initial threshold may have anticipated perception. These findings agree with those of Fagius and Wahren, who concluded that the consistency of readings at a given site improves progressively with an increasing number of determinations (up to 10 in their study).²

We agree entirely with Dr Pearce that biothesiometry should not be used in isolation to screen for neuropathy. We feel, however, that its use in monitoring change must be cautious in view of the extremely wide day to day variability at a given site which has been convincingly shown by the careful studies of Fagius and Wahren.² These authors have calculated from their confidence intervals that only changes of the order of 50% from the initial value are likely to be significant. This margin of error is several times larger than the changes reported in many longitudinal studies on the natural course or response to treatment of diabetic peripheral neuropathy.

GARETH WILLIAMS
JASWINDER S GILL
VIC ABER
HUGH M MATHER

Department of Medicine,
Royal Postgraduate Medical School,
Hammersmith Hospital,
London W12 0HS

1 Dyck PJ, Zimmerman IR, O'Brien PC, *et al.* Introduction of automated systems to evaluate touch-pressure, vibration and thermal cutaneous sensation in man. *Ann Neurol* 1987;5:502-10.

2 Fagius J, Wahren LK. Variability of sensory threshold determinations in clinical use. *J Neurol Sci* 1981;51:11-27.

Anaesthetic services in obstetrics

SIR,—Dr G Young believes that the Association of Anaesthetists has made unbalanced decisions about small and isolated obstetric units (6 February, p 431). Of the 524 obstetric units in the United Kingdom, 222 have an annual delivery rate of less than 500 mothers. After a call from an isolated unit there is a delay until the anaesthetist arrives. There is usually a lack of fully trained assistance and limited equipment. Early transfer is preferable. This also prevents reduced cover for mothers in the base hospital while the anaesthetist is away.

Although the selection process in Penrith is working, it is imperfect, since "1.7% of women in Penrith need an anaesthetist" and "the perinatal mortality averages 4.7 per 1000 births and this includes those transferred in labour." These perinatal deaths, presumably in healthy mature pregnancies, also have implications for neonatal services.

The Association of Anaesthetists of Great Britain and Ireland and the Association of Obstetric Anaesthetists have recommended that each district should consider withdrawing anaesthetic services where there are infrequent demands. This would provide more complete cover for higher risk pregnancies. Mothers should be given information about the service, including any restrictions on the options for pain relief. Each mother can then choose whether she wishes to have her baby close to home or travel to a unit with full facilities for the four or five days in her lifetime which she will spend in the obstetric unit to have her average two children. Recent surveys suggest that at least 40% of mothers would prefer to travel to the facilities. Our recommendations are aimed at providing safer practice with limited resources, ensuring that each mother has the facts to make the choice between safer anaesthetic service or convenience.

MICHAEL ROSEN

Department of Anaesthetics,
University Hospital of Wales,
Cardiff CF4 4XW

Chronic fetal hypoxia in diabetic pregnancy

SIR,—Mr R J Bradley and others (9 January, p 94) selected a patient at particularly high risk of fetal complications. It would be interesting to know why this patient requested cordocentesis at 23 weeks for fetal karyotyping. Was there a high suspicion of a fetal abnormality?

The patient allegedly had "good control of her diabetes" yet her glycosylated haemoglobin concentration was persistently above the normal range for pregnancy. The definition of "normal" cord blood pH and oxygen tension should have been based on data from uncomplicated diabetic pregnancies rather than a non-diabetic population. The second cordocentesis suggested fetal hypoxia without acidosis. This is unusual and it would be interesting to know if the cord blood lactate concentration was normal or not. The authors comment that ultrasonic assessments of fetal growth failed to identify that the fetus was small for gestational age and therefore at risk of hypoxia. Infants of diabetic mothers tend to be larger than the normal population and macrosomia may occur even if diabetic control is optimal. It would have been more appropriate to plot fetal growth on centile charts for diabetic pregnancies.

The authors suggest that Doppler studies and cordocentesis may allow early detection of fetal hypoxia, but their patient was delivered after developing an abnormal fetal heart rate pattern, which is a "traditional" test of fetal wellbeing. It is difficult to appreciate from this case how Doppler studies and cordocentesis improved fetal prognosis by early detection of hypoxia since by the time the fetus was delivered it was both acidotic and hypoxic.

