia and gives better healing with less sacculation. It may also reduce the incidence of febrile morbidity. Using a locked stitch is surprisingly not associated with local ischaemia since retraction of the uterus reduces tissue volume and thus releases any tension around the stitch within a few hours.

20. Check that all bleeding has stopped and that the blood pressure is normal so that haemostasis is not threatened after the operation. If necessary add single cross stitches to stop any small bleeding points. If you close the wound while the blood pressure is still low, bleeding may start when the blood pressure returns to normal. **21. Remove blood clots** but do not put packs or towels into the peritoneal cavity to try to mop up all the liquid blood. Liquid blood is absorbed by the peritoneum. The amniotic fluid that is spilled into the peritoneal cavity has a bacteriostatic effect. The minimal interference with the bowel is important in allowing early alimentation.

22. Leave visceral peritoneum unstitched.

23. Bring down the omentum to cover the repaired uterine wall. Leaving the peritoneum open is the most important step to stop adhesions developing. The peritoneum heals itself better without stitching and within 12 hours has already begun to come together as the coelomic cells reconstructed the peritoneum.

24. **Leave the parietal peritoneum unstitched**. It is probable that the stitching of the peritoneum leads to local ischaemia which stimulates a repair response by the body causing scar tissue and adhesions.

25. Identify the two layers of the fascia at either corner and grasp them with artery forceps. Use two more forceps on the upper and lower cut edges two-thirds of the way along the fascial cut.

26. Start stitching the fascia at the end of the cut nearest you. Start the stitch from the inside out on the upper border and then from the outside in on the lower border so that the knot is buried inside the fascia. Use chromic catgut No.1 or an equivalent that is strong enough to withstand the tension of early ambulation. Each bite goes slightly diagonally across the cut. Use a continuous running suture which need not be a locked suture unless there are special reasons. Do not interfere with the blood supply at either end by going beyond the end of the cut .

Fig 27

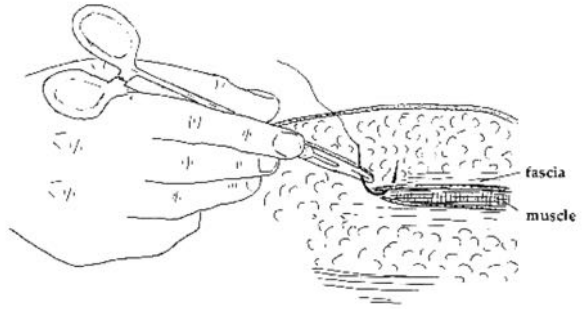

Fig. 8. Suture the rectus sheath.

27. Close the skin using two or maximum three mattress sutures.
28. Pinch the skin together with Allis forceps in the interval between the sutures so that each edge is exactly apposed to the other. Leave the Allis forceps on for about 10 minutes and then remove them. The edges will now stick to each other. This type of very simple repair saves time, reduces the incidence of keloids and gives the best scar.
29. Start fluids immediately and get the patient out of bed as soon as the anaesthetic has worn off. There is no need for post-operative starvation, and ileus after this method is rare. Early mobilization reduces the risk of deep vein thrombosis and shortens post-operative pain.
30. Remove the stitches on the 5th. post operative day. This early removal of stitches reduces the risk of infection and keloids. There is now no place in obstetrics for the use of a classical Cesarean section.

Difficulties

1. Previous Cesarean section. Even if a previous section was a midline lower abdominal incision or a Pfannenstiel incision the Misgav Ladach method is the best for a repeat section.
2. If there is scarring in the tissues down to the peritoneum use your fingers to free the scarring. More force may be necessary when separating the fascia.
3. If there are peritoneal adhesions try to free these using your fingers only, but sometimes cutting them will be necessary. Here it is even more important to keep away from the bladder. If these adhesions are so dense that the baby cannot be delivered through a lower segment uterine incision make a transverse incision through the upper segment.
4. If there is a Bandl's ring and the baby is above this ring make the uterine opening a transverse incision in the upper segment just above the ring.
5. If there is a Bandl's ring around the baby's neck it is best to try to get the baby out as in 4. but sometimes it will be necessary to make a vertical incision down from the transverse incision i.e. making a "T" incision. This does not heal as well and thus every further pregnancy will need a Cesarean section at delivery.
6. If there is a very thin lower segment this could tear during the delivery of the baby. Try to keep to the upper part of the lower uterine segment when making your transverse incision.
7. If there is placenta praevia go through the placenta when opening the lower segment and quickly deliver the baby to reduce the bleeding. Then proceed immediately to manual removal of placenta and, if necessary, squeezing the uterus between your palms to stop the bleeding.
8. If there is transverse lie use a transverse lower uterine incision. Do a breech extraction by putting your hand inside the uterus and grasping the baby's foot (and even better both feet) and

then pulling it through your uterine incision. If the baby's head is readily available sometimes the head can be delivered first.

