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Research Article

Role of amnioinfusion in meconium stained liquor in relation to fetal outcome

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ABSTRACT

Background: Meconium aspiration syndrome complicates 1.7 to 35.8% of deliveries. The meconium aspiration syndrome is believed to result from aspiration of meconium during intrauterine gasping or at the time of first breath. Transcervical infusion of saline into amniotic cavity or amnioinfusion has been proposed as a method to reduce the risk of the meconium aspiration syndrome.
Methods: The study was conducted in Department of Obstetrics and gynecology in collaboration with the department of paediatrics, Era's Lucknow Medical College, Lucknow, India in the study period of 18 months. It was a prospective case control study. A total number of 80 patients were enrolled for the purpose of study. The patients were randomly divided into two groups. Control group (n=40) those who received standard treatment (i.e. labor analgesia, maternal nutrition and record of progress of labor) and Study group (n=40) patients who were managed by giving amnioinfusion in addition to the standard treatment. Both groups were compared in terms of fetal outcome. Data so obtained was subjected to statistical analysis using statistical package for Social Science Version 15.0.
Results: Majority of babies of control group (n=22, 55%) have Apgar score at 1 minute was <7 whereas majority of babies born to mothers of study group (n=27, 67.5%) have apgar scores at 1 minute was ≥7. Resuscitative measures were required in majority of control group babies (n=22, 55%) as compared to only 13 (32.5%) babies of study group. Meconium aspiraton syndrome was present in 12 babies (30%) of control group as compared to only 4 babies (10%) of study group. Rate of neonatal death was higher in control group (5%) as compared to study group (2.5%). A total of 25 (62.5%) babies required NICU admission in control group and 15 (37.5) babies in study group.
Conclusions: The findings in present study indicates that aminoinfusion in a well-equipped tertiary care unit reduces the rate of caesarean section significantly while at the same time influences the neonatal outcome in terms of better Apgar score, reduced need of resuscitative measures and reduced neonatal morbidity.

Keywords: Amnioinfusion, Meconium aspiration syndrome, Fetal outcome

INTRODUCTION

Meconium aspiration syndrome complicates 1.7 to 35.8% of deliveries.[1-4] The meconium aspiration syndrome is believed to result from aspiration of meconium during intrauterine gasping or at the time of first breath. Prophylactic pharyngeal suctioning and tracheal aspiration have not been shown to reduce the risk of meconium aspiration syndrome.[2]

Transcervical infusion of saline into amniotic cavity or amnioinfusion has been proposed as a method to reduce the risk of the meconium aspiration syndrome. The potential mechanism include dilution of meconium to reduce its mechanical and inflammatory effects and

cushioning of umbilical cordto correct recurrent umbilical cord compression that leads to fetal acidaemia.

Amnioinfusion was described by Miyazaki and Taylor in 1983.[5] They proved that in case of meconium stained amniotic fluid, amnioinfusion significantly decreases the number of decelerations in fetal heart rate and the rate caesarean sections.

A number of studies found an overall reduction in incidence of MAS, operative or instrumental deliveries and perinatal morbidity and mortality in the group of patients where amnioinfusion was done.[4] However multicentric trials done recently showed that for women in labor who had thick meconium staining of amniotic fluid, amnioinfusion did not reduce the risk of moderate or severe meconium aspiration syndrome, perinatal death or other major maternal or neonatal disorders. In view of these conflicting reports, ACOG has recommended the use of intrapartum amnioinfusion only when variable decelerations in CTG are accompanied with presence of meconium in amniotic fluid.

With the above facts in mind this study has been planned to evaluate the significance of meconium staining during labor and to find out the role of amnioinfusion on fetal outcome. The present study was carried out with following objectives.

1. To evaluate the beneficial effect of amnioinfusion in cases of meconium stained liquor during labor and its effect on fetal outcome.
2. To assess the the rate of caesarean deliveries following transcervical amnioinfusion in women with Meconium stained liquor.