FIONA M FAIRLIE
J J WALKER
A M MATHERS
ALAN D CAMERON

Glasgow Royal Maternity Hospital,
Glasgow G4 0NA

AUTHORS' REPLY.—The case we described did not seem initially to be one in which the fetus was particularly at risk. Although the glycosylated haemoglobin concentration was raised, the results of monitoring the mother's blood glucose concentrations were satisfactory and she had no evidence of diabetic vasculopathy. The only cause for anxiety came when the Doppler studies carried out routinely at 23 weeks were abnormal. Cordocentesis would not have been performed at this time but for the fact that she had already requested fetal karyotyping to complement the detailed fetal anomaly scan she had already had. Some diabetic women who are aware of the risk of fetal abnormality wish to be reassured that their fetus is chromosomally as well as structurally normal.

The traditional tests of fetal wellbeing failed to identify this pregnancy as being at high risk, and without the blood flow studies the case would have been managed on an outpatient basis without cardiotocography and the deterioration in the fetal condition would have gone unnoticed.

The rate of diffusion of carbon dioxide and hydrogen ions across the placenta is much faster than that of oxygen, explaining the well recognised phenomenon of fetal hypoxia without acidosis. As the degree of uteroplacental insufficiency worsens acidosis ensues. Although the umbilical venous lactate concentration was 1.95 mmol/l (normal 0.55-1.95) at the first cordocentesis, it rose to 2.4 mmol/l (normal range of 0.65-2.05) at the second.

It is customary in the management of high risk pregnancies to compare the measures of fetal wellbeing with those in a normal pregnancy. We

agree, however, that if the fetal growth had been plotted on our diabetic fetal growth chart the fetus would have appeared to be mildly growth retarded. The extent of the growth retardation even then would not have prompted admission to hospital for intensive monitoring, and the deterioration in the fetal condition would have gone unnoticed. The growth pattern of the growth retarded diabetic fetus is difficult to interpret in view of the conflicting effects of the two conditions. Recent work in our unit suggests that all babies are "growth promoted" to some degree by maternal diabetes.

We do not claim that blood flow studies are the answer to the monitoring of fetal wellbeing in diabetic pregnancy, and, like Dr Tyrell (6 January, p 428), we have recently had a case of late intrauterine fetal death in a diabetic pregnancy three days after normal blood flow studies. In the case we described, however, the blood flow studies were of crucial importance in identifying a fetus at risk. Until the place of blood flow studies in diabetic pregnancy has been elucidated they will continue to form an integral part of our monitoring of the fetal condition.

R J BRADLEY
J M BRUDENELL
K H NICOLAIDES

Department of Obstetrics and Gynaecology,
King's College Hospital,
London SE5 8RX

SIR,—Mr R J Bradley and others (9 January, p 94) discuss the benefits of cordocentesis; however, this is not widely practised in the third trimester and we recommend caution in relying too much on Doppler studies of blood flow in the management of diabetic pregnancy. We have found Doppler studies to be highly predictive of antenatal fetal compromise in 450 non-diabetic high risk pregnancies, but the same has not been true in the 65 diabetic pregnancies we have studied. This is illustrated by the following cases.

A 24 year old primigravida with severe retinopathy, nephropathy, and hypertension controlled with atenolol and then labetalol had Doppler flow studies at 26 weeks' gestation. The umbilical artery showed absent end diastolic flow. The studies were repeated many times over the next six weeks and end diastolic flow was always absent. Ultrasound examination showed satisfactory growth, and other indices of fetal wellbeing remained satisfactory, although her hypertension became slightly less well controlled and her proteinuria increased to 6 g in 24 hours. At 31 weeks she had an acute inferior myocardial infarction and was stabilised in the coronary care unit. Because of her gradually deteriorating condition a caesarean section was performed at 32 weeks' gestation with intensive cardiovascular monitoring. The baby boy weighed 1800 g and was in good condition. He required ventilation for the respiratory distress syndrome but made good progress, and he and his mother are now well.

A 31 year old parous patient was transferred from another hospital at about 32 weeks' gestation. She weighed 121 kg and her diabetes had been very poorly controlled. She had massive hydramnios with one pool of liquor measuring 16 × 16 cm, and a huge fat line was seen on ultrasound examination. Despite stabilisation of her plasma glucose concentration fetal movements were absent and there were only very short episodes of fetal breathing. Cardiotocography was non-reactive over three hours with reduced variability of the fetal heart rate. Umbilical artery Doppler studies showed a resistance index of 0.67, which is well within our normal range. At caesarean section that day the baby girl weighed 3050 g and was asphyxiated with Apgar scores of two and six at one and five minutes