

ROLE OF AMNIOINFUSION ON NEONATAL OUTCOME IN CASES WITH MECONIUM-STAINED AMNIOTIC FLUID

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ABSTRACT

BACKGROUND

Amnioinfusion is thought to dilute meconium present in the amniotic fluid and so reduce the risk of meconium aspiration in newborn.

AIM

The effect of amnioinfusion in meconium-stained amniotic fluid in reducing the incidence of meconium aspiration syndrome, hypoxic ischaemic encephalopathy and perinatal mortality in newborn.

MATERIALS AND METHODS

The study was carried out in the Departments of Obstetrics and Gynaecology and NICU at Government Medical College, Kozhikode, in a time duration of one year from January 2014 to December 2014. This is a prospective case control study. We have studied 210 antenatal women admitted to the labour room with grade 2/3 meconium-stained amniotic fluid after 36 weeks of gestation. Amnioinfusion was given in 140 cases and 70 cases given standard care. Patients were monitored with electronic foetal heart monitoring and caesarean section was done in case of foetal distress or those who are in early labour. There was no significant difference between study group and control group according to age, parity, gestational age, presence of complications like hypertension/pre-eclampsia, post-dated pregnancy, anaemia, etc.

RESULTS

Foetal heart rate decelerations occurred in 27 out of 140 cases (19%) in the study group and 23 out of 70 (33%) in control group (P <0.05).

NEONATAL OUTCOME

In our study those who received amnioinfusion, only 19% delivered babies with APGAR <9 at 1' while those who do not received, 36% delivered babies with APGAR <9 at 1' (P value of 0.009). Meconium aspiration syndrome occurred in 2.1% of cases in the infusion group and 11.4% in the non-infusion group (P<0.005). Respiratory distress was markedly reduced in amnioinfusion group 28% compared to 63% in controls (P=0.002). NICU admissions were 64% in control group compared to 22% in amnioinfusion group. Perinatal mortality and hypoxic ischaemic encephalopathy in the infusion group were nil as compared to 7% and 11% in the control group.

CONCLUSION

Intrapartum amnioinfusion is effective in reducing the incidence of foetal distress and improving the Apgar at 1 minute. The rate of meconium aspiration syndrome, respiratory distress, neonatal intensive care unit admissions and hypoxic ischaemic encephalopathy were also significantly less in the study group. There was no increase in the maternal and neonatal infection rates and complications. Therefore, intrapartum amnioinfusion is a beneficial procedure using simple equipment in the absence of modern electronic foetal monitoring facilities especially in low resource settings.

KEYWORDS

Amnioinfusion, Foetal Distress. Meconium-Stained Amniotic Fluid.

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BACKGROUND: Meconium is the first intestinal secretion, which starts as early as 10 weeks of gestation. Meconium maybe passed during the intrauterine life in about 7-22% of cases and is usually due to foetal hypoxia.

Many studies have shown that meconium-stained amniotic fluid is associated with increased rate of foetal distress, increased operative delivery, perinatal morbidity and mortality.^[1] Amnioinfusion is instillation of normal saline or Ringer lactate into amniotic cavity either transcervically or

transabdominally.^[2] Transcervical amnioinfusion is instillation of fluid through cervix during labour once membrane ruptures. When meconium-stained amniotic fluid is detected during labour with moderate to thick meconium, amnioinfusion is done. This will dilute thick meconium and increases amniotic fluid index. Bansal N et al^[3] and Bhatia P et al^[4] have shown that amnioinfusion in moderate to thick meconium-stained amniotic fluid improves obstetric and neonatal outcome and decrease in operative delivery.

OBJECTIVES:

1. The role of amnioinfusion on meconium-stained amniotic fluid in reducing the incidence of Meconium Aspiration Syndrome (MAS), Hypoxic Ischaemic Encephalopathy (HIE) and perinatal mortality in newborn.
2. The effect on neonate as evaluated by assessing Apgar score, respiratory distress, requirement of intubation and ventilation and Neonatal Intensive Care Unit (NICU) admissions.
3. To study the complications of the procedure, if any.

MATERIALS AND METHODS: This study was conducted in the Department of Obstetrics and Gynaecology and Neonatal Intensive Care Unit, Government Medical College, Kozhikode. The period of study was January 2014 to December 2014. This was a prospective cohort with a control. We had studied total of 210 women, 140 women in the study group and 70 as control. Sample size was calculated with StatCalc software. All pregnant women admitted in labour with meconium-stained liquor after spontaneous or artificial rupture of membranes with single foetus, cephalic presentation with gestational age 36 weeks or more were included in the study. Women with malpresentations, multiple pregnancy, cord prolapse, antepartum haemorrhage, chorioamnionitis, foetal congenital anomalies, polyhydramnios, severe foetal bradycardia and maternal cardiovascular or respiratory disease were excluded from the study. The control group studied were the women admitted with meconium-stained liquor who have not received amnioinfusion.