METHODS

The study was conducted in Department of Obstetrics and gynecology in collaboration with the department of paediatrics, Era's Lucknow Medical College, Lucknow, India in the study period of 18 months. It was a prospective case control study. All the pregnant women with meconium stained liquor during labor with reassuring fetal heart pattern were studied.

Inclusion criteria

- Gestational age ≥37 weeks
- Single live fetus
- Cephalic presentation
- Moderate to thick meconium stained liquor with normal cardiotocography

Exclusion criteria

- Major medical or obstetrical complication
- Known fetal malformation

A total number of 80 patients were enrolled for the purpose of study. The patients were randomly divided into two groups using computerised randomization table.

Control group (n=40) are those who received standard treatment (i.e. labor analgesia, maternal nutrition and record of progress of labor).

Study group (n=40) are the patients who were managed by giving amnioinfusion in addition to the standard treatment.

All the patients included in the study were clinically evaluated. Informed consent was also obtained from all the patients. Detailed physical examination was done with special reference to uterine contraction, fetal heart sound, cervical dilatation at the time of detection of meconium and station of head.

Procedure

Patients were randomly divided into two groups- control group received standard treatment while study group received amnioinfusion in addition to standard treatment.

In amnioinfusion prewarmed normal saline 1000 ml was instilled transcervically into the amniotic cavity with the help of soft tip urethral catheter. All the patients were closely monitored by continuous fetal heart rate monitoring and maintaining the partogram. Antibiotic was given if indicated.

Following information was noted.

- Vigorous / non vigorous baby
- Apgar scores at 1 and 5 minutes
- Admission to NICU
- Presence of meconium aspiration syndrome and perinatal mortality
- Caesarean section rate

Statistical analysis

Data so obtained was subjected to statistical analysis using statistical package for Social Science Version 15.0.

RESULTS

A total of 80 women fulfilling the inclusion criteria were enrolled in the study and were randomly allocated to the two groups. There were 40 patients in control group who were managed by standard therapy for meconium stained liquor. There were 40 patients in study group who were given amnioinfusion in addition to standard therapy (Table 1).

Majority of patients in both the groups were between 21 - 30 years of age. Maximum patients were of age between 21-25 years of age (Table 2) statistically both the groups

were matched for age. In control group 19 (47.5%) patients were primipara and rest 21(52.5%) were multipara. Similarly in study group 20(50%) patients were primipara and 20(50%) patients were multipara (Table 3).

Table 1:Groupwise distribution.

Groups	Description	No. of cases	Percentage
Control	Patients with meconium satined liquor during labor who were managed by standard therapy	40	50%
Study	Patients with meconium stained liquor during labor who were managed by amnioinfusion in addition standard therapy	40	50%

Table 2: Age-wise distribution.

Age	Control (n=40)		Study (n=40)	
	Number	%	Number	%
≤20	5	12.5	7	17.5
21-25	17	42.5	16	40
26-30	12	30	8	20
31-35	5	12.5	7	17.5
36-40	1	2.5	2	5

χ^2=1.830(df=4); p=0.767.

Table 3: Parity status.

Parity	Control (n=40)		Study (n=40)	
	Number	%	Number	%
Primipara	19	47.5	20	50
Multipara	21	52.5	20	50

χ^2=0.050;p=0.823 (NS).

In control group cervical dilatation was <5cm in 13 patients (32.5%), 5-7cm in 16 patients (40%), >7cm in 11 patients (27.5%). In study group cervical dilatation was <5cm in 13 patients (32.5%), 5-7cm in 17 patients (42.5%), and >7 cm in 10 patients (25%). There was no statistically significant difference present when cervical dilatation was compared (Table 4).

Majority of women in control group were delivered through caesarean section (24 cases, 60%) as compared to 14 patients (35%) in the study group. The proportion of vaginal delivery was higher in study group (n=26, 65%) as compared to control group (n=16, 40%). Statistically the difference was significant (p= 0.025) (Table 5).

