Basrah Journal Of Surgery

Bas J Surg, September, 14, 2008

MATERNAL AND NEONATAL COMPLICATIONS IN RELATION TO MECONIUM-STAINED AMNIOTIC FLUID

Ahlam Abdul-Hadi* & Haifaa D Jabar[@]

*FICOG, DOG, Lecturer, Dept.of Obstetrics and Gynecology. Basrah Medical College. [@]MB,ChB, Al-Mawanii Hospital, Basrah, Iraq.

Introduction

What is meconium? Meconium is a term derived from Greek mekonion which is mean poppy juice or opium-like. Meconium is a mixture of numerous chemicals, including: mucous, glycoprotein, swallowed vernix caseosa, gastrointestinal secretion, bile, pancreatic & liver enzymes, plasma protein, minerals and lipids. The concentration of pancreatic and liver enzymes varies with gestational age. If a baby passes it after birth, there is no danger and it just naturally leaves the baby`s body in the first few days after birth[1].

Types and significant

Meconium staining was classified as; early when noted before or during the active phase of labor and late when it is passed in the second stage of labor after clear fluid.

Early meconium is subdivided into: Light, when it was lightly stained yellow or greenish. Heavy, when it was stained dark green or black, usually thick and tenacious.

Meconium observed on the vertex presentation as following distribution: Early light (53.6%), Early heavy(25.2%) & Late(21.2%)[2].

The predictive value of meconium as an indication of fetal asphyxia is better when in occur in high-risk patient and when it dark green or black thick and tenacious. Another study found that the sensitivity and the positive predictive values of moderate or sever meconium staining in the prediction of fetal acidosis were 31% and 5% respectively[2].

The incidence of 1 and 5 minute Apgar score below 7 and intra-partum and neonatal death was significantly greater in patient with early heavy meconium than in the control matched by age, parity and birth weight[2].

Incidence

Meconium passage occurs in utero in 8-2% of all deliveries with most cases occurring at term and particularly post term[3].

Mechanisms of passage of meconium:

The passage of meconium is usually a normal response in the mature fetus and it is probably the effect of vagal response to cord pinching, while hypoxia has been implicated in the evacuation of meconium from the gut in the amniotic fluid,

Many theories had been put to explain the passage of meconium:

1. Fetal hypoxia stimulates vasoconstriction of fetal gut which causes hyperperstalsis, sphincter relaxation and passage of meconium[2].
2. The hormonal control of fetal meconium passage is maturity dependent, Motilin is an intestinal peptide that stimulate motor function in the stomach and the intestine. It causes contraction of smooth muscle

in the gut wall, level of motilin in the cord blood increases with gestation. Stress may cause release of motilin[2].

3. Meconium may be detected in the amniotic fluid after induction of labor by prostaglandine PGE2, which may be a direct effect on the smooth muscle of the fetal gut[2].
4. Infection of the fetal gut by micro-organism like Listeria, Ureaplasma Urealyticum and rota virus will stimulate the gut of the premature fetus to pass meconium[2].

Maturation theory: Meconium is seldom passed into amniotic fluid before 34 weeks and the presence of meconium may reflect gastrointestinal maturity in late gestation, the incidence of meconium at 40 weeks of gestation is around 30% and reaches to 50% at 42 weeks of gestation[4].

Neonatal complication of meconium

1. Fetal hypoxia: The meconium–stained liquor with the presence of abnormal fetal heart rate may indicate fetal distress. Thick meconium even in the absence of abnormal fetal heart rate may denote to fetal acidosis and fetal hypoxia[5].
2. Meconium aspiration syndrome: Meconium aspiration occurs when a baby breaths in amniotic fluid containing meconium[2].

   The aspiration of some amniotic fluid before birth is most likely a physiological event[5], unfortunately this normal process can be the cause of inhalation by the fetus of amniotic fluid containing thick meconium which in some cases leads to subsequent respiratory distress and hypoxia. On the other hand some neonates inhale meconium at birth. Thus M.A.S. may follow delivery in the other wise normal labor but it more often is encountered in post term pregnancy or in those complicated by fetal growth retardation[6].

