Prophylactic Transabdominal Amnioinfusion During Labor with Thick Meconium: Does it Work?

DOĞUM EYLEMİNDEKİ KOYU MEKONYUMLU HASTALARDA PROFİLAKTİK TRANSABDOMİNAL AMNİYOİNFÜZYON ETKİLİMİDİR?

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Özet

Objective: This study was conducted at Dr.Zekai Tahir Burak Women's Hospital, between July 1996 and March 1998. Our objective was to assess the effectiveness of intrapartum prophylactic transabdominal amnioinfusion, in reducing meconium related morbidity, in patients who had amniotic fluid stained with thick meconium.

Study Design: Thirty nine women with thick meconium during labor were randomized into two groups; first group (n=19) for transabdominal amnioinfusion and second group (n=20) for no amnioinfusion. Sterile isotonic sodium chloride solution with an amount of 250-500 cc warmed up to 37^0 C was used for amnioinfusion with an infusion rate of not exceeding 50 ml/min. Transabdominal amnioinfusion was performed under direct ultrasound guidance. Continuous fetal heart rate monitoring was standard during labor.

Results: Patients receiving amnioinfusion had significantly less 5 minutes APGAR scores< 7 and less occurrence of tracheal meconium, and a significantly lower incidence of cesarean section for fetal distress.

Conclusion: Amnioinfusion in patients with thick meconium during labor is a simple, inexpensive and safe technique that reduces the incidence of tracheal meconium and improves fetal and obstetric outcome.

Key Words: Meconium, Meconium aspiration syndrome, Transabdominal amnioinfusion

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Summary

Amaç: Bu çalışma Dr.Zekai Tahir Burak Kadın Hastanesi'nde, Temmuz 1996 ile Mart 1998 tarihleri arasında gerçekleştirilmiştir. Amacımız koyu mekonyumlu hastalarda intrapartum profilaktik transabdominal amniyoinfüzyonun mekonyuma bağlı morbiditeyi azaltmadaki etkinliğini değerlendirmekti.

Metod: Doğum eylemindeki koyu mekonyumlu 39 hasta iki gruba randomize edilmiştir. Birinci grup (n=19) transabdominal infüzyon grubunu ve ikinci grup da (n=20) kontrol grubunu oluşturdu. Amniyoinfüzyon için 37^0 C'ye kadar ısıtılan 250-500 ml steril ringer laktat solusyonu dakikada 50 ml'yi geçmeyecek şekilde kullanıldı. Transabdominal amniyo-infüzyon direkt ultrasonografi eşliği altında yapıldı. Doğum sırasında devamlı fetal kalp atım monitorizasyonu standart olarak uygulandı.

Sonuçlar: Amniyoinfüzyon uygulanan hastalarda, 5. dakika APGAR skoru <7 olması, trakeal mekoyuma rastlanması ve fetal distres nedeniyle yapılan sezaryen sıklığı belirgin olarak azalmıştır.

Tartışma: Doğum eylemindeki koyu mekonyumlu hastalarda basit, ucuz ve güvenli bir yöntem olan transabdominal amniyoinfüzyon trakeal mekonyum insidansını azaltarak fetal ve obstetrk sonucu iyileştirmektedir.

Anahtar Kelimeler: Mekonyum, Mekonyum aspirasyon sendromu, Transabdominal amniyoinfüzyon

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The incidence of meconium stained amniotic fluid gradually increases with gestational age and reaches to 10-15% at term (1-3). Aspiration of meconium can lead to mechanical obstruction in trachea and lungs, finally, resulting in chemical perialveolitis and meconium aspiration syndrome (MAS) which occurs in 10-30% of fetuses with meconium staining (3). Meconium staining per se increases perinatal mortality rate ; in cases of MAS, this may even be as high as 25% (4).

