Journal Homepage: - www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI: 10.21474/IJAR01/6025
DOI URL: http://dx.doi.org/10.21474/IJAR01/6025

RESEARCH ARTICLE

INTRAPARTUM TRANS-CERVICAL AMNIOINFUSION AS ADJUVANT TO CONVENTIONAL MANAGEMENT OF WOMEN HAD RUPTURED MEMBRANES WITH THICK MECONIUM-STAINED AMNIOTIC FLUID.

Mohamed Farag El Sherbeny MD.
Department of Obstetrics & Gynecology, Faculty of Medicine, Benha University.

Manuscript Info

Manuscript History

Received: 10 October 2017
Final Accepted: 12 November 2017
Published: December 2017

Key words:-
Amnioinfusion, Thick meconium-stained amniotic fluid, Neonatal and maternal outcome.

Abstract

Objectives: To evaluate maternal and fetal outcome after trans-cervical amnioinfusion (AI) for women presenting by ruptured membranes with thick meconium-stained amniotic fluid (MSAF).

Patients & Methods: Eighty-eight women with ruptured membranes and thick MSAF were randomly divided into: Control group received conventional therapy and Study group received AI in addition to conventional therapy. Study outcomes included frequency of cesarean section (CS), assisted vaginal delivery (VD), APGAR score of neonates and frequency of NICU admission.

Results: In comparison to control group, frequency assisted VD and CS for fetal distress or failure of labor was significantly lower with AI. Neonates of AI group showed significantly higher 1-min APGAR score, lower frequency of complications or requiring NICU admission. Eleven women of AI group developed tetanic uterine contraction that required stoppage of AI; in 3 women normal uterine tone was regained and infusion was continued and had assisted VD, while in 8 women normal uterine tone failed to be regained and underwent urgent CS.

Conclusion: Amnioinfusion significantly increased the chance for getting normal VD, improved variable decelerations of fetal heart rate, reduced neonatal complications and need for NICU admission. Thus, AI may be provided as an essential item during management of such cases.

Introduction:-

Amniotic fluid (AF) is a dynamic medium that plays a significant role in fetal well-being as it contains antimicrobial and growth factors, and helps fetal lung growth and maturity [(1)].

Meconium-stained amniotic fluid (MSAF) represents the passage of fetal colonic content into the amniotic cavity [(2)]. MSAF should be regarded as a symptom rather than a syndrome [(3)] with a common occurrence among women in spontaneous labor at term [(4)].

MSAF is a risk factor for microbial invasion of the amniotic cavity and preterm birth among women with preterm labor and intact membranes [(2)]. Placental histologic maternal inflammatory response and fetal inflammatory response

Corresponding Author:- Mohamed Farag El Sherbeny.
Address:- Department of Obstetrics & Gynecology, Faculty of Medicine, Benha University.

are frequent findings in MSAF and thick MSAF is associated with higher fetal inflammatory response than thin MSAF [5].

Factors that are associated with MSAF included small for gestational age, older maternal age and lack of prenatal care [6]. Higher risk of MSAF is associated with early onset of intrahepatic cholestasis of pregnancy and raised maternal serum bile acids [7].

Amnioinfusion is a technique of instilling an isotonic fluid, such as a normal saline or lactated ringer's soluteon, into the amniotic cavity [8]. Amnioinfusion can be done antenatally through trans-abdominal approach or during labor through trans-cervical approach [9]. It may be diagnostic to enable better fetal visualization or for some therapeutic indications as it may help during external cephalic version for breech presentation at term and in cases of early premature rupture of membrane [10], to reduce the incidence of variable deceleration due to cord compression [11], reduce the risk of meconium aspiration, so as to increase possibility of vaginal delivery [12].

Objectives:-
The current study targets to evaluate the maternal and fetal outcome after amnioinfusion for women presenting by ruptured membranes with thick meconium-stained amniotic fluid

Setting:-
University Hospital, Benha, Egypt

Design:-
Prospective comparative clinical trial

Patients & Methods:-

This study was conducted at Obstetrics & Gynecology Department, Benha university Hospital since June 2015 till Aug 2017. The study protocol was approved by the Local Ethical Committee and enrolled pregnant women and their husbands signed written fully informed consent for study participation and receiving the trial therapeutic modality.