9. If there is a transverse lie with an arm prolapse and the baby is alive there will be more danger of the lower segment tearing out towards the major vessels during delivery. It is safer to make a transverse incision through the upper segment of the uterus and deliver the baby by breech extraction bringing the baby's arm up prior to delivery of the head. If the baby is dead and there is no risk of uterine rupture a destructive procedure with sawing off the head and arm together is safer for the mother.

10. If the baby presents as a breech follow the same method as in 8. Do a breech extraction by putting your hand inside the uterus and grasping the baby's foot (and even better both feet) and then pulling it through your uterine incision.

11. If there are twins with head presentation deliver them as usual but if they present as breech or transverse lie, put your hand inside the uterus and grasp the feet and deliver them by breech extraction.

12. If the head is jammed in the pelvis you may need an assistant to push the head up in order to deliver it through the uterine incision.

13. If there is a prolapsed cord this method of Cesarean section is especially advantageous since the baby is out so quickly. Prior to starting the operation have the mother in a knee-elbow position with a nurse pushing the head up to keep the pressure off the cord.

14. If there is abruptio placentae with a live baby this method of Cesarean section is an advantage because of the rapid delivery of the baby and the rapid haemostasis under direct vision. If the baby is dead avoid Cesarean section if possible.

15. If her bladder opens, identify the hole carefully, hold its edges with Allis forceps, mobilize the surrounding tissues if necessary, and bring together the edges with continuous inverting sutures of fine chromic catgut or other absorbable suture material. Put in a second inverting layer to stop any leakage of urine.

16. If there is already evidence of intramniotic infection (prolonged rupture of membranes, prolonged difficult labour, fever or foul smelling liquor) start antibiotics immediately intravenously using whatever is suitable in your situation. Benzyl penicillin with an aminoglycoside such as gentamicin may be suitable, as may be chloramphenicol. If there is risk of traumatized anoxic tissue add metronidazole given intravenously or rectally. In this situation ignore the advice given above about not cleaning out liquid blood in the peritoneal cavity since this may contain septic material. Infected blood in the peritoneal cavity needs to be removed and so careful cleaning, even accepting some bowel dysfunction afterwards, is important. Any clots that remain can be an important nidus of infection.

17. If the lower segment tears as you deliver the baby it is likely to tear in the corner which will run down behind her bladder, often with heavy bleeding. Get your assistant to firmly compress the aorta with the thumb while you identify the edges of the incision and the tear. Mobilize her bladder further down if necessary. Grasp the edges with Armytage forceps. If you can get to the corner of the tear without endangering the ureter, suture the edges together with chromic catgut as in the method description above. * ***If the uterine vessels are damaged*** a cross stitch will be needed to stop the bleeding. * ***If it is impossible to stop the bleeding*** use the method of inserting a condom into the uterine cavity (as described above in the section on post-partum haemorrhage) connected with a rubber tube and inflating with 250 - 500 mls of normal saline (Fig.11).

* ***If even this fails*** go to a mass ligation of the uterine arteries (see section on post-partum haemorrhage Fig. 12)

This method description together with that of symphysiotomy should be combined with the use of the DVD containing 5 films of operations to improve maternal health care.These include symphysiotomy, the Misgav Ladach methods of Cesarean section and of Abdominal hysterectomy and two films about the repair of obstetrical fistulae. These have been produced under the auspices of the Department of Women's and Children's Health at Uppsala University, Sweden and available free from Teaching Aids at low cost; TALC, http://www.talcuk.org/index.htm or from Dr. Gunnar Holmgren, Department of Infectious Diseases, Ryhov County Hospital, SE-551 85 Jönköping, Sweden.

