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CLINICAL ARTICLE

Intrapartum transcervical amnioinfusion for meconium-stained amniotic fluid

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Abstract

Objective: To assess the rates of cesarean deliveries and perinatal outcome following intrapartum transcervical amnioinfusion in women with meconium-stained amniotic fluid (MSAF) in a setting with no electronic fetal monitoring or specialized neonatal care. *Materials and methods:* In this prospective comparative study with 150 women who were in labor and had MSAF, 50 of the women received a transcervical amnioinfusion and the remaining 100 women received standard care. The inclusion criteria were a pregnancy of at least 37 weeks' duration, a single live fetus in cephalic presentation, no major medical or obstetric complications, and no known fetal malformation. The amnioinfusion was performed with 1000 mL of normal saline solution through a red rubber catheter. *Results:* Amnioinfusion was associated with a significant decrease in the incidence of low Apgar score (<7) at 1 min (12% vs. 47%; relative risk [RR], 0.26; 95% confidence interval [CI], 0.12–0.56); low Apgar score at 5 min (4% vs. 23%; RR, 0.17; 95% CI, 0.04–0.71); and meconium aspiration syndrome (4% vs. 18%; RR, 0.22; 95% CI, 0.05–0.92). There was also a trend towards a lesser incidence of cesarean deliveries (18% vs. 30%; RR, 0.6; 95% CI, 0.31–1.16) and perinatal deaths (4% vs. 13%; RR, 0.31; 95% CI, 0.07–1.31). The incidence of maternal hospital stays longer than 3 days was significantly lower in the amnioinfusion than in the control group (24% vs. 48%; RR, 0.5; 95% CI, 0.29–0.85). There were no major complications related to amnioinfusion. *Conclusions:* Intrapartum amnioinfusion for MSAF is a simple, safe, effective, and inexpensive procedure feasible in settings where intrapartum monitoring is limited. It is associated with improved perinatal outcome and could lower cesarean delivery rates in low-resource countries.

1. Introduction

Meconium staining of amniotic fluid is frequently encountered in obstetric practice, with incidences between 7% and 22% of all live births [1–3]. The presence of moderate to

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thick meconium in the amniotic fluid is associated with an increased incidence of meconium aspiration syndrome (MAS), a potentially fatal hypoxic condition due to mechanical obstruction of the bronchioles and chemical pneumonitis [1–3]. Routine prophylactic intrapartum oropharyngeal and nasopharyngeal suctioning have not been shown to reduce the risk of MAS [3–5].

Transcervical intrapartum amnioinfusion has been proposed as a method for reducing the risk of MAS in widely varying obstetric and neonatal settings [2,6–13]. By increasing amniotic fluid volume, amnioinfusion cushions the umbilical cord and dilutes the meconium, thereby probably improving variable deceleration [13,14] and reducing the risk of mechanical obstruction of the bronchioles and chemical pneumonitis [2,13]. Although a systematic review of randomized controlled trials has suggested a lower frequency of MAS, cesarean deliveries, and perinatal death following amnioinfusion [15], a recent multicenter trial could not verify these benefits [16]. In any case, most of these controlled trials were carried out in developed countries, in facilities where electronic fetal monitoring and neonatal intensive care were available, and information coming from under-resourced centers without such facilities is scant [2,10]. Therefore, a prospective comparative study was designed to evaluate maternal and perinatal outcomes following transcervical intrapartum amnioinfusion in women with moderate to thick meconium-stained amniotic fluid (MSAF) in a rural setting with limited facilities for peripartum monitoring and neonatal care.

2. Materials and methods

The study was carried out between May 2001 and July 2002 at B.S. Medical College, Bankura, India, a busy teaching hospital in rural eastern India. More than 14,000 deliveries are performed each year at this hospital, which offers free service to an economically deprived population. The inclusion criteria were being at least 37 weeks pregnant, having a single live fetus in cephalic presentation, and being in labor with moderate to thick MSAF. Women were excluded if they had major medical complications, a scarred uterus, chorioamnionitis, or antepartum hemorrhage, or if there were known fetal malformations or indications for immediate delivery such as severe fetal bradycardia or cord prolapse. Women with mild anemia (hemoglobin concentration between 9 and 10.9 g/dL) or hypertension (blood pressure between 140/90 and 150/100 mm Hg) were not excluded.

Of the 150 women who were included, 50 received an amnioinfusion (the study group), and 100 received standard care (the control group). In the study group, the amnioinfusion was carried out with a size-8 red rubber catheter 2.5 mm in outer diameter. The catheter was inserted through the cervix into the uterine cavity just above the fetal head. Initially, 500 mL of normal saline solution at room temperature was infused through the catheter over 30 min by means of an intravenous line between the bottle and the catheter. Then, another 500 mL was infused at the rate of 2 mL per minute by gravity drainage [2].

The control group received only conventional treatment, which included cesarean delivery if immediate vaginal delivery was not anticipated (in cases of early labor with unfavorable cervix) or if there was fetal bradycardia (heart rate <110 beats/min). Women in both groups were managed in the left lateral position, and they received intravenous fluids and moist oxygen. Fetal heart rate was monitored by intermittent auscultation with a stethoscope (every 20 to 30 min, and between and at the end of contractions). Uterine tone and the frequency of uterine contractions were assessed by palpation. In both groups, decisions regarding assisted vaginal delivery or cesarean section were taken if there were fetal rate abnormalities (bradycardia or irregularity for 10–20 min) or slow progress of labor. Informed consent was taken as per hospital practice. The residents and midwives performed suctioning of the oropharynx and nasopharynx upon delivery of the fetal head, before delivery of the shoulders [3]. A pediatrician was usually not present at the time of delivery, but was called upon when there were any neonatal problems.

The outcomes studied were the rates of cesarean delivery, low Apgar score (<7 at 1 and 5 min), MAS, perinatal death, and maternal hospital stay longer than 3 days. Maternal febrile morbidity ($>38\ ^\circ C$) 24 h after delivery was also noted. Meconium aspiration syndrome was defined as respiratory distress (tachypnea, retractions, or grunting) in a neonate born through MSAF, with a need for oxygen within 2 h of delivery in the absence of congenital malformations of the airways, lungs, or heart. Perinatal deaths included all stillbirths and deaths within 7 days of birth. The 2 groups were compared using the t or χ^2 test, as appropriate. Relative risks (RRs) with 95% confidence intervals (CIs) were calculated using the Epi Info 2000 statistical package (distributed by the Centers for Disease Control and Prevention, Atlanta, GA, USA).

3. Results

3.1. Socio-demographic and clinical profiles of the participants

The socio-demographic and clinical profiles of the women in the amnioinfusion and control groups were similar. Most of the women were young (mean age, 22 years), in their first pregnancy (76%), and with a mean pregnancy duration of about 39 weeks. Most belonged to a poor socio-economic

Table 1 Labor events and mode of delivery in the amnioinfusion and control groups

Event	Amnioinfusion group ($n=50$)	Control group ($n=100$)
Induced labor	6 (12)	24 (24)
Cervical dilatation at detection of meconium, cm	5.1 ± 2.1	5.4 ± 2.1
Detection of meconium to delivery interval, h	3.8 ± 2.0	4.1 ± 2.1
Mode of delivery		
Spontaneous vaginal	30 (60)	58 (58)
Operative	20 (40)	42 (42)
Forceps-assisted	11 (22)	12 (12)
Cesarean section	9 (18) [a]	30 (30) [a]

Values are given as mean ± SD or number (percentage).
[a] $P=0.04$ for the comparison of cesarean delivery rates in the subgroups of women who underwent operative delivery. There was no significant difference for other variables.