

ASSESSMENT OF FOETAL MATURITY BY FOAM TEST AND ITS CORRELATION WITH AMNIOTIC FLUID PHOSPHOLIPIDS

by

SHASHI RAMESH,* M.S., F.A.C.S.

PADMA VACCHANI,** M.B.,B.S.

and

KRISHNA KHUSHALANI,*** M.S.

Introduction

The perinatal mortality is directly influenced by foetal maturity at the time of delivery. Prematurity and postmaturity contribute highly to the infant mortality. Accuracy in determination of foetal maturity directly reflects upon the obstetrical judgement and efficacies.

The various biochemical parameters which indicate foetal maturity are amniotic fluid creatinine levels, bilirubin levels, osmolality, uric acid, urea, sodium chloride levels. Cytological examination is another method. Lately, amniotic fluid phospholipid level has been related to correlate well with the foetal maturity.

A new technique 'Foam Test' has been evolved (Clement *et al.*, 1972 and Caspi *et al.*, 1975) which reflects the phospholipid concentration in amniotic fluid which in turn indicates the foetal lung maturity.

The current literature reports the test to be quick easy, inexpensive, applicable at the bedside even when no other laboratory facilities are available. The results have been claimed to be favourable as

compared to after parameters of foetal maturity tests.

Phospholipids are known to correlate well and possibly are the most reliable index for the foetal maturity. In our study we have undertaken phospholipid estimations for comparison with the 'foam' test. The test correlates well with the phospholipid levels and indirectly with foetal maturity and is of great value in our country.

Material and Methods

The present study was carried out on 100 cases who delivered at R.N.T. General Hospital, Udaipur. Of these 36 cases were of normal pregnancy, 30 premature pregnancy, and the rest 34 cases of abnormal pregnancies including toxæmia, hydramnios and postmature pregnancy.

A detailed history with reference to age, family history, period of gestation and history of quickening was recorded. General and systemic examination of patients was also carried out. The mode of delivery and condition of baby was assessed by apgar score.

Routine haemoglobin and urine examination for albumin was done in all cases.

Amniotic fluid was collected by syringe and needle per vaginum during the second stage of labour before rupture of membranes and by amniocentesis in

*Professor and Head.

**Postgraduate Student.

***Reader in Post-partum.

Department of Obstetrics and Gynaecology,
R.N.T. Medical College, Udaipur (Rajasthan).

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caesarean section cases. All the samples were taken in sterile tubes and stored in refrigerator till full estimation of 'foam' test and phospholipids was carried out. Samples contaminated with blood or meconium were discarded.

Foam test was performed as described by 'Clements' *et al* (1972). It is based on the principle that the surface active material produces an extremely stable foam which can not be broken by a defoaming agent such as alcohol. Estimation of phospholipids were done by Trichloroacetic acid precipitation method.

The results of foam test were correlated with amniotic fluid phospholipids.

Discussion

Observations reveal that foam test and total phospholipid content is independent of age and parity of the mother and sex of baby. Tables I and II.

It is dependent upon the gestation age and foetal lung maturity. The estimation of amniotic fluid phospholipids and foam test was done in 36 cases of normal pregnancy ranging from 36-40 weeks gestation. The value of amniotic fluid phos-

TABLE I
Cases According to Age of Mother in Foam Test and Phospholipid Test

Age	No. of deliveries	Normal	Premature	Abnormal
15-20	28	8	13	7
20-25	43	15	13	15
26-30	26	13	4	9
31 and above	73	—	—	3
	100	36	30	34

FOAM TEST:

	Normal		Premature				Abnormal	
2	1	5	13	0	—	1	5	1
2	1	12	10	3	0	2	1	12
1	1	11	3	1	—	—	3	6
—	—	—	—	—	—	2	—	1
5	3	28	26	4	0	5	9	20

PHOSPHOLIPIDS:

Normal		Premature		Abnormal	
Mean	Range	Mean	Range	Mean	Range
10.3	9.7-14.0	7.38	5 -8	9.18	2.8-13.8
10.34	8.0-14.0	7.01	4 -9.2	10.4	3.4-13.9
10.5	8.0-16.0	7.83	6.7-9.4	13.08	9.0-16.6
			—	7.25	5.7- 8.8

TABLE II
Parity of Mother—Foam Test—Results

Parity	Total No. of cases	Parity of Mother—Foam Test—Results				Phospholipids means	Total									
		Negative	Intermediate	Positive	Phospholipids means											
Prema- ture	46	10	2	1	7	10.61	12	12	12	—	7.05	24	4	6	14	10.22
1-2	41	17	1	2	15	10.65	16	12	4	0	6.78	8	1	1	6	11.01
3-4	10	8	1	1	6	9.6	1	1	—	—	5.72	1	—	1	—	9.0
5 and above	3	1	1	—	—	8.5	1	1	—	—	9.4	1	—	1	—	8.9
	100	36	5	3	28		30	26	4	0		34	5	9	20	

phospholipids in these cases varied with a mean from 9.93-11.53% (Table III). Correspondingly 'foam' test was positive in 28 cases, intermediate in 3 cases and negative in 5 cases. Negative results may be due to technical error such as collection of samples, storage and transportation from place of collection to the place of study (Clements *et al*, 1972).

