A COMPARATIVE STUDY TO ASSESS THE MATURITY OF THE FETUS BY BUBBLE STABILITY TEST AND PLACENTAL MATURITY GRADING ON ULTRASONOGRAPHY

By

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SUMMARY

This study was carried out in the Department of Obstetrics & Gynaecology, Maulana Azad Medical College and Associated Lok Nayak Jai Prakash Narayan and G. B. Pant Hospitals, New Delhi. A total of 65 patients were studied, in which a comparison was made between the Bubble Stability Test (BST) and placental maturity grading on ultrasonography as a test of fetal maturity. This was confirmed by Ballard scoring of the newborn after delivery.

The Bubble Stability Test was found to be a good method of assessing fetal maturity in normal as well as complicated pregnancies—the possibility of Respiratory Distress Syndrome developing with a positive BST being very remote. Placental grading by ultrasonography is a simple, quick and non invasive method of assessing fetal maturity; a grade III placenta correlates in 100% cases with a positive BST. However, a grade III placenta was present only in 19.45% of cases at term—and this was a major limiting factor. In this study, there was no case of RDS even with a grade II placenta (present in 41.67% of cases at term)—however, it was associated with a positive BST in only 66.67% cases.

Introduction

Management of most pregnancies is simplified if gestational age is known—its estimation is further important as perinatal mortality is related to the gestational age at birth.

Although, the date of the last menstrual period remains the best way of estimating gestational age, it may be unknown in as many as 22% of women. (Beazley and Underhill, 1970).

As is well known, the presence of pulmonary surfactant in the amniotic fluid indicates fetal lung maturity. The bubble stability test is based on the ability of this surfactant to form a stable film which can support the structure of foam. (Clements et al, 1972).

A practical classification of placental maturity changes as seen on ultrasonography has been developed by Grannum

et al in 1979. This grades placentae from 0 to III according to specific ultrasonographic findings in the:

(a) chorionic plate,
(b) placental substance, and
(c) basal layer.

They found Grade III placentae to correlate with full fetal pulmonic maturity in 100% cases.

In this study, an effort has been made to compare the simple and inexpensive bedside Bubble Stability Test with placental maturity changes as seen on ultrasonography (Grannum *et al*, 1979), as a method of assessing fetal maturity especially fetal pulmonary maturity which remains an important factor in the survival of the premature infant.

Material and Methods

A total of 65 cases were studied which were divided into three groups:

Group A: (30) Normal pregnancy with known LMP.

Group B: (25) Complicated pregnancy, sure of LMP.

Group C: (10) Normal pregnancy with unknown LMP.

Patients were taken in the third trimester of pregnancy. A detailed history and clinical examination was done in all cases. Each patient underwent at least 2 ultrasonographic examinations of which the last one was at least within one week of delivery. In patients who went into preterm labour, placentae grading and bubble stability test were performed at the onset of labour. In others, the bubble stability test was performed within 48 hrs of the last ultrasonographic examination. Amniotic fluid was obtained by Abdominal amniocentesis. The scanner used was a 4000 SL ADR, B-mode real time, grey scale, linear accelerator.

The clinical maturity of the newborn was assessed by the Ballard scoring system between 30 and 42 hrs of age. The newborns were followed up for any development of respiratory distress syndrome.

Observations

Out of the 30 normal pregnancies of known LMP (Group A)—3 patients went into spontaneous preterm labour: one at 34 weeks and 2 at 36 weeks, leaving 27 cases who reached term (38 weeks or more).

In Group B, one case was induced at 36 weeks due to uncontrolled hypertension and in the remaining 24 cases, pregnancy was continued till 38 weeks before termination.

In Group C, one patient (out of 10 total cases) delivered spontaneously at 36 weeks gestation.

