Research Article

A study of reliability of shake test in the estimation of the fetal maturity

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Abstract

Background: It is thought that babies with respiratory distress syndrome (R.D.S.) have insufficient pulmonary surfactant. This surface active lecithin in the pulmonary secretion contributes to the amniotic fluid and its analysis accurately reflects the degree of lung maturity. Lecithin-sphingomyelin ratio (L/S ratio) in amniotic fluid tells us about lung maturity reasonably accurately. However, estimation of L/S ratio needs help of elaborate laboratory facilities which may not be possible in developing countries especially in rural areas. So there is a need to develop simple bedside clinical test to assess fetal lung maturity. Shake test is a rapid, simple, bedside, inexpensive test giving us as good a result as L/S ratio. **Objective:** Present study was done to assess the reliability of shake test in the estimation of fetal pulmonary maturity. **Methods:** This prospective study was carried out over a period of one and a half years (April 2014 to Dec. 2014). 80 cases (40 high risk and 40 without high risk factors) were included in this study group. The shake test was carried out on amniotic fluid sample obtained by ultrasonography guided transabdominal or transcervical amniocentesis. The false positive and false negative results of Shake test were critically analysed. **Results:** Shake test results revealed improvement in fetal pulmonary maturity with advancement of gestational age in 80% of cases. It was observed that positive Shake test correlates well with fetal pulmonary maturity as the incidence of R.D.S. was very low (2.77%) in cases with positive Shake test. However, negative Shake test result does not confirm fetal pulmonary immaturity, because even with negative shake test result, only 39.29% of newborns developed R.D.S. **Conclusions:** Shake test is a simple bedside inexpensive test requiring less laboratory facilities, thus useful in rural set ups. Positive shake test result correlates very well with fetal pulmonary maturity.

Keywords: Shake test, respiratory distress syndrome, Lecithin-sphingomyelin ratio.

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INTRODUCTION

An obstetrician is often faced with the problem of deciding the optimum time to terminate a high risk pregnancy while continuously weighing the increasing fetal risk in an unfavourable intrauterine environment against the risks of immaturity as a result of immediate delivery. In assessing fetal maturity many obstetricians are still slow to appreciate that this term embraces the three related but essentially separate processes of fetal aging, fetal growth and fetal maturity. The last of which signifies, the physiological development of various fetal tissues and systems. From the point of view of viability, it is maturation rather than age or growth that is important and it is the maturation of fetal lungs that ensures survival, provided the baby is born alive and without either traumatic or asphyxia related damage. Respiratory distress syndrome (R.D.S) is a major cause of death in babies born before 37 weeks of gestation. It is thought that babies with respiratory distress syndrome (R.D.S.) have insufficient pulmonary surfactant. This surface active lecithin in the pulmonary secretion contributes to the amniotic fluid and its analysis accurately reflects the degree of lung maturity. With the brilliant research of Gluck *et al.* (1971) [1], we have lecithin-sphingomyelin ratio (L/S ratio) in amniotic fluid which tells us about lung maturity reasonably accurately. However, estimation of L/S ratio needs help of elaborate laboratory facilities which may not be possible in developing countries

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especially in rural areas. So there is a need to develop simple bedside clinical test to assess fetal lung maturity. With the efforts of Clements *et al.* (1972) [2], we now have a Shake test. It is a rapid, simple, bedside, inexpensive test giving us as good a result as L/S ratio. Present study was done to assess the reliability of shake test in the estimation of fetal pulmonary maturity.

METHODS

This prospective study was carried out over a period of one and a half years (April 2014 to Dec. 2014). 80 cases (40 high risk and 40 without high risk factors) were included in this study group. The shake test was carried out on amniotic fluid sample obtained by ultrasonography guided transabdominal or transcervical amniocentesis. The false positive and false negative results of Shake test were critically analysed. Neonatal outcome especially in respect to pulmonary maturity was studied. The false positive and false negative results of shake test were critically analysed. Paediatrician was requested to attend all deliveries. The newborn were immediately dried at birth, were put under a radiant warmer. Fluid and secretions were aspirated from the oropharynx and they were stimulated to cry. If they made no respiratory efforts, intubation was done to expand their lungs with positive pressure and ventilated them with oxygen. The diagnosis of the idiopathic respiratory-distress syndrome was made when there was a typical pattern of military atelectasis on chest roentgenogram and when the clinical features of grunting, intercostals retractions and cyanosis were demonstrable for more than 24 hours. The diagnosis of transitional respiratory distress was made when the signs of respiratory distress lasted for less than 24 hours and required less than 40 per cent oxygen. The babies were shifted to neonatal care unit for subsequent management, if required. All the babies were followed up till discharge from the hospital.

