The coloured parity distribution was markedly different. Primiparas accounted for 38% in both trienniums, compared with 27% and 28% for black women. The main difference was, however, in respect of grand multiparas. There was a decrease in the percentage of coloured grand multiparas from 17% in 1974 to 13% in 1978 - 1980 and a further marked decrease to 9% in 1981 - 1983. This resulted in a drop of approximately 550 or 27% in the average annual number over the decade.

Combining the black and coloured parity data there was a decrease in the percentage of grand multiparas from 17% in 1974 to 14% in 1978 - 1980 and 11% in 1981 - 1983. The average annual number, because of the inordinate increase in black grand multiparas, increased by approximately 100 over the period.

At the end of the decade reviewed, therefore, the PMNS cared for many more black teenagers, grand multiparas and older women than in 1974. These categories of patients contributed disproportionately to the already intolerable workload of the PMNS. The main ray of demographic hope was provided by the marked decline in the number of coloured grand multiparas, despite a 40% increase in total deliveries. A smaller encouraging sign was the decreasing percentage, if not the number, of pregnant coloured women over 34 years of age. There has been no improvement with regard to teenage deliveries.

It is clear that grand multiparity and to a lesser extent pregnancy in older women are increasingly being brought under control in the coloured community in Cape Town. All our efforts are still required to combat teenage pregnancy, the premier social evil of the Third World. There is, alas, no ray of demographic hope in the black data presented.

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Placental grading by ultrasonography as an index of fetal maturity

Its application to the problem of elective caesarean section

P. M. SHWENI, S. C. MOODLEY

Summary

Ultrasonographic placental grading for estimation of fetal maturity before elective caesarean section was assessed at 38 weeks' gestation in 100 patients. It was impossible to grade the placenta in 5 cases, but in 95 it could be graded with confidence. In 90 cases the placenta was graded as II or III, and all the infants in these two groups had achieved lung maturity. Five patients had grade I placentas, and one of these patients had an immature baby. Amniocentesis for determination of the lecithin/sphingomyelin ratio and the presence of phosphatidyl glycerol was attempted in all cases. We failed to obtain liquor amnii from 6 of the 100 patients.

Gross cephalopelvic disproportion is still a major problem, and is the main indication for caesarean section at King Edward VIII Hospital, Durban. This, together with other major obstetric problems seen at this referral hospital, results in a high caesarean section rate, averaging 28% for the hospital (and 18% for the whole service). In actual numbers this means that on average 14 caesarean sections a day are performed. The problem is a major and self-perpetuating one.

The patients treated in this institution, mostly indigent, include many who do not know their exact menstrual dates. Moreover, because most book in the third trimester, it is often not possible to establish or confirm the true gestational age. This uncertainty makes accurate timing of elective caesarean section difficult. Late tests of fetal maturity such as determination of the lecithin/sphingomyelin (L/S) ratio and the presence of phosphatidyl glycerol (PG) have therefore become necessary if delivery of a premature infant is to be avoided. This means that a large number of amniocenteses have to be done.

Amniocentesis, an invasive procedure, places both mother and fetus at risk. Although ultrasonographic guidance has reduced the risks, it has not eliminated them. If after amniocentesis the tests show fetal immaturity, we are faced not only with the unhappy prospect of having to repeat an invasive procedure but with the problem of timing the repeat amniocentesis properly in order to avoid another negative result.
Mistiming of elective caesarean section can cause problems other than prematurity, because spontaneous labour may ensue. While the onset of spontaneous labour largely eliminates prematurity, it brings with it other difficulties, namely: (i) an increase in the number of emergency caesarean sections, which further stretches our already overworked facilities; and (ii) the even more serious problem that, if it occurs at a time when the patient cannot readily get medical attention, commonly because of transport difficulties, the uterus may rupture, with dire consequences for both mother and fetus. Accurate timing of repeat elective caesarean section is therefore of critical importance in our practice.

In view of the hazards of amniocentesis it has become necessary to find alternative methods to L/S ratio and PG determination for timing repeat caesarean section. Hayashi et al.,1 Lee et al.2 and Golde et al.3 used the ultrasonographic biparietal diameter at term to time elective caesarean section. Petrucha et al.4 used Grannum et al.'s5 ultrasonographic placental grading to determine fetal maturity before elective caesarean section, with good results.

In this study we used ultrasonographic placental grading and related this to the L/S ratio and PG presence and neonatal outcome.

Patients and methods

One hundred patients booked for repeat elective caesarean section formed the study group. All were at least 38 weeks pregnant as far as could be established. Patients known to be or diagnosed as diabetic were excluded, although routine glucose tolerance tests were not done unless clinical indications were present. Hypertensive patients were also excluded.

Ultrasonography was carried out with either a real-time sector scanner, ATL echo-analyser or ADR linear array. The placenta was graded by the method of Grannum et al.5

Amniocentesis was carried out in the ultrasonography department after marking out the area with the largest pool of liquor amnii.

