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Original Article

Prophylactic Amnioinfusion during Labor Complicated by Moderate to Thick Meconium - A Prospective Randomized Study

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Abstract

Introduction: Transcervical amnioinfusion is a simple, easy, and efficacious method by which normal saline is infused into the amniotic cavity following spontaneous or induced rupture of membranes in laboring patients with moderate to thick meconium. Saline thus infused dilutes the amniotic fluid which, in turn, becomes amenable to oropharyngeal suctioning and reduces the incidence of meconium aspiration and neonatal respiratory distress syndrome, thereby improving the neonatal outcome.

Materials and Methods: This prospective randomized controlled study was performed on 40 patients admitted to the labor room in District Hospital, Doda, from October 2016 to December 2017. The patients included women in the first stage of labor who were found to have thick meconium on spontaneous or artificial rupture of membranes and a regular FHR.

Results: Maximum number of patients were in 37–40 weeks group. In Group-I, 65% of the patients had normal delivery as compared to 40% in the control group. This difference was statistically significant. The percentage of cases delivered by lower (uterine) segment cesarean section (LSCS) was also higher (50%) in Group-II as against Group-I (25%) which was again statistically significant.

Conclusion: The results of the study suggest that transcervical amnioinfusion should be considered in patients with moderate to thick meconium during labor as it improves the maternal and neonatal outcome in a setup with limited intrapartum surveillance facilities.

Key words: Amnioinfusion, Amniotic fluid, Aspiration, Meconium, Syndrome

INTRODUCTION

Meconium, a viscous dark green substance, is the first intestinal discharge in a fetus or neonate and is composed of intestinal epithelial cells, mucus, bile, vernix, lanugo hair, and glycerophosphates secreted from lungs, as its solid content amounting to about 5–15% and water as its major constituent (85–95%). The presence of meconium in amniotic fluid can be detected in 8–20% of all births after 34 weeks of gestation, 1–9% of these may develop meconium aspiration (Clark and Clark, 2002).

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The amount of meconium in the fetal intestine is small during the first two trimesters but increases during the third, probably reflecting the physiological maturation of fetal gut (Matthews and Warshaw, 1979). As the internal and external anal sphincters are closed during fetal life, the amniotic fluid usually remains clear; however, various stimuli are known to cause relaxation of sphincter tone and passage of meconium into the amniotic fluid. Fetal hypoxia is one of the most important factors that induce hyperperistalsis, contraction of the smooth muscles of colon, and relaxation of fetal anal sphincters resulting in intra-amniotic defecation (Rosenfeld and Porter 1985). However, parasympathetic stimulation resulting from cord compression may also cause meconium passage without concomitant hypoxia (Eriksen, 1994).

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Aspiration of meconium-stained amniotic fluid is one of the important causes of neonatal respiratory distress syndrome. Carson *et al.* (1976) reported that meconium aspiration syndrome could be prevented by oropharyngeal suctioning of neonate following delivery of head followed by laryngoscopic visualization of vocal cords with additional suctioning of trachea when meconium was visualized. In this study, meconium aspiration syndrome was reduced but not eliminated, this suggested that only delivery factors were not solely responsible. Since then, obstetric-pediatric delivery protocol became common. Other techniques such as squeezing the chest of baby and inserting finger into the mouth of baby have been proved to be harmful.

It was found that intrauterine aspiration of meconium is more common than aspiration during the course of labor. Any episode of intrauterine fetal gasping such as physiological breathing, umbilical cord occlusion, or chronic placental insufficiency can result in aspiration of meconium into fetal trachea and lungs (Brown and Gleicher, 1981).

Dooley *et al.* (1985) reported that liberal cesarean delivery (60%) for meconium did not alter the frequency of meconium found below vocal cords.

When a patient is discovered to be in labor with thick meconium without any evidence of fetal distress or hypoxia, whether some intervention during labor to prevent the ill effects of meconium would be ideal in such patients who would otherwise be good cases for vaginal delivery. Amnioinfusion is a new technique with important implications for such cases. It involves infusion of a sterile physiological solution into the amniotic cavity abdominally or transcervically. Transcervical amnioinfusion is a relatively simple method of increasing the amniotic fluid volume following rupture of membranes.

Miyazaki and Nevarez (1985) noted that amnioinfusion dilutes the amniotic fluid and suggested the possibility of meconium-exchange amnioinfusion in patients with moderate to thick meconium with otherwise signs of a healthy fetus.

The present study has been done to evaluate the role of amnioinfusion in patients with moderate to thick meconium under conditions of limited intrapartum surveillance at a District Hospital level.

REVIEW OF LITERATURE

The incidence of meconium-stained amniotic fluid and its *in utero* aspiration varies in different studies. Gregory *et al.* (1974) found an 8.8% incidence of meconium-stained amniotic fluid, meconium was present in the trachea of 50% of such neonates, but only 20% developed meconium aspiration syndrome. Routine endotracheal intubation and suctioning was recommended in these neonates to prevent the aspiration syndrome.

