

## Can non-stress test predict meconium stained amniotic fluid presence without performing an amniotomy?

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### Abstract

**Objective:** Meconium stained amniotic fluid is a frequently encountered situation, it can really disturb an obstetrician, as it increases the rates of neonatal morbidity and mortality and it is difficult to prevent meconium passage in utero. Noninvasive tests are needed to predict the meconium staining of the amnion fluid without making amniotomy or making a fetal invasive procedure. Non stress test is a commonly used method to determine the status of intrapartum fetal wellbeing. The purpose of this study was to predict fetal meconium release during labor by examining the fetal heart rate traces without performing an amniotomy procedure.

**Materials and Methods:** A total of 280 patients who have been diagnosed with active labor were included in the study. The 140 of them have demonstrated meconium stained fluid and 140 of them have clear amniotic fluid. The patients' labor courses have been watched and non-stress test results have been recorded besides obstetric outcomes.

**Results:** Non-stress tests performed before amniotomy; 52 (37.1%) of the non-stress tests in the meconium group were non-reactivated, whereas in the control group this count was 19 (13.5%) before amniotomy. When we accepted the deceleration entity as fetal distress; fetal distress was seen in 62(44.3%) of the patients in the meconium group and in 21(15.1%) of the patients in the control group.

**Conclusion:** In the presence of non-reactive non stress test pattern; we should be suspicious of meconium-stained amniotic fluid. In this case, caution should be taken in terms of fetal distress.

**Keywords:** Meconium stained amniotic fluid, Non stress test

### Introduction

Presence of meconium stained amniotic fluid (MSAF) is seen in 12-16 % of deliveries. Meconium aspiration syndrome (MAS) which occurs in 2% to 36% of meconium-stained neonates is characterized with respiratory distress syndrome (1). Meconium output normally occurs within the first 24-48 hours after birth. It is not uncommon for amniotic fluid to be stained with meconium. The most serious complication of meconium-stained amniotic fluid is meconium aspiration syndrome (2,3). The incidence of meconium-stained amniotic fluid increases with gestational age and reaches 30% in postterm pregnancies. Regardless of fetal maturation, a significant increase in the incidence of meconium transmission in the amniotic cavity is evident in the presence of fetomaternal stress factors such as hypoxia and infection (4). Meconium stained amniotic fluid is associated with higher rate of caesarian delivery, increase the need for neonatal resuscitation and the need for neonatal intensive care (5,6).

Although meconium stained amniotic fluid is a frequently encountered situation, it can really disturb an obstetrician, as it increases the rates of neonatal morbidity and mortality and it is difficult to prevent meconium passage in utero. In utero, passage of meconium may simply represent the normal gastrointestinal maturation or it may indicate an acute or chronic hypoxic event. These fetuses are 100 times more likely to exhibit respiratory distress syndrome than those which are born through clear amniotic fluid (7). Meconium can cause umbilical vascular vasospasm and impair fetal-placental blood flow. Meconium presence may also have occurred with anal sphincter loosening resulting in intrauterine hypoxia. This is associated with fetal distress and non-reassuring fetal heart rate (FHR) (8,9). It is unclear why the meconium aspiration syndrome develops in one part of the babies painted with meconium and does not develop in others.

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Because of this reason if meconium is present in the amnion fluid, it should be regarded as a stimulant marker for fetal distress and the fetus should be closely evaluated for presence of fetal distress (10,11).

FHR monitorization and checking the presence of meconium in the amniotic fluid are the commonly used methods during labor. Electronic fetal heart rate monitoring helps to reduce fetal mortality and morbidity rates by detecting fetal hypoxia early but may increase unnecessary cesarean rates (12,13,14). The MSAF is a clinical diagnosis with no practical confirmatory test except diagnostic amniocentesis which is an invasive intervention.

Noninvasive tests are needed to predict the meconium staining of the amnion fluid without making amniotomy or making a fetal invasive procedure. Non-stress test is a commonly used method to determine the status of intrapartum fetal well being. Our leading purpose to investigate the difference between non-stress test patterns before and after amniotomy.