The L/S ratio and PG were estimated by the methods of Richardson4 and Norman and Joubert7 respectively.

All investigations were carried out on the day before elective caesarean section. After delivery the infants were weighed. Neonatal condition and progress were noted with regard to prematurity and the respiratory distress syndrome (RDS).

Results

Placental grading and amniocentesis

We failed to grade the placenta confidently in 5 cases. The reasons for failure were, either alone or in combination, posterior location of the placenta, oligohydramnios and obesity; we also failed to obtain liquor amnii from 6 patients.

All placentas were graded as I, II or III (Tables I and II). The most common grade was II (75.7%), with grade III (18.9%) the second commonest. Least often seen was grade I, with only 5 examples. All the fetuses in the grade II and III groups were mature, as shown by an L/S ratio of >2 and the presence of PG. One of the 5 patients with a grade I placenta had an L/S ratio of <2 and no PG and the infant developed the RDS.

Discussion

Grannum et al.5 classified placental maturity into four grades, 0-III, according to the ultrasonographic appearances of the chorionic plate, the placental substance and the basal layer. The placenta can be graded from about 12 weeks, when the chorionic plate can be identified. In grade I the chorionic plate appears as a smooth line with no indentations. The placental substance and the basal layer are homogeneous with no high-level echoes. According to Grannum et al., all first- and second-trimester placentas show this appearance until about 28 weeks of pregnancy.

In grade I the chorionic plate develops subtle indentations and in the placental substance echogenic densities 1-4 mm in

TABLE I. RELATIONSHIP OF PLACENTAL GRADE TO L/S RATIO AND RDS

<table>
<thead>
<tr>
<th>Placental grade</th>
<th>No. of patients</th>
<th>L/S ratio</th>
<th>No.</th>
<th>RDS</th>
<th>No.</th>
<th>RDS</th>
</tr>
</thead>
<tbody>
<tr>
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<td>5</td>
<td>&lt;2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>&gt;2 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>5</td>
<td>&lt;2 2</td>
<td>1*</td>
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<td>4</td>
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<tr>
<td>II</td>
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<td></td>
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<tr>
<td>III</td>
<td>18</td>
<td>&lt;2 2</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
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<td></td>
<td>1</td>
<td>15</td>
<td>88</td>
<td></td>
</tr>
</tbody>
</table>

*This patient also had no PG and the baby developed transient RDS.

TABLE II. RELATIONSHIP OF PLACENTAL GRADING TO THE PRESENCE OF PG AND THE RDS

<table>
<thead>
<tr>
<th>Placental grade</th>
<th>No. of patients</th>
<th>PG absent</th>
<th>No.</th>
<th>RDS</th>
<th>PG present</th>
<th>No.</th>
<th>RDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failed to grade</td>
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<td></td>
<td></td>
<td></td>
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<tr>
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<td></td>
</tr>
<tr>
<td>I</td>
<td>5</td>
<td>1*</td>
<td>1</td>
<td>4</td>
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<tr>
<td>II</td>
<td>72</td>
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<tr>
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<td>15</td>
<td>88</td>
<td></td>
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</tr>
</tbody>
</table>

*This patient also had an L/S ratio of <2, and the baby developed transient RDS.
size with their long axes parallel to the long axis of the placenta appear. The basal layer remains devoid of echogenic densities (Fig. 1).

In grade II, echoes with their long axes parallel to the base of the placenta appear in the basal layer. The echoes in the substance of the placenta become numerous and confluent. The chorionic plate becomes markedly indented and these indentations coalesce with vertical echoes in the substance of the placenta to form 'comma-like' densities which traverse the substance of the placenta towards the basal plate but do not reach it. According to Grannum et al.5 the basal echoes should be regarded as the hallmark of a grade II placenta. Fig. 2 shows the basal echoes but no comma-like densities.

In our study the majority of patients (nearly 76%) had grade II placentas, based on the presence of echogenic densities in the basal layer (D in Fig. 2), the hallmark of this grade according to Grannum et al.5 Only a few patients had comma-like densities ascending from the chorionic plate. Five patients (5.2%) had a grade I placenta. The difference between the incidences of grade I and grade II placentas in this and other studies may be related to the strictness of application of grading criteria and also to the fact that, in contrast to other studies,5,6,10 only patients 38 weeks pregnant or more were included. There were 18 grade III placentas (18.9%). This is in keeping with the 20% in other studies.11,12 We failed to grade the placenta in 5 cases, largely owing to posterior location — a problem recognized by others.11,12 In 6 cases we failed to obtain liquor amnii by amniocentesis because the patient was obese (Table I). When the study was carried out we did not possess the probe designed to carry and guide an amniocentesis needle.