Procedure: An informed written consent was taken from all the women. Injection Ampicillin 2 grams IV given before the procedure and an NST was taken. A Nelaton catheter No. 12 was introduced transcervically into a depth of 30 cm into the amniotic cavity and 500-750 mL of warm normal saline was infused over 30 minutes followed by continuous infusion of 3 mL per minute. The foetal heart rate and uterine tone were assessed continuously during the infusion. Patients were monitored with pulse and BP every 30 minutes. Caesarean section was carried out in either group when there was foetal distress or patient was in very early labour. Mother and neonate were followed for 5 to 7 days postnatally. All neonates were managed by standard protocol of immediate oropharyngeal suction followed by endotracheal suction if baby is non-vigorous. Laryngoscopy and endotracheal intubation and suctioning were reserved for babies with

respiratory depression requiring positive pressure ventilation. The data was collected from antenatal history and clinical examination using a proforma designed for the study. Parameters studied regarding maternal outcome were age, parity and gestational age in weeks (Table 1). High-risk factors like hypertension/preeclampsia, previous caesarean section, post-dated pregnancy and intrauterine growth restriction were noted (Table 2). Need for obstetric interventions like forceps or vacuum delivery and need for caesarean section also noted (Table 3).

Peripartum complications like endometritis, uterine hypertonus, postpartum haemorrhage, uterine rupture (Scar rupture), amniotic fluid embolism and hysterectomy were also studied. Foetal and neonatal outcome were assessed from the foetal heart rate changes, Apgar at 1' and 5', presence of respiratory distress, need for intubation and ventilation, neonatal intensive care unit admission, meconium aspiration syndrome as diagnosed by chest x-ray, hypoxic ischaemic encephalopathy and perinatal mortality. Chest radiograph was considered abnormal if one or more of the following findings were noted; hyperinflation, coarse patchy infiltrates, atelectasis, interstitial emphysema, pneumomediastinum, pneumopericardium and pleural effusion.

OBSERVATIONS: The age of patients ranged between 19 and 35 years in both groups and the average being 27.5 years. Regarding parity, 61% were primigravidas and 39% multigravidas in the study group, while in the control group 51% primigravidae and 49% multigravidae.

Characteristic	Study Group (n=140)	Control Group (n=70)
Average Age (Years)	27.5	28.6
Gestational Age		
<37 weeks	13 (9.2%)	4 (5.7%)
37-40 weeks	110 (78.8%)	58 (82.8%)
>40 weeks	17 (12%)	(11.4%)
Primi	85 (61%)	36 (51.6%)
Induced Labour	83 (59.4%)	3 (46%)
Artificial Rupture of Membranes	38 (27.1%)	30 (43%)

Table 1: Baseline Data

Gestational Hypertension/Pre-Eclampsia	25 (17.8%)	15 (21.4%)
Diabetes	7 (5%)	8 (11.4%)
Foetal Growth Restriction	8 (5.7%)	1 (1.4%)
Anaemia	4 (2.8%)	0

Table 2: Pregnancy Complications

The distribution of high-risk pregnancies in each group is comparable, but meconium-stained liquor is higher in hypertension/pre-eclampsia patients (Table 2). Regarding gestational age also there was no significant difference

between study group and control group. Large group of cases belong to 37 to 40 weeks, 78.8% in amnioinfusion group and 82.8% in routine care. Increased incidence of meconium was noticed in gestation >40 weeks. There was no significant difference between two groups whether it was spontaneous or induced labour and membrane ruptured spontaneously or not.

Type of Delivery: There was no significant difference between study group and control with regard to the rate of caesarean deliveries.

Out of 140 cases in the amnioinfusion group, 89 (63%) underwent caesarean section was almost the same in those who have not received amnioinfusion, 67% (47 out of 70) with P value ≥ 0.2 (Table 3).

Mode of Delivery	Amnioinfusion	Routine Care	P value
Vaginal delivery	43 (31%)	19 (27.1%)	0.59
Caesarean section	89 (63.5%)	47 (67.1%)	0.609
Instrumental	8 (5.7%)	4 (5.7%)	1.0
Total	140 (100%)	70 (100%)	

Table 3: Comparison of Outcome in Study and Control Group

	Amnioinfusion	Routine Care	Significance
Apgar <1 at 10'	27 (19%)	25 (36%)	P - 0.009
Respiratory Distress	39 (28%)	44 (63%)	P <0.002
Intubation and Ventilation	12 (9%)	26 (37%)	P - 0.00
Neonatal Intensive Care Unit Admission	31 (22%)	45 (64%)	P <0.002
Meconium Aspiration Syndrome	3 (2.1%)	8 (11.4%)	P <0.002
Hypoxic Ischaemic Encephalopathy	0	8 (11.4%)	P <0.001
Perinatal Mortality	0	5 (7%)	P - 0.004

Table 4: Neonatal Characteristics

Foetal Distress: In group without amnioinfusion 23 out of 70 (33%) developed foetal distress with foetal heart rate <100/minute while in the amnioinfusion group only 27 out of 140 (19%) developed foetal distress, which was statistically significant with P value <0.05.