Table 4: Cervical dilatation.

Cervical dilatation at the time of detection of meconium	Control (n=40)		Study (n=40)	
	Number	%	Number	%
<5 cm	13	32.5	13	32.5
5-7 cm	16	40	17	42.5
>7 cm	11	27.5	10	25

χ^2=0.078; P=0.962 (NS).

Table 5: Mode of delivery.

Age	Control (n=40)		Study (n=40)	
	Number	%	Number	%
LSCS	24	60	14	35
Vaginal	16	40	26	65

χ^2=5.013; P=0.025.

All the patients included in the study, irrespective of any group delivered a live baby (Table 6).

Table 6: Fetal outcome.

Fetal outcome	Control (n=40)		Study (n=40)	
	Number	%	Number	%
Live birth	40	100	40	100

A total of 18 (45%) babies of control group and 27 (67.5%) babies of study group were vigorous at birth , 22 babies (55%) of control group and 13 (32.5%) babies from study group were non vigorous. Babies of study groups were significantly more vigorous (Table 7).

Table 7: Status of babies at birth.

Status	Control (n=40)		Study (n=40)	
	Number	%	Number	%
Vigorous	18	45	27	67.5
Non-vigorous	22	55	13	32.5

χ^2=4.114; p=0.043.

Majority of babies of control group (n=22, 55%) have apgar score at 1 minute was <7 whereas majority of babies born to mothers of study group (n=27, 67.5%) have apgar scores at 1 minute was ≥7. The difference was statistically significant (p=0.043) (Table 8).

Table 8: Apgar score at 1 minute.

Apgar score	Control (n=40)		Study (n=40)	
	Number	%	Number	%
<7	22	55	13	32.5
≥7	18	45	27	67.5

χ^2=4.114, p=0.043.

Apgar scores at 5 minutes of birth were ≥7 in majority of babies in both the groups. A total of 18 (45%) babies in control group and 14(35%) in study group had apgar scores <7. Difference in apgar scores at 5 minutes between the groups was not statistically significant (Table 9).

Table 9: Apgar score at 5 minute.

Apgar score	Control (n=40)		Study (n=40)	
	Number	%	Number	%
<7	18	45	14	35
≥7	22	55	26	65

χ^2=0.833; p=0.361 (NS).

In majority of babies born to mothers in study group (67.5%) had heart rate >100/minute whereas only 18 (45%) of babies born to mothers in control group had heart rate >100/minute. There were 18 babies (45%) in control group and 9 babies (22.5%) in study group with heart rate between 60-100. Number of babies with heart rate <60 was same in both the groups (n=4, 10%). Despite these differences between the two groups the difference was not statistically significant (Table 10).

Table 10: Heart rate of babies.

Heart rate of babies	Control (n=40)		Study (n=40)	
	Number	%	Number	%
<60/min	4	10	4	10
60-100/min	18	45	9	22.5
>100/min	18	45	27	67.5

χ^2=4.800; p=0.091.

Resuscitative measures were required in majority of control group babies (n=22, 55%) as compared to only 13 (32.5%) babies of study group. This difference was statistically significant (p= 0.043) (Table 11).

Table 11: Resuscitative measures.

Resuscitative measures	Control (n=40)		Study (n=40)	
	Number	%	Number	%
Required	22	55	13	32.5
Not required	18	45	27	67.5

χ^2=4.113; p=0.043.

Meconium aspiraton syndrome was present in 12 babies (30%) of control group as compared to only 4 babies (10%) of study group, thereby showing a significant difference in prevalence of meconium aspiration syndrome between the two groups (p=0.025) (Table 12).

Rate of neonatal death was higher in control group (5%) as compared to study group (2.5%) yet the difference between two groups was not statistically significant (p= 0.556) (Table 13).

A total of 25 (62.5%) babies required NICU admission in control group and 15 (37.5%) babies in study group. Statistically there was no significant difference in NICU stay of two groups (Table 14).

