

Relationship between fetal biophysical activities, oligohydroamnios and clinical infection in patients with premature rupture of membranes

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Since the analysis of the individual biophysical components rather than the score has been shown to be more representative of fetal status in detecting fetal asphyxia, it makes sense to assess the value of fetal biophysical profile to detect the clinical infection (clinical amnionitis and neonatal infection) in patients with premature rupture of the membranes (PROM) by analyzing the individual biophysical components alone and in combination. For this purpose, 111 patients with PROM were categorised in three groups (Group 1: Reactive Nonstress Test (NST) and/or Fetal breathing movements (FBM) present, Group 2: Nonreactive NST and FBM absent but Fetal Movements and Fetal Tone present, Group 3: Each of those parameters negative or absent) according to the combination of biophysical activities, and infection outcome was studied for each group. In Group 1 the infection outcome was significantly lower than Group 2 and Group 3 ($p < 0.0001$). Further combination of the parameters mentioned above with oligohydroamnios showed that the presence of oligohydroamnios was especially meaningful for the patients in Group 2, since Group 2 patients with normal amniotic fluid had an infection rate 0%, versus 90% when there was oligohydroamnios. According to these data, a protocol has been proposed for the management of patients with PROM. [Turk J Med Res 1993; 11(2): 66-69]

KeyWords: PROM, Fetal biophysical profile

The predictive value of fetal biophysical profile (non-stress test, fetal breathing movements, fetal movements, fetal tone, amniotic fluid volume and placental grading) in antepartum surveillance has very well been documented (1,2). It also has been described as a predictor of impending infection in patients with premature rupture of the membrane (PROM) (2,3) which is still one of the most common and challenging problems in perinatal medicine.

Since the analysis of the individual biophysical components rather than the score has been shown to be more representative of fetal status in detecting fetal asphyxia, it makes sense to assess the value of fetal biophysical profile to detect the clinical infection (clinical amnionitis and neonatal infection) in patients with premature rupture of the membranes by analyzing the individual biophysical components alone and in combination.

The present retrospective study was undertaken at the Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, University of Connecticut to make a new assessment in predicting infection outcome in patients with premature rupture of the membranes using the individual components in combination. We also studied the relationship between oligohydroamnios, fetal biophysical activities alone and in combination, and infection outcome in these patients.

MATERIALS AND METHODS

This retrospective study is based on two previous studies by Vintzileos et al (3,4). We studied 111 patients with premature rupture of the membrane who had a fetal biophysical profile within 24 hour of delivery. All patients were free of infection (clinical amnionitis) at the time of biophysical examination. These 111 patients were previously reported by the studies mentioned above but analysis of the results previously was based on the score rather than individual biophysical components in combination. In those two studies which we have reviewed only singleton pregnancies with gestational age >25 weeks, premature rupture of membranes, and no labor had been included. Patients with signs of labor, chorioamnionitis,

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bleeding, or fetal distress had been excluded. The prior use of tocolysis and the presence of complicating factors (for instance, pregnancy induced hypertension, diabetes, intrauterin growth retardation) had also been considered as contraindications for entering the study.

In all patients rupture of membranes had been diagnosed by sterile speculum examination using pooled fluid, ferning, and alkaline pH determination (nitrazine paper). Digital vaginal examination had not been done after admission. The ultrasound examination had been performed by means of a linear array real time ultrasound method (Picker LS-2000) equipped with a 3.5 MHz transducer. Real time scanning consisted of a maximum 30 minute observation period during which fetal movements and fetal breathing movements had been counted and fetal tone, amniotic fluid volume, and placental grading has been estimated.

These 111 patients were categorised in three groups according to the combinations of biophysical activities:

Group 1: — Reactive Nonstress Test

(The presence of two or more fetal heart rate accelerations of at least 15 bpm and lasting at least 15 sec and associated with fetal movement in 20 min) and/or

- Fetal Breathing Movements present
(The presence of at least 30 sec sustained fetalbreathing movements in the 30 min of observation)

Group 2: — Nonreactive Nonstress Test

- Fetal Breathing Movements absent
- Fetal Movements Present

(Three or more gross body movements in 30 min of observation.' Simultaneous limb and thrunk movements were counted as a single movement).

- Fetal Tone present
(At least one episode of motion of a limb from a position of flexion to extension and a rapid turn to flexion).

Group 3: — Nonreactive Nonstress Test

- Fetal Breathing Movements absent
- Fetal Movements compromised or absent
- Fetal Tone compromised or absent

Oligohydroamnios was defined when the largest pocket of amniotic fluid measured less than 2 cm in two perpendicular planes.

Measures of infection outcome included the presence of clinical amnionitis, neonatal infection (neonatal sepsis and possible neonatal sepsis), and

overall infection which included patients with maternal and/or neonatal infection. The diagnosis of either clinical amnionitis and neonatal infection was based on previously described criteria (3).

Statistical analysis was performed by contingent^ tables and chi-square test. A p value less than 0.05 was considered significant.

