THE JOURNAL OF OBSTETRICS AND GYNECOLOGY OF INDIA

The Journal of Obstetrics and Gynecology of India (January–February 2013) 63(1):59–63
DOI 10.1007/s13224-012-0262-5

ORIGINAL ARTICLE

Role of Intrapartum Transcervical Amnioinfusion in Patients with Meconium-Stained Amniotic Fluid

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Received: 10 July 2011 / Accepted: 5 July 2012 / Published online: 27 September 2012

Abstract
Objectives The study was undertaken to evaluate maternal, perinatal outcomes following transcervical intrapartum amnioinfusion in women with meconium-stained amniotic fluid.
Methods A prospective comparative study was conducted on 100 women with meconium-stained amniotic fluid in labor. Group A: study group (50 cases) received amnioinfusion. Group B: control group (50 cases) did not receive amnioinfusion. FHR monitoring was done using cardiotocography.
Results Significant relief from variable decelerations was seen in 68.18 % cases in the amnioinfusion group as compared to 7.1 % cases in the control group. 78 % cases who were given amnioinfusion had vaginal delivery as compared to 18 % cases in the control group. Fourteen percent cases in the study group had cesarean delivery as compared to 68 % cases in the control group. Meconium aspiration syndrome was seen in six percent neonates in the study group as compared to 20 % in the control group. Two neonates died in the control group due to meconium aspiration syndrome. There was no maternal mortality or major maternal complication.
Conclusions Intrapartum transcervical amnioinfusion is valuable in patients with meconium-stained amniotic fluid.

Keywords MSAF · MAS · Meconium

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Introduction

Meconium aspiration syndrome (MAS) remains one of the most common causes of neonatal respiratory distress; hence, the presence of meconium in amniotic fluid is a subject of concern for both obstetrician and pediatrician. Intrauterine passage of meconium can occur due to intrauterine asphyxia, physiological defecation, or vagal stimulation. Intrapartum or antepartum aspiration of meconium, associated with processes that may interfere with the clearing of meconium, cause severe MAS. MAS is due to mechanical obstruction and chemical inflammations occurring as a result of meconium in the lower respiratory tract of the fetus or neonate. Wenstrom and Parsons [1] proposed intrapartum amnioinfusion for diluting meconium to decrease the incidence of MAS.

Potential mechanisms through which amnioinfusion acts include mechanical cushioning of the umbilical cord to correct or prevent recurrent umbilical compressions that lead to fetal acidemia, predisposition to MAS, and dilution of meconium to reduce its mechanical and inflammatory

effects in the pathogenesis of MAS. Amnioinfusion is a simple, inexpensive, effective, and safe method for relief of severe heart rate anomalies during labor with oligohydramnios and meconium-stained liquor.

Hofmeyr et al. [2] reviewed randomized controlled trials and suggested a lower frequency of MAS, cesarean deliveries, and perinatal death following amnioinfusion. However, Fraser et al. [3], in their multicenter trial, could not verify these benefits. Results regarding the benefit of amnioinfusion in meconium-stained amniotic fluid are variable. Therefore, a prospective comparative study was undertaken to evaluate maternal and perinatal outcomes following transcervical intrapartum amnioinfusion in women with moderate to thick meconium-stained amniotic fluid (MSAF).

Materials and Methods

The present study was carried out prospectively. Hundred patients with gestation of more than 37 weeks, singleton live fetus, cephalic presentation, in labor with moderate to thick MSAF were selected. Patients with cephalopelvic disproportion, Antepartum hemorrhage, previous cesarean section or previous uterine surgery, Chorioamnionitis, fetal malformations, hemoglobin <8 g%, blood pressure >140/90 mmHg, Diabetes mellitus, associated medical complications, or having indications of immediate delivery such as cord prolapse or severe fetal heart rate abnormalities suggestive of fetal distress were excluded.

Fifty subjects (Group A) were given saline amnioinfusion and formed a study group. The other fifty were not given amnioinfusion and formed a control group (Group B).

The study was approved by the Institutional Ethical Committee

Group A (study group) Amnioinfusion was carried out with a catheter inserted through the cervix into the uterine cavity just above the fetal head. 500 ml of normal saline solution at room temperature was infused through the catheter over 30 min using a drip set between a bottle and the catheter. Another 500 ml of saline was infused at a rate of 30 drops per minute. Labor was augmented.

Group B (control group) received conventional treatment, which included provisional preparation for cesarean section, oxygen by mask, lateral positioning, hydration, and decreasing or discontinuing oxytocin.

