that insulin promotes growth by stimulating protein synthesis and thereby the size of cells. This study has shown that the period in which insulin secretion has been shown to rise coincides with that in which cellular growth takes place mainly by cellular division (Widdowson, Crab, and Milner, 1972). This is followed at about the 30th week by a period in which growth occurs largely by an increase in cellular size. These findings are neither contrary to nor in support of Cheek and Greystone’s hypothesis. It is possible that insulin secretion increases in the period studied due to a preferential development of β cells within the islet or of islets within the pancreas. Alternatively, the change could be of secretory activity within each β cell. If insulin has an anabolic role in the fetus it is interesting to note that the stage of development in which pancreatic insulin secretion increases precedes that in which cells grow by increase in size.

**Summary**

Insulin release from pieces of human fetal pancreas incubated in vitro was found to be correlated with the body weight and gestational age of the fetus between weeks 15 and 24 of fetal life.

We are grateful to Professor J. A. Davis for his encouragement and to our gynaecological colleagues for their generous co-operation. This work was supported by the British Diabetic Association and the Medical Research Council.

**REFERENCES**


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**Clinical assessment of gestational age in the neonate**

The scoring system of Dubowitz, Dubowitz, and Goldberg (1970) for the clinical assessment of gestational age in newborn infants was used in the assessment of 522 consecutively examined neonates from the Obstetric Landings and Special Care Baby Unit of the Jessop Hospital for Women, Sheffield.

All infants were assessed within 48 hours of delivery and, whenever possible, without prior knowledge of gestational dates from the obstetrical notes.

**Case material**

In the study there were 264 male and 258 female infants.

From data obtained from the routine maternity notes on menstrual cycles and ‘last menstrual period’ it was found that 434 normal neonates (218 males and 216 females, including 5 sets of twins) were born to mothers with certain dates and regular 28-day (±2 days) cycles, who were not taking oral contraceptive preparations in the month before conception.

Of the remaining infants, 85 were born to mothers with uncertain dates, irregular cycles, or on oral contraceptives. 3 infants with major abnormalities at birth were assessed but the results were not included in the analysis.

**Results**

The scoring system was easy to apply, and after initial practice could be used during routine neonatal examination and without reference to charts illustrating the criteria. It took between 5 and 10 minutes to complete an assessment.

**Normal infants.** For all normal neonates where the gestation by dates was certain the difference between assessment by dates and by score was one week or less in 400 infants. The difference

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*This scoring system is based on a combination of 11 external criteria as originally delineated by Farr, Kerridge, and Mitchell (1966), and 10 neurological criteria selected for their ease of elicitation, reliability of inter-observer assessment, and consistency, irrespective of the state of the infant.*
was from 1 to 1.5 weeks in 26 infants and greater than 1.5 weeks in 8 infants, the maximum difference being 3.0 weeks.

Sixty infants were of 2500 g or less birthweight. Using scored gestational age assessments 27 of these were small-for-dates (i.e. below the 10th centile weight for gestational age, according to the data of Thomson, Billewicz, and Hytten, 1968); 25 were of short gestation (i.e. less than 37 weeks); and 8 were both of short gestation and small-for-dates.

Of the 60 low birthweight infants, 48 were born to mothers with certain dates and regular cycles and in 45 of these the difference between assessment by dates and by score was one week or less. In the remaining 3 infants the maximum difference was 1.8 weeks.

Five sets of twins were assessed. The difference in assessment between twins was less than 0.5 weeks in 4 pairs and 1.0 weeks in the fifth pair (Table I).

**Abnormal infants.** 3 grossly abnormal infants were assessed.

One with Werdnig-Hoffmann’s disease, 39 weeks’ gestation by dates, scored 36-8 weeks; one with Down’s syndrome, 40-1 weeks by dates, scored 39 weeks; and one with severe myelomeningocele, 39 weeks by dates, scored 36 weeks.

All these infants were hypotonic and had weak or absent Moro responses. They all tended to score normally on ‘external’ criteria, but low on neurological criteria.

**Infants born by extended breech delivery.** It was found that when infants born by extended breech delivery were examined in the few hours after birth they scored consistently lower than their estimated gestation from dates. They all scored higher than the initial assessment when the examination was repeated after 24 hours.

Four extended breech infants (3 of certain dates) were assessed just after birth and the assessment repeated after 24 hours with the results shown in Table II. In each case the second score was included in the analysis of normal infants.

The two neurological criteria which tended to score lower on the first assessment were ‘popliteal angle’ and ‘heel to ear manoeuvre’.