The study intended to collect all pregnant women of >37 weeks gestational age (GA), having a singleton live fetus in cephalic presentation and attended the emergency department for being in labor with ruptured membranes and thick meconium stained amniotic fluid. Exclusion criteria included cephalopelvic disproportion, antepartum hemorrhage, chorioamnionitis, fetal malformation, and fetal indications for immediate delivery as cord prolapse or severe fetal heart rate abnormalities. Also, patients with blood pressure of >140/90, diabetes mellitus, other medical co-morbidities or history of previous cesarean section or uterine surgery were excluded from the study. All patients underwent full clinical examination to fulfill inclusion and exclusion criteria. Enrolled patients were randomly divided into two equal groups using sealed envelops containing a folded card indicating the group to be included in. These envelops were prepared by an assistant who was blinded about the groups' target and were chosen by the patient herself.

Management protocols:-
All patients had received conventional management in the form of intravenous fluid therapy for hydration, oxygen by mask, maintenance in left lateral position, minimizing or stoppage of oxytocin infusion if any with preparation for CS. Continuous fetal heart rate (FHR) monitoring using continuous cardiotopography (CTG) was applied for all pregnant women and operative decision was taken accordingly.

During the 1st stage of labor, all patients were monitored for number of uterine contractions in 10 min and tone and duration of each contraction, FHR, extent of fetal head descent using pelvic grip examination and per vaginal (P/V) examination was conducted hourly to assess labor progress. Fetal distress was the indication for CS. During the 2nd stage of labor, FHR was monitored and P/V examination was done to look for cord prolapse, position and station of the head, and progress of the descent of the head. If there was normal labor progress with no contraindication for normal vaginal delivery, it was allowed as long as FHR was normal, but if fetal distress was diagnosed, forceps or ventouse was applied to aid for completion of the 2nd stage of labor.

Once the head was delivered, baby's mouth and pharynx were cleaned using sterile gauze, and on completion of fetal delivery, immediate oronasopharygeal suction, warming and positioning was done. NICU admission was

indicated if direct endotracheal suction and monitoring are required. Then, placenta was delivered and patients were monitored actively for postpartum complications.

Protocol of trans-cervical amnioinfusion:-

Patients of study group received transcervical amnioinfusion using a catheter that was inserted through the cervix into the uterine cavity just above the fetal head and in the form of drip of normal saline solution at room temperature, 500 ml infused through the catheter over 30 min using a drip set without bombing. On development of fetal distress on CTG, and/or tetanic uterine contraction, the amnioinfusion drip was stopped till resolution of these manifestations and to be re-continued, otherwise patient was transferred to theater for immediate cesarean delivery.

Study outcome:-

1. The frequency of cesarean section in general and differential according to frequency of fetal distress as judged by CTG, prolonged 2nd stage and/or development of tetanic uterine contraction.
2. The frequency of vaginal delivery and if it was assisted or normal.
3. The frequency of patients required stoppage of amnioinfusion either for development of tetanic contraction or fetal distress.
4. One and five minute APGAR score, the frequency of NICU admission and its indications.
5. Fetal mortality rate and maternal postpartum complication and mortality rates.

Statistical analysis:-

Obtained data were presented as mean±SD, ranges, numbers and ratios. Results were analyzed using One-way ANOVA with post-hoc Tukey HSD Test and Chi-square test (X^2 test). Statistical analysis was conducted using the IBM SPSS (Version 23, 2015) for Windows statistical package. P value <0.05 was considered statistically significant.

Results:-

Throughout the duration of the study, 88 women were presented by ruptured membranes with thick MSAF were included in the study. Enrolment data showed non-significant (p>0.05) difference between women of both groups (Table 1).