Shake Test: This test was done as described by Clements *et al.* in 1972 [2], it is based on the presence of pulmonary surfactant in amniotic fluid. This test is also called as "foam test", "Bubble stability test" or "Ethanol shake test".

RESULTS

Table 1: Distribution of cases according to duration of pregnancy

Duration of pregnancy	Number of cases	Percentage
Up to 34 weeks	19	23.75
35 - 36 weeks	17	21.25
37 weeks and above	44	55.00
Total	**80**	**100**

It was observed that in 45% of cases in the study group, the duration of pregnancy was less than 37 wks and had associated high risk obstetric or medical problem requiring confirmation of fetal pulmonary maturity.

Table 2: Results of shake test in relation to duration of pregnancy

Sr. No.	Duration of Pregnancy in weeks	Total Number of cases	Result of shake test		
			Positive	Intermediate Positive (%)	Negative (%)
1.	Up to 34 wks	19	1(5.26)	2(10.52)	16(84.21)
2.	35-36 wks	17	7(41.17)	7(41.17)	3(17.65)
3.	37 wks and above	44	28(63.63)	7(15.90)	9(20.45)

Shake test results reveal improvement in fetal pulmonary maturity with advancement of gestational age in 80% of cases. It was further observed that at 35-36 weeks of gestation, results of shake test suggest fetal pulmonary maturity in 82.35% of cases (positive result and intermediate positive result combined).

Table 3: Neonatal respiratory distress in relation to duration of pregnancy

Sr. No	Duration of pregnancy (wks)	Number of Cases	Respiratory distress syndrome Number of cases (%)
1	Up to 34 wks	19	9 (47.36)
2	35-36 wks	17	3 (17.64)
3	37 wks and above	44	4 (9.09)

It was observed that the incidence of R.D.S. was very high (47.36%) when the duration of pregnancy was less than 34 wks. The incidence decreased with the advancement of pregnancy.

Table 4: Correlation of surfactant titre with the respiratory status of newborn

Shake test result	Number of cases	Respiratory distress syndrome Number of cases (%)
Positive at 1:2 dilution	36	1 (2.77)
Intermediate positive	16	2 (12.5)
Negative at 1:1 dilution	28	11 (39.29)

It was observed that positive shake test correlates well with fetal pulmonary maturity as the incidence of R.D.S. was very low (2.77%). Whereas negative shake test result does not confirm fetal pulmonary immaturity, because even with negative shake test result, only 39.29% of newborn developed R.D.S.

Table 5: Predictive value of shake test in development of respiratory distress syndrome (RDS)

Result of shake test	Number of cases	Number of cases with RDS	Percentage of false positive shake test
Positive	36	1	2.77
Result of shake test	Number of cases	Number of cases without RDS	Percentage of false negative shake test
Negative	28	17	60.71

It was noted that positive shake test correlated well with good neonatal outcome i.e. absence of RDS, where as negative shake test does not predict the likelihood of RDS in a newborn.

In the present study, out of 36 cases with positive shake test result, only 1 (2.77%) new born developed RDS, thus the percentage of false positive shake test result was 2.77% whereas out of 28 cases with negative shake test result, 17 newborn did not develop RDS giving false negative shake test result in 60.71% of cases.

DISCUSSION

We found that Shake test results reveal improvement in fetal pulmonary maturity with advancement of gestational age in 80% of cases. It was further observed that at 35-36 weeks of gestation, results of shake test suggest fetal pulmonary maturity in 82.35% of cases (positive result and intermediate positive result combined). In 1973 Bhagwanani [3] found that earlier the gestation, greater the proportion of negative foam test. Our study results also correlate well with the study of Kiran Bhushan and Mirchandani (1978) [4], Manjeet Kaur and S. Vohra (1980) [5], Reddy *et al.* (1978) [6] and Shashi Ramesh and Padma Vacchani (1980) [7].

It was observed that positive shake test correlates well with fetal pulmonary maturity as the incidence of R.D.S. was very low (2.77%). Whereas negative shake test result does not confirm fetal pulmonary immaturity, because even with negative shake test result, only 39.29% of newborn developed R.D.S. The results of our study correlate well with the results of Lalita Badhwar and S.Vohra (1989) [8], Kiran Bhushan (1978) [4] and Clements *et al.* (1972) [2] who showed that there was low incidence of respiratory distress syndrome in newborns that showed positive shake test.

CONCLUSIONS

Shake test is a simple bedside inexpensive test requiring less laboratory facilities, thus useful in rural set ups. Positive shake test result correlates very well with fetal pulmonary maturity.

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