RESULTS

There were 111 patients with premature rupture of membranes. All of those patients had been delivered in 24 hours of the final examinaton: There were 81 patients in Group 1, 13 in Group 2 and 17 in Group 3. 64 of the patients had normal amniotic fluid but 47 of them had oligohydroamnios. 16 of the patients (14.4%) developed clinical amnionitis, 27 (24.3%) neonatal infection (neonatal sepsis and possible neonatal sepsis), and 31 (27.9%) developed overall infection (one or more infection outcomes).

The frequency with which infection outcome was developed in each group is shown in Table 1.

As can be seen the results were statistically significant (p<0.0001). In Group 1 the infection rate was significantly lower than Group 2 and Group 3.

The relationship between the amount of amniotic fluid and the different infection outcomes is shown in Table 2. There was statistically significant higher incidence of clinical infection in patients with oligohydroamnios for all three infection outcomes.

Because the biophysical activities in combination and also the amount of amniotic fluid alone have a predictive value for infection outcome, it makes sense to further combine these in order to determine if both together predict infection more accurately. Table 3 shows the number and percentage of the patients who developed infection outcome according to the presence or absence of oligohydroamnios. This data suggest that the presence of oligohydroamnios is especially meaningful for the patients in Group 2, since Group 2 patients with normal amniotic fluid had an infection rate 0% versus 90% when there was oligohydroamnios.

Table 1. Relationship between each group and infection outcome

	Amnionitis	Neonatal Infection	Overall Infection*
Group 1 (N-81)	4 (4.9%)	3 (3.7%)	6 (7.4%)
Group2(N-13)	3 (23%)	9 (69.2%)	9 (69.2%)
Group3(N-17)	9 (52.9%)	15(88.2%)	16(94.1%)
P <	0.0001	0.0001	0.0001

Total number of patients - 111

*Some patients had more than one infection outcome

Table 2. The relationship between the amount of amniotic fluid and the different infection outcomes

Infection Outcome	Amnionitis	Neonatal Infection	Overall Infection
Normal amniotic fluid (N-64)	5 (7.8%)	7(10.9%)	10(15.6%)
Oligohydroamnios (N-47)	11 (23.4%)	20 (42.5%)	21 (44.6%)
P<	0.004	0.0003	0.001

Total number of patients - 111

Table 3. Relationship between the groups, amniotic fluid and infection outcome

Infection Outcome	Amnionitis		Neonatal Infection		Overall Infection	
	Normal	Oligo	Normal	Oligo	Normal	Oligo
Amniotic Fluid						
Group 1 (N-81)	4/57 (7%)	0/24 (0%)	3/57 (5.3%)	0/24 (0%)	6/57 (10.5%)	0/24 (0%)
Group2(N-13)	0/3 (0%)	3/10 (30%)	0/3 (0%)	9/10 (90%)	0/3 (0%)	9/10 (90%)
Group 3 (N-3)	1/4 (25%)	8/13 (61.5%)	4/4 (100%)	11/13 (84.6%)	4/4 (100%)	12/13 (92.3%)

Total number of patients - 111

DISCUSSION

Premature rupture of the membranes is still one of the common and challenging problems in obstetrics. In literature, the reported incidence ranges from 5% to 40% (5,6).

Many investigators recommend prompt delivery of the fetus when premature rupture of the membranes occurs at term, because of increased incidence of amnionitis with prolonged rupture of membranes (7). However this action will usually result in increased incidence of primary cesarean section for failed induction of labor and cephalopelvic disproportion (8). The management becomes more controversial when it occurs in a preterm gestation. Conservative management carries an increased risk of fetal neonatal infection and cord prolapse. The management protocols which involve the use of amniocentesis (9,10) have a certain risk to the fetus and also it is not always successful to obtain fluid. Moreover there is not a strong correlation between the presence of bacteria in the amniotic fluid and fetal sepsis.

The predictive value and the superiority of fetal biophysical profile versus amniocentesis has very well been documented in the patients with premature rupture of the membranes (3,4). However, in these studies the result was based on total score rather than the biophysical parameters in combination. Since the analysis of the individual score rather than the score has been shown more representative of detecting fetal asphyxia it makes sense to assess the value of the fetal biophysical profile to predict the development of clinical infection in patients with premature rupture of the membranes by analysing the components alone and in combination.

It has been showed that fetal biophysical assessment becomes abnormal before the development of

fetal acidosis (11). The proposed mechanism by which fetal infection diminishes fetal biophysical activities is that the increased fetal demands cause local tissue hypoxia and thereby malfunction of the fetal central nervous system centers which control the reflex biophysical components, nonstress test, fetal breathing movements, fetal tone have been found important in the above sequence. It also has been reported that the degree of oligohydroamnios is correlated with infection outcome. Therefore daily biophysical profile was proposed for the patients with premature rupture of the membranes and severe oligohydroamnios (2).