The common debate on whether fetal asphyxia or natural maturation of fetal intestines causes meconium staining has been of concern. Both theories captured attention, however, the presence of intrapartum meconium staining in otherwise normal laboring patients confirms the fact that meconium staining is not a feature of fetal distress unless fetal heart rate abnormalities exists.

Various management protocols regarding the prevention of MAS during the antepartum and intrapartum period have been proposed. Carson's proposition of immediate aspiration of nasopharynx, oropharynx and hypopharynx by De Lee catheter followed by direct visualization of vocal cords enabling aspiration of meconiun particles has gained popularity in recent years. (5). This method has been thought to decrease the incidence and the severity of MAS. However, MAS has been thought to occur in the intrauterine period questioning the effectiveness of the above-mentioned procedure.

Transcervical amnioinfusion procedure was first performed by Miyazaki et al, in order to diminish the intrapartum variable decelerations (7,8). In the presence of oligohydroamnios vagal stimulation due to cord compression results in thickened meconium and thus it has been believed that amnioinfusion has a substantial role in the prophylaxis of MAS. (4, 9-11). Although this method is being used in various centers, many clinics still question the effectiveness of this method by prospective randomized cohort studies.

In the present study we aimed to assess the value of intrapartum transabdominal prophylactic amnioinfusion in a prospective randomized trial, by evaluating the presence of tracheal meconium and MAS in patients with thick meconium staining.

Materials and Methods

This study was designed in a randomized prospective fashion and intrapartum prophylactic transabdominal amnioinfusion was performed in patients who had amniotic fluid stained with thick meconium, at Dr. Zekai Tahir Burak Women's Hospital, Ankara, between July 1996 and March 1998. Patients with a singleton, vertex presentation at ≥37 weeks who had thick meconium detected after spontaneously or artificially ruptured membranes during labor were included into the study. Patients with multiple pregnancy, fetal malformation, chorioamnionitis, an anticipated time to delivery <1 hour were excluded from the study. Also patients with light meconium were not enrolled into the study. Thick meconium was defined as particulated opaque, dark green colored and viscous. Fetal heart rate monitoring was performed in each laboring patient for at least 30 minutes before the procedure, followed by ultrasonographic examination of fetal biometry and placental localisation. Patients were randomized into two groups, amnioinfusion or no amnioinfusion, by a randomization list which was prepared prior to the study on the basis of an admission day(date) to the hospital. An informed consent was obtained before prophylactic amnioinfusion or no amnioinfusion.. A 22 gauge spinal needle was inserted into the amniotic cavity under direct ultrasound guidance avoiding the placental site. Sterile ringer lactate solution with an amount of 250-500 cc warmed up to 37^0 C was infused into the amniotic cavity with an infusion rate of not exceeding 50 ml/min until a normal amniotic fluid index was measured by ultrasonography. After completion of procedure amniotic fluid volume was re-evaluated and fetal monitoring was re-established. Prophylactic antibiotic was not given to any patient and cesarean section was performed only for the obstetric indications. Amnioinfusion was performed by a physician who was not directly related to the patient's care and the decision for cesarean section was also made by a different obstetrician.

Pharynges of the fetus were immediately aspirated following delivery of the head and after delivery, vocal cords were inspected by using laryngoscope for the presence of meconium. MAS was diagnosed on the basis of respiratory distress occurring within 4 hours following delivery, increased oxygen consumption and abnormal lung X-ray finding in neonates with meconium staining. The outcome was analyzed from the aspects of MAS, tracheal meconium, duration and mode of delivery, birth weight, APGAR scores and the abnormal fetal heart rate patterns.

Statistical analysis was performed by using SPSS program. Student-t test and Mann-Whitney-U test were used in comparison of two parameters, while Wilcoxon, Chi-square and Fisher's exact test were applied to dependent variables.