References for the Misgav Ladach method for cesarean section

1. Joel-Cohen S. Abdominal and vaginal hysterectomy. New techniques based on time and motion studies. London: William Heinemann Medical Books, 1972: 170.
2. Federici D, Lacelli B, Muggiasca A, Agarossi L, Cipolla L, Conti M. Cesarean section using the Misgav Ladach method. Int J Gynecol Obstet 1997; 57: 273-9
3. Stark M, Finkel AR. Comparison between the Joel-Cohen and Pfannenstiel incisions in cesarean section. European J Obstet Gynecol Reprod Biol. 1994; 53: 121-2
4. Stark M, Chavkin C, Kupfersztain P, Finkel AR. Evaluation of combinations of procedures in Cesarean section. Int J Gynecol Obstet. 1995; 48: 273-6
5. Guedj P, Eldor J, Stark M. Immediate postoperative oral hydration after Caesarean Section. Asia-Oceania J Obstet Gynaecol. 1991; 17: 125-9
6. Stark M. Technique of Caesarean section: the Misgav Ladach method. In: Popkin DR, Peddle LJ, editors Women's health today: perspectives on current research and clinical practice. Proc. XIV World Congress Gynecol Obstet: Montreal. New York and London: Parthenon, 1994: 81-85
7. Darj E. Nordström, M-L. The Misgav Ladach method for cesarean section compared to the Pfannenstiel method. Acta Obstet Gynecol Scand. 1999; 78: 37-41
8. Björklund K, Kimaro M, Urassa E, Lindmark G. Introduction of the Misgav ladach caesarean section at an African tertiary centre: a randomized controlled trial. Br J Obstet Gynaec. 2000; 107: 209-16
9. Wu Lianfang, Fan Ling, Zhai Guirong. Randomized controlled trial of operative techniques for Cesarean section. In Press.
10. Singh D, Prasad J, Abraham V, Minz S, George K, Abraham S, Holmgren G. Misgav-Ladach versus Pfannenstiel incision - A randomized controlled trial for LSCS in secondary health care in South India. In press.
11. Björklund K, Lindmark G, et al Randomized controlled trial of Misgav Ladach method in Kampala, Uganda. In press - early draft.
12. Li M, Zou L, Zhu J. Study on modification of the Misgav Ladach method for cesarean section. J Tongji Med Iniv. 2001; 21: 75-7
13. Ansaloni L, Brundisini R, Morino G, Kiura A. Prospective randomized comparative study of Misgav Ladach versus traditional cesarean section at Nazareth Hospital, Kenya. World J Surg. 2001; 25: 1164-72
14. Redlich A, Koppe I. The "gentle cesarean section" - an alternative to the classical way of section. A prospective comparison between the classical technique and the method of Misgav Ladach. Zentralbl Gynakol. 2001; 123: 638-43
15. Xavier P, Ayres-De-Campos D, Reynolds A, Guimaraes M, Costa-Santos C, Patricio B. Acta Obstet Gynecol Scand. 2005; 84: 878-82
16. King M, Bewes P, Cairns J, Thornton J. Primary Surgery Non-Trauma. 1990 Oxford. Oxford Medical Publications pp 608-9.
17. Irion O, Luzuy F, Béguin F. Nonclosure of the visceral and parietal peritoneum at caesarean section: a randomized controlled trial. Br J Obstet Gynaec. 1996; 103: 690-4
18. Hull DB, Varner MW. A randomized study of closure of the peritoneum at cesarean delivery. Obstet