Carson *et al.* (1976) observed a marked reduction in the frequency of meconium aspiration syndrome with their combined obstetric-pediatric method. As soon as the head was delivered, but before the delivery of shoulders, oropharyngeal and nasopharyngeal suction was done. After completion of delivery, trachea was intubated under direct vision. Endotracheal suction was done only if meconium was present on the vocal cords, this reduced the incidence of meconium aspiration syndrome from 1.9% to 0.4%.

It was in 1976 that Gabbe *et al.* gave the concept of amnioinfusion. They postulated that infusion of normal saline into amniotic fluid increased its volume and served as cushion that prevented umbilical cord compression.

In 1983, Miyazaki and Taylor also observed that transcervical amnioinfusion was a safe and effective treatment for fetal heart rate (FHR) variable decelerations.

Wenstrom and Parson (1989) concluded that amnioinfusion was a simple and safe technique that reduced the incidence of meconium below the vocal cords and improved the obstetric outcome in patients laboring with thick meconium.

Macri *et al.* (1991) demonstrated that amnioinfusion was an effective technique for improving the perinatal outcome of pregnancies with thick meconium and oligohydramnios.

Macri *et al*. (1992) studied amnioinfusion and oligohydramnios and found that rates of fetal distress, cesarean section for fetal distress, and meconium aspiration were significantly reduced by amnioinfusion.

Glantz and Latteney (1996) found that the use of amnioinfusion was associated with a decreased risk of fetal distress, meconium below the cords, and cesarean delivery.

Rathore *et al.* (2002) in a prospective randomized controlled study used intermittent auscultation of fetal heart during labor and found that in an under-resourced labor ward, amnioinfusion decreases cesarean section rate and fetal morbidity.

Sahu and Induvadani (2003) have reported that transcervical intrapartum amnioinfusion for meconium-stained amniotic fluid using normal saline and nasogastric tube

was technically feasible, safe, and effective in developing country situation with limited intrapartum facilities.

Aims and Objectives

This study aims to study the maternal and neonatal outcome of transcervical amnioinfusion in labor complicated by thick meconium in terms of:

- Mode of delivery.
- Maternal complications.
- Neonatal Apgar score.
- Admission in neonatal intensive care unit (NICU).
- Meconium below vocal cords.
- Meconium aspiration syndrome.
- Mortality.

MATERIALS AND METHODS

This prospective randomized controlled study was performed on 40 patients admitted to the labor room in District Hospital, Doda, from October 2016 to December 2017. The patients included women in the first stage of labor who were found to have thick meconium on spontaneous or artificial rupture of membranes and a regular FHR. No patient with maternal comorbidity as hypertension, diabetes, heart disease, polyhydramnios, cord prolapse, fetal malformation, fetal malpresentation, or fetal distress was included in the study.

Material Used

- Foleys catheter No. 14.
- Normal saline.
- Drip set.
- Artery forceps.
- Sims vaginal speculum.
- Anterior vaginal wall retractor.
- Sterile swabs, drapes, gloves, and betadine lotion.

Methods

Patient was prepared and draped in dorsal position; vaginal examination performed to confirm cervical dilatation and fetal presentation. A Foleys catheter no. 14 was inserted through cervix into the uterine cavity between fetal head and amniotic sac under direct vision using a Sims vaginal speculum. The other end of the catheter was connected to a bottle of normal saline at room temperature. Initially, 500 ml normal saline was infused over a period of 1 h. FHR was noted every half hourly by auscultation. Uterine tone and frequency of contractions were assessed every 30 min. Cervical dilatation was noted before and after the bolus infusion. In patients where the decision was taken to continue with monitoring of labor, infusion was continued at the rate of 5 ml/min. Cesarean sections were performed for fetal indication or for failure in the progress of normal labor. After delivery, all patients received prophylactic antibiotics. A pediatrician was present at all the deliveries. Infants underwent oropharyngeal and nasopharyngeal suctioning on delivery of head. After delivery, they were intubated by the pediatrician for the presence of meconium below vocal cords and accordingly tracheal intubation and suctioning done. Neonatal outcome was assessed by the pediatrician. Mothers and babies were followed for 1 week postpartum and data on neonatal outcome were obtained from record in the neonatal ward (sick newborn care unit).

Observations

This randomized controlled study was conducted on 40 women in labor with thick meconium and a normal FHR. Of 40 patients, 20 were randomized as a study group (Group-I) and 20 patients as a control group (Group-II). Group-II patients received the usual treatment, whereas Group-I cases received amnioinfusion in addition to the usual management for meconium.

In both the groups, most of the patients were in the age group of 20–24 years.

Most of the patients were primigravida.

Maximum number of patients were in 37–40 weeks group.