Results

Thirty-nine patients were included into the study and 19 were randomized to undergo amnioinfusion. The demographic data of the patients were demonstrated in Table 1. There was no significant difference between the two groups with respect to gravidity, parity, gestational week and neonatal birth weight. In the control group mean maternal age was found to be higher in comparison to the amnioinfusion group. (26.75 ± 4.76 versus 23.68± 4.67). Besides from the maternal age that presumably has no effect on the overall study design both groups were homogeneously selected.

Delivery data among the groups were given in Table 2. Mean duration of labor was found to be as 488.95± 178.07 minutes (ranging from 150 to 810 min) while this time interval was found to be 633.5± 353.2 min (ranging from 60 to 1560 min) in the control group and no statistical difference was found between the two groups. The number of fetuses with 5-minute APGAR scores <7 was found to be significantly lower in the amnioinfusion group. ($p<0.05$) When delivery route was assessed, cesarean section for fetal distress in the amnioinfusion group was performed in 1 patient (5.2%) while 4 patients (20%) of the control group underwent cesarean section with the same indication ($p<0.05$). No statistical significance was found between two groups on the basis of the operative delivery rate.

Table 1. Patient characteristics

	Amnioinfusion (n=19)	Control (n=20)	
Age (years)	23.68 ± 4.67	26.75 ± 4.76	p<0.05
Gravidity	1.58 ± 0.84	2.20 ± 1.91	NS
Parity	0.42 ± 0.61	1 ± 1.45	NS
Gestational age (day)	284.42 ± 7.34	282.30 ± 9.27	NS

*NS: Not significant

Table 2. Labor characteristics

	Amnioinfusion (n=19)	Control (n=20)
Labor duration (minute)	488.95 ± 178.07	633.50 ± 353.2
Induction	3	5
Birth weight (g)	3477.37 ± 408.91	3313 ± 391.3
Birth height (cm)	49.21 ± 4.67	50.6 ± 1.23
5-minute APGAR<7	1 (5.2%)*	5 (25%)*
Mode of Delivery		
Vaginal	16	13
Cesarean section (C/S)	3*	7*
C/S (fetal distress)	1	4
Operative delivery	6	8

*P<0.05

The data of the neonates with meconium aspiration was shown in Table 3. The presence of meconium below the vocal cords was seen in 3 fetuses of the amnioinfusion group (15.8%) and in 8 fetuses (42.1%) of the control group (p< 0.05) MAS developed in 9 fetuses and one fetus weighing 3290 g died 4 hours after delivery due to severe MAS. Two (10.9%) of the 9 MAS cases were in the amnioinfusion group and 7 (36.8%) were in the control group. Positive pressure ventilation (PPV) was needed in 3 fetuses in the control group. The occurrence of MAS and the need for PPV did not reach to significance in the study group (p=0.06 and 0.08, respectively).

In Table 3, the comparison of the neonates with or without tracheal meconium and MAS in respect to birth characteristics are displayed. No difference was found between the groups on the basis of duration of labor, gestational week and fetal weight.

Discussion

Since MAS is one of the insignificant causes of perinatal morbidity and mortality, it is still in part of the basic concerns of obstetric practice. Recently amnioinfusion procedure has partly replaced the other approaches including the Carson's aggressive modality in prevention of MAS. Amnioinfusion acts positively by not only diluting the meconium but also preventing cord compression, which frequently occurs in cases with oligohydroamnios. Sadovsky et al in 1989 (9) questioned the effectiveness of prophylactic amnioinfusion during labor complicated by meconium and found that arterial cord pH values were normalized and the presence of tracheal meconium declined to nil in the amnioinfusion group. The positive pressure ventilation requirement was also found to be decreased from 49% to 16%. However, the authors could not comment on any precise reason of this improvement. Wenstrom et al, in 1989 (10) found that low APGAR scores, existence of meconium on vocal cords and the operative delivery incidence were lower in the amnioinfusion group. Dye in 1994 (11) reviewed 11 articles and found 5 of them suitable for data analysis. In his collected data analysis, it was shown that the possibility of meconium presence in vocal cords was lowered by 80% in amnioinfusion group. Recently, Spong et al (4) postulated that the positive effect of prophylactic amnioinfusion was due to diminishing variable decelerations instead of direct dilution effect.