During the 1st stage of labor, the patient was kept in a left lateral position and given i/v fluids. No. of uterine contractions in 10 min. and tone and duration of each contraction were noted. Fetal heart rate was monitored by CTG. Pelvic grip examination was done to see descent of the head. P/V was done four hourly or earlier, if required, to assess progress of labor. If fetal distress was diagnosed, the patient was taken for cesarean section. During the 2nd stage of labor, FHR monitoring was done at the end of contractions. 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 fetal distress was diagnosed, forceps or ventouse was applied. Normal vaginal delivery was conducted if FHS was normal. The baby's mouth and pharynx were wiped with sterile gauze as the head was delivered. The baby was handed over to a pediatrician. After delivery, immediate suction of the oronasopharynx was done. Warming, mopping, and positioning were done. Endotracheal suction directly through an endotracheal tube was done if required. The baby was admitted to NICU if necessary and monitored for respiratory distress, seizure, hypoglycemia, electrolyte imbalance, etc., and managed. The placenta was delivered by the Modified Brandt Andrews method. Postpartum hemorrhage, other complications were managed. Patients were monitored actively for 24 h. Postpartum complications were noted and managed.

Results were analyzed by standard statistical methods

Results

Relief from variable decelerations was seen in 68.18 % (15/22) cases in the study group, but only in 7.1 % (2/28) in the control group. This difference was very significant ($\chi^2 = 20.45$; $p < 0.001$). Mean duration of meconium detection to delivery of the fetus was 4.27 ± 2.51 h in the study group and 2.96 ± 2.36 h in the control group. Time interval between detection of meconium and delivery was significantly less in the control group ($p = 0.008$)

In the study group, 39 out of 50 cases (78 %) had normal vaginal delivery as compared to 9 out of 50 cases (18 %) in the control group (Table 1). This difference was highly significant ($p < 0.001$). Fourteen percent cases in the study group had a cesarean delivery as compared to 68 % in the control group. This was also a highly significant difference ($p < 0.001$). Fetal distress was an indication for cesarean section in 3 out of 7 (28.57 %) primigravidas in the study group and 19 out of 34 (55.8 %) in the control group. In multiparae, 15 out of 34 (44.11 %) cesareans were done for

Table 1 Mode of delivery

Mode of delivery	Study group (A)		Control group (B)	
	No.	(%)	No.	(%)
Normal vaginal	39	78	9	18
Assisted vaginal	4	8	7	14
Cesarean section	7	14	34	68

fetal distress in the control group, but none in the study group. Thus, cesarean section rates for fetal distress in both primigravidas and multiparae were significantly reduced in the study group ($\chi^2 = 44.44$; $p < 0.001$).

Incidence of assisted vaginal delivery was 8 % in the study group and 14 % in the control group. Obstetric forceps were applied for seventy five percent in the study group and 71.5 % in the control group for fetal distress and 25 % in the study group and 28.5 % in the control group for maternal distress.

There was no maternal mortality or major maternal complication following amnioinfusion.

No uterine hypertonus or amniotic fluid embolism was seen after amnioinfusion. Atonic PPH occurred in 4/50 (8 %) cases in the study group, but in only 1/50 (2 %) cases in the control group (Table 2). This difference was not significant ($\chi^2 = 4.167$; $p = 0.217$). No patient required blood transfusion. There was no case of retained placenta.

Maternal pyrexia did not occur in the study group, but in the control group, 6 % cases had pyrexia, although this difference was not significant statistically. 18 % cases in the study group as compared to 70 % cases in the control group stayed in hospital for more than 3 days. This difference was statistically significant ($p < 0.001$).

There were no cases of acute fetal distress or cord prolapse after amnioinfusion.

Apgar score <7 at 1 min was seen in 22 % cases in the study group and 26 % cases in the control group (Table 3). But, this difference was not statistically significant ($p = 0.640$)

Apgar score <7 at 5 min was seen in 2 % cases in the study group and 6 % cases in the control group (Table 4). But, this difference was also not statistically significant ($p = 0.617$).

Table 2 Maternal morbidity

Maternal complication	Study group (A)		Control group (b)		*p* value
	No.	(%)	No.	(%)	
Uterine hypertonus	0	0	0	0	
Incoordinate uterine activity	0	0	0	0	
Atonic PPH	4	8	1	2	0.217
Retained placenta	0	0	0	0	

Table 3 Apgar score of neonates at 1 min

Apgar score	Study group (A)		Control group (B)		*p* value
	No.	(%)	No.	(%)	
<4	0	0	0	0	–
4–7	11	22	13	26	0.64
>7	39	78	37	74	–

Table 4 Apgar score of neonates at 5 min

Apgar score	Study group (A)		Control group (B)		*p* value	RR (95 % CI)
	No.	(%)	No.	(%)		
<4	0	0	0	0	–	–
4–7	1	2	3	6	0.617	0.490 (0.089–2.704)
>7	49	98	47	94	–	–

Table 5 Neonatal morbidity

Neonatal morbidity		Study group (A)		Control group (B)		*p* value
		No.	(%)	No.	(%)	
Birth asphyxia	Mild	9	18	11	22	0.803
	Mod.	3	6	4	8	1
	Severe	1	2	1	2	1
	Total	13	26	16	32	
Meconium below cords		8	16	25	50	0.001
MAS		3	6	10	20	0.037

Only 16 % neonates had meconium below vocal cords in the study group as compared to 50 % in the control group (Table 5), and this difference was statistically significant ($\chi^2 = 13.071$; $p = 0.001$). MAS was seen in six percent neonates in the study group as compared to 20 % in the control group (Table 4). This difference was statistically significant ($\chi^2 = 4.332$; $p = 0.037$). Mean NICU stay was 2.3 ± 2 days in the study group and 2.5 ± 1.2 days in the control group and there was no significant difference ($p = 0.5457$).