Table (1):- Enrolment data of women of both groups

Data		Control group (n=44)	Study group (n=44)	P value
Age (years)		26.8±4.6	26.4±5	0.734
Weight (kg)		81.4±9.6	83.7±8.7	0.241
Height (cm)		168.8±3.2	169.7±3.5	0.236
BMI (kg/m^2)		28.6±3.9	29.1±3	0.175
Gravidity		2.2±1.1	2±1	0.422
Parity		1.1±1	0.9±1	0341
Gestational age (weeks)		38±0.9	38.3±1	0.124
Blood pressure	SBP	115.4±6	117.8±7.9	0.223
	DBP	83.5±12	83.8±11.4	0.309
FBG (mg/dl)		89±10	86.7±8.9	0.562

Data are presented as mean±SD & numbers; percentages are in parenthesis; BMI: Body mass index; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; FBG: Fasting blood glucose; p>0.05: indicates non-significant difference

Concerning the outcome of amnioinfusion, 27 women completed their labor uneventfully. Eleven women developed tetanic uterine contraction that required stoppage of amnioinfusion, but unfortunately in 8 women the infusion could not be completed due to failure of uterine relaxation and development of fetal bradycardia, so these 8 women underwent urgent CS. On contrary, in three women normal uterine tone was regained and infusion was continued and all of the three had VD that was assisted to shorten the 2nd stage. Four women showed no progress of labor and CTG showed fetal bradycardia and so had transferred to theater for CS. Despite of conventional treatment and normal uterine tone and progress of labor during amnioinfusion, two fetuses showed bradycardia so a decision of shift to CS was mandatory for sake of the fetus. Among women of the control group, 25 women had CS for fetal

distress as judged by CTG in 19 women and for failure of progress of labor in 6 women. Nineteen women completed their labor process and had vaginal delivery; 10 had assisted vaginal delivery, while 9 had NVD (Table 2).

In comparison to control group, the frequency of women required CS was significantly (p=0.032) lower among women received amnioinfusion. As regards women had vaginal delivery, the frequency of women had assisted vaginal delivery was significantly (p=0.044) lower among women received amnioinfusion. Moreover, the frequency of women had CS for fetal distress as judged by CTG was significantly (p=0.022) lower among women received amnioinfusion, and the frequency of women had CS for failure of labor was significantly (p=0.039) lower among women received amnioinfusion. No woman in control group had CS for tetanic uterine contraction with significantly lower frequency in comparison to women of study group (Table 2).

Table (2):- Outcome of women of both groups

Mode of delivery		Nature	Control	Study	P value
Vaginal delivery		Normal	9 (20.5%)	27 (61.4%)	0.044
		Assisted	10 (22.7%)	3 (6.8%)	
		Total	19 (43.2%)	30 (68.2%)	0.032
Operative delivery	Number	Total	25 (56.8%)	14 (31.8%)	
	Indications	Fetal distress	19 (43.2%)	2 (4.5%)	0.022
		Failure of labor progress	6 (13.6%)	4 (9.1%)	0.039
		Tetanic uterine contraction	0	8 (18.2%)	0.0001

Data are presented as numbers; percentages are in parenthesis

Amnioinfusion improved neonatal outcome as manifested by the significantly higher frequency of neonates with 1-min APGAR score of >7 and significantly (p=0.033) higher mean score compared to neonates of control group. Moreover, the frequency of neonates developed birth asphyxia, showed meconium below cord or developed meconium aspiration syndrome was significantly lower among neonates of women received amnioinfusion compared to neonates of control women. Eleven neonates required NICU admission; 5 for developing MAS, 3 for being small for gestational age, two for phototherapy and one for management sepsis. Unfortunately, two neonates died, one of each group, while the remaining 9 were charged alive. The frequency of neonates required NICU admission showed significantly lower frequency among neonates of study than control group (Table 3). No maternal definite complications were reported in either group.

