The prevalence of intra-uterine growth retardation in patients with positive contraction stress tests

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Summary

The gestational ages of 66 neonates delivered after positive contraction stress tests (CSTs) were estimated by means of the Dubowitz score. Forty-three (65%) of these infants had birth weights below the 10th percentile according to their gestational age. At the beginning of the study 40% of the infants were found to be growth-retarded, but as experience with antenatal fetal heart rate monitoring increased the CSTs were interpreted more accurately. This led to an increase in the incidence of IUGR in infants born after a positive CST to 82%, a predictive value which means that the test compares favourably with other methods of diagnosing the small-for-dates fetus.

Reports in the literature suggest that there may be an increased incidence of intra-uterine growth retardation (IUGR) in patients in whom the results of antenatal fetal heart rate (FHR) monitoring are abnormal. Barrada et al.1 found that 5 out of 10 infants delivered after a positive contraction stress test (CST) were small for dates but that only 5 out of 17 (29%) growth-retarded fetuses had had positive CSTs. In their series 86% (130 of 152) of neonates with normal birth weights had had negative stress tests. In another study, Basken and Sandly2 found 22.5% of infants to be growth-retarded; in the presence of a positive test, however, the figure rose to 66.7%. Freeman et al.3 found that 37% of infants born after a positive CST were growth-retarded. Of infants which were of appropriate weight for gestational age 88% had had negative stress tests. A significant correlation between antenatal cardiocotography and IUGR was also found by Pearson and Weaver.4 The sensitivity of their test was 77% and the specificity 73%. We were therefore interested to see if these tests might prove of value in detecting the presence of chronic placental insufficiency, i.e. intra-uterine growth retardation.

Patients and methods

From January 1975 to May 1979 antenatal fetal monitoring was performed 11 316 times for 7036 patients. The method used and the indications for the test have been described previously.5 6 Tests were positive in 161 cases, and the patient was usually delivered soon after a positive test result when the fetus was regarded as mature. If the date of the mother’s last menstrual period was known the infant’s birth weight was plotted against the calculated gestational age on intra-uterine growth charts of the Tygerberg Hospital7 (birth weights below the 10th percentile indicated growth retardation). Neonates which weighed more than 2800 g were not regarded as growth-retarded. The Dubowitz score8 was assessed within 3 days of birth unless the infant’s clinical condition was unsatisfactory or the assessor (A.M.J.) was not available. The birth weights and estimated gestational ages of these infants were plotted as mentioned previously. Stillborn fetuses were excluded from the study.

Results

It was possible to calculate the gestational age from the date of the last menstrual period for 129 of the 161 patients with a positive CST. For 32 the date of the last menstrual period was unknown and the infant weighed less than 2800 g. Growth retardation was present in 60 (47%) of the 129 infants for which the gestational age could be calculated. Clinical assessment of gestational age by Dubowitz scores9 of 66 infants revealed that 43 (65%) were small for dates. Initially the incidence of IUGR was 40%, but it gradually rose to 82% towards the end of the study. As was the case with the calculated gestational age a drop (to 42%) in the incidence of IUGR was noted in the last group of patients, but there were 5 intra-uterine deaths in this group (Table I).

| TABLE I. PREVALENCE OF IUGR IN PATIENTS WITH POSITIVE CSTs |
|-----------------------------------|-------|------------------|------------------|
| Patients | IUGR according to COD | %    | IUGR according to Dubowitz score | %    |
| 1 - 20   | 6/16                  | 38   | Not done          | —    |
| 21 - 40  | 8/20                  | 40   | Not done          | —    |
| 41 - 60  | 7/17                  | 41   | 1/1               | 100  |
| 61 - 80  | 7/19                  | 37   | 4/10              | 40   |
| 81 - 100 | 9/17                  | 53   | 6/9               | 67   |
| 101 - 120| 10/15                 | 67   | 13/17             | 76   |
| 121 - 140| 10/15                 | 67   | 14/17             | 82   |
| 141 - 161| 3/10                  | 33   | 5/12              | 42   |
| Total    | 60/129                | 47   | 43/66             | 65   |

COD = calculated date of delivery.

Discussion

Although the infant with features of IUGR may underscore in the Dubowitz method when external features are assessed.9,10 the introducers of this assessment11 feel that external and neurological scores are influenced in opposite directions by
weight. They believe that a combination of neurological and external scores gives an excellent correlation with the known period of gestation. If growth retardation does lead to an underscoring of gestational age, the real incidence of IUGR in this study would have been lower.