In our study we investigated the effectiveness of intrapartum transabdominal amnioinfusion in patients with thick meconium. Instead of the commonly used transvaginal approach we selected the transabdominal way due to some hypothetical advantages such as reduced infectious morbidity and diminished back leakage of the infused solution leading to longer maintenance of intra amniotic fluid. In the present study, the incidence of tracheal meconium presence and MAS incidence was lower in the amnioinfusion group. However, the reduction of MAS was not found to be statistically significant due to limited number of patients and low background risk of meconium aspiration in the population.. The overall MAS incidence in our study was 23% and this high incidence might be due to the fact that our series involved patients, all with thick meconium staining. Cesarean section due to fetal distress was performed in 33.3% of the patients in amnioinfusion group, while this rate was found to be 57.1% for the control group. Duration of labor

Table 3. Labor characteristics of patients with tracheal meconium group and meconium aspiration syndrome (MAS) group

	Tracheal meconium			MAS		
	(+)	(-)		(+)	(-)	
Gestational age (day)	282.73±11.42	283.67±7.15	NS	281.11±11.95	284.1±7.16	NS
Labor duration (min)	731.36±414.26	283.67±7.15	NS	725±463.91	517.41±199	NS
Birth weight (g)	3395.45±522.41	3370.37±345	NS	3198.89±428.88	34.33.1±377.04	NS
5-minute APGAR<7	1(9.1%)	5(17.9%)	p<0.05	6(66.6%)	0	p<0.05
Amnioinfusion (n=19)	3	16	p<0.05	2	17	NS
Control (n=20)	8	12		7	13	

NS: Not significant

was found to be shorter in the amnioinfusion group however the wide range and the high SEM unabled us to show statistical significance. The number of patients with 5-minute APGAR scores <7 were significantly lower in the amnioinfusion group. Postpartum febrile morbidity was not faced in any of the cases in both groups. Two studies were reported in the literature; one of them being prospective and the other retrospective analysis of the patients undergoing amnioinfusion before labor. Mandelbrot et al, in 1993 (12) retrospectively analyzed postdate pregnancies with unripe cervix and oligohydramnios. They postulated that the procedure was safe and had perinatal benefits. Vergani et al, in 1996 (13) studied the effectiveness of transabdominal infusion prospectively in a randomized setting and suggested that the procedure was safe enough with 100% applicability with no complications. However, both studies mentioned an increased possibility of onset of labor. In our series, we also report a 100% applicability with no bleeding, febrile morbidity and fetal complications. The results of our preliminary observations are encouraging in a way that intrapartum transabdominal amnioinfusion seems to be a safe, simple and efficacious approach that leads to a decrease in tracheal meconium, low APGAR scores and cesarean section rate for fetal distress. However, due to the low background incidence of MAS and the limited number of patients we could not demonstrate any significant reduction for the direct meconium related morbidity. We propose that our results should be interpreted with caution and prospective studies that involve higher number of patients, comparing different methods of amnioinfusion are needed before our results are generalized.

No specific fetal heart rate pattern has been defined to predict MAS occurrence, the above mentioned fetal heart rate parameters may lead us to consider a more intensive fetal surveillance protocol in order not to overlook a forthcoming fetal jeopardy. When literature on this topic is reviewed it seems that the existence of tracheal meconium particles and MAS occurrence can be prevented by amnioinfusion. However the net impact of amnioinfusion in prevention is not certain yet. The main contributor of this debate arises from the fact that meconium aspiration could not only occur in labor but also during in utero period. Thus to ease further studies aiming to lessen the morbidity and the mortality due to meconium one should precisely know the pathogenesis of MAS.

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