Gynecol. 1991; 77: 818-20
19. Pietrantoni M, Parsons MT, O'Brien WF et al. Peritoneal closure or non-closure at cesarean. Obstet Gynecol. 1991; 77: 293-296
20. Mowat J. and Bonnar J. Abdominal Dehiscence after Caesarean section. Br Med J. 1971; 2: 256-7.
21. Greenall MJ, Evans M, Pollack AV. Mid-line or transverse laparotomy? A random controlled trial period. Br J Surg 1980; 67: 188-93
22. Adeloye A. (Editor). Davey's Companion to Surgery in Africa. 2nd ed. Edinburgh: Churchill Livingstone, 1987: 59-68
23. Jelsema RD, Wittingen JA, Vander Kolk KJ. Continuous nonlocking single-layer repair of the low transverse uterine incision. J Reprod Med. 1993; 38: 393-6
24. Hauth JC, Owen J, Davis RO. Transverse uterine incision closure: one layer versus two layers. Am J Obstet Gynecol. 1992; 167: 1108-1111
25. Tucker JM, Hauth JC, Hodgkins P. et al. Trial of labour after a one- or two-layer closure of a low transverse uterine incision. Am J Obstet Gynecol. 1993; 168: 545-6
26. Ellis H, Heddle R. Does the peritoneum need to be closed at laparotomy? Br J Surg. 1977; 64: 733-6
27. Ellis H. The aetiology of post-operative abdominal adhesions. Br J Surg 1962; 50: 10-16
28. Stark M. Adhesion-free Cesarean section. (Letter to Editor). World J Surg. 1993; 17: 419
29. Down RH, Whitehead R, Watts JM. Do surgical packs cause peritoneal adhesions? Aust N Z Surg. 1979; 49: 379-82
30. Larsen B, Davis B, Charles D. Critical assessment of antibacterial properties of human amniotic fluid. Gynecol Obstet Invest. 1984; 18: 100-4
31. Axemo P, Rwamushaija E, Pettersson M, Eriksson L, Bergström S. Amniotic fluid antibacterial activity and nutritional parameters in term Mozambican and Swedish pregnant women. Gynecol Obstet Invest. 1996; 42: 24-7
32. Sjöholm L. Holmgren G. Caesarian section The Misgav Ladach method. News on Health Care in Developing Countries. 1995; 9: 4-14
33. Holmgren G. Sjöholm L. The Misgav Ladach method of Caesarean section: evolved by Joel-Cohen and Michael Stark in Jerusalem. Trop Doct 1996; 26: 150-7
34. Holmgren G. Sjöholm L. Stark M. The Misgav Ladach method for cesarean section: method description. Acta Obstet Gynecol Scand. 1999; 78: 615-21
35. Hofmeyr GJ, Mathai M, Shah AN, Novikova N. Techniques for caesarean section. Cochrane Database of Systematic Reviews 2008;Issue 1. Art. No.: CD004662; DOI: 10.1002/14651858.CD004662.pub2.
36. M Mathai, GJ Hofmeyr. Abdominal surgical incisions for caesarean section. Cochrane Database of Systematic Reviews 2007;Issue 1. Art. No.: CD004453; DOI: 10.1002/14651858.CD004453.pub2.
37. http://apps.who.int/rhl/reviews/CD004662.pdf
38. Justus G. Hofmeyr, Natalia Novikova, Matthews Mathai, Archana Shah. Techniques for cesarean section. Am J Obstet Gynecol. 2009; 201: 431-44

Appendix 2. Maternal Health Programmes in Africa

All focus on reducing the Maternal Mortality and bringing relief for the severe morbidity of complicated deliveries are very worthy and deserve support and encouragement.

However this sector of health care has been the slowest to improve according to the Millenium Goals and it may mean that traditional ways of tackling the needs and assessing interventions may need to be refocussed in the light of vast experience of places where there has been success in bringing improvement and to learn from all the failures of programmes where the focus has been wrong.

In general there is need for thinking at different levels and all will need to come into play but some are more urgent than others.

1. There should not be too much focus on the training of TBAs. When there are no midwives in an area this would seem to be a possible solution. However apart from a few exceptions this measure has only a very limited effect on Maternal Mortality unfortunately. This training has a place but it should be subservient to other more urgent measures as shown below.

2. If it is possible try to arrange a study on the true maternal mortality rate in the district prior to launching this project. The two best methods of identifying matenal deaths are (a.) the use of "**verbal autopsy**, where key informants in each village relate how pregnant and delivering women in the village have died during the last generation, trying to assess the most likely cause of death. (b.) The use of the **sisterhood method** where all women in the village relate how their sisters who have died during pregnancy/delivery died and thereby to see what was the most likely cause of death.

3. There is great value in trying to coordinate this programme with others that are trying to improve female literacy, enhancing women's empowerment. Others are involved in getting people's movements to launch microcredit programmes and others even bring new thinking about reproductive health through community discussions and consensus formation.