The lower incidence of small-for-dates infants in the first part of the study was probably due to the fact that there were more false-positive tests in the initial period. These false-positive results were mainly caused by over-stimulation of the uterus and wrong interpretation of recordings. In the latter part of the study, when more experience in antenatal fetal monitoring had been gained, tests were interpreted more accurately and false-positive results were reduced.

The decline in the incidence of growth retardation at the end of the study was probably due to a change to a more conservative approach in the management of the last group of patients with positive stress tests. There were 5 stillbirths in this group. These patients were unsure of the dates of their last menstrual periods and on clinical examination the fetuses felt very small. Amniocentesis failed in 2 of these patients and in the 3rd the lecithin/sphingomyelin (L/S) ratio was below 1.5. Most of these stillborn fetuses would probably have been found small for dates if they had been delivered immediately after the positive test. The fact that more infants were growth-retarded according to the Dubowitz score than according to the calculated gestational age reflects the possibility that in many cases the dates were inaccurate. However, it is interesting to note that when the Dubowitz score was used the incidence of IUGR was always 3-15% higher than when the calculated duration of pregnancy was used. This must have been because the Dubowitz method overscored rather than underscored the gestational age of the infant.

It is important to determine the sensitivity (in this study the proportion of patients who produced a small-for-dates infant after a positive CST) of tests which are used to detect abnormality. The specificity of the test (the proportion of patients producing an infant of normal birth weight after a negative stress test) should also be determined. Although the sensitivity and specificity of the CSTs have not been calculated for this study, a previous study carried out in this hospital should be representative for the purposes of the present study. In this study of 1,102 high-risk patients who underwent antenatal FHR monitoring 786 infants of appropriate weight for gestational age and 86 growth-retarded infants were born after a negative test. There were 35 positive tests, after which 19 normal and 16 growth-retarded infants were born. According to these numbers the sensitivity of the test was 15.7%, the specificity 97.6% and the predictive value 45.7%. The specificity of the test was therefore good but the sensitivity was not. In the present study the predictive value was 47%, which is very similar to that in the previous one. In the study by Barrada et al., the sensitivity, specificity and predictive value of the CST were 29%, 85% and 50% respectively, figures similar to those in our study.

Excellent results were reported by Campbell, who found 82% of infants born after ultrasonography had indicated a reduced rate of growth to be small for dates. When a single estimation of the biparietal diameter in late pregnancy was used, birth weights have been predicted within 406 g in 68% of cases. Accuracy was improved to a prediction of within 280 g in 68% of cases when measurement of the abdominal circumference was used. By using the head/abdominal ratio, Varma et al. could identify IUGR at an accuracy of 82.9% at 33 weeks and at an accuracy of 85.7% at 36-38 weeks.

Although there is a correlation between human placental lactogen (HPL) values and fetal weight, studies have shown that only 7% of infants born after the HPL value had been found to be low were growth-retarded. Bechter et al. studied urinary oestriol excretion in a large number of patients and found that 21% of mothers with low values produced a growth-retarded infant. There have been few large series in which positive stress tests have been used to indicate IUGR; the incidence has been found to vary between 41% and 43%,

It seems that ultrasonography is the most accurate method of diagnosing IUGR in the antenatal period. However, the incidence of IUGR in patients with a positive CST in this study means that the test compares very favourably with hormonal methods of diagnosing poor fetal growth. Apart from suggesting the possibility of a growth-retarded fetus with reasonable accuracy, the positive stress test rapidly provides an indication as to whether the fetus should be delivered immediately. Previous experience at Tygerberg Hospital has demonstrated that if the fetus is not delivered after a positive test intra-uterine death occurs in 86% of cases. When other tests are used several examinations are necessary before it can be decided whether the fetus should be delivered. If the antenatal fetal monitoring is negative growth retardation is unlikely, but if the test is positive there is an almost 50% chance that the fetus is growth-retarded. Although the CST was not developed to diagnose IUGR it is extremely useful in the patient with possible placental insufficiency, since a positive result not only predicts growth retardation with almost 50% accuracy but also suggests that intra-uterine death is likely and that delivery should therefore be seriously considered.

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REFERENCES