Maternal complication of meconium:

Although the neonatal complications that are associated with meconium passage have been studied extensively, the maternal outcomes are still being elucidated.

One theory posits that M.S.A.f. is associated with intrapartum and postpartum infections[7,8].

Several investigators have examined this issue in preterm pregnancies[7,9].

Romero et al[7] performed amniocenteses on women with preterm labor and found a significantly higher rate of positive amniotic fluid cultures in women with M.S.A.F. compared to women with clear amniotic fluid, further studies have investigated the association of M.S.A.F. with intra-partum and postpartum infection of term pregnancies[10,11].

Material and methods

The study was performed prospectively at Al-Mawanii General hospital from 1st of November 2005 to the 30th of April 2006.

The women included in the study were 86 with meconium stained amniotic fluid and 86 women who were control group with clear amniotic fluid. The inclusion criteria were women with single pregnancy term or post term according to last menstrual period and ultrasound, at first stage of labor with vertex presentation, any obstetrical or medical risk factor other than M.S.A.F. was excluded.

Regarding the quality of meconium included in our study we decided to select only women with moderate-thick meconium and we excluded those of thin meconium.

All women received standard labor management including: History and complete general and obstetric examination.

We did a prospective cohort study, variables included are;

Maternal age, parity, gestational age, mode of delivery, development of post-

partum hemorrhage, endomyometrities and retained placenta.

The neonatal outcome parameters including; Sex, birth weight, Apgar score at 1 and 5 minutes, admission to N.I.C.U., development of meconium aspiration syndrome, jaundice, neonatal sepsis and neonatal death within one week.

Maternal monitoring done by frequent checking of vital signs, uterine contraction and pelvic examination. Fetal monitoring done by sonic aid.

Endomyometritis was defined as maternal temperature >38C at least 24hr after delivery associated with uterine tenderness and foul discharge without other causes of fever.

We follow the mother and the neonate for one week for development of any complication.

Statistical analysis was performed with chi square test. Significant was set as $p< 0.05$.

The results

Table I shows maternal characteristic of both groups, no statistical difference between them regarding mean age and parity, but there were significantly higher incidence of post term pregnancy 24.4% in meconium group versus 3.5% in control group.

The study of mode of delivery in table II revealed there was a higher rate of caesarean section (C.S.) in the women with M.S.A.F. 24.4% compared to 7.0% in the control group.

There is only one case of instrumental delivery ventouse in meconium group and none in the control group.

Table III shows the indication of C.S. in both groups; it shows a higher incidence of fetal distress in the meconium group compared to a control group and no statistically significant difference in the other indications.

Table IV compared maternal complications between the two groups it shows a higher incidence of endomyometritis and retained placenta in the meconium group compared to a control group with P value <0.01 and <0.03 respectively. While there was no difference between the two groups regarding the development of post partum hemorrhage P.P.H.

Table V shows the neonatal outcome of both groups, it reveals that there were no significant difference regarding the sex of the babies and the birth weight between the two groups.

The assessment of fetal condition according to the Apgar score indicated that there were 69 infants 80.2% with Apgar score below 7 at 1 minute in the study group and 13 infants 15.1% of them remain with Apgar score below 7 at 5 minute and this is significantly higher than in the control group.

Admission to the N.I.C.U. was indicated in 35 infants 40.7% of the meconium group which is significantly higher than in the control group.

There were higher incidence of neonatal sepsis, neonatal death and neonatal jaundice in the meconium group.

M.A.S. occur in 27 cases of meconium group (31.4%).

Table VI shows the outcome of meconium group whom delivered vaginally compared to those delivered by C.S. in the same group 65 women (75.6%) delivered vaginally and 21 women (24.4%) delivered by C.S., no statistically difference between them regarding development of retained placenta, P.P.H. and endomyometritis.