Further, it was observed that total phospholipid content of amniotic fluid and foam test had a definite relationship with the foetal pulmonary maturity and with weight of foetus (Table III).

Out of 30 premature pregnancies studied, it was observed that 26 gave negative foam test and that remaining 4 cases gave intermediate results. It would be of interest to note that not a single foam positive result was observed in cases of premature pregnancies and invariably all pregnancies below 30 weeks gestation gave negative foam test. Similarly, total phospholipid in amniotic fluid was low varying from 5.91-8.00 mg% depending upon gestation timing. The results obtained are in conformity with findings of Nelson, 1969 and Gluck *et al*, 1971).

In the study of 13 postmature pregnancies (Table III), no negative foam test was obtained and that 9 were positive and 4 were intermediate. The level of phospholipid in amniotic fluid also rose between 12.44-14.9 mg%.

Thus in all the 79 cases studied in premature normal and postmature pregnancies, foam test and amniotic fluid total phospholipids correlated with each other.

Toxaemia of Pregnancy

In all 15 cases of toxaemia of pregnancy were studied and it was observed that there was an increase in amount of amniotic fluid total phospholipid and foam test positive result with increasing gestation (Table IV).

TABLE III

Gestation age	No. of cases	5 mts. apgar score	R.D.S.	Mean Wt. of the baby	Sex		Foam Test		Positive	Phospholipids	
					Male	Female	Negative	Inter-mediate		Mean Percent age	Range
Premature:											
28	3	5.7	—	1.71	5	3	8	0	0	5.91	4.0-6.8
29	2	5.0	—	1.5	1	1	2	0	0	6.8	6.0-6.9
30	8	5.3	+	1.52	5	3	8	0	0	7.0	5.0-7.4
32	3	8.5	—	1.62	1	2	2	1	0	7.10	6.0-7.4
34	2	8.0	—	1.70	1	1	1	1	0	7.45	6.0-8.4
35	7	9.0	—	2.02	4	3	5	2	0	8.0	6.0-9.4
	30				17	13	26	4	0		
Normal:											
36	8	10.0	—	2.10	4	4	3	1	4	9.93	8.5-12.2
37	1	10.0	—	2.40	—	1	—	—	1	9.94	—
38	8	9.8	—	2.45	3	5	2	—	6	10.3	8.0-12.00
39	6	10.0	—	3.00	4	2	—	—	6	10.66	8.0-13.7
40	13	10.0	—	3.00	9	4	—	2	11	11.33	8.0-16.2
	36				20	16	5	3	28		
Postmaturity:											
41	7	10.0	—		4	3	—	3	4	12.44	11.0-13.9
42	4	10.0	—		2	2	—	—	4	14.25	12.0-16.2
43	2	10.0	—		2	0	—	1	1	14.90	14.0-15.5
	13				8	5	0	4	9		

TABLE IV
Results of Foam Test

Toxaemia of pregnancy	No. of cases	5 mts. apgar score	Foam Test			Phospholipids	
			Negative	Intermediate	Positive	Mean	Average
33	1	4.0	1	—	—	5.7	—
36	1	5.13	1	—	—	5.71	—
38	5	7.0	—	2	3	9.33	8.0-10.2
39	2	4.0	—	—	2	11.3	10.5-12.1
40	3	9.5	—	—	3	11.4	8.9-13.9
42	3	8.0	—	—	3	12.6	10.0-14.9
	15		2	2	11		
Hydramnios:							
30	2	—	2	—	—	2.8	2.6- 3.0
36	1	—	1	—	—	3.4	—
	3		3				
Pregnancy in hypertension							
36	2	10.0	—	2	—	8.8	8.6- 9
40	1	10.0	—	1	—	9.0	—
	3		—	3	—		

However, in contradiction to the findings of Bhagwarani *et al* (1972) it was observed that amniotic fluid total phospholipids were less in comparison to normal pregnancies of same gestation.

Hydramnios: Three cases of hydramnios between the gestation ages of 30-36 weeks were studied. The mean value of total phospholipids was 2.8 to 3.4% and all the results of foam test were negative. The lower level content of amniotic fluid phospholipid may be explained due to dilution, which is also suggested by Nelson (1969) and Fisher *et al* (1973).

Pregnancy with Hypertension: There were 3 cases of pregnancies with hypertension between 36-40 weeks of gestation. All the 3 gave intermediate foam test and that amniotic fluid total phospholipid level was between 8.8-9.0 mg% which is

lower than normal pregnancies of same gestation.

In view of restricted number of such cases studied, it is futile to explain reasons of such a happening which otherwise is not in conformity with the results of Gluck and Kulovich (1973).

Conclusion

The present study shows that the amniotic fluid foam test which is a bedside test correlates well with the amniotic fluid total phospholipid level method. It is a simple and cheaper method and can be used to be of advantage in remote places where highly sophisticated facilities are not available.

The new tool available to obstetrician shall go a long way to help him in taking

correct and crucial decision regarding safety of induction of labour in high risk pregnancies and in determining maturity of foetus.

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