



Is meconium stained amniotic fluid related to occult myocardial injury in term low risk pregnancies?

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ABSTRACT

Aim: The present study aimed to compare Troponin T (Tp T) levels of infants born with meconium stained amniotic fluid (MSAF) to those with clear amniotic fluid.

Study design: Case–control study

Subjects: Thirty-five women who had delivery complicated by MSAF between 37 and 41 weeks of gestation were defined as the study group and women with healthy uncomplicated pregnancies with clear amniotic fluid who were matched for age, parity, and gestational age were defined as the control group.

Outcome measures: Cord blood Tp T level, gas analysis and neonatal outcomes were compared between groups. **Results:** Tp T levels of the study and control groups were 0.026 ± 0.013 ng/ml and 0.031 ± 0.016 ng/ml, respectively. The difference was not statistically significant ($p = 0.132$). On the other hand, the study group had a statistically lower HCO_3^- level (21.80 vs 23.60 mmol/l) and higher rate of base deficit (4.85 vs 3.25 mmol/l) than the control group.

Conclusion: The presence of meconium during labor is not related to occult myocardial injury in low-risk term pregnancies.

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1. Introduction

Troponin (Tp) is an inhibitory protein complex located in all striated muscle. Three subunits, T, C, and I are present. High cardiac troponin T concentration is considered to be a sensitive and specific marker of myocardial infarction in adults [1]. Recent studies have shown that newborns with intrapartum asphyxia have increased plasma Tp I and Tp T concentrations, suggesting that the fetal heart is sensitive to acute hypoxia [2,3].

Meconium in the amniotic fluid is a frequent situation in obstetric practice [4]. Expulsion of meconium from the intestinal lumen into the amniotic cavity is thought to be a consequence of increased intestinal peristalsis and of anal sphincter relaxation resulting from vagal stimulation [5]. Despite its high prevalence, the significance of meconium stained amniotic fluid (MSAF) has not yet been clarified. Many previous studies defined MSAF as a sign of fetal hypoxia or acidosis [6–10], while others defined MSAF as a physiological event with no adverse perinatal outcomes [7,11–13]. Moreover, none of the studies

to date have evaluated the presence of occult cardiac injury in infants born with MSAF. Therefore, we aimed to compare cord blood Tp T values and cord blood gas parameters of infants born with MSAF to those with clear amniotic fluid.

2. Materials and methods

Women who had deliveries at the Etlik Zübeyde Hanım Maternity and Women's Health Academic and Research Hospital between July 2011 and January 2012 were included in the study. Singleton pregnancies complicated by MSAF between 37 and 41 weeks of gestation were defined as the study group and healthy uncomplicated pregnancies with clear amniotic fluid who were matched for age, parity, and gestational age were defined as the control group. Criteria for exclusion from the study were multiple pregnancies, preeclampsia, diabetes or other systemic diseases, infants with major congenital anomalies and intrauterine growth retardation. In all women, gestational age was determined based on the last menstrual period and confirmed by ultrasonography performed before 20 weeks of gestation. Cord blood gas parameters and Tp T levels were measured in both groups.

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Close and continual fetal monitoring was performed with all patients during labor. For the interpretation of fetal heart rate (FHR) patterns, we used the criteria proposed in 1997 by the National Institute of Child Health and Human Development Research Planning Workshop [14], which considers basal FHR assessment, variability, accelerations, and decelerations. Conditions at birth were evaluated by Apgar score at 1 and 5 min, by considering the need for the newborns to receive neonatal resuscitation or be moved to the neonatal intensive care unit, and by assessing blood gas parameters in the umbilical cord immediately after birth. Oxygen supplementation was given to newborns who had spontaneous respiration but had central cyanosis.

The color of the amniotic fluid was assessed at the time of membrane rupture and at the time of delivery. Meconium was categorized as thick, moderate or thin, based on its naked-eye appearance, by the same investigator.

Indications for cesarean section were: previous cesarean section, non-reassuring FHR and cephalopelvic disproportion. Moreover, women in the control group who required cesarean section due to non-reassuring FHR were not included in the study.

At delivery, the umbilical cord was clamped and arterial blood was collected for the immediate determination of blood gases. Afterwards, cord blood was centrifuged at 900 g for 10 min, and serum samples were stored at -80°C and analyzed at the end of the study period. Serum Tp T levels were analyzed with a Troponin T STAT Immunoassay (Roche Diagnostics GmbH, Mannheim, Germany). This has a lower limit of detection of 0.010 ng/ml, with minimal cross reactivity with cardiac troponin I (0.002%) and skeletal troponin T (0.001%). Precision and repeatability studies were performed.

Data were analyzed with the SPSS software version 15.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Data was transferred to computer media. Error control and necessary corrections were done. Groups were controlled in terms of conformity to normal distribution by graphical check and Shapiro Wilk test. Median (IQR) was used for groups that were not distributed normally. Chi-square tests were conducted to test the distribution between categorical variables. The Mann–Whitney test was performed for not normally distributing variables and Student's *t* test was used for normally distributed variables. A *P*-value <0.05 was taken as significant. Power analysis of the study showed that a total of 68 patients was needed to gain 80% power when alpha error was set at 0.05, beta error at 0.20 and effect size at 0.70.

