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FETAL GROWTH DISORDERS

The Importance of Detecting Fetal Growth Disorders

The detection of fetal growth disorders, i.e. growth retardation and excessive fetal growth, is an important component of antenatal care. After prematurity and congenital malformations, the next most common cause of perinatal wastage is stillbirth. A substantial proportion of stillborn infants (up to 30%) are small-for-dates. Fetal overgrowth, when it is associated with maternal diabetes mellitus, is also associated with a risk of stillbirth. Other large-for-dates infants require special perinatal care because there is an increased risk of dystocia in labour and the neonate may be at risk of such metabolic sequelae as hypoglycaemia and hypocalcaemia.

However, it is worth remembering that not all babies who are at risk of death in utero exhibit a disorder of fetal growth. One of the more challenging aspects of obstetrics for the future is to detect those fetuses which are not achieving their genetic growth potential but remain within the wide range of normal with respect to size at birth.

Causes of Fetal Growth Disorders

Wrong Dates

When assessing whether a fetus is appropriate in size, it is a prerequisite that the gestational age is known with reasonable certainty. When a problem of fetal growth is detected, it is worthwhile first checking that a simple miscalculation of gestation has not occurred. In more taxing cases, every effort must be made to accurately date the pregnancy by reference to the last menstrual period, date of confirmation of pregnancy, early clinical assessments of uterine size etc. Of these the most important is the first estimate of gestation by ultrasound and contact with the service which performed this study can be rewarding.

Physiological Causes

It is advisable to then consider those physiological factors which are important in determining fetal size. The most important of these is maternal size (including height, weight and the mother's own birth weight), the patient's parity, the birth weights of her previous infants, and her ethnic origin. The mean birthweight in our community (3.6 kg) is relevant only to Caucasians. This is almost 1 kg heavier than that occurring in an Indian population and 1 kg less than that occurring amongst Maoris or Pacific Islanders.

Twins, polyhydramnios and ovarian or uterine tumours should be considered when the uterus is large-for-dates. These diagnoses can be readily confirmed by ultrasound.

Growth Retardation

The principal pathological causes of fetal growth retardation are listed in Table 1. For purposes of classification and prognosis it is useful to think of constraints of growth which occur intrinsically (within the fetus) or extrinsically (from the uterus and placenta or from more distant maternal disease or habits).

Intrinsic causes of growth retardation are mostly those of congenital malformations (particularly chromosomal disorders) and chronic infections. Uterine and placental causes of growth retardation usually relate to problems of utero placental blood flow. Into this should probably be included most of the "idiopathic" group, since studies have shown that they have similar disorders of the spiral arteries and placental bed vessels as that which occurs with pre-eclampsia.

It is the extrinsic group which are at greatest risk of chronic hypoxia and for which our tests of fetal wellbeing have been devised. Poor maternal nutrition, in the form of reduced energy intake, is not a common cause of fetal growth retardation in our community but it may be a factor when there is continuing hyperemesis of pregnancy, maternal viral infections which limit maternal food intake, or other pathological situations such as anorexia nervosa. A careful dietary history is important in those women thought to be at risk. Maternal smoking is an important factor which limits fetal growth by an average of 150-300 g at birth and it may be a potent confounding factor when other maternal disease, such as pre-eclampsia, is present.

Table 1. Causes of fetal growth disorder

Physiological Factors

Race		
Maternal Size	-	ask about maternal birthweight
Family	-	consider previous birthweights
Paternal Size	-	influence debatable
Altitude	-	important only above 1800m

Pathological Conditions

Intrinsic to the Fetus

Congenital Anomalies	5-15%
Chromosome Disorders	2%
Infections	
- Toxoplasmosis	i.e. "TORCH"
- Other viruses	altogether
- Rubella	about 3%
- Cytomegalovirus	
- Herpes	

Uterine and Placental Factors

Uterine malformations
Hypertensive disorders of pregnancy including pre-eclampsia
Recurrent antepartum haemorrhage
Multiple pregnancy
Idiopathic group - up to 30%

Other Maternal Factors

Drug abuse	-	including tobacco and alcohol
Prescribed medication	-	e.g. corticosteroids
Chronic diseases	-	e.g. cyanotic heart disease

Malnutrition
Low socio-economic class
Stress and vigorous work or exercise

Chronic alcohol ingestion is an important cause of growth retardation which may be overlooked unless one is meticulous in history taking and a high index of suspicion is maintained.

Studies have suggested that the fetal growth retardation associated with multiple pregnancy is not physiological but due to competition for a limited uterine blood flow and placental exchange. The implications of growth retardation in multiple pregnancy is therefore the same as that which occurs in singleton pregnancies.

"Placental insufficiency", a favoured term of the 50's and 60's, fell into disrepute when it was revealed that the placenta itself has considerable reserves. Up to 50% of its mass can be lost before there is any observable effect on fetal growth. However, since the most important group of pathological conditions involves problems of uterine

and placental blood flow, in a practical sense, it is as well for us to focus on this area in terms of fetal assessment and management.

Fetal Overgrowth

The most important cause of a fetus which is large-for-dates is unrecognised or uncontrolled maternal diabetes mellitus. In actual fact, only a small proportion of those infants weighing more than the 90th centile are the infants of diabetic mothers. A glucose tolerance test, although frequently performed in this group, detects few mothers with a true problem of glucose intolerance.

Physiological causes are probably responsible for most other fetuses which are large-for-dates although there may be certain endocrine abnormalities, intrinsic to the fetus, which can be responsible. Maternal obesity is a significant risk factor for fetal overgrowth.