Group	Preterm Labour	Delivery at 38 wks.	Total
A	3	27	30
B	1	24	25
C	1	9	10
Total	5	60	65

TABLE I

(GROUP A)

Results of BST at ≫ *38 weeks of Gestation*

BST	No. of Cases	Total No. of Cases at 38 weeks
Positive	22 (81.48%)	27
Intermediate	4 (14.81%)	27
Negative	1 (3.71%)	27
Total	27	

P <0.001 (highly significant)

Thus at term, the BST was positive in 81.48% cases and negative in one case (3.71% false negative).

In 14.81% cases at term it was intermediate. There was no false positive BST.

TABLE II

Group B. (Complicated with Known LMP)

BST	No. of cases	Total Cases at Term
Positive	21 (87.5%)	24
Intermediate	3 (12.5%)	24
Negative	Nil	24
Total	24	

Here again the BST was positive in 87.5% cases (true positive rate). There was no false positive case. It was intermediate in 12.5% cases and negative in none (no false negative).

Thus, a positive BST was associated with no case of RDS (No false positive), an intermediate with RDS in 10% cases and negative BST was associated with RDS in 80% cases (20% false negative).

It was also seen that there was not much difference in the relationship of BST to the development of RDS in the normal and high risk pregnancies.

In normal pregnancies, the prevalence of the three placental grades at term were as follows:

Grade I   38.88%
Grade II   41.67%
Grade III 19.45%
                    In complicated cases:
Grade I   37.5%
Grade II   37.5%
Grade III 25%

This is not a significant difference in the prevalence of the 3 placental grades

Relationship of BST to the Development of Respiratory Distress Syndrome (RDS) in the New-born

GROUP A+B+ C. (Overall Results)

BST	RDS	NO RDS	Total No. of Samples
Positive	Nil	50 (100%)	50
Intermediate	1 (10%)	9 (90%)	10
Negative	4 (80%)	1 (20%)	5
	5	60	65

at term between normal and complicated pregnancies.

However, on studying 6 cases of IUGR at term, 50% had a grade III placenta. Of the 5 neonates who developed RDS, all had a placenta of grade I maturity within a week of delivery.

Relationship of Placental Grade to BST Before Delivery in Normal Pregnancy:

With Grade I BST was positive in 50% cases, with Grade II in 86.67% and with Grade III in 100% cases.

In complicated pregnancy, a positive BST was associated with a Grade I placenta in 70% cases, with a Grade II in 88.89% and with a Grade III in 100% cases, thus indicating a direct correlation between increasing placental and lung maturity.

On comparing the value of predicting term gestation by BST and a grade III placenta, it was observed that in normal cases (with known LMP) the BST predicted maturity in 85.18% cases, whereas a grade III placenta was present in only 18.5% cases.

Discussion

The BST is a good method of assessing the fetal maturity in normal as well as complicated pregnancies. It is true positive in 81.48% cases at term and has minimal risk of false positive result. A positive BST indicates fetal lung maturity. It is especially of importance in cases not sure of dates. The limiting feature of this test is the high rate (14.8% at term) of intermediate results which remain inconclusive. Moreover, it is an invasive procedure, with the inherent risks of amniocentesis .

Placental grading by ultrasonography is a simple, quick and non-invasive method of assessing fetal maturity. Although all placentae start with grade 0, not all progress to grade III maturity and at term only 19.45% were found to be grade III in cases of normal pregnancy. The presence of a grade III placental maturity was found to be associated with a good neonatal outcome as well as absence of RDS in the newborn and correlated in 100% cases with a positive BST.

In this study, a grade II placenta (present in 41.67% cases at term) was also associated with absence of RDS in the neonate, however, it correlated with a positive BST in 88.89% cases.

The major limiting factor here was that though a grade III placenta is a definite (though indirect) indicator of fetal pulmonary maturity, it was only found in 19.45% cases at term, and in the rest, the result remains inconclusive. However, if taken in association with other parameters it further corroborates the diagnosis of term pregnancy.

In cases of IUGR at term, a grade III placenta was found in 50% of cases. In this situation it gains importance as amniocentesis may be difficult due to decreased liquor.

References

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