Consequently, one may consider that evaluation of the biophysical activities in combination also in association with amniotic fluid volume may be more helpful and accurate in predicting infection outcome. For this purpose, patients were categorized in three groups. The result was extremely meaningful in all groups for predicting the fetal infection outcome (Table 1) with the p values 0.0001. Although the highest infection rate was encountered in Group 3 for overall infection ($p < 0.0001$) oligohydroamnios alone was also associated with an increased incidence of infection (Table 2). However, further combination of the groups with the presence or absence of oligohydroamnios was especially helpful in group 2 to assess the risk of infection (Table3).

These observations suggest that analysis of biophysical components in combination and taking into consideration the presence or absence of oligohydroamnios is more practical and useful in clinical practice rather than the total score.

As a result of these observations we would suggest the following protocol as illustrated in Figure 1.

In summary, rather than the total score, combination of the biophysical activities with or without

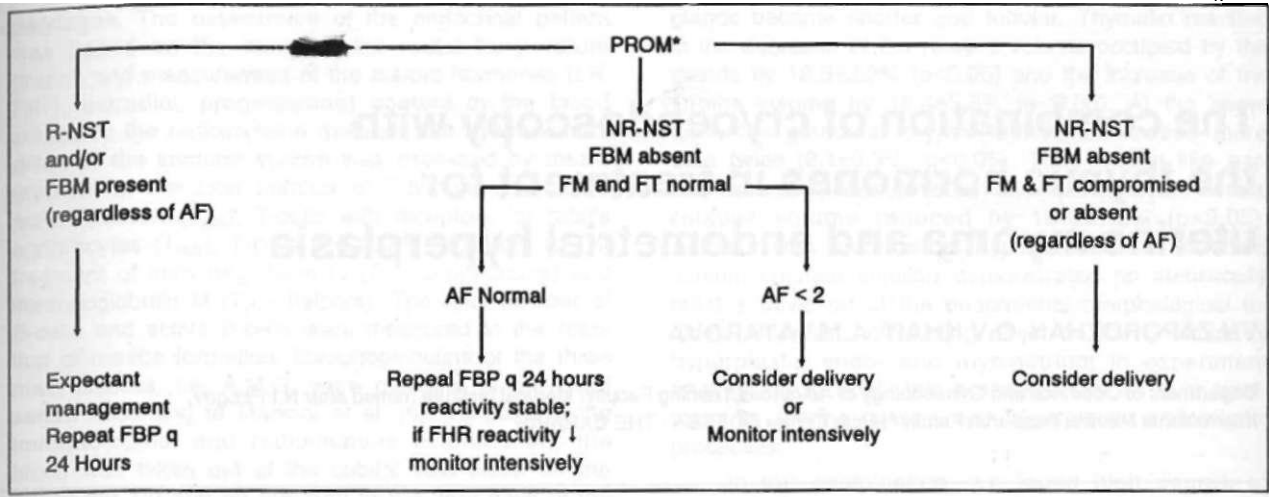


Figure 1. Proposed protocol for management of premature rupture of the membranes.

*Premature rupture of the membranes. R-NST - Reactive Nonstress Test, NR-NST - Nonreactive Nonstress Test, FBM - Fetal Breathing Movements, FM - Fetal Movements, FT - Fetal Tonus, AF - Amniotic Fluid, FBP - Fetal Biophysical Profile, FHR - Fetal Heart Rate.

oligohydroamnios may be considered as more predictive and helpful in predicting the development of infection in patients with premature rupture of the membranes.

Prematüre membran rüptürü olan hastalarda fötal biyofiziksel aktiviteleri ile oligohidroamnios ve enfeksiyon arasındaki ilişki

Fötal asfiksizin saptanmasında skordan ziyade bireysel biyofiziksel komponentlerin analizinin fötal durumun daha iyi bir göstergesi olduğu gösterilmiş olduğundan dolayı prematüre membran rüptürü olan hastalarda biyofiziksel komponentlerin (PROM) tek başına ve kombine olarak inceleyerek klinik enfeksiyonu (klinik amnionitis ve neonatal enfeksiyon) saptamada fötal biyofiziksel profilin önemini değerlendirmek anlamlıdır. Bu amaçla PROM'lü 111 hasta biyofiziksel aktivitelerin kombinasyonuna göre üç gruba ayrıldı (Grup 1: Reaktif Nonstres Test (NST) ve/veya Fötal Solunum Hareketleri (FBM) mevcut, Grup 2: Nonreaktif NST ve FBM yok fakat fötal hareketler ve fötal tonus mevcut, Grup 3: yukarıdaki parametrelerin herbirisi negatif veya yok), ve her grup için enfeksiyon sonucu incelendi. Grup 1'de enfeksiyon Grup 2 ve 3'dekinden anlamlı derecede azdı ($p < 0.0001$). Yukarıda söz edilen parametrelerin oligohidramnios ile kombinasyonu oligohidramnios varlığının Grup 2'deki hastalar için özellikle anlamlı olduğunu göstermektedir zira bu gruptaki normal amniotik sıvili hastalarda enfeksiyon oranı %0 iken oligohidramnios varlığında %90 bulunmuştur. Bu veriler ışığında PROM'lu hastaların takibi için protokol önerilmiştir [Turk J Med Res 1993; 11(2): 66-69]

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