

EVALUATION OF FOETAL MATURITY BY AMNIOTIC FLUID

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During the course of complicated gestation, the obstetrician may decide an early delivery to effect a more satisfactory outcome for the foetus or for the mother. In such cases the advantages of early delivery may be lost if the foetus is delivered in a premature state. Premature birth is firmly established as a leading factor associated with neonatal mortality, as well as morbidity which may give rise to serious sequelae in later life. When possible, maximum efforts should be made to prevent unintentional prematurity by antenatal assessment to ensure a reasonably mature foetus. The amniotic fluid, by virtue of its ready accessibility, and certain changes in its biochemical constituents at various periods of gestation, has been used to assess foetal maturity. The present study was undertaken to evaluate the usefulness of amniotic fluid bilirubin and glucose estimation as the parameters of assessing foetal maturity in normal state.

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Material and Methods

Eighty pregnant women attending outdoor or admitted in the maternity ward of S.V.B.P. Hospital, Meerut were studied. Most of the patients were about 36 to 40 weeks of gestation. No special selection as to age, parity etc. was exercised. Selection of the cases was done on the following criteria: (1) There should be no menstrual disorder. (2) They should know exact date of their last menstrual period. (3) Patients with past history of toxæmias, hypertension, diabetes and Rh sensitization were not included.

Amniotic fluid was mainly obtained by abdominal aminocentesis. The samples were kept at 4°C and estimation of bilirubin and glucose carried out as soon as possible, usually within 1 to 2 hrs. of collection. The samples were centrifuged and filtered so as to remove all the particulate matter. The fluid thus prepared was analysed for its bilirubin content by spectrophotometric method and glucose content by chemical method.

Bilirubin content

The method used was of Liley (1961). All the samples were analysed on DU 2 Beckman spectrophotometer at 450 m μ after treating with Diazo reagent.

Glucose content

Glucose content estimation of the amniotic fluid was determined by glucose oxidase method, a modification based on the procedure of Hugget and Nixon (1957). This method is highly specific and sensitive for glucose. No other reducing carbohydrate or non-carbohydrate interferes with the method. It is thus, a measure of the true glucose content of fluid.

Results and Discussion

Spectrophotometric analysis of amniotic fluid gives satisfactory and correct results of bilirubin pigment. This estimation can safely be used for assessing foetal maturity.

Table I shows fall in amniotic fluid bilirubin content with advancing pregnancy; and ΔD 0.000 reading at 450 mu by spectrophotometer indicates mature foetus and gestation period of at least 36 weeks. These findings coincide with other workers (Liley, 1961; Mandelbaum and Corix 1967; Black and Pennington, 1969; Edgar and Makowashi, 1979; Doregmuller and Jackson, 1969; Henne-man *et al*, 1970; Andrews, 1970; Donni *et al*, 1971; Malhotra *et al*, 1975 and Bhatnagar *et al*, 1978).

Fort *et al* (1971) explained the mechanism of disappearance of bilirubin. It was reported that unconjugated bilirubin perfuses through amnio-chorion from uterine venous bed into the amniotic sac.

TABLE I
Relationship Between Amniotic Fluid Bilirubin Content and Gestation Period

Gestation Period in weeks	Number of cases	Mean O.D. at 450 mu	Range
			Mean \pm S.D. O.D. at 450 mu Peak
26	1	0.061	0.061 \pm 0.000
28 to 30	1	0.056	0.056 \pm 0.000
30 to 32	1	0.043	0.043 \pm 0.000
32 to 34	3	0.038	0.038 \pm 0.021
34 to 36	7	0.027	0.027 \pm 0.018
36 to 38	13	0.016	0.016 \pm 0.010
38 to 40	52	0.005	0.005 \pm 0.009
41st week onward	2	0.000	0.000 \pm 0.000

TABLE II
Relationship Between Amniotic Fluid Glucose Content and Gestation Period

Gestation Period in weeks	Number of Samples	Glucose (mg%)
		Mean \pm S.D.
26	1	24.02 \pm 0.000
28 to 30	1	20.16 \pm 0.000
30 to 32	1	19.36 \pm 0.000
32 to 34	3	18.38 \pm 3.76
34 to 36	7	18.04 \pm 2.68
36 to 38	13	17.38 \pm 2.34
38 to 40	52	8.96 \pm 1.87
41st week onward	2	0.00

Table II depicts the relation of amniotic fluid glucose content with gestation period in normal pregnancy. The amniotic fluid glucose level steadily decline throughout gestation period in normal pregnancy. This finding coincides with results of Dhar *et al* (1980).

Glucose is of outstanding importance in the energy metabolism of the foetus. It acts as a raw material for all the metabolic processes of the foetus. The exact pathway of origin of glucose in amniotic fluid and its dynamics is still unknown. According to Pederson (1954), Schereiner and Gubler (1963), Drazanic and Kuracic (1974) amniotic fluid glucose, in the presence of normal maternal glycemia, seem to reflect the foetal glucose concentration. In the first trimester, amniotic fluid seems to be direct extension of foetal extracellular fluid, because the glucose levels in amniotic fluid are high, as in the maternal (and foetal) blood.

The raised amniotic fluid glucose in early gestation reflects the inability of foetal liver to store glycogen and regulate blood glucose concentration upto 15 weeks of gestation. This causes increased leakage of glucose into amniotic fluid. As soon as the foetal liver is fully active, the surplus glucose is stored as glycogen, with the result that amniotic fluid glucose falls as is evident from Table II.

Summary and Conclusion

Eighty samples of amniotic fluid obtained by amniocentesis were studied for its bilirubin content by spectrophotometric and glucose contents by glucose oxidation method.

Amniotic fluid bilirubin and glucose were higher towards earlier period of

gestation and it showed a progressive fall with advancing gestation of pregnancy. All these observations are conclusive that there was a direct and definite correlation between amniotic fluid bilirubin and glucose and maturation of the foetus.

It is thus concluded that estimation of bilirubin and glucose in fluid in normal pregnancy can serve as a fairly good parameter of foetal maturity. Since it is less time consuming method, it can be used in high risk pregnancies.

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