EVALUATION OF THE SHAKE TEST FOR THE FETAL WELL-BEING

by

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Introduction

The most important determinant of the capacity for extrauterine survival is the ability of the lungs to aerate and for this pulmonary surfactant is essential as it lines the alveoli of the lungs.

Clements *et al* (1972) developed a rapid, inexpensive bedside test for estimation of pulmonary surfactant. The rationale of this test is based on the ability of pulmonary surfactant to form highly stable surface film that can support the structure of a foam for relatively long periods. It is a semi-quantitative test. The present study was carried out to evaluate the place of "Shake Test" in the fetal well-being and fetal maturity and its role in the management of high-risk pregnancy if any.

Material and Methods

The study was performed on 170 pregnant women at or after 36 weeks of gestation. One hundred and forty-five belonged to high-risk pregnancies and 25 from normal pregnancies selected from cases admitted to Government Hospital for Women, Srinagar and Govt. S.M.H.S.

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The amniotic fluid was collected by either transabdominal or transvaginal amniocentesis or by amniotomy and was immediately tested. Samples contaminated with blood and meconium were discarded. The Shake test was performed by the method of Clements *et al* (1972). Gestational age of the newborn infant was estimated by the method of Dubowitz *et al* (1970). The presence or absence of respiratory distress syndrome was determined on clinical findings or radiological findings or on autopsy.

Discussion

The present study showed, as seen in Table I, that the positive shake tests increased with the rise in the period of gestation from 36 to 40 weeks, whereas the negative tests decreased. Statistically it was highly significant at $P < 0.01$ in high-risk cases. These findings corraborated with Clements *et al* (1972) who noted an abrupt rise in the surfactant after 35 weeks. Bhagwanani *et al* (1973) did not get any positive test before the end of 36 weeks. Roux *et al* (1973) found it 100% accurate in predicting a mature fetus. The increase in positive tests with the increase in the period of gestation was also observed by Mukherjee *et al* (1974), Keniston *et al* (1975) and Reddy *et al* (1978). It

TABLE I

The Relationship Between the Shake Test and the Period of Gestation in Normal and High-risk Cases

Shake test	Negative				Intermediate				Positive				Total samples			
Period of Gestation in weeks	Normal cases		High-risk cases		Normal cases		High-risk cases		Normal cases		High-risk cases		Normal cases		High-risk cases	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
36	—	—	7	4.83	—	—	9	6.20	2	8.0	7	4.83	2	8.0	23	15.86
38	—	—	1	0.69	—	—	8	5.52	11	44.0	46	31.72	11	44.0	55	37.83
40	—	—	0	0	2	8.0	7	4.83	10	40.0	60	41.38	12	48.0	67	46.21
Total	—	—	8	5.52	2	8.0	24	16.55	23	92.0	113	77.93	25	100.0	145	100.0

TABLE II

The Relationship Betweet the Shake Test and Respiratory Problems in Babies at Birth in Normal and High-risk Cases

Shake Test	Respiratory Distress Syndrome				Other causes of Respiratory problem				No respiratory Problem				Total Samples			
	Normal cases		High-risk cases		Normal cases		High-risk cases		Normal cases		High-risk cases		Normal cases		High-risk cases	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Negative	—	—	3	2.07	—	—	3	2.07	—	—	2	1.38	—	—	8	5.52
Intermediate	—	—	—	—	—	—	6	4.13	2	8.0	15	10.34	2	8.0	21	14.48
Positive	—	—	—	—	—	—	5	3.45	23	92.0	111	76.55	23	92.0	116	80.0
Total	—	—	3	2.07	—	—	14	9.66	25	100.0	128	88.27	25	100.0	145	100.0

has been observed that the stress factors involved in high-risk pregnancies may be responsible for the presence of greater amounts of surfactant with the increase in the period of gestation unlike the normal pregnancies (Thibeault and Hobelt, 1974 and Rothbard and De Jesus, 1974).

The 3 cases who developed respiratory distress syndrome as seen in Table II had negative shake tests and belonged to high-risk pregnancies. They had the typical clinical findings of expiratory grunting, cyanosis, inspiratory recession and tachypnoea. Autopsy on a case showed firm, reddish purple lungs which on microscopic examination there was atelectasis of lung tissue, dilatation of terminal air passages with pyknotic nuclei of necrotic epithelium piled several layers and hyaline membrane along the walls of the terminal air passages (Fig. 1). Similar findings were observed by Joshi (1975). The positive test precluded the possibility of respiratory distress syndrome, while with an intermediate test it may or may not develop, but a negative test carried a high-risk of developing it, as also noted by Keniston et al (1975). Respiratory difficulty due to intrapartum complications did occur with positive and intermediate tests, which was explained on the basis that the half-life of the surfactant was shortened by pregnancy complication and synthesis delayed (Reddy et al, 1978) and result from complicated labour (Shephard et al, 1974).

The mortality occurred only in high-risk cases as seen in Table III. There was a total mortality of 9 cases (6.21%) and of these 6 had negative, 1 intermediate and 2 positive tests. These included deaths due to intrapartum factors too. Only 3 cases (2.07%) of respiratory distress occurred in the whole series and all 3 succumbed to it. Bhagwanani et al

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TABLE III

The Relationship Between the Shake Test and the Perinatal Mortality in Normal and High-risk Cases

Shake Test	Mortality				No Mortality				Total samples			
	Normal cases		High-risk cases		Normal cases		High-risk cases		Normal cases		High-risk cases	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Negative	—	—	6	4.14	—	—	2	1.38	—	—	8	5.52
Intermediate	—	—	1	0.69	2	8.0	20	13.79	2	8.0	21	14.48
Positive	—	—	2	1.38	23	83.0	114	78.62	23	92.0	116	80.0
Total	—		9	6.21	25	100.0	136	93.79	25	100.0	145	100.0

(1973) had a mortality of 2 cases in the intermediate group. **Thibeault** *et al* (1974) had 21 deaths, 16 due to hyaline membrane disease, and thought that factors other than surfactant deficiency such as intrapartum events with resultant low apgar scores increase the severity and case fatality rate of respiratory distress syndrome. Reddy *et al* (1978) had 12 cases of respiratory distress syndrome, of which 8 had negative tests and of these 2 died.

Conclusion

The shake test is a rapid, simple, inexpensive and a sensitive bedside test. It accurately predicts with a high degree of specificity both fetal well-being and fetal maturity, especially when positive and it showed excellent correlation with the fatal outcome.

Summary

The study was conducted on 170 pregnant women of which 145 were high-risk pregnancies. The shake test has been found to be an ideal test for a rapid screening procedure for determining lung maturity, hence fetal well-being and fetal maturity. It provides the clinician with useful data quickly and can be used for timing of intervention in high-risk pregnancies and in routine, clinical practice even in rural areas with a high degree of safety.

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See Fig. on Art Paper 1