ABC of preterm birth

Obstetric issues in preterm birth

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This is the third in a series of 12 articles

Predicting and preventing preterm labour and choosing the safest method of delivery are important challenges in reducing the number of preterm births and improving outcomes for mother and baby. This article covers the predictive tests, methods of prevention, maternal and fetal indications for preterm birth, and various approaches to delivery.

Prediction

Most preterm deliveries follow spontaneous onset of preterm labour or preterm prelabour rupture of the amniotic membranes (pPROM). Much work has been done (with limited success) to find diagnostic tests that predict accurately if a woman who is at risk of preterm delivery will go on to deliver preterm. For these women, who may have a history of preterm birth or clinical signs of preterm labour, such tests would allow early and targeted use of antenatal interventions. These interventions, especially antenatal corticosteroids, improve neonatal and long term outcomes for preterm infants.

The most common clinical tests used to determine the risk of preterm labour are transvaginal sonography (to measure the length of the endocervix) and the cervicovaginal fetal fibronectin test. These tests have high negative predictive values—that is, if results are negative then the women probably will not progress to preterm delivery. Although there does not seem to be a role for routine use of the fibronectin test or transvaginal sonography to screen women for preterm birth, women thought to be at high risk can be reassured by negative results. This may help women to avoid unnecessary interventions such as antenatal transfer to a distant perinatal unit.

Prevention

Current medical approaches to preventing preterm labour include the use of tocolytic drugs, antibiotic treatment, and cervical cerclage.

Tocolytic drugs

Tocolytic drugs can delay the progress of preterm labour in the short term but maternal side effects include hypotension, tachycardia, and fluid overload. No evidence exists to show that tocolysis improves perinatal outcomes; however, the delay in delivery may allow enough time to give the woman antenatal steroids or to arrange her transfer to a perinatal centre with neonatal intensive care facilities if needed.

Antibiotic treatment

The recent ORACLE II trial concluded that antibiotics should not be prescribed routinely for women in preterm labour who have intact fetal membranes and no evidence of clinical infection.

A systematic review of randomised controlled trials (including the large ORACLE I trial) indicated that antibiotics for preterm prelabour membrane rupture prolong pregnancy and reduce the incidence of neonatal infection. Antibiotic prophylaxis, however, is not associated with a substantial

Length of the endocervix can be measured using transvaginal sonography

Antenatal corticosteroids

- Reduce perinatal mortality, respiratory distress syndrome, and intraventricular haemorrhage
- Have maximum benefit when delivery occurs 24 hours to seven days after treatment
- When fetus remains undelivered repeated courses have uncertain benefit

Cervicovaginal fetal fibronectin test

Fibronectin is:

- Glycoprotein in amniotic fluid or placental tissue
- Released because of damage to membrane of placenta
- Measured from cervical or vaginal swabs

Tocolytic drugs

- β_2 agonists
- Calcium channel blockers
- Prostaglandin synthetase inhibitors
- Magnesium sulphate
- Oxytocin antagonists

When fetal membranes are intact, with no signs of clinical infection, antibiotics do not seem to prolong pregnancy or improve neonatal health

reduction in perinatal mortality. Long term follow up data from ORACLE I will show if antibiotic prophylaxis affects neurodevelopmental impairment in preterm infants born after prelabour membrane rupture.

Cervical cerclage

Reports conflict over the value of prophylactic, therapeutic, or rescue cervical cerclage for women at risk of preterm labour because of cervical incompetence. A systematic review indicates that this invasive procedure should be considered only for women at very high risk of miscarriage in the second trimester or extremely preterm labour. Identifying these women is not easy. Further large randomised controlled trials are needed.

Screening for bacterial vaginosis

Bacterial vaginosis is overgrowth of anaerobic bacteria in the vagina. It can predispose women to preterm delivery. Current evidence does not support screening and treating asymptomatic pregnant women for bacterial vaginosis. For women with a history of preterm birth, detecting and treating bacterial vaginosis early in pregnancy may prevent a proportion of these women having a further preterm birth.