## Material and Methods

A total of 280 patients who have been diagnosed with active labor were included in the study. Half (N:140) of them demonstrated meconium stained fluid and 140 of them clear amniotic fluid based on physical properties of the amniotic fluid following amniotomy procedures during close follow-up of labor. Patients whose gestational age was between 37 and 41 weeks were included to the study. Patients with high risk conditions were excluded. Informed consent was taken from all patients. The patients' labor courses have been watched and nonstress test results have been recorded besides obstetric outcomes. Caesarean section was liberally performed when fetal heart rate pattern has revealed late and/or variable decelerations. Newborns with respiratory distress were accepted to the intensive care unit as per the pediatrician's advice.

Statistical analysis was performed by using IBM SPSS Statistics Software (22.0, SPSS Inc., Chicago, IL). Patients's obstetric data has been evaluated for normal distribution by using the Kolmogorov-Smirnov test. The continuous variables were presented by means  $\pm$  standard deviation and compared by using the independent samples t test based on normal distribution status. The non-parametric variables and data without normal distribution were compared by using the Mann-Whitney U test. Wilcoxon Signed Ranks test was used for comparing non-stress test patterns for two patient groups separately. The comparison of categorical variables was made by using Fisher's exact test, or the chi-square test. All p values  $<0.05$  were considered statistically significant.

## Results

A total of 280 patients were included in the study. Half (N:140) of them had meconium stained amniotic fluid. The amniotic fluid in the control group was clearly seen. Patients in the meconium group 74 of them were thin and 66 of them were thick meconium stained. Patients' age, parity, gestational age, body mass indexes, and birth weight results were similar. Also the need for oxytocin was similar in both groups (Table 1).

After amniotomy; non-reassuring non stress test pattern was observed in 6 (8.1%) of patients with thin meconium and 14 (21.2%) of patients with thick meconium. This difference was statistically significant ( $p=0.021$ ). Among patients with meconium stained amniotic fluid, 123 (87.9%) patients were delivered through normal vaginal delivery, while 17 (12.1%) were delivered by caesarean section. Caesarean rate was found significantly higher in the thick meconium group than in the thin meconium group (21% versus 4,2%) ( $p:0.003$ ). A total of 5 newborns (3.7%) were transferred to intensive care unit due to meconium aspiration syndrome.

**Table 1.** Demographic and clinical characteristics of the groups (n:280)

Variables	Meconium group (n:140)	Control group (n:140)	P value
Age(yrs)	29.1 $\pm$ 5.6	28.5 $\pm$ 5.5	0.455*
BMI (kg/m <sup>2</sup> )	26.2 $\pm$ 2.1	26.1 $\pm$ 2.4	0.851
Birthweight(gr)	3313 $\pm$ 329	3267 $\pm$ 308	0.252*
Gestationalage (wks)	39.6 $\pm$ 1.0	39.4 $\pm$ 1.2	0.302*
Primipar	75(53.6%)	71(50.7%)	0.322¶
Vaginal Delivery	123(87.9%)	125(89.3%)	0.075¶
C-section	17(12.1%)	15(10.7%)	
Oxytocin	76(54.3%)	79(56.4%)	0.405¶
Nicuadmission	8(5.7%)	6(4.3%)	0.832¶
5th minuteApgar<7	9(6.4%)	7(5.0%)	0.226¶

Mean  $\pm$  standard deviation and number(percentage). \*Mann Whitney-U test, ¶Chisquare test. A p value $<0.05$  is considered statistically significant.

**Table 2.** Distribution of non stress test results of groups.

	Nonstress test	Meconium(n:140)	Control (n:140)
<b>Before amniotomy</b>	Reactive	72 (51.4%)	111 (79.3%)
	Non reactive	52 (37.1%)	19 (13.6%)
	Early deceleration	16 (11.4%)	10 (7.1%)
<b>After amniotomy</b>	Reactive	34 (24.3%)	89 (63.6%)
	Non reactive	44 (31.4%)	30 (21.4%)
	Early deceleration	41 (29.3%)	6 (4.3%)
	Late deceleration	12 (8.6%)	11 (7.9%)
	Variable deceleration	9 (6.4%)	4 (2.9%)

