Evaluation and Management of Neonates with Meconium Stained Amniotic Fluid

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Objective: **The purpose of this study was to evaluate neonates with meconium stained amniotic fluid and to investigate whether pulmonary disease and mortality were significantly greater in infants with thick meconium.**
Method: **We evaluated 278 meconium stained neonates between January 1993 – February 1999. Amniotic fluid was defined as thin (221 neonates) or thick (57 neonates) by a pediatrician.**
Results: **Compared to neonates with thin meconium, those with thick meconium appeared to have significantly greater rates of acidemia, low APGAR scores at the 1th and 5th minutes, more need for resuscitation and higher mortality rate. Meconium aspiration syndrome and hypoxic ischemic encephalopathy were also significantly higher in infants with thick meconium.**
Conclusion: **Amniotic fluid with thick meconium may cause more respiratory and other complications in neonates than amniotic fluid with thin meconium. Therefore, tracheal suction is recommended for infants born depressed and with thick meconium stained amniotic fluid.**

Key words: *Meconium stained amniotic fluid, neonate*

Meconium-stained amniotic fluid occurs in 8 to 20% of all pregnancies, usually associated with the term fetus. On the other hand, meconium aspiration syndrome occurs in 2 to 6% of these neonates and may be associated with significant neonatal morbidity including respiratory failure. Prevention of neonatal meconium aspiration syndrome remains a major objective for obstetricians and neonatologists (1-4).

Aggressive tracheal suctioning at delivery before the first neonatal breath demonstrated a reduction in the incidence of neonatal meconium aspiration syndrome. This strategy was adopted by many institutions. Subsequent reports have challenged the concept that meconium aspiration syndrome is strictly a postnatal event. In institutions where aggressive upper airway management including tracheal intubation was adopted, neither neonatal morbidity nor mortality resulting from meconium aspiration syndrome was completely averted, and there were no clear benefits established in the prevention of neonatal meconium aspiration syndrome (5-8).

In recent years, adopting the suggestions by Carson et al. and Linder et al (9-11), the delivery room approach to infants with meconium-stained amniotic fluid at our unit has been selective intervention. Vigorous infants born with thick meconium-stained amniotic fluid as well as infants born with thin stained fluid do not require tracheal intubation and suction. However, infants with poor tone and respiratory effort or apnea continue to be managed by attempted tracheal suction.

The purpose of this study was to evaluate neonates with meconium stained amniotic fluid and to see whether pulmonary disease and mortality were significantly greater in infants with thick meconium.

Material and Method

The study was carried out on the 278 neonates born in Balcalı Hospital of Çukurova University between January 1993 and February 1999. The data about babies were collected from patients' charts. For the last 18 months, patients were evaluated prospectively. For all neonates, gender, mother's age, route of delivery, birth weight, gestational age calculated according to last menstrual period of mother or according to Dubowitz, New Ballard score systems, APGAR scores at the 1st and the 5th minutes, and abnormalities about labour or placenta (preeclampsia, eclampsia, abnormal placenta, traumatic labour, twisted cord etc.) were recorded by clinicians. Resuscitation practices after delivery (tracheal intubation and positive pressure ventilation), capillary blood gas levels in the first hour of life, postnatal respiratory complications (pneumothorax, pneumonia, persistent pulmonary hypertension etc.) and presence of asphyxia were also recorded.

During labor or at delivery, the characteristics of amniotic fluid was identified as rupture of fetal membranes. If meconium was present, the quality of meconium was also identified as either thick or thin. Thick meconium was defined as turbid and viscous or particulate. Thin meconium was watery and thinly stained.

At delivery of in all meconium exposed fetuses, secretions in the oropharynx, nasopharynx and trachea were aspirated by the pediatrician with appropriate feeding tubes. But during the last 18 months, tracheal suctioning was not recommended if the following criteria were

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fulfilled: 1) an anticipated 1-minute APGAR score >7; 2)estimated gestational age of >37 weeks at delivery 3) thin meconium stained amniotic fluid.

The diagnosis of meconium aspiration syndrome determined by the neonatologists required exposure to meconium-stained amniotic fluid, the presence of respiratory distress, an abnormality on chest roentgenogram, and the absence of any other cause to explain to constellation of signs and symptoms.

The data were analysed using SPSS statistical package program. The significancey between the groups were studied by Student-t and chi-square test. P<0.05 was considered significant.

Results

A total of 278 neonates with a mean gestational age of 39.01± 2.3 weeks and a mean birth weight of 3149±713 grams were included. 33 (11.8%) neonates were premature and 46 (16.5%) were small for gestational age (SGA). Hundred and thirty three (51.4%) babies were males and 135 (48.6%) were females. The route of delivery and other characteristics of infants were shown in Table I.

The meconium was thin in 221 delivery (79.4%) and thick in 57 deliveries (20.6%). APGAR scores and capillary blood gas results were significantly lower in infants with thick meconium (p<0.05) (Table II).

All of postnatal problems and mortality rate were significantly higher in infants with thick meconium. In assessing the pulmonary outcomes of infants with thin and thick meconium, each diagnosis was compared individually. In addition, the occurrence of any respiratory problems was analyzed, counting each infant once only, without respect to the presence of multiple pulmonary diagnoses. It was not always possible to make a single diagnosis, and some of the infants were concomitantly diagnosed with meconium aspiration syndrome and pneumonia.

Table I. The characteristics of meconium stained neonates at delivery.

	N	%
Route of delivery		
Vaginal	123	44.2
Cesarean	155	55.8
Small for gestational age	26	9.4
Large for gestational age	22	7.9
Mortality	31	11.2

Table II. Comparision of neonates with thin and thick amniotic fluid.