Table I: Maternal Characteristic

Maternal character	Case group	Control group	p- value
Maternal age mean	26 year	23 Year	
Term	49 57.0 %	72 83.7 %	P<0.01
Post term	21 24.4%	3 3.5%	
Gestational age Uncertain	16 18.6%	11 12.8%	
Primi	38 44.2%	45 52.3%	N.S.
Parity	41 47.7%	36 41.9%	
1-4	7 8.1%	5 5.8%	
>=5			

Table II: Mode Of Delivery

Character	Meconium	Clear	Sign
N.V.D.	64 74.4%	80 93.0%	P< 0.004
Instrumental delivery	1 1.2%	0	
C.S.	21 24.4%	6 7.0%	

Table III: Indication for C.S.

Character	Meconium	clear	Sign
Fetal distress	15 17.5%	1 1.16%	P< 0.01
Maternal distress	2 2.3%	1 1.16%	N.S
Failure to progress	4 4.6%	4 4.7%	N.S
Total	21 24.4%	6 7.02 %	

Table IV: Maternal Complications

Types	Meconium		Clear		Sign.
Retained placenta	7	8.1%	1	1.2%	P<0.03
P.P.H.	14	16.3%	7	8.1%	N.S.
Endomyometritis	10	11.6 %	2	2.3%	P< 0.01

Table V: Neonatal Outcome

Character	Meconium	Control	Sign.
Male	45 52.3%	39 45.3%	
Sex of infant	41 47.7%	47 54.7%	
Female			
Birth weight mean	3.104	3.019	
1, min	69 80.2 %	16 18.6%	P< 0.01
Apgar score <7	13 15.1 %	3 3.5 %	
5 min			
Admission to NICU	35 40.7%	7 8.1 %	P< 0.01
Jaundice	35 40.7%	14 16.3%	P< 0.01
M.A.S	27 31.4 %		P< 0.01
Neonatal sepsis	10 11.6%	2 2.3%	P< 0.01
Neonatal death	12 14.0%	2 2.3 %	P< 0.01

Table VI: Outcome of meconium group

		Vaginal delivery	C.S.	Sign.
Mode of delivery		65 75.6%	21 24.4%	
Retained placenta		7 10.8%	0	N.S.
P.P.H.		11 16.9%	3 14.3%	N.S.
Endomyometris		8 12.3%	2 9.5%	N.S.
Admission to N.I.C.U.		21 32.3%	14 66.6%	P<0.03
Apgar score <7	Within 1 min.	49 75.4%	20 95.2%	P< 0.03
	Within 5 min.	11 16.9%	2 9.5%	N.S
M.A.S.		21 32.3%	6 28.6%	N.S
Neonatal death		10 15.4%	2 9.5%	N.S
Jaundice		24 36.9%	11 52.4%	N.S
Neonatal sepsis		8 12.31	2 2.3%	N.S

Regarding neonatal outcome of both groups there was no significant difference in all parameters between two groups except that C.S. group had lowest Apgar score at 1 minute and higher admission to N.I.C.U.

Discussion

M.S.A.F. occurs in 7%–22% of pregnancies with most cases occurring at term and particularly post term[3].

Meconium passage may be considered as a normal physiological action because of increased myelination and reponsiveness of the fetal gastrointestinal tract with advancing gestational age, also meconium can be passed in utero in response to hypoxia or vagal stimulation as a result of cord compression[12,13].

Adverse neonatal outcome have been associated with meconium passage including M.A.S., admission to an N.I.C.U., neonatal sepsis and pulmonary diseases. M.A.S. is the most serious of these complications and has been reported in approximately 5% of all pregnancies complicated by meconium with resulting mortality rate 5% to 10%[1].

Although the neonatal complications that are associated with meconium passage have been studied extensively, the maternal out come still being elucidated A number of studies have reported an association between meconium and increased maternal infection during and after delivery[7,9,11].

In our study we try to find out any association between M.S,A.F. and other complications (maternal and neonatal) apart from infection since most of previous studies concentrating on infection only.

In our study we noticed no significant difference in mean age and parity between the two groups, this result is similar to other study[10]. But M.S.A.F. occur more commonly in women with post-term pregnancy, this is in agreement with other studies[16,3]. and this is not surprising since M.S.A.F. is one of the complications of post-term pregnancy[17].