The local ethics committee approved this study and informed consent was obtained from all participants. The study was supported by the Scientific Research Fund of Fatih University under the project number P53011111_B (1538).

3. Results

A total of 70 women were included in the study: 35 women in the MSAF group and 35 women in the control group. The mean maternal and gestational age of the patients was 26.50 ± 5.26 years and 39.3 (37–41) weeks, respectively. There was no statistical difference in maternal age, gestational age, parity, FHR pattern, delivery characteristics or birth weight between the study and control groups (Table 1).

Apgar scores and cord blood gases were statistically different between the groups. Infants born with MSAF had significantly lower Apgar scores at 1 min ($p=0.03$), however, Apgar scores at 5 min were not different between groups. None of the infants born from women in the control group required oxygen administration while 11 (31.4%) infants in the study group needed oxygen. The difference was statistically significant ($p<0.001$). The study group had a statistically lower HCO_3^- level (21.80 vs 23.60 mmol/l) and higher rate of base deficit (4.85 vs 3.25 mmol/l) than the control group. However, median HCO_3^- and base deficit values were within normal limits in both groups. Other blood gas parameters were statistically similar in both groups (Table 1). None of the patients in either group required neonatal intensive care unit admission.

Table 1
Demographic, delivery and laboratory parameters of both groups.

	Meconium group (n=35)	Control group (n=35)	p
Maternal age (years)	26.46 ± 5.18	26.54 ± 5.40	0.946
Gravidity	2 (1–5)	2 (1–6)	0.650
Parity	0 (0–3)	1 (0–4)	0.557
Gestational age (week)	40 (37–41)	39.20 (37–41)	0.205
FHR baseline (beat/min)	140 (120–154)	140 (130–150)	0.127
Variability normal	32 91.4	34 97.1	0.307
Decreased	3 8.6	1 2.9	
FHR deceleration yes	9 25.7	3 8.6	0.057
No	26 74.3	32 91.4	
Labor induction no	19 54.3	22 62.9	0.467
Yes	16 45.7	13 37.1	
Labor duration (hours)	4 (1–12)	4 (1–9)	0.977
Delivery route NVD	27 77.1	32 91.4	0.101
C/S	8 22.9	3 8.6	
Birth weight (g)	3385 (3000–3850)	3450 (3000–3820)	0.701
Apgar at 1 min	9 (7–9)	9 (6–9)	0.030
Apgar at 5 min	9 (9–9)	9 (8–9)	0.348
pH	7.29 (7.13–7.44)	7.30 (7.10–7.40)	0.649
O ₂ requirement yes	11 31.4	0 0.0	<0.001
No	24 68.6	35 100.0	
pCO ₂ (mmHg)	46.90 (33–71)	48.10 (38–73)	0.065
HCO ₃ ⁻ (mmol/l)	21.80 (15–25)	23.60 (20–62)	0.004
Base deficit (mmol/l)	4.85 (1–14)	3.25 (0–16)	0.007
Troponin T (ng/ml)	0.026 ± 0.013	0.031 ± 0.016	0.132

P < 0.05 statistical significance and written in bold; FHR: fetal heart rate.

The median Tp T level of all patients was 0.029 ng/ml. The mean Tp T levels of the study and control groups were 0.026 ± 0.013 ng/ml and 0.031 ± 0.016 ng/ml, respectively (Fig. 1). The difference was not statistically significant ($p=0.132$). Furthermore, patients were divided into two groups according to median Tp T level, as <0.029 ng/ml and ≥ 0.029 ng/ml. Fourteen (40%) of the infants with a Tp T level <0.029 ng/ml had MSAF and 21 (60%) of the infants with a Tp T level ≥ 0.029 ng/ml had MSAF. Although MSAF was observed more frequently in the ≥ 0.029 ng/ml Tp T level group, the difference was not statistically significant ($p=0.076$).

Patients in the meconium group were divided into three groups according to the appearance of the meconium as “mild”, “moderate” or “severe” and the mean Tp T levels for these groups were 0.032 ± 0.016 ng/ml, 0.028 ± 0.013 ng/ml, and 0.019 ± 0.013 ng/ml, respectively (Fig. 2). Tp T level differences were not statistically different ($p=0.101$).

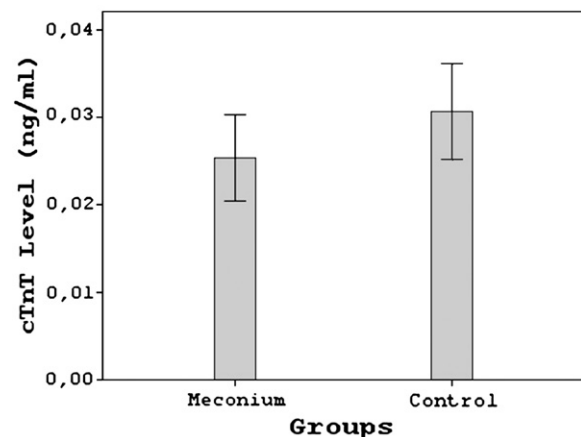


Fig. 1. Troponin T levels of both groups.

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