Detection of Fetal Growth Disorders

It is a well-accepted maxim that only about 40% of babies which are born small-for-dates are detected in utero by the usual clinical means. There is a need to improve this figure to 80 or 90% if there is to be any substantial impact on the stillbirth rate. Traditional antenatal care has visits spaced at 4 week intervals until 28 weeks and thereafter 2-weekly. Such timing means that fetal growth failure from 24 weeks is not recognised for at least four weeks. This needs rethinking in the light of a need for the early detection and salvage of the occasional fetus who runs into trouble during this period.

Some antenatal services now include an evaluation of uterine blood flow by Doppler before 20 weeks of pregnancy and claim high sensitivity in the prediction of intra uterine growth retardation associated with pre eclampsia.

The detection of intrauterine growth retardation begins with a careful history and a high index of suspicion when the factors listed in Table 2 are elicited. Serial plotting of the symphysis fundal height is a useful screening test according to some observers but not everyone agrees. In some studies, it has been responsible for detecting 80% of small-for-dates infants with 92% specificity. A number of normal charts have been published including one on a local population (2). One simple rule of thumb is that between 20 and 35 weeks gestation the 50th centile in centimetres is equal to the number of weeks of amenorrhoea. Moreover the 10th and 90th centile is approximately 3 cm above or below this figure at all gestations through to 36 weeks. It is important to note that this relationship is not valid between 35 and 40 weeks, and when in doubt, it is best to refer to appropriate charts.

Several studies have documented that serial plotting of symphysis fundal height is of greater value than cross sectional data. This is logical when it is recognised that growth is dynamic and poorly reflected by single measurements in time.

Table 2. Additional factors which should alert to the possibility of IUGR

Low maternal weight or ponderal index at the start of pregnancy
Poor maternal weight gain
Maternal hypoglycaemia
Past history of small-for-dates infants or pregnancy loss

In practice, measurements of uterine size fail to detect about 30% of problems of fetal growth. It is therefore appropriate that, when any of the factors listed in Tables 1 and 2 are present, consideration be given to a more precise method of fetal growth assessment. This means ultrasonic examinations of the pregnancy. In some obstetric practices, scanning is routinely performed at 34-36 weeks gestation with the aim of detecting problems of fetal growth. However, controlled trials of this in an unselected population of pregnant women have not proven it to be of value and selective screening is recommended.

Ultrasound

Ultrasound has opened a further dimension to the assessment of fetal growth. It may be of value in both differential diagnosis and prognosis. It is customary now to measure both biparietal diameter and head circumference (to take into account differences in size arising from differences in head shape), femur length and abdominal

circumference. Of these, the abdominal circumference alone is the best predictor of fetal weight since it is largely a reflection of fetal liver size which in turn reflects general nutrition. Fetuses which are running into problems of nutrient supply or progressive hypoxia are likely to have head sparing growth retardation, i.e. there is maintenance of head size (and sometimes bone length) at the expense of fetal weight. This is sometimes expressed as a ratio of the head to abdomen circumference. Symmetrical growth retardation, on the other hand, arises when there is a more generalised or earlier disturbance of fetal growth such as occurs with fetal anomaly or intrauterine infection.

Ultrasound is probably the single most important investigation which can be performed in the presence of suspected IUGR since other important parameters of fetal wellbeing can be simultaneously assessed, i.e. amniotic fluid volume, the biophysical profile and umbilical Doppler flow. Sometimes a significant congenital malformation will be detected. A single ultrasound study should not be over interpreted, and a repeat examination or serial examinations may be necessary. If such is required then there is little point in repeating the ultrasound at intervals of less than two weeks.

Other Tests

It is generally accepted that antenatal cardiotocography is a poor screening test for problems of fetal growth although it has an important part in the management of confirmed IUGR. Tests such as serum unconjugated oestriol or human placental lactogen have been abandoned in modern obstetrics although data suggests that they have a role in screening for IUGR.

Management of Fetal Growth Disorder

The detection of a significant fetal growth disorder is best dealt with by referral to a specialist obstetric unit. The task is there to perform tests to determine aetiology (if possible), institute a limited range of therapeutic options, i.e. essentially bed rest and observation, and most importantly to develop a programme of monitoring which is necessary to predict the need for and timing of elective delivery.

It is important that babies with significant intrauterine growth retardation should be delivered in a Level 3 unit since some have a need for ventilation support because of persisting pulmonary hypertension, meconium aspiration or pulmonary haemorrhage. Hypothermia, polycythemia, hypoglycaemia and hypocalcemia are also more common with dysmature infants.

Prognosis

Fetuses with third trimester, asymmetrical growth retardation due to utero placental insufficiency commonly catch up growth by late infancy or early childhood. This is less likely in symmetrically growth retarded babies with an intrinsic cause of growth failure, or those with prolonged or severe intrauterine asphyxia. The most important adverse influences on neuro-developmental outcome are malformations (especially those with chromosome abnormalities or dysmorphic syndromes), low gestational age and any perinatal complications. After infancy, socio-economic status and educational stimulation play an increasing part in determining the intellectual outcome. As a group, growth retarded babies who were born at term, have only a slightly increased risk of such major disabilities as cerebral palsy and mental retardation. Between 10-35% of them, however, have minimal cerebral dysfunction in the form of problems with speech and language, attention deficits, learning problems and minor neurological abnormalities.

Intrauterine growth retardation is also recognised as a cause of chronic diseases of adult life including hypertension and increased risk of diabetes mellitus.

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