Table (3):- Neonatal outcome in both groups

Data			Control group (n=44)	Study group (n=44)	P value
1-min APGAR score	Frequency	4-7	34 (77.3%)	27 (61.4%)	0.041
		>7	10 (22.7%)	17 (38.6%)	
	Mean (±SD)		6.2±1.4	6.9±1.5	0.033
5-min APGAR score	Frequency	4-7	8 (18.2%)	3 (6.8%)	0.062
		>7	36 (81.8%)	41 (93.2%)	
	Mean (±SD)		8.1±1.3	8.5±0.9	0.079
Birth asphyxia	No		23 (52.3%)	36 (81.8%)	0.033
	Mild		12 (27.7%)	5 (11.4%)	
	Moderate		6 (13.6%)	2 (4.5%)	
	Severe		3 (6.8%)	1 (2.3%)	
Meconium below cord	No		30 (68.2%)	39 (88.6%)	0.017
	Yes		14 (31.8%)	5 (11.4%)	
MAS	No		38 (86.4%)	43 (97.7%)	0.049
	Yes		6 (13.6%)	1 (2.3%)	
NICU admission	No		36 (81.8%)	41 (93.2%)	0.043
	Yes		8 (18.2%)	3 (6.8%)	

Data are presented as numbers & mean±SD; percentages are in parenthesis; MAS: Meconium aspiration syndrome; $p<0.05$: indicates significant difference

Discussion:-

Management policy provided for enrolled women with ruptured membrane and thick-meconium stained amniotic fluid (MSAF) consisted of maternal hydration, and oxygenation and fetal monitoring using CTG with discontinuation of oxytocin infusion if any was provided. Such policy coincided with **Bullens et al.** [13] who conducted a survey among 86 Dutch hospitals, and found that in 100% of hospitals CTG was used for fetal monitoring and when fetal distress was suspected, oxytocin is discontinued and tocolytic drugs are applied and 98% of hospitals use maternal reposition for fetal resuscitation, 33% use amnioinfusion (AI), and 58% provide maternal hyperoxygenation.

Among total studied women, the frequency of CS was 44.3%, of which 53.8% had CS for fetal distress and 25.6% for failure of labor progress. Moreover, the frequency of assisted vaginal delivery (VD) among women had VD was 26.5%. These figures point to the fact that women presenting with thick MASF are always at high risk of complications, irrespective of the applied therapeutic modality. Similarly, **Hiersch et al.** [14] found MSAF was significantly associated with operative delivery, CS and increased risk for short-term neonatal morbidity.

The frequency of NICU was 12.5%; with significantly lower frequency among those received AI than controls (18.2% vs. 6.8%). The reported frequency of NICU admission for neonates of mother who did not receive AI goes in hand with **Shaikh et al.** [15] who reported that about 25% of neonates with meconium aspiration syndrome (MAS) were admitted to NICU for chemical pneumonitis or its complications. Also **Hiersch et al.** [14] documented that MSAF is associated with a higher rate of adverse perinatal outcome even in low-risk pregnancies at term. NICU mortality rate in the current study was 27.3%; a figure which coincides with **Shaikh et al.** [15] who reported a NICU mortality rate of 19.4%.

Amnioinfusion significantly reduced the frequency of CS, either for fetal distress or no progress of labor and significantly reduced the need for assisted VD. These findings go in hand with **Regi et al.** [16] who found AI was a beneficial therapeutic intervention in women patients showing fetal distress in first stage of labor, and it reduced CS for fetal distress. **Choudhary et al.** [17] who found AI during labor was not associated with any significant maternal complications, but was associated with a statistically significant reduction in CS incidence than in control women (31 vs. 61%). Also, **Butt & Ahmed** [18] reported that transabdominal AI is a useful procedure to reduce complications that result from oligohydramnios as AI increases the latency period, and may result in better perinatal outcome by improving birth weight. Thereafter, **Bansal et al.** [19] found the CS rate due to fetal distress was significantly lower in women of received AI than in controls (20% vs. 40.0 %) and **Bhatia et al.** [20] documented that intrapartum transcervical AI is valuable in patients with MSAF as it significantly increased the chance for having VD with significant reduction of frequency of development of MAS (6% vs. 20%).

Neonates of women of AI group showed significantly higher mean 1-min APGAR score, lower frequency of development of birth asphyxia, meconium below cord, MAS or requiring NICU admission. However, neonatal mortality rate was non-significantly lower in neonates of AI versus control group.