One out of two neonates (2 %) in the study and control group each had severe birth asphyxia. Moderate asphyxia was seen in 6 and 8 % neonates in the study and control group, respectively (Table 4).

No neonatal mortality was seen in the study group. Two neonates died in the control group within 2 days of birth due to MAS (chemical pneumonitis and severe respiratory distress).

Discussion

The presence of MSAF remains a concern for both obstetrician and pediatrician because of the high morbidity and mortality associated with MAS. The most severe complication of MSAF, MAS occurs in about 2 % neonates with MSAF.

Amnioinfusion during labor for potential or suspected cord compression has been proposed as a rational approach for prevention and treatment of problems that are

associated with intrapartum meconium passage. The application of amnioinfusion to the management of MSAF is logical for two reasons. First, it corrects concurrent oligohydramnios and may dilute thick meconium so that the toxic effects of aspiration, should it occur, are diminished. Second, diminished vagal stimulation due to cord compression after amnioinfusion probably reduces further meconium passage and removes a stimulus for fetal gasping.

In this study, Transcervical amnioinfusion was carried out following the technique of Mahomed et al. [4].

Relief from variable decelerations was seen in 68.18 % (15/22) cases in the amnioinfusion group, but only in 7.1 % (2/28) cases in the control group. Relief from variable decelerations in two cases of the control group might have occurred due to a change in posture from supine to left lateral position. Surbek et al. [5] reported amnioinfusion to be effective in 76.9 % cases for relief from FHR abnormalities. Puertas et al. [6] also showed decreased frequency of variable FHR decelerations after amnioinfusion (RR 0.74, CI 0.59-0.92). Abdel-Aleem et al. [7] reported 30 % reduction in non-reassuring and ominous FHR patterns in amnioinfusion group.

Incidence of normal delivery in the amnioinfusion group (78 %) was higher than the control group (18 %), which was highly significant. A similar significant difference was also reported by Rathore et al. [8].

There was a significantly lower incidence of cesarean section in the amnioinfusion group (14 %) in comparison to the control group (68 %). All cesarean sections in the control group were done for fetal distress, whereas only 42.8 % of cesareans in the study group were done for fetal distress. A probable explanation for the lower incidence of cesarean section in the study group is that by increasing amniotic fluid volume around the fetus, amnioinfusion reduces the risk of fetal distress caused by umbilical cord compression. Whether amnioinfusion has any effect independent of relieving fetal distress on reducing the rate of cesarean deliveries is not clear.

Mean duration of meconium detection to delivery of the fetus was significantly more (4.27 ± 2.51 h.) in the amnioinfusion group as compared to the control group (2.96 ± 2.36 h).

Incidence of maternal hospital stay longer than 3 days was significantly less in the amnioinfusion group (18 %) than the control group (70 %). This was most probably because amnioinfusion decreased the need for cesarean section in the study group. A shorter hospital stay reduces cost of childbirth especially where health resources are overstretched in developing countries like India. Abdel-Aleem et al. [7] and Das et al. [9] also reported higher no. of patients in the control group with hospital stay of ≥3 days.

There was a statistically significant decrease in the incidence of MAS in the study group (6 %) than the control group (18 %). Decrease in incidence of MAS in the study group must be due to decreased meconium below the level of vocal cords, decreased fetal gasping, and active resuscitation of the neonate after birth.

There was no neonatal mortality in the study group, but two neonates died in the control group within 2 days of birth due to MAS (chemical pneumonitis and severe respiratory distress).

There was no maternal mortality or major maternal complication of amnioinfusion. No case of uterine hypertonus, incoordinate uterine activity, or amniotic fluid embolism was encountered. Maternal pyrexia did not occur in the amnioinfusion group, but in control group, 6 % cases had pyrexia. Atonic PPH occurred in more (8 %) cases of the amnioinfusion group as compared to 2 % cases of the control group (Table 2), but this difference was not significant ($\chi^2 = 4.167$; $p = 0.217$)and no patient had PPH requiring blood transfusion. There was no case of retained Placenta. Rathore et al. [8] observed one case of incoordinate uterine activity in the amnioinfusion group and two in the control group. Abdel-Aleem et al. [7] observed uterine hypertonus in 7.3 % cases of the amnioinfusion group as compared to 6.3 % cases of the control group.

Conclusions

Intrapartum transcervical amnioinfusion is very valuable in patients with MSAF. It is a technically simple procedure with no adverse effects on either the mother or neonate. Besides decreasing the cesarean section rate, it also decreases the incidence of MAS and thus, the burden on overloaded neonatal care facilities.

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