Table 12: Meconium aspiration syndrome.

Meconium aspiration syndrome	Control (n=40)		Study (n=40)	
	Number	%	Number	%
No	28	70	36	90
Yes	12	30	4	10

χ^2=5; p=0.025.

Table 13: Neonatal death.

	Control (n=40)		Study (n=40)	
	Number	%	Number	%
No Neonatal death	2	5	1	2.5

χ^2=0.346; p=0.556.

Table 14: Duration of NICU stay.

Duration of NICU stay	Control (n=40)		Study (n=40)	
	Number	%	Number	%
Not required	15	37.5	25	62.5
<7 days	3	7.5	2	5
>7days	22	55	13	32.5

χ^2=5.014; p=0.081.

DISCUSSION

Fetal distress is a widely used but poorly defined term. Its use commonly indicates anxiety about fetal condition which is usually assessed by measuring the fetal heart rate and for the presence of meconium in the amniotic fluid, and it is often assumed that an abnormal fetal heart rate, especially in the presence of meconium stained liquor, indicates hypoxia and acidosis.[6]

The purpose of this study was to evaluate the possible effects of amnioinfusion in improving fetal outcome.

The fetus passes meconium into the amniotic fluid in 10% of all pregnancies. In 5% of these (i.e. 1:200 of all pregnancies), the meconium is aspirated into the lungs of the fetus or neonate. This can result in severe respiratory difficulty, the meconium aspiration syndrome.[7]

The presence of meconium in the amniotic fluid of the fetus in a vertex presentation has been considered to be a sign of fetal distress. Meconium has been associated with increased perinatal morbidity and death, especially when meconium aspiration syndrome is present.[8-10]

In present study rate of caesarean section was 60% in control group and 35% in study group thereby showing a significant difference between the two groups (Table 5).

Most of the literature from the developing countries supports a significant reduction in caesarean section rate following amnioinfusion which is consistent with present study (Table 16).[11-18]

Table 15: Antenatal maternal factors and their association with meconium stained amniotic fluid and their prevalence in present study.

Factors	Sankhyan et al			Prevalence in present study
	Clear amniotic fluid (%)	Meconium stained amniotic fluid (%)	p	
Teenage mother	2.1	1.25	0.51	1.25%
Maternal age>30	7.5	11.9	0.063	18.75%
Primipara	45.3	56.6	0.009	47.5%
Postdated pregnancy	17.06	29.6	0.001	41.25%

Table 16: Rate of caesarean section in Control and Study Group subjects in different studies.

Study	Rate of caesarean section		Significance
	Control group	Study group	
Rathour et al (2002)[11]	36%	21%	<0.05
Ashfaq and Shah (2004)[6]	-	37%	-
Sood et al (2004)[12]	42%	12%	<0.05
Singh, Magu (2005)[13]	57%	33%	<0.05
Choudhary, Bano (2010)[24]	61%	31%	<0.05
Present study (2012)	60%	35%	<0.05

In present study, majority of babies in aminoinfusion group (67.5%) were vigorous at birth as compared to 18 (45%) in control group, thereby showing a significant effect on the respiratory distress (p=0.043). The findings in present study are in accordance with the observation of Rathoret al who also observed that aminoinfusion was useful in reducing the respiratory distress among babies (Table 7).[11]

Table 17: Incidence of low apgar scores in control and study group subjects in different studies.

Study	Apgar <7 at 1 min		Significance
	Control group	Study group	
Rathore et al (2002)[11]	8%	2%	0.05
Ashfaq and Shah (2004)[6]	31%	68%	<0.05
Singh and Magu (2005)[13]	19%	15%	NS
Das et al (2007)[15]	47%	12%	<0.05
Choudhary, Bano (2010)[24]	37.2%	10%	<0.05
Present study (2012)	55%	32.5%	NS

In present study, though the proportion of babies with low Apgar at 1 min and 5 min higher in control group as compared to aminoinfusion. The result in present study are in accordance with the observations made by Rogers et al (1996), Wenstrom and Parsons (1998), Lembet et al Rathore et al who all observed that aminoinfusion reduces the risk of low Apgar.[11,19-21] In present study, trends were similar to the above cited studies though the non-significance (p>0.05) can be attributed to limitation of sample size.