Non-stress test patterns which were performed before amniotomy have been grouped as reactive, non-reactive and early deceleration (Table 2). Fifty two (37.1%) of the nonstress tests in the meconium group were nonreactive, whereas in the control group this number was 19 (13.5%) before amniotomy. This difference was statistically significant ( $p < 0,001$ ). Similarly non-stress test patterns were evaluated after amniotomy and grouped as reactive, non-reactive, early deceleration, late deceleration and variable deceleration (Table 2). When we accepted variable deceleration, late deceleration and non-reactive entity as non-reassuring test; non-reassuring pattern was seen in 62 (44.3%) of the patients in the meconium group and in 21 (15.1%) of the patients in the control group. Non-reassuring nonstress test incidence in the meconium group was statistically significantly higher ( $p:0.014$ ). Within the meconium group itself; fetal distress was found to be higher in patients with thick meconium than thin meconium (22.8% versus 8.5%  $p < 0,001$ ).

We used the Wilcoxon Signed Ranks test to determine if the non-stress tests were different before and after amniotomy. Non-stress tests were found to be prone to transformed to worse patterns in terms of fetal distress and this statistical analysis was significant for both groups (for meconium group  $p < 0,001$ ,  $z:-6.6$  and for control group  $p < 0,001$ ,  $z:-3.7$ ). This statistically significant relationship was found to be stronger for the meconium group which is demonstrated with z values.

Incidence of vaginal delivery was 87.9 % in the study group and 89.3 % in the control group. normal birth rates in both groups were statistically similar ( $p:0.426$ ). A total of 14 newborns (5.0%) were transferred to neonatal intensive care unit. Eight (57%) of these babies were in the meconium group. There was no difference in intensive care need between two groups ( $p:0.832$ ). Apgar score at 1 and 5 min was lower in the meconium group than in the control group. This difference statistically significant ( $p < 0.001$ ) (Table 1).

## Discussion

The presence of MAF during delivery varied between 10% and 16.6% in low risk pregnancies. Meconium Aspiration Syndrome (MAS) is a complication present in MAF and life-threatening disease affecting newborns with meconium staining (15). Meconium can cause umbilical vascular vasospasm and impair fetal-placental blood flow. This is associated with fetal distress and non-reassuring FHR (7,8,9). When we examined the non-stress test patterns of both groups before amniotomy; we have seen that the number of patients with nonreactive pattern was found to be higher in the meconium group (37.1% versus 13.5%  $p: 0,001$ ).

There was a difference in non-stress test before and after amniotomy for both groups. We observed that the number of non-reassuring non stress tests increased after amniotomy. Also we found that the probability of non reassuring non stress test was higher in pregnant women with meconium-stained amniotic fluid after amniotomy (44.3% vs. 15.1 %). Similarly, Wong et al. found that the incidence of non-reassuring nonstress test with meconium-stained amniotic fluid was significantly higher (9.8% versus 6.4%) (12). Therefore if meconium is detected after spontaneous or artificial amniotomy clinicians must be careful in terms of fetal distress following amniotomy. In our study, 87.9% patients in meconium group delivered through normal vaginal delivery, and 12.1% through cesarean section. Contrarily, in the study of Karim et al, 60% patients with meconium stained fluid were delivered through normal vaginal delivery, while 40 % were delivered by caesarean section (16). This may be due to false positive non-stress test results whereas there was no difference between the groups in terms of newborn perinatal outcome.

As a result; performing amniotomy increases the likelihood of non-reassuring non-stress test pattern due to lack of protective effect of surrounding amniotic fluid. Amniotomy

should not be done early during labor progress if possible. If the fetal membrane is spontaneously ruptured; clinicians must be careful with fetal distress establishment in pregnancies with meconium stained amnion fluid.

## Conclusion

In our study, we have seen that amniotomy increases the likelihood of non-reassuring non-stress test. Also we found that the probability of fetal distress was higher in pregnant women with meconium-stained amnion fluid after amniotomy. In this case, caution should be taken in terms of fetal distress following spontaneous or artificial amniotomy. It would be better not to do early amniotomy during labor regardless of meconium presence or absence in amniotic fluid .

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