In the present series all fetuses in the grade II or III groups had achieved lung maturity. Of the 5 fetuses in the grade I group, 1 had not achieved lung maturity as shown by an L/S ratio of < 2, absence of PG, and development of the RDS (Tables I and II). In the original study by Grannum et al.,5 later confirmed by Petrucha et al.,4 a grade III placenta predicted fetal lung maturity in 100% of cases. It was therefore suggested that placental grading could replace estimation of the L/S ratio and thereby avoid amniocentesis and its complications.

Subsequent workers in this field have cast doubt on the reliability of placental grading as a predictor of fetal lung maturity.9,10,13,14 It must be made clear, however, that this finding was largely confined to cases complicated by hypertension, diabetes mellitus or Rh iso-immune disease. These infants were either delivered or tested for maturity when they were grossly preterm. It has subsequently become clear that placental grading should not be used to predict fetal lung maturity in complicated pregnancies, since in such cases maturity may be accelerated or delayed without a corresponding effect on placental maturation.3,18 Ashton et al.3 suggested that even in uncomplicated cases a grade III placenta cannot be equated with fetal maturity, since of 133 women who had no disease known to accelerate placental or fetal maturation and were found to have grade III placentas, 11 were only 30 - 33 weeks pregnant. However, none
of the infants born to these 11 patients developed hyaline membrane disease. Harman et al. found grade III placentas at a wide range of gestational ages (31-44 weeks) and concluded that placental grading was not sufficiently accurate to replace estimation of the L/S ratio.

Another reason for the controversy is the finding of grade I or II placentas at term. Absence of grade III or presence of a grade I or II placenta therefore cannot be taken to mean that term has not been reached or that maturity has not been achieved. Grade III is not even the predominant grade at term, its incidence being in the region of 20\% (18.9\% in our study). The fact that a grade III placenta is found only in a minority of patients would further limit the use of a grade III placenta as the only basis for diagnosing fetal lung maturity. Fetal maturity has therefore been associated with all placental grades and is not exclusive to grade III. 4,5,10

In our study, both grade II and grade III placentas were associated with 100\% fetal lung maturity. Spirit and Gordon 6 maintain that although pulmonary maturity and placental calcification (on which grading is based) are both related to advancing gestational age, the two are not necessarily related to each other. They also state that other factors which influence placental calcification — maternal serum calcium levels, parity and maternal age — have not been taken into consideration in studies on placental grading.

Hadlock et al. 15 maintain that all this controversy indicates basically that gestational age and not necessarily placental grade is the determinant of fetal lung maturity. It is therefore not surprising that a patient with a grade III placenta will have a baby which develops the RDS if delivered at 32 weeks; conversely, the RDS will not develop in a baby with a grade I placenta if it is delivered at term. This impact of gestational age on lung maturity has been shown in several studies. 10,11,16

An example is Kazzi et al.'s 9 study in which a grade III placenta had 100\% predictive power for the presence of PG after 38 weeks but only 15.8\% predictive power before 38 weeks. Hadlock et al. 15 maintain that, because placental grading is an unreliable predictor of fetal lung maturity, ultrasonography should concentrate on accurate assessment of gestational age early in pregnancy so that fetal lung maturity can be predicted more accurately in later gestation. However, inability to assess gestational age in early pregnancy because patients book late is unfortunately precisely our problem, and this study was an attempt to see whether our extensive use of amniocentesis, necessary to estimate fetal maturity late in pregnancy, could be reduced.

We consider that in view of: (i) the almost uniform agreement that a grade III placenta after 37 weeks in uncomplicated pregnancies is associated with fetal lung maturity in 100\% of cases; 4,5,10,16,16 (ii) the fact that it is almost exclusively in patients with complications delivered much earlier than 37 weeks that a grade III placenta is associated with fetal lung immaturity; and (iii) the finding in our study of fetal lung maturity in all infants in the grade III group, we are justified in using a grade III placenta to indicate fetal lung maturity before repeat caesarean section in patients who it is reasonably certain have reached 38 weeks gestation and who have no complicating disease. However, because only 18.9\% of our patients had a grade III placenta only a few would be spared amniocentesis, and grade II patients satisfying the provisos mentioned above should be managed in the same way as those in grade III on the basis of our findings that even in this group 100\% of fetuses had achieved lung maturity. Only then would placental grading make an impact on the number of amniocenteses needed. Amniocentesis would then be reserved for patients uncertain of their dates, those with complicated pregnancies, and those with grade I or 0 placentas.

Cognizant of the continuing controversy in placental grading, we would agree with Hadlock et al. 15 that other ultrasonographic tests of fetal lung maturity deserve to be studied. The bowel grading system proposed by Ziliani and Fernandes 18 is one such test. Other tests are the relative echogenicity of the fetal liver and lung, 19,20 and the presence or absence of vernix caseosa in the liquor amnii. 21

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