CHECKING FOR FETAL WELLBEING—I

Geoffrey Chamberlain

The great reduction in maternal mortality and morbidity in the past 20 years allows more attention to be concentrated on the fetus during antenatal care. Perinatal mortality has been reduced, but still in England and Wales out of 100 babies born, one will die around the time of birth, two have an abnormality, and six have a birth weight under 2500 g. With smaller family sizes in the Western world, parents expect a perfect result. General practitioners and obstetricians are performing more thorough checks to try to pick up fetuses who are likely to be at risk. These investigations do not replace clinical examination but provide the fine tuning of assessment. The mother still needs, however, to see someone who can talk to her and discuss the new tests with her.

Some groups of women are at high risk because of their medicosocial background. The extremes of maternal age (under 20 and over 40), high parity (over four pregnancies), low socioeconomic class (Office of Population Censuses and Surveys classes IV and V), and some racial groups (Pakistan born women) seem to confer a higher actuarial risk on the babies born to such women. Consequently these women deserve extra antenatal surveillance to detect a fetus with variations from normal. Others show poor growth of the fetus in the latter days of pregnancy or develop raised blood pressure during pregnancy, two manifestations of a poor flow to the placental bed. Such fetuses have a poor nutritional reserve—a decreased blood flow to the placental bed reduces the amounts of nutrients in pregnancy and oxygen in labour. A series of tests have been developed; some of these are screening tests applied to the total antenatal population or to a subset of it considered to be at higher risk. Other tests are diagnostic and specifically used for women with babies thought to be clinically compromised.

Tests in early pregnancy (up to 13 weeks)

Ultrasonography—The earliest in pregnancy that the embryo may be visualised by abdominal ultrasonography is six to seven weeks; it may be shown a little earlier with a vaginal probe. At six weeks the embryonic sac can be seen but embryonic tissue cannot be confidently visualised, even with machines of high resolution and skilled ultrasonographers. By eight weeks most ultrasound machines should be able to show the embryo; by seven weeks a fetal heart pulse can often be seen.

(a) The embryonic sac can be seen at six weeks of gestation in decidua. As yet no fetal parts can be identified.

(b) The same sac two weeks later. Fetal parts can easily be seen between the arrows. The pulsation of the fetal heart may also be seen at this time.
Hormone tests are currently being developed that may be helpful in very early pregnancy to detect women who are likely to miscarry early. They mostly measure proteins derived from the placenta—for example, human chorionic gonadotrophin and Schwangerschaftsprotein 1. Several other proteins are measurable, but these two have been most researched. Oestrogen and progesterone tests are too non-specific to be of prognostic value so early in gestation.

Chorionic villus sampling is at present mainly used to detect chromosomal abnormalities and will be considered in a future article on the detection and management of congenital abnormalities.

Tests in mid-pregnancy (14-28 weeks)

Ultrasoundography has become a more sophisticated tool in the past 15 years, so that by 20 weeks of pregnancy the fetus can be visualised precisely. Two distinct sets of measurements are taken of the fetus to assess growth and detect malformations. The detection of malformations is the subject of a future article.

Growth may be determined by assessment of a series of measurements of the individual fetus at different times in pregnancy. These may then be compared with a background population to see whether the fetus is growing at the same rate as a statistically comparable group of its peers. Obviously the growth chart should relate to a population from which the fetus comes and not be taken from another population mix, although growth charts generated by ultrasonography are stable for many races except Asians.

Crown-rump length—From seven to 12 weeks the length of the embryo's body can be measured precisely from the crown of the head to the tip of the rump. This measurement is helpful in dating the maturity of an embryo or early fetus, but after 12 weeks it becomes less reliable because the fetus flexes and extends to a greater degree.

Biparietal diameter — The distance between the two parietal eminences of the skull gives a precise measurement of fetal head size. From about 16 weeks the range of variation in a normal population widens so that after about 28 weeks this measurement is less useful. Earlier biparietal measurements are extremely helpful in dating the pregnancy with more precision even than using the date of the last menstrual period when the woman is certain of her dates. Currently, this is probably the most commonly used technique of ultrasound fetal monitoring in the Western world.

Abdominal circumference—Measurement of the fetal waist at the level of the umbilical vein provides a good assessment of the size of the fetal liver. Poor fetal nutrition prevents adequate growth of the liver following the failure to lay down glycogen. Serial measurements of abdominal circumference (or area) give good warning of placental insufficiency. A fetus who is growing well is unlikely to die except from an acute event.
Late in pregnancy fetal growth can be detected by examining the fetal abdomen, and the circumference can be marked out (by a series of dots).

Femur length can be readily measured from about 12 until 40 weeks. It allows a check on the somatic growth of the fetus. Impaired femur growth follows skeletal dysplasia.

**Amniotic fluid volume**—The estimation of amniotic fluid volume is a measure of fetal metabolism. Volume is assessed by measuring the height of the largest vertical column of fluid detected by ultrasonography. A column less than 2 cm near term indicates poor production of amniotic fluid (oligohydramnios).

All these five measurements have different uses at different times of pregnancy.

Measurements of the biparietal diameter and femur should be used for dating gestational age. Growth is best assessed by serial circumference measurements of the fetal head and abdomen. In late pregnancy fetal weight is estimated by using all variables. Assessment of amniotic fluid is an attempt to study dynamic changes as it reflects fetal urine production; this is decreased in placental underperfusion.

The figure showing concentrations of human chorionic gonadotrophin and Schwangerschaftsprotein 1 is reproduced by permission of Blackwell Scientific Publications from Westergaard JG, Teisner B, Sinosich MJ, Madsen LT, Grudzinskas JG, *British Journal of Obstetrics and Gynaecology* 1985;92:77-83. The figure showing the relation between amniotic fluid volume and perinatal mortality is reproduced by permission of the W B Saunders Company from *Maternal Fetal Medicine* edited by R Creasy and R Resnick.

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**MATERIA NON MEDICA**

**Thrill of recognition**

My first reaction on looking out of the bathroom window last week was “Why has that blackbird, bobbing up and down on its legs like a manic debutante curtsying at speed, got a white bib?”

We all have that experience of not at first believing what we see or hear. Doubting Thomas had to feel as well as see before he leapt into belief. Why were the breath sounds inaudible on one side in that young man who was so alarmed by a funny pain in his chest? Must be something wrong with the stethoscope. Of course.

Only a week previously we had been enjoying a course on bird recognition at the Kingcombe Centre in Dorset, attended this year by five blind people and one partially sighted among others. There was A with deep eye sockets from removal of retinoblastoma in early life, and now in his 20s, who has a fantastic ability to pick out individual species’ songs, contact calls, and warning calls, and to remember all the species he has heard during one day. He regularly added up about 50 species during our week at Kingcombe. The certainty with which he distinguished the richer warbling of the blackcap from the higher pitched and energetic liquid notes of the garden warbler and the trailing off of the willow warbler brought back the sort of admiration one had as a student watching the apparently effortless diagnostic skills of, say, a neurologist of the calibre of Dr Elkington of St Thomas’s.

Now the cacophony of birdsong up the lane near here can be heard with an entirely new awareness. Yes, that is a garden warbler; and no doubt at all about the easy to recognise willow warbler—if only that strident wren wasn’t drowning the lot. The multitudes of chaffinches, robins, and chiffchaffs do tend to dominate. Then a rarer bird pipes up to give one the thrill of recognition.

On the course the experts saw or heard 109 species, but failed to find a dipper. But a dipper it was, bobbing up and down so obligingly by the stream in our garden last week. How marvellous. —TONY CHASE, Corcombe, Dorset