	Thin N=221	Thick N=57	p
Gestastional age (week)	39.02±2.2	38.9±2.7	0.860
Birth weight (gram)	3170±722	3068±680	0.336
1-minute Apgar score	5.7±2.1	3.1±2.2	0.000
5-minute Apgar score	8.0±4.1	5.9±1.9	0.000
Mother's age (year)	28.4±5.6	28.5±6.5	0.933
Duration of hospitalization (day)	8.4±9.1	11.2±12.5	0.068
Capillary pH	7.27±0.10	7.13±0.18	0.000
Capillary pCO2	40.9±9.7	45.6±17.3	0.008
Capillary BE	-6.2±4.6	-11.6±7.4	0.000
Capillary HCO3	18.3±4.0	15.1±5.8	0.000

Table III. Comparison of neonates with thin and thick amniotic fluid.

	Thin N=221	Thick N=57	p
Gender			
Male	114	30	0.978
Female	107	27	
Route of delivery			
Vaginal	99	24	0.715
Cesarean	122	33	
Small for gestational age	23	3	0.192
Large for gestational age	20	2	0.139
Preeclampsia	28	6	0.977
Eclampsia	10	7	0.016
Abnormal placenta	3	1	0.822
Twisted cord	8	7	0.009

Table IV. Comparison of postnatal events in two groups.

	Thin N=221	Thick N=57
Need for resuscitation	20	32*
Hypoxic ischemic encephalopathy	9	19*
Meconium aspiration syndrome	20	22*
Pneumonia	10	19*
Pneumothorax	2	7*
Persistent pulmonary hypertension	-	6*
Mortality	15	16*

**chi-square p<0.0001*

Although there were no differences for gender, route of delivery, small for gestational age ratio, large for gestational age ratio, abnormal placenta and preeclampsia cases, but eclampsia and twisted cord cases were significantly higher in infants with thick meconium (Table III).

The incidence of meconium aspiration syndrome for all neonates with meconium stained amniotic fluid was 15.1% (42 babies), whereas in infants with thick meconium, it was 38.5% (22 babies) (Table IV).

Discussion

The increased risk for pulmonary morbidity and mortality among infants born through meconium stained amniotic fluid is well recognized. Though many reports have noted a clinical spectrum of pulmonary dysfunction such as mild tachipnea and severe pulmonary insufficiency,

this study confirms that meconium stained amniotic fluid is associated with an increased risk for pulmonary dysfunction. The risk for pulmonary disease, however, is not manifested equally in all infants with meconium staining. Infants with more viscous, particulate meconium (thick) staining have an overall risk for pulmonary disease that is significantly greater than that of infants with thin meconium staining. As it was shown by several previous studies, the greatest risk for pulmonary disease occured among infants with associated signs of possible intrapartum fetal compromise. Despite airway management following recommended guidelines, these infants continued to manifest a high rate of pulmonary morbidity (12-15).

The recommendation by the American Academy of Pediatrics in 1983 did not suggest that all infants born through thick meconium stained amniotic fluid necessarily require tracheal suction. The second edition of these Guidelines noted the absence of additional studies to support or refute the practice of tracheal suction for meconium stained amniotic fluid and recommended that "in the presence of thick or particulate meconium, the larynx should be visualized, and if meconium is present, the clinician should intubate the trachea and apply suction". The most recent edition of the Guidelines published in 1992, is less dogmatic. It is recommended that depressed infants with meconium in the hypopharynx have tracheal suction. However, it is further noted that cord visualization and tracheal suction in the vigorous infant with thick meconium may not be necessary. None of the Guidelines have recommended tracheal suction of infants born through thin meconium stained amniotic fluid (12,13). Similar to these recommendations, we administer tracheal suction only to neonates with depressed and thick meconium for the last 18 months.

In premature deliveries, meconium stained amniotic fluid is very rare. In our study population, 33 (11.8%) neonates were premature and 46 (16.5%) were small for gestational age (SGA). Similar findings have been reported previously (16).

Low APGAR scores and acidemia are important problems of neonates born with thick meconium amniotic fluid. Starks at al. (17) found no difference in APGAR scores or intrapartum fetal scalp pH values for patients with thin meconium versus controls. When fetal scalp pH of neonates with thick meconium compared to thin meconium, they had more pH values (<7.25). With regard to APGAR scores, in the thick meconium group, 9% had 5-minute scores of <6, while only 1% had scores in the thin meconium group. Fetal acidemia was found in 72% of patients with thick meconium and late decelerations (17).

Most of the infants with meconium aspiration syndrome had fetal distress and neonatal acidemia. Investigations suggest that the respiratory distress and hypoxia of meconium aspiration syndrome results from severe asphyxia leading to pulmonary vasoreactivity and vasoconstriction. A study by Jovanonic and Nguyen (18) illustrates the relationship between severe in utero hypoxia and meconium aspiration syndrome. In their study fetal guinea pigs were exposed to a pH of 7.10 for 1 to 2 hours before delivery, or they were delivered without asphyxia. At delivery the trachea of the pups was injected with either clear amniotic fluid or meconium. In the unasphyxiated guinea pig pups both produced minimal lung reaction. There were no cases of chemical pneumonitis related to meconium as a pulmonary toxin. However, the asphyxiated pups had extensive pulmonary necrosis and hypertrophy of alveolar cells. These data strongly suggest that the extent of lung destruction seen in meconium aspiration syndrome is not related to the aspiration of meconium but to the length and degree of asphyxia. Our findings were also similar to this last study. Low APGAR scores, acidemia and hypoxic ischemic encephalopathy were higher in infants with thick meconium (19-22).

In conclusion, amniotic fluid with thick meconium can cause more respiratory problems and other complications in neonates than amniotic fluid with thin meconium. Therefore, tracheal suction is recommended for infants born depressed and with thick meconium stained amniotic fluid.

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