In line with these findings, **Regi et al.** [16] found AI was a beneficial therapeutic intervention as it reduced the frequency of neonatal acidemia. Also, **Choudhary et al.** [17] reported that AI during labor was not associated with any significant neonatal complications, but was associated with improved neonatal outcome as evidenced by statistically improved Apgar score at 1 min in newborns of women of study versus control group (10 vs. 37.2%). Moreover, **Bansal et al.** [19] detected significantly lower frequency of respiratory distress of neonate of women received AI than in control group (4% vs. 12 %). **Bhatia et al.** [20] documented that AI is valuable in patients with MSAF as it provided significant relief from variable decelerations in 68.18% vs. 7.1% in control group, significantly increased the chance for having VD with significant reduction of frequency of development of MAS 6% vs. 20 % in control group. Moreover, multiple literature reviews concluded that AI is associated with substantive improvements in perinatal outcome especially in settings where facilities for perinatal surveillance are limited [12, 21].

In support of the beneficial effects of AI, **Morita et al.** [22] presented a case complicated by chronic abruption-oligohydramnios sequence that showed success of AI in significant reduction of high amniotic fluid concentrations of iron, lactose dehydrogenase, and 8-hydroxy-2'-deoxyguanosine, a marker of oxidative DNA damage, and the baby was born at 26 weeks' gestation, admitted to NICU and was discharged home without supplemental oxygen 116 days after birth. Moreover, **Vikraman et al.** [23] documented that antepartum AI is a valuable ancillary technique in prenatal diagnosis as it increases the diagnostic yield from pregnancies presenting with severe oligo- and

anhydramnios. Also, **Haeri et al.** [24] used serial antepartum amnioinfusion for fetal pulmonary palliation to attenuate the risk of pulmonary hypoplasia in cases with abnormal fetal renal function who were not candidates for traditional intervention.

Conclusion:-

Amnioinfusion significantly increased the chance for getting normal vaginal delivery, improved variable decelerations of fetal heart rate, reduced neonatal complications and need for NICU admission. Thus, amnioinfusion could be considered as a safe and beneficial management policy, so may be provided as an essential item during management of women presenting by ruptured membranes associated with thick meconium stained liquor.