In Group-I, 65% of the patients had normal delivery as compared to 40% in the control group. This difference was statistically significant. The percentage of cases delivered by lower (uterine) segment cesarean section (LSCS) was also higher (50%) in Group-II as against Group-I (25%) which was again statistically significant.

1 min Apgar score <7 was found in 30% of neonates in Group-I as against 50% in Group-II; similarly, 5 min Apgar score <7 was observed only in 5% of cases in Group-I as compared to 10% in Group-II. 15% of neonates in Group-I had need for positive predictive value (PPV) as against 25% in Group-II. Only 5% of babies had meconium below vocal cords in the amnioinfusion group versus 15% in the control group. In Group-I, only 10% of neonates were admitted to NICU as compared to 30% in Group-II. No neonate in the study group developed meconium aspiration syndrome, whereas in the control group, 15% of babies suffered from it. There was only one perinatal death that too in the control group [Tables 1-5].

DISCUSSION

Passage of meconium *in utero* has been noted in 7–22% of live births (Katz and Bowes, 1992). Meconium aspiration syndrome has been reported in 6.6–30% of cases of meconium-stained amniotic fluid (Brown and Glicher

Table 1: Age distribution of patients

Age group (years)	Group-I	Group-II
	n (%)	*n* (%)
<20	1 (5)	0 (0)
20–24	9 (45)	10 (50)
25–29	8 (40)	9 (45)
>29	2 (10)	1 (5)

Table 2: Distribution of patients according to parity

Parity	Group-I	Group-II
	n (%)	*n* (%)
P0	10 (50)	9 (45)
P1	6 (30)	7 (35)
P2	3 (15)	3 (15)
P3 and >	1 (5)	1 (5)

Table 3: Distribution of patients according to gestational age

Gestational age (weeks)	Group-I	Group-II
	n (%)	*n* (%)
34–37	1 (5)	1 (5)
37–40	14 (70)	13 (65)
>40	5 (25)	6 (30)

Table 4: Mode of delivery

Mode of delivery	Group-I	Group-II
	n (%)	*n* (%)
Normal	13 (65)	8 (40)
Forceps	1 (5)	1 (5)
Ventouse	1 (5)	1 (5)
LSCS	5 (25)	10 (50)

LSCS: Lower (uterine) segment cesarean section

Table 5: Comparison of neonatal outcome

Characteristics	Group-I	Group-II
	n (%)	*n* (%)
1 min A/S<7	6 (30)	10 (50)
5 min A/S<7	1 (5)	2 (10)
Need for PPV	3 (15)	5 (25)
Meconium below vocal cords	1 (5)	3 (15)
NICU admission	2 (10)	6 (30)
Meconium aspiration syndrome	0 (0)	3 (15)
Perinatal death	0 (0)	1 (5)

PPV: Positive predictive value, NICU: Neonatal intensive care unit

1981). It has been noted that intrapartum dilution of meconium by transcervical amnioinfusion reduces the rate of meconium aspiration syndrome. The purpose of this study was to evaluate the safety and efficacy of transcervical amnioinfusion during labor complicated by thick meconium in a setting with limited intrapartum surveillance and to evaluate clinically perinatal and maternal outcomes.

In this study, a total of 40 women in labor with moderate to thick meconium were included, of these 20 were given transcervical amnioinfusion besides the usual management for meconium and 20 patients were taken as control in whom only usual management was done. Both the study and control groups were found to be almost similar in terms of age, parity, and gestational age. No patient with comorbidity as hypertension, diabetes, and heart disease was included in the study.

Average volume of normal saline needed for amnioinfusion was 800 ml and 90% of the patients required maintenance after bolus infusion. Operative delivery was noted in 35% of the patients in Group-I and 60% of cases in Group-II. The incidence of 1 min Apgar score <7 was 30% in the study group as against 50% in the control group, whereas 5 min Apgar score <7 was noted to be 5% in Group-I and 10% in Group-II. Meconium below vocal cords was observed in 5% of cases as compared to 15% in the control group. The number of neonates admitted to NICU was also higher (30%) in the control group as against 10% in the study group. Meconium aspiration syndrome occurred in 15% of neonates in the control group with one perinatal death (5%); however, no neonate developed meconium aspiration syndrome in the study group. No maternal complication was noted related to amnioinfusion.

CONCLUSION

- Transcervical amnioinfusion during labor complicated by moderate to thick meconium is a simple, safe, and effective procedure.
- It improves the maternal morbidity by reducing the rate of LSCS and instrumental deliveries.
- It improves neonatal outcome by improvement in Apgar score, reduction in meconium below vocal cords, and decreasing the need for PPV and admission to NICU.
- It also decreases the incidence of meconium aspiration syndrome and neonatal mortality.

The results of the study suggest that transcervical amnioinfusion should be considered in patients with moderate to thick meconium during labor as it improves the maternal and neonatal outcome in a setup with limited intrapartum surveillance facilities.

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