Maternal and fetal indications

About 15% to 25% of preterm births are caused by obstetric or medical complications of pregnancy. Obstetric complications such as pre-eclampsia may result in maternal morbidity or mortality and perinatal death if the infant is not delivered. Maternal risks of pre-eclampsia include eclamptic seizures, cerebral haemorrhage, HELLP (haemolysis, elevated liver enzymes, low platelets) syndrome, and maternal death.

Women with diabetes, renal disease, autoimmune disease, and congenital heart disease need intensive surveillance. Preterm delivery may be indicated because of deterioration of maternal or fetal health, and obstetric complications may occur.

When planning the timing and mode of delivery of preterm infants in these circumstances, it is necessary to weigh the risks to the mother and fetus of continuing the pregnancy against the risks of preterm birth and delivery. With the potentially compromised very preterm fetus, the aim is to allow the pregnancy to continue to a point before damage occurs without taking unnecessary risks that may harm the mother.

Several tests of fetal wellbeing are available. In high risk pregnancies, fetal growth is usually monitored using serial ultrasonography to measure circumference of the head and abdominal girth. A fall in the growth velocity of the abdominal circumference indicates intrauterine growth restriction.

Abdominal circumference shown on ultrasonography is used to assess fetal growth

Cervical cerclage is circumferential suturing around the cervical os

Effect of use of antibiotic for bacterial vaginosis on preterm birth compared with placebo. Adapted from Macdonald H et al. *Cochrane Database Syst Rev* 2003;2:CD000262

Many factors must be taken into account when deciding the timing and type of delivery

Growth charts are used to plot the circumference of the head and abdomen over time (menstrual weeks). This chart shows the progress of a fetus with intrauterine growth restriction

Cardiotocography and fetal biophysical profiling are two tools often used to determine the physiological status of the potentially compromised fetus. Unfortunately these tools have no benefit in predicting and preventing poor outcomes in high risk pregnancies. Some evidence shows, however, that computerised cardiotocography is more accurate in predicting poor outcome than subjective clinical assessment alone. The biophysical profile takes into account the tone, movement, breathing, heart rate pattern of the fetus, and liquor volume.

Doppler

Doppler measurement of fetoplacental blood velocity may be a more useful test of fetal wellbeing than cardiotocography or biophysical profiling. Umbilical arterial blood flow becomes abnormal when there is placental insufficiency—for example, secondary to pre-eclampsia. A recent systematic review of randomised controlled trials did not indicate that Doppler measurement of fetoplacental blood velocity is associated with a substantial reduction in perinatal mortality. Additionally, there is uncertainty over the ideal frequency of examination and the optimum threshold for intervention. Umbilical artery Doppler ultrasonography to detect fetal compromise is part of routine obstetric practice for high risk pregnancies in many countries, so there may not be further randomised controlled trials in high risk populations.

Recent studies have investigated the use of middle cerebral artery and ductus venosus Doppler waveforms in evaluating cardiovascular adaptations to placental insufficiency. Results are promising, although the effect on important outcomes when used as part of clinical practice has yet to be evaluated.

Preventing pre-eclampsia

Women who have had pre-eclampsia can be given low doses of aspirin in a future pregnancy. In a systematic review of randomised trials that involved over 30 000 women, prophylactic antiplatelet treatment that was started in the first trimester reduced the risk of recurrent pre-eclampsia and stillbirth and neonatal death by about 15%.

Calcium supplements in the diet can reduce the risk of hypertension and pre-eclampsia associated with pregnancy for women at high risk, and in communities with a low intake of dietary calcium.

Mode of delivery

Vaginal delivery of the preterm infant is associated with lower maternal morbidity than delivery by caesarean section. It is important, however, to consider the following points:

- Obstetric history
- Likely interval between induction and delivery in the context of deterioration of maternal health
- Probability of achieving a vaginal delivery versus risk of emergency caesarean section
- Presentation and prelabour condition of the fetus.

Breech delivery

In developed countries with good antenatal services most term breech pregnancies are managed by elective caesarean section, as are many multiple pregnancies. The increase in caesarean sections has caused a loss of obstetric skill in vaginal delivery of breech and multiple pregnancies. Most planned preterm breech and twin pregnancies are delivered by elective caesarean section even though there is no clear evidence of benefit.

