A NEW BIOCHEMICAL METHOD FOR ASSESSING MATURITY OF FOETUS

by

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Introduction

Determination of foetal maturity is gaining increasing importance in the field of perinatology. At present several physical and neurological criteria are available for assessing foetal maturity, but till date only few attempts have been made to explore the biochemical criteria. The available reports on the subject do not suggest a clear cut biochemical parameter for assessing foetal maturity. Although cord serum values for various biochemical substances are now available they need further evaluation in face of their new applications. The need for a biochemical criterion for assessing foetal maturity is not new, but as far as known to the authors not a single study is available which can define foetal maturity in terms of biochemical parameter, though several attempts were made (Kretchmer, 1959; Bhatia *et al*, 1977; Morris and King, 1961). Taking cognisence of the above facts, it was decided to undertake the present work and to find out if cord serum aspartate (Asp. T) and alanine (Ala. T) aminotransferases (Wilkinson, 1965) can be used as a reliable index for assessing foetal maturity at birth.

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Material and Methods

The present study was carried out on 65 cord serum samples from randomly selected neonates delivered at State Zanana Hospital Jaipur from 1st March 1978 to 31st December 1978. A detailed obstetric history was obtained in every case with special emphasis on the determination of gestational age which was confirmed later by combined criteria of Dubowitz *et al* (1970). Only normally delivered cases were included in the study. The newborns were grouped in various groups according to the criteria suggested by Keay and Morgan (1974). The cord blood samples were taken from maternal side of cut end of the cord and the aspartate and alanine aminotransferase activity was determined by colorimetric technique of Reitman and Frankel (1957). The results were analysed and the statistical significance was obtained for various groups of newborns. No small for date newborn was included in the study.

Observations

Out of the 65 cases, 33 were full term,

17 were preterm and postterm. Thirty-one cases were females and 34 males. The mothers of these newborns were healthy during pregnancy and labour. The mean cord serum Asp. T. and Ala. T. activity for full term; preterm and postterm group is shown in Table I. When values for preterm and postterm groups were compared with full term group the values were found significantly lower ($P < 0.05$) in preterm and were higher in postterm group ($P < 0.01$). (Table I).

TABLE I

Cord Serum Aspartate and Alanine Aminotransferase Activity in Relation to Foetal Maturity

Maturity of the foetus	No. of cases	(Asp. T.) activity units/ml		(Ala. T.) activity Units/ml	
		Mean	±S.D.	Mean	±S.D.
1. Fullterm	33	60.81	10.42	31.81	8.24
2. Preterm	17	49.11	3.82	27.35	5.51
P (1 vs. 2)		<0.01		<0.05	
3. Postterm	15	75.86	10.05	42.00	10.11
P (1 vs 3)		<0.01		<0.01	

Similarly the Asp.T. and Ala.T. activity showed a gradually rising trend with increasing gestational age of new born and exhibited a positive correlation with gestational age ($r = + 0.9461$ for Asp.T. and $+ 0.8942$ for Ala.T.). The 'P' for coefficient of correlation was (< 0.05). The mean rise in Asp.T. activity per week of increasing gestational age over 28 weeks was 2.64 units/ml/week and for Ala.T. was 1.35 units/ml/week.

Discussion

In the present series it was observed that cord serum Asp.T. and Ala.T. activity increased consistantly with increasing foetal maturity (Table II). The mean activity was lowest in preterm and highest in postterm babies. This indicates that assessment of foetal maturity is possible by estimation of serum Asp.T. and Ala.T. activity.

Although we could not find similar observations in the reviewed English literature Kretchmer (1959) was the first author to bring to notice the value of serum aminotransferase and other biochemical parameters for assessing foetal maturity. But contrary to our findings he found no significant correlation between any of the biochemical parameters studied and the foetal maturity.

King and Morris (1961) reported slight increase in the cord serum Ala.T. activity with increasing gestational age but they could not draw any conclusion on account of small number of cases, neither they thought of the possibility of the association between foetal maturity and the serum Ala.T. activity. Bhatia *et al* (1977) reported increase in cord serum Asp.T. and Ala.T. activity with corresponding

TABLE II

Coefficient of Correlation (r) of Cord Serum Aspartate and Alanine Aminotransferase in Relation to Gestational Age

Series		Asp. T. (GOT)	Ala T. (GPT)
Bhatia *et al.* (1977)[6]	r	+0.1078	+0.1216
	p	<0.10*	<0.10*
Present series (1978)	r	+0.9461	+0.8942
	p	<0.05**	<0.05**

* Not significant.

** Significant.

increase in gestational age and found a positive correlation between foetal maturity and cord serum Asp.T. and Ala.T. activity, however the rise was not significant statistically (Table II); whilst the rise noted in our series is statistically significant (Table II). These authors attributed this rise in enzymatic activity to the increasing foetal maturity, but they did not mention the possibility of using these values as a parameter for assessing foetal maturity. They also reported that the values in preterms were significantly lower than in full term new borns (they did not study postterm new borns). However, it is not possible to compare the figures reported by these authors as their method for estimation was different from ours. Even then our observations confirm the findings reported by Bhatia *et al* (1977). Few other workers have also studied the neonatal serum Asp.T. and Ala.T. values and found no change in their activity with corresponding change in foetal maturity. (King and Morris 1961; Lapan *et al* 1959; Stewart and Bribeck 1962). Our findings completely differ from Lapan *et al* (1959) who reported that assessment of foetal maturity is not possible by estimating cord serum Asp. T. and Ala. T. activity. To our surprise none of the authors referred above mentioned postterm group in their series; hence an accurate comparison is not possible with present series.

Conclusions

To conclude the observations of present series revealed that:

(1) There is significant correlation between foetal maturity and cord serum Asp.T. and Ala.T. activity in units/ml. and these may be of use as a biochemical index of foetal maturity.

(2) The study needs further confirmation as the number of variables seems great and the number of cases is small.

(3) These findings may be treated as preliminary findings, till there is collection of large number of data.

(4) The Probable cause for rising Asp.T. and Ala.T. values is increased number of foetal cells and increased rate of foetal metabolism with increasing maturity of developing foetus.

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References

1. Bhatia, B. D., Katiyar, G. P. and Agarwal, K. N.: Ind. Pediatr. **9**: 691, 1977.
2. Dubowitz, L. M. S., Dubowitz, V. and Goldberg, C.: J. Pediatr. **77**: 1, 1970.
3. Keay, A. J. and Morgan, D. M.: Craigs care of newly born infant 5th Ed. 1974 Churchill Livingston Edinberg, London New York P. 65.
4. King, J. and Morris, M. B.: Arch. Dis. Child. **36**: 604, 1961.
5. Kretchmer, N.: Pediatrics. **23**: 606, 1959.
6. Lapan, B., Friedman, M. M. and Taylor, T. H.: J. Lab. Clin. Med. **54**: 417, 1959.
7. Morris, M. B. and King, J.: Arch. Dis. Child. **36**: 610, 1961.
8. Reitman, S. and Frankel, S.: Am. J. Clin. Path. **28**: 56, 1957.
9. Stewart, A. G. and Birkbeck, J. A.: J. Pediatr. **61**: 395, 1962.
10. Usher, R. McLean, F. and Scott, K. E.: Pediatr. Clin. North. Am. **13**: 835, 1966.
11. Wilkinson, J. H.: Isoenzymes: The aminotransferases. I. Ed. 1965, E & F. N. Spon Ltd. London P. 195.