Also in our study there were significantly higher incidence of C.S. among meconium group and the most common indication for C.S. is fetal distress, this result is in agreement with other studies[15,18] several potential explanation exist: Meconium has been associated with fetal heart rate abnormalities which may in turn prompt an urgent or emergency delivery on the bases of concern for fetal well being[19]. The presence of meconium may increase obstetrician anxiety, resulting in a lower threshold for intervention by C.S. There may be something intrinsic to meconium that impedes labor, perhaps through sub clinical infection which could lead to poor progress in labor. In vitro studies by Motgomery et al[18]. showed that meconium may inhibit the umbilical vessels smoth muscles contractile effect of thromboxane A2 analog. It is possible that meconium may

also inhibit uterine smooth muscles and increase the risk of labor dystocia and operative delivery.

Regarding maternal complications of M.S.A.F., in our study we noticed higher incidence of retained placenta and endomyometrities 8.1% and 11.6% respectively in meconium group this result is similar to other studies which found that M.S.A.F. is associated with increased peripartum infection independent of other risk factors[10,11,15.20].

Several mechanisms have been proposed for meconium associated puerperal infections, which include:

1) Alteration in the antibacterial properties of A.F. and enhanced bacterial growth[3,21].
2) Additionally, impaired host immune response through the inhibition of phagocytosis and neutrophil oxidation burst by meconium was reported by Clark and Duff[22].
3) Alternatively, meconium itself may initiate a foreign body inflammatory response in the uterus and the fallopian tubes, resulting in activation of the inflammatory cytokines, fever and clinical picture of endometritis.

The higher incidence of retained placenta in meconium group found in our study can be explained by increase incidence of post-term pregnancy, which is associated with higher incidence of retained placenta as reported by Treger-M et al[17].

With respect to the neonatal complications of M.S.A.F.:

In our study meconium group shows increased neonatal risk of low Apgar score at 1 and 5minuts, admission to N.I.C.U. jaundice, neonatal death and neonatal sepsis, also there were 27 cases of M.A.S. as diagnose by pediatrician who handling the babies.

This adverse neonatal outcome is also confirmed by other studies[1,3,19,23].

Reduced 1 minute Apgar score in the setting of M.S.A.F. would not be surprisingly, given that the neonate may require intubation to perform suctioning of the lungs, however reduced 5 minute Apgar score are concerning and suggest an association with neonatal depression at the time of delivery and possible acideamia, meconium may decrease the neonates ability to breathe on it is own, particulary if M.A.S. develops, thus pediatrician knowledge of meconium may lower the threshold for N.I.C.U. admission[15].

When we compare the women in meconium group whom delivered vaginally to those delivered by C.S. we found that there was no relationship between the mode of delivery and the maternal or neonatal outcome except that in C.S. group had lower Apgar score at 1 minute and more admission to N.I.C.U.

The lowest Apgar score at 1 minute in C.S. group could be due to the effect of anesthetic drugs on the neonate[24] and this is the reason for higher admission to N.I.C.U. in C.S. group[2].

Even so we cannot say that we should not perform C.S. in case of thick meconium because if we left them for vaginal delivery many of them may develop intrapartum death.

Recommendation

1. Use of prophylactic antibiotic for cases of M.S.A.F. weither delivered vaginally or by C.S.
2. Since there is association between M.S.A.F.and post-term pregnancy, we suggest that induction of labor should be considered before 42 weeks.
3. Active management of third stage of labour for women with M.S.A.F. to avoid developed of retained placenta.
4. Pediatrician should be available at the time delivery to deal with the neonate.

Abbreviation

C.S.= Caesarean Section
M.A.S.=Meconium Aspiration Syndrome
N.I.C.U.= Neonatal Intensive Care Unit
M.S.A.F.= Meconium Stained Amniotic Fluid
A.F.= Amnrotic Fluid
PPH= Postpartum Hemorrhage