Neonatal Outcome: In the amnioinfusion group, 27 out of 140 (19%) delivered babies with Apgar score <9 at 1', while in the control group 25 out of 70 (36%) delivered babies with low Apgar, which is statistically significant (P value

<0.009). Those who received amnioinfusion, 111 (79%) delivered vigorous babies while those received routine care, only 41 (59%) delivered vigorous babies. Meconium aspiration syndrome developed in 8 out of 70 (11.4%) in the routine care while 3 out of 140 (2.1%) in the amnioinfusion group (P value <0.002). Respiratory distress was markedly reduced in amnioinfusion group, 39 out of 140 (28%) compared to 44 out of 70 (63%) in controls, which is statistically significant. The requirement of intubation and ventilation in babies of amnioinfusion group was 9% (12 out of 140) while it was 37% (26 out of 70) in controls.

As shown in Table 4, the incidence of neonatal intensive care unit admissions was 22% in amnioinfusion group while 64% in the controls. Hypoxic ischaemic encephalopathy occurred in 8 babies out of 70 (11%) in the routine care group whereas no babies suffered from HIE in the study group. Perinatal mortality was 7% (5 out of 70) in the routine care, but no death in study group.

Complications: In our study, there was no maternal mortality or major maternal complication following amnioinfusion.

	Amnioinfusion	Routine Care	P value
Puerperal pyrexia	9	10	0.061
Postpartum haemorrhage	4	3	0.688

Table 5: Maternal Complications

DISCUSSION: The presence of meconium in the amniotic fluid is of concern to both the obstetrician as well as the paediatrician. The incidence of meconium during our study period was 10.3%. The study group and control group were comparable regarding Age, Parity, Gestational Age and High-Risk Factors. Out of 210 pregnancies we studied, 116 cases (83%) in the study group and 45 (64%) in the control group had thick meconium. Thick meconium carried an increased risk of neonatal asphyxia, meconium aspiration syndrome, and neonatal mortality. There was no significant difference in the mode of delivery in both groups, but caesarean section rate was high with 63% in study and 67% in controls, CRAMP - 2.^[2] Meta-analysis study showed that caesarean section rate were similar in both groups. Hofmeyr et al (2001) showed that the rates of foetal distress and caesarean section were significantly reduced in amnioinfusion group.^[5] Bansal et al^[3] found that amnioinfusion in cases of meconium-stained amniotic fluid significantly improved neonatal outcome and reduced caesarean section rate.

Bhatia P et al^[5] also showed decreased caesarean section rate and decreased incidence of meconium aspiration syndrome. The incidence of low Apgar of <6 at 1', meconium aspiration syndrome, neonatal intensive care unit admission, need for neonatal ventilation and hypoxic ischaemic encephalopathy were significantly reduced in amnioinfusion group. Nathen et al^[6] states that meconium

in amniotic fluid is an obstetric hazard with small, but significantly increased risk of adverse foetal and neonatal outcome. Different studies by Macri et al and Wenstrom et al^[7] showed that patients receiving amnioinfusion had significantly fewer incidence of foetal distress, caesarean section, meconium aspiration and meconium aspiration syndrome. Foetal heart deceleration was seen in 33% cases in control group, but only in 19% (27/140) in amnioinfusion group in our study. Surbek et al^[8] reported amnioinfusion to be effective in 76.9% cases for relief from foetal heart rate decelerations. Puertas et al^[9] also showed decreased frequency of variable decelerations after amnioinfusion (RR 0.74, CI 0.59-0.92).

Abdel-Aleem et al^[10] reported 30% reduction in non-reassuring and ominous foetal heart rate patterns in amnioinfusion group. There was a statistically significant reduction in the incidence of meconium aspiration syndrome in the study group (2.1%) than the control group (11.4%). There was no perinatal mortality and hypoxic ischaemic encephalopathy in the study group, but 7% and 11% respectively in control group. A large multicentre trial 2005 by Williams D Frazer et al^[11] showed that in clinical settings with standard peripartum surveillance, amnioinfusion in the presence of thick meconium staining of amniotic fluid did not reduce the risk of perinatal death, moderate or severe meconium aspiration syndrome or other serious neonatal disorders. According to Cochrane review 2000,^[12] the use of amnioinfusion should be considered for women with meconium-stained amniotic fluid in units with limited facilities for peripartum surveillance. Regarding maternal complication, there was no increased incidence of fever or endometritis in the study group. Reported complications of amnioinfusion were ranging from hydramnios, umbilical cord prolapse and hypertonus to severe maternal cardiopulmonary compromise.

CONCLUSION: Intrapartum amnioinfusion is effective in reducing the incidence of foetal distress and improving the Apgar at 1 minute. The rate of meconium aspiration syndrome, respiratory distress, neonatal intensive care unit admissions and hypoxic ischaemic encephalopathy were also significantly less in the study group. There was no increase in the maternal and neonatal infection rates and complications. Therefore, intrapartum amnioinfusion is a beneficial procedure using simple equipment in the absence of modern electronic foetal monitoring facilities especially in low resource settings.

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