4. Try to encourage the formation of people's movements with groups of pregnant women in the area forming "study circles." These together with a facilitator try to identify the main risks in pregnancy, delivery and neonatal period as well as possible solutions to these risks. See the example from Nepal shown below:

Costello et al and Nepal study of Neonatal deaths and MMR - Lancet
Summary Background Neonatal deaths in developing countries make the largest contribution to global mortality in children younger than 5 years. 90% of deliveries in the poorest quintile of households happen at home. We postulated that a community-based participatory intervention could significantly reduce neonatal mortality rates.
Methods We pair-matched 42 geopolitical clusters in Makwanpur district, Nepal, selected 12 pairs randomly, and randomly assigned one of each pair to intervention or control. In each intervention cluster (average population 7000), a female facilitator convened nine women's group meetings every month. The facilitator supported groups through an action-learning cycle in which they **identified local perinatal problems** and **formulated strategies to address them**. We monitored birth outcomes in a cohort of 28 931 women, of whom 8% joined the groups. The primary outcome was neonatal mortality rate. Other outcomes included stillbirths and maternal deaths, uptake of antenatal and delivery services, home care practices, infant morbidity, and health-care seeking. Analysis was by intention to treat. The study is registered as an International Standard Randomised Controlled Trial, number ISRCTN31137309.
Findings From 2001 to 2003, the **neonatal mortality rate was 26·2 per 1000** (76 deaths per 2899 livebirths) in **intervention clusters** compared with **36·9 per 1000** (119 deaths per 3226 livebirths) **in controls** (adjusted odds ratio 0·70 [95% CI 0·53–0·94]). Stillbirth rates were similar in both groups. The **maternal mortality ratio was 69 per 100000** (two deaths per 2899 livebirths) in **intervention clusters** compared with **341 per 100000** (11 deaths per 3226 livebirths) in **control clusters** (0·22

[0·05–0·90]). Women in intervention clusters were more likely to have antenatal care, institutional delivery, trained birth attendance, and hygienic care than were controls.

These preliminary impressive results are now being tested in several other settings and the first results from India were equally impressive but from Bangladesh less so. Bigger studies are underway.

What are the most important interventions to reduce maternal mortality?

The most urgent measures and even the cheapest to quickly bring down maternal mortality have been shown to be at the level of the district hospital recognizing that bleeding especially in the post-partum period is the commonest cause of mortality followed by pueperal sepsis and then, in some areas, eclampsia:

A. Improve the first referral level, that is the district hospital in order to be able to carry out the following **6 functions** in conjunction with introducing accurate assessment of the delivery using the ***partogram*** ("the most important improvement in delivery care during the last generation": John Lawson, the father of tropical obstetrics):

1 Operative functions: Symphysiotomy (in the 60% of obstructed labour where the partogram has shown that this is the best solution), Caesarean sections (using the Misgav Ladach method which is cheapest method with the lowest complications and the quickest recovery), evacuation of uterus, repair of ruptured uterus, laparotomy for peritonitis and ectopic pregnancy, repair of ruptured cervix and major vaginal tears.
2 Anaesthesia: safe anaesthesia during pregnancy and delivery (especially focussed on safe spinal anaesthesia)
3 Blood transfusions: blood grouping and Rh-typing of receiver and donor, cross-matching, HIV and hepatitis B and C screening, organization of blood donations and storage of blood.
4 Manual dexterity for: twin and breech deliveries, vacuum extractions, manual removal of placenta, external cephalic version with the focus on training midwives to do what previously was done by doctors.
5 Medical skills to deal with convulsions (in eclampsia), hypertension, severe infections, complications of septic abortions, fluid imbalance.
6 Family planning: the capacity for sterilization of both males and females and a wide range of suitable methods for fertility control.

The impact of these 6 measures shows itself in the cost per avoided maternal death, which is equivalent to US$5 000 .
This can be compared with the figure for each avoided maternal death when all the resources are put into improving only antenatal health care and training of TBAs where the cost would be US$20 000 per avoided death.

In Sri Lanka the most rapid improvement came with widespread measures to counteract and treat pueperal sepsis. This led to a major decline among sepsis deaths. Deaths from haemorrhage declined more slowly.
In China the campaign for clean deliveries resulted in a massive fall in sepsis-related deaths.

B In the longer perspective to improve women´s social situation by:

1. obligatory schooling for girls and better opportunities for further training of girls and women.