**TABLE II**

*Scores at birth and after 24 hours in 4 infants with extended breech deliveries*

<table>
<thead>
<tr>
<th>Infant no.</th>
<th>First gestational score (wk)</th>
<th>Second gestational score (wk)</th>
<th>Gestation by dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>37-0</td>
<td>37-8</td>
<td>Uncertain</td>
</tr>
<tr>
<td>II</td>
<td>38-2</td>
<td>39-5</td>
<td>39-4</td>
</tr>
<tr>
<td>III</td>
<td>38-8</td>
<td>37-4</td>
<td>37-6</td>
</tr>
<tr>
<td>IV</td>
<td>34-9</td>
<td>35-5</td>
<td>35-9</td>
</tr>
</tbody>
</table>

**Infants with low Apgar scores.** In general the clinical assessment of gestational age was not affected by low scoring on the Apgar scale after delivery, even when the assessment was applied during the first few hours after birth. However, in two short gestational infants who required extensive perinatal resuscitation, muscular hypotonia persisted for several hours after birth and when the neurological criteria were applied during this period misleadingly low scores were obtained. These infants were assessed again after 24 hours and the scores obtained were included in the full analysis.

One of these infants was delivered by Keillands forceps after spontaneous labour at 34-3 weeks by maternal dates. The Apgar score at 1 minute was 3 and respirations were not established for 20 minutes despite immediate endotracheal intubation, positive pressure ventilation with oxygen, and intravenous sodium bicarbonate. The infant then recovered well but showed marked muscular hypotonia with absent Moro reflex, for 4 to 6 hours after birth. A scored gestational age at 2 hours was 33-3 weeks. The assessment was
repeated after 24 hours when the neurological criteria scored higher and the gestational age was 34.6 weeks.

The other infant was delivered from a diabetic mother by difficult breech extraction after spontaneous labour at an uncertain gestation of 29 weeks. The Apgar score at 1 minute was 1 and the infant required extensive resuscitation with endotracheal intubation, positive pressure ventilation with oxygen, external cardiac massage, and intravenous sodium bicarbonate. He showed marked hypotonia for 3 to 4 hours after birth and initial gestational assessment was 28.6 weeks. This was repeated after 24 hours when the neurological criteria scored higher, giving an assessment of 30 weeks' gestation.

Discussion

The scoring system devised by Dubowitz et al. proved an accurate method of assessing gestational maturity in the newborn, and proved practical in the day-to-day care of neonates on the obstetric unit, where there was no difficulty in applying the system as a routine procedure.

The scoring system was as reliable in low birthweight and short gestation infants as in term, 'weight appropriate for dates' infants.

The scoring system can be reliably used in all normal babies except those that are so ill from any cause that the Moro reflex is partially or completely suppressed (Dubowitz et al., 1970).

Misleadingly low scores may be found from the initial assessment of infants born by extended breech delivery and occasionally on infants requiring prolonged resuscitation for perinatal hypoxia. Such scores should be repeated after 24 hours for greater reliability.

The scoring system is not usually reliable in grossly abnormal neonates.

The scoring system is easy to learn and to apply in day-to-day practice. At first the system can be applied by reference to charts illustrating the various criteria. After practice, however, these criteria are easily memorized and can be scored during the normal routine neonatal examination, the total assessment taking between 5 and 10 minutes.

The system could be used by medical and nursing staff, in either hospital or domiciliary practice, to give gestational assessments of within one week's accuracy in the vast majority of normal babies examined.

Summary

A scoring system, based on a combination of neurological and external criteria, was used in the assessment of gestational age in 522 infants. Of these infants, 434 were normal and of certain gestation by dates.

The scoring system gave a difference between assessment by dates and assessment by score of 1 week or less in 400 infants. In 5 sets of twins assessed the difference between twins was less than 0.5 week in 4 cases, and 1.0 week in the fifth pair.

The scoring system provides an accurate and practical method of assessing gestational age in neonates by resident staff on obstetric units and should also prove valuable in domiciliary practice.

I am grateful to Dr. V. Dubowitz for his interest and advice in this study. I also wish to thank Dr. J. A. Black for permission to include infants under his care.

References


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Lymphovenous obstruction in anomalous midgut rotation

Anomalous midgut rotation is a recognized disease entity in the neonate. When it presents as an unrelenting obstruction or midgut volvulus with strangulation, the diagnosis or the need for surgical treatment is hardly ever in doubt. However, some patients may pass into childhood with symptoms of recurrent subacute intestinal obstruction or a malabsorption state where the underlying cause is malrotation of the midgut. We present two patients whose case histories illustrate some of these features.

Case reports

Case 1. This 3-month-old boy was the fifth child of a group O Rh-ve mother, delivered by caesarean section at 33 weeks. Gastric aspirate at birth was copious. Neonatal episodes of abdominal distension and failure to pass meconium resolved spontaneously and were attributed to immaturity.

At age 10 weeks he was admitted to his local hospital
Clinical assessment of gestational age in the neonate.

B W Hancock

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Notes

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