References

1. Wisweel TE,Tuggle JM, Turner BS. Mecconiumaspiration syndrome: have we made a difference? Pediatrics 1990;85:715-21.
2. Fernando Arias 2th eth (1993) particular guide to high risk pregnancy and delivery.
3. Katz VI,Bowes WA. Meconium aspiration syndrome on a murky subject. AM J Obstet Gynecol 1992;166:171-83.
4. Dewhurt's Textbook of obstetrics and Gynecology for postgraduates 5th Eddition p76.
5. Gregory GA Gooding CA phibbs RH Tooley WH meconium aspiration in infant aorospective study J pediatric 1974, 151 731-6.
6. Gunningham FGM.D Mac Donald PcMD Gant NF MD Williams Text book of obstetric (1989) p 595.
7. Romero R, Hanaoka S Mazor M Athanassiadis AP, Callahan RC, Hsu YC, et al. Meconium- stained amniotic fluid: a risk factor for microbial invasion of the amniotic cavity. Am J Obstet Gynecol 1991; 164:859-62.
8. Wen TS, Eriksen NL, Blanco JD, Graham JM, Oshiro BT,Prieto JA. Association of clinical intra-amniotic infection and meconium. AM J Perinatol 1993; 10:438-40.
9. Mazor M, Futman B,Wizbitzer A, Shoham- Vardi, Cohen J, Ghezzi F. Maternal and perinatal B, Wiznitzer A,Shoham-Vardi I, Cohen J, Ghezzi F. Maternal and perinatal outcome of patients with preterm labor and meconium- stained amniotic fluid . Obstet Gynecol 1995; 86:833.
10. Jazayeri A, Jazzayeri MK, Sahinler M, Sincich T. Is meconium passage a risk factor for maternal infection in term pregnancies? 2002;99: 548-52.
11. Piper JM, Newton ER, Berkus MD, Peairs WA. Meconium: a marker for peripartum infection. Obstet Gynecol 1998; 91: 741-5.
12. Wenstron DK parsons MJ. The prevention of meconium aspiration in labour using amnioinfusion Obstet and Gynecol 1989; 73: 647-50.
13. Perlman EJ Moore GW Hutchins GM The pulmonary vasculature in meconium aspiration Hun pathol 1989; 20:701-6.
14. Adair CD, Ernest JM, Sanchez-ramos L.Burrus DR, Boles ML, Veille J.Meconium-stained amniotic fluid- associated infectious mobidity: a randomized double blind trial of ampicillin-sulbactum prophylaxis. Obstet Gynecol 1996;88:216-20.
15. Susan H. Tarn, MD, Aaron B.Caughey, MD, MPH, and Thomas J. Musci, MD. Meconium- stained amniotic is associated with puerperal infection AM J Obstet and Gynecol 2003;189:746-50.
16. Woods JR clantz JC significant of amniotic fluid meconnium in crealy RK Resnick Read maternal-fetal medicine, Philadelphia WB sounders 1994.417.
17. Treger,-M; Hallak,-M; Silberstein,-T; Friger,-M; Katz,-M; Mazor,-M Department of Obstetrics and gynecology, Soroka Medical Center, Faculty of Health Science, Ben-Gurion University of yje Negey, Beer-Sheva.
18. Montgomery LD, Belfort MA,Saade GR, Moise KJ Jr, Vedernikov TP.Meconium inhibits the contraction of umbilical vessels induced by the thromboxane A2 analog U46619. AM J Obstet Gynecol 1995;173:1075-8.
19. Nathan L, Leveno KJ, Carmody TJ, Kelly MA, Sherman MI, Meconium: 1999s perspective on an old obstetric hazard. Obstet Gynecol 1994;63:329-32.
20. Kalis, V; Turek,J; Hudec,A; Rokyta, P; Rokyta,Z; Mejchar, B Meconium and its significance Ceska-Gynekol. 2000;65:477-82.
21. Florman AL. Teubner D. Enhancement of bacterial growth in amniotic fluid by meconium J Pediatr 1969; 74:111-4.
22. Clark P, Duff P. Inhibition of neutrophil oxidative burst and phagocytosis by meconium. Obstet Gynecol 1995;173:1301-5.
23. Ziadeh, S-M; Sunna, E Obstetric and perinatal outcome of pregnancy with term labour and meconium- stained amniotic fluid Arch- Gynecol-Obstet.2000; 264:84-7.
24. Lee's synopsis of anaesthesia p 533.