2. encourage women´s movements to take their own initiatives ("empowerment"). This includes improving their economic situation, the legal frame work, reform of land-ownership and the questions of inheritance, banning, after obtaining community consensus, all child brides to avoid pregnancy in young teenage girls. Even trying to get going anti-AIDS clubs in schools to bring a new focus on teenagers thinking about sex and sexuality with encouragment of peer support for delay in age of sex debut..

3. involve women in all development projects from start to finish.

C Improve transport facilities for referral of patients by:

1. negotiations with all in the district who have any form of transport and the offer of reimbursement at referrals from health centres of acute delivery complications. Such decisions have to be approved by the district health team or the equivalent.

2. where no roads exist for vehicles, assess the possibility of transport using a two wheeled wheel-chair or trolley that is pulled behind a bicycle, as is used in Vietnam.

3. encourage all the pregnant women to negotiate an agreement with some neighbour who has transport, about possible evacuation in the event of a delivery complication.

D Build maternity waiting shelter at the district hospital where all primipara and high risk patients can wait together with a family member who helps them with food etc. They could stay there in the last weeks of the pregnancy. During this period they would be given good antenatal care and even health education about family planning, breastfeeding and weaning together with their family member.
This measure had a dramatic effect in reducing maternal mortality in Cuba.

E Further training of:

1. Traditional birth attendants, especially to improve hygiene at delivery (clean hands, clean perineum, clean cord care), to initiate early emergency measures to stop post-partum bleeding by uterine massage, putting the newborn to the breast, and safe ways of speeding up delivery of the placenta. Then adding the use of rectal tablets of rectal misoprostol when bleeding continues. Try to train the TBAs to make the right diagnosis at complications with the decision which patient to refer.

2. Midwives: In many situations the most important part of further training of midwives is to improve the attitudes towards the patients so as to win their confidence and establish empathy. Personal, hands on, support and encouragement during labour is one of the key elements in ensuring a quick and successful delivery

In Sweden in the second half of the 19th. century, training and rural assignment of qualified midwives led to a marked reduction in maternal mortality.
Midwifes should be trained to improve their manual skills to successfully manage the common complications and even to use vacuum extractors for which most of them have not been trained.

In some settings **Assistant Medical Officers are trained to carry out Cesarean sections** and other operations. Where Assistant Medical Officers are not available, training midwives to assess for Obstructed labour using the partogram and where appropriate to carry out symphysiotomies and even Caesarean section is called for.
Basic training of midwifes has to be reviewed including fertility control, counselling and monitoring activities.

3. Doctors to be able to carry out the 6 functions under A including normal operations such as evacuations of uterus, Caesarean sections, possibly symphysiotomy and even more importantly when these should and should not be used. Ideally they should be able to do a laparotomy for ectopic or a ruptured uterus.

F To introduce monitoring of all deliveries at the hospital and health centres using the **partogram** including the so-called "alert-line" and "action-line".
The partogram has been called the most important advance in obstetrics over the last 20 years. Using this, one can decide at an early stage which patients are going to need more advanced help in the delivery and thereby start interventions to reduce the number of patients who would otherwise have gone on to require symphysiotomy or Caesarean section. Preventing prolonged labour will reduce deaths from obstructed labour, sepsis, and haemorrhage.

G Work out for each level of care a schedule of treatment in order to deal with the 5 major causes of maternal mortality,especially post-partum bleeding (introduce and train delivery staff in using the condom method of stopping severe PPH - see above), pueperal sepsis, eclampsia and severe pregnancy induced hypertension and obstructed labour. All staff to be trained in implementing these schedules. Use the ideas detailed above.

H Introduce Vitamin-A supplementation during pregnancy where there is evidence of Vit-A deficiency (check for levels of night blindness). Weekly supplementation with Vitamin-A during pregnancy in one study in Nepal reduced the Maternal Mortality Rate by 40%. This study is now being repeated on a large scale in Indonesia.

I Improved attitude of staff to give better support and encouragement. Better continuity of staff supervision of labour and removal of administrative chores from the midwives involved in supervision of labour.

J Improved ante-natal services. This has less impact than was previously thought but is still important to get a contact with pregnant women. Try to get malaria presumptive treatments where malaria is a big problem. Try to reduce the risk of severe anaemia at the time of delivery but give iron supplementation once or maximum twice a week instead of daily as this improves compliance, by reducing side-effects without reducing the benefit. Try to test for syphilis as treating this has a considerable impact on reducing neonatal morbidity and mortality.