In present study significantly lower proportion of babies in study group required resuscitative measures (32.5%) as compared to those in control group (55%) (Table 11). A number of studies have indicated the role of aminoinfusion in reducing perinatal morbidly and

mortality. Uhing et al. (1993) reported the need of resuscitative measures in 2.7% of study group and 10.1% of control group, thus showing a significant difference between the two groups. These findings are consistent with our study.[22]

In present study, rate of meconium aspiration syndrome (MAS) was 30% in control and 10% in study group, thus showing a significant difference between the two groups (p=0.025) (Table 12). Sood et al (2004) reported the prevalence of MAS to be 6.3% in study group and 20% in control group, thereby showing a significant difference between the two groups.[12]

Rate of meconium aspiration syndrome in present study is much higher than reported in different studies. There is variability regarding prevalence of MAS in literature. Singh and Magu reported only 1% prevalence of MAS in both case and control group.[13] Rathore et al (2002) did not report any event of MAS in intervention group as compared to only 1% in control group while Mahomed reported this prevalence to be 3.1% in intervention group and 3.3% in control group.[11,23] Choudhary, Bano (2010) reported a negligible prevalence of MAS (0.7%) in study group and 15.8% in control group (p<0.05) (Table 18).[24]

Table 18: Rate of meconium aspiration syndrome in control and study group subjects in different studies.

Study	MAS		Significance
	Control group	Study group	
Mahomed et al (1998)[23]	3.3%	3.1%	NS
Rathore et al (2002)[11]	0	1%	NS
Sood et al (2004)[12]	6.3%	20%	<0.05
Choudhary, Bano (2010)[24]	15.8%	0.7	<0.05
Present study (2012)	30%	10%	<0.05

In present study, Neonatal death was reported in 2 (5%) of control group and 1 (2.5%) of study group subjects, though this difference was not significant statistically (p=0.346) yet the rate of mortality was two times higher in control group as compared to study group (Table 13). Given the fact that aminoinfusion reduces respiratory distress, improves Apgar score and reduces caesarean section , the difference in rate of mortality is explainable and absence of a significant difference in present study might be attributed to limitation sample size of present study.

In a study by Rathor et al (2002), rate of mortality was 1% in study and 2% in control group, whereas Mahomed (1998) reported the rate of mortality to be 1.2% in study and 3.6% in control group.[11,23]

In present study, the proportion of neonates requiring NICU stay was more in control group as compared to study group yet the difference was not significant statistically. Choudhary, Bano (2010) also reported shorter duration of NICU stay (4.45±3.46 days) in study group as compared to control group (7.24±4.11 days).[24]

The findings in present study highlighted the role of aminoinfusion in reducing the caesarean rate, improving neonatal Apgar, reducing respiratory distress leading to lesser need of neonatal resuscitative measures and reduced neonatal morbidity. These findings are encouraging and provide evidence that even in well-equipped facilities aminoinfusion plays an important role in reducing caesarean rates and neonatal morbidity. Further studies on larger sample size are recommended to elucidate and clarity the role of aminoinfusion on trends obtained in present study.

CONCLUSION

The findings in present study indicates that aminoinfusion in a well-equipped tertiary care unit reduces the rate of caesarean section significantly while at the same time influences the neonatal outcome in terms of better Apgar score, reduced need of resuscitative measures and reduced neonatal morbidity. The trends in present study also indicate that the mortality rate, neonatal heart rate and Apgar scores at 1 and 5 minutes shows an improvement in aminoinfusion group as compared to control group. The reduced mortality in present study might be attributed to better infrastructural facilities and hence indicate that aminoinfusion in a well-equipped facility improves maternal and neonatal outcome significantly.

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