References:-

1. Dad N, Abushama M, Konje JC, Ahmed B: What is the role of amnioinfusion in modern day obstetrics? J Matern Fetal Neonatal Med. 2016; 29(17):2823-7.
2. Romero R, Yoon BH, Chaemsaithong P, Cortez J, Park CW, Gonzalez R, Behnke E, Hassan SS, Gotsch F, Yeo L, Chaiworapongsa T: Secreted phospholipase A2 is increased in meconium-stained amniotic fluid of term gestations: potential implications for the genesis of meconium aspiration syndrome. J Matern Fetal Neonatal Med. 2014; 27(10):975-83.
3. Monen L, Hasaart TH, Kuppens SM: The aetiology of meconium-stained amniotic fluid: pathologic hypoxia or physiologic foetal ripening? (Review). Early Hum Dev. 2014; 90(7):325-8.
4. Romero R, Yoon BH, Chaemsaithong P, Cortez J, Park CW, Gonzalez R, Behnke E, Hassan SS, Chaiworapongsa T, Yeo L: Bacteria and endotoxin in meconium-stained amniotic fluid at term: could intra-amniotic infection cause meconium passage? J Matern Fetal Neonatal Med. 2014; 27(8):775-88.
5. Saeed H, Jacques SM, Qureshi F: Meconium staining of the amniotic fluid and the presence and severity of acute placental inflammation: a study of term deliveries in a predominantly African-American population. J Matern Fetal Neonatal Med. 2017:1-6
6. Pariente G, Peles C, Perri ZH, Baumfeld Y, Mastrolia SA, Koifman A, Weintraub AY, Hershkovitz R: Meconium-stained amniotic fluid--risk factors and immediate perinatal outcomes among SGA infants. J Matern Fetal Neonatal Med. 2015; 28(9):1064-7
7. Estiú MC, Frailuna MA, Otero C, Dericco M, Williamson C, Marin JJG, Macias RIR: Relationship between early onset severe intrahepatic cholestasis of pregnancy and higher risk of meconium-stained fluid. PLoS One. 2017; 12(4):e0176504.
8. Rathor AM, Singh R, Ramji S, Tripathi R: Randomised trial of amnioinfusion during labour with meconium stained amniotic fluid. BJOG. 2002;109(1):17-20.
9. Turhan NO, Atacan N: Antepartum prophylactic transabdominal amnioinfusion in preterm pregnancies complicated by oligohydramnios. Int J Gynaecol Obstet. 2002; 76(1):15-21.
10. Roberts D, Vause S, Martin W, Green P, Walkinshaw S, Bricker L, Beardsmore C, Shaw N, McKay A, Skotny G, Williamson P, Alfirevic Z: Amnioinfusion in very early preterm prelabor rupture of membranes (AMIPROM): pregnancy, neonatal and maternal outcomes in a randomized controlled pilot study. Ultrasound Obstet Gynecol. 2014; 43(5):490-9.
11. Hofmeyr GJ, Lawrie TA: Amnioinfusion for potential or suspected umbilical cord compression in labour. Cochrane Database Syst Rev. 2012; 1:CD000013.
12. Hofmeyr GJ, Xu H, Eke AC: Amnioinfusion for meconium-stained liquor in labour. Cochrane Database Syst Rev. 2014; (1):CD000014.
13. Bullens LM, Moors S, van Runnard Heimel PJ, van der Hout-van der Jagt MB, Oei SG: Practice variation in the management of intrapartum fetal distress in The Netherlands and the Western world. Eur J Obstet Gynecol Reprod Biol. 2016; 205:48-53.
14. Hiersch L, Krispin E, Aviram A, Wiznitzer A, Yogev Y, Ashwal E: Effect of Meconium-Stained Amniotic Fluid on Perinatal Complications in Low-Risk Pregnancies at Term. Am J Perinatol. 2016; 33(4):378-84
15. Shaikh M, Irfan Waheed KA, Javaid S, Gul R, Hashmi MA, Fatima ST: Detrimental Complications Of Meconium Aspiration Syndrome And Their Impact On Outcome. J Ayub Med Coll Abbottabad. 2016; 28(3):506-9.
16. Regi A, Alexander N, Jose R, Lionel J, Varghese L, Peedicayil A: Amnioinfusion for relief of recurrent severe and moderate variable decelerations in labor. J Reprod Med. 2009;54(5):295-302.
17. Choudhary D, Bano I, Ali SM: Does amnioinfusion reduce caesarean section rate in meconium-stained amniotic fluid. Arch Gynecol Obstet. 2010; 282(1):17-22.

18. Butt FT, Ahmed B: The role of antepartum transabdominal amnioinfusion in the management of oligohydramnios in pregnancy. J Matern Fetal Neonatal Med. 2011; 24(3):453-7
19. Bansal N, Gupta V, Nanda A, Chaudhary P, Tandon A, Behl N: Intrapartum amnioinfusion in meconium-stained liquor: a case-control study. J Obstet Gynaecol India. 2013; 63(3):164-7.
20. Bhatia P, Reena K, Nangia S: Role of intrapartum transcervical amnioinfusion in patients with meconium-stained amniotic fluid. J Obstet Gynaecol India. 2013; 63(1):59-63.
21. Hofmeyr GJ, Xu H: Amnioinfusion for meconium-stained liquor in labour. Cochrane Database Syst Rev. 2010; (1):CD000014.
22. Morita A, Kondoh E, Kawasaki K, Fujita K, Mogami H, Minamiguchi S, Konishi I: Therapeutic amnioinfusion for chronic abruption-oligohydramnios sequence: a possible prevention of the infant respiratory disease. J Obstet Gynaecol Res. 2014; 40(4):1118-23
23. Vikraman SK, Chandra V, Balakrishnan B, Batra M, Sethumadhavan S, Patil SN, Nair S, Kannoly G: Impact of antepartum diagnostic amnioinfusion on targeted ultrasound imaging of pregnancies presenting with severe oligo- and anhydramnios: An analysis of 61 cases. Eur J Obstet Gynecol Reprod Biol. 2017; 212:96-100.
24. Haeri S, Simon DH, Pillutla K: Serial amnioinfusions for fetal pulmonary palliation in fetuses with renal failure. J Matern Fetal Neonatal Med. 2017; 30(2):174-176.