Monitoring the fetal heart rate can help determine the physiological wellbeing of the fetus. This cardiotocogram shows fetal tachycardia with reduced variability and decelerations

Doppler measurement of umbilical arterial flow is used to test fetal wellbeing. This recording shows reversed end diastolic velocity waveform

Doppler measurement of middle cerebral arterial flow. Abnormal waveforms can show cardiovascular adaptations to placental insufficiency

Induction of labour is most likely to be successful in a woman with a favourable cervix (as assessed by the Bishop score) who has had no caesarean sections and has a history of vaginal delivery

Extremely preterm birth

When planning preterm delivery before 26 weeks' gestation, it is important to consider the overall reproductive outcome for the mother. The choice of the most appropriate mode of delivery for extremely preterm infants is affected by the difficulty in carrying out a lower segment caesarean section at such early gestations and the potential for substantial fetal trauma. Classic (vertical incision) caesarean section presents major risks for the mother. After classic caesarean section, elective caesarean section for subsequent pregnancies is mandatory because there is an increased risk of uterine rupture and perinatal death. These issues are difficult for prospective parents and any discussion is limited by a lack of robust evidence to guide practice.

Conclusion

Predicting and preventing preterm labour remain elusive goals. Greater numbers of preterm deliveries are planned because of early recognition of obstetric complications, an increase in women who plan pregnancies in the context of medical disorders, and a lowering in the threshold for viability. The aim in these circumstances is to achieve a timely delivery by the safest route possible. Advances in neonatal care have improved perinatal outcome considerably, but the falling threshold of viability has created a new set of dilemmas for parents and carers.

The photograph of transvaginal sonography measuring cervical length is courtesy of the Fetal Medicine Foundation, London, and the remaining images are courtesy of Professor Phillipa Kyle.

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Further reading

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Competing interests: DJM has provided expert opinion on preterm birth in medicolegal cases. For WMCG's competing interests see first article in the series.

A memorable patient

A forlorn hope

Saturday nights in accident and emergency are busy, and this particular one was to be no exception, but in a way that I had not anticipated.

At 2 am the "blue call" telephone went off. A young man under the influence of alcohol had been involved in a road traffic crash. The arrival of the ambulances was heralded initially by sirens and then the warm, low pitched growl of their engines. The doors opened, and the first thing to come out, carried by a paramedic, was an ice filled plastic bag containing a whole arm from the axilla down. It transpired that the victim had had his arm hanging out of the window while driving. The subsequent crash had resulted in a complete, traumatic amputation.

Miraculously the stump was not bleeding, and throughout resuscitation the patient was asking me if his arm could be reattached. I answered that I did not know but that he would be transferred to a nearby plastic surgery unit where they would be able to tell him, but I hinted at the possibility of a limb saving outcome.

At the time, I think I genuinely did believe there was a chance his arm might be saved, but, considering it afterwards, how could I not have known that it was lost? Analysing my answers on that night, I think I deluded myself into giving a non-committal response rather than coming out with the truth. In the circumstances, I do not think what I did was wrong, but reflecting on that young man with his terrible injury reminds me that much of medicine is about breaking bad news—in some cases really bad news—and it's hard.

When hope is minimal or gone, when there is nothing else to offer a patient medically and we are stripped of our healing powers, we can only do what any other human can—offer sympathy and a sense of concern. But to admit defeat, to say goodbye to hope and tell a patient, "I'm sorry but there's nothing else we can do," seems to go against our training and nature. Not all answers can be "sugar coated," but they still need to be given, albeit in a sensitive and supportive manner.

No training session on communications skills or breaking bad news could have prepared me for that night. Seeing a fellow human in extremis and being unable to answer his question left an indelible impression on me. Sometimes the truth is hard to bear for patients and doctors alike, but our inability to face up to it should not stop our patients from having the opportunity to do so.

Jay Kuruvatti *senior house officer, Maudsley Hospital, London*

We welcome articles up to 600 words on topics such as *A memorable patient*, *A paper that changed my practice*, *My most unfortunate mistake*, or any other piece conveying instruction, pathos, or humour. Please submit the article on <http://submit.bmj.com> Permission is needed from the patient or a relative if an identifiable patient is referred to. We also welcome contributions for "Endpieces," consisting of quotations of up to 80 words (but most are considerably shorter) from any source, ancient or modern, which have appealed to the reader.