Meconium

28

Yogita Dogra

28.1 Introduction

Meconium is the first intestinal discharge from newborns. It is a viscous, dark-green material composed of intestinal epithelial cells, mucus, lanugo and intestinal secretions (e.g. bile). The characteristic colour results from bile pigments, especially biliverdin. It also contains undigested debris from swallowed amniotic fluid. Meconium is sterile which differentiates it from stool.

Obstetrical teaching conventionally viewed meconium passage as a potential warning of fetal asphyxia. Moreover obstetricians have also long realized the prognostic dilemma of meconium. It occurs mostly in term and post-term pregnancies. It may be associated with fetal compromise but is also common in normal labours.

The meconium staining has been graded as:

(a) Thick—viscous, tenacious containing large amount of particulate material.
(b) Thin—fluid is normal except for greenish colour.
(c) Moderate—if it is thicker and darker in colour.

Y. Dogra (✉)
Department of Obstetrics and Gynecology,
All India Institute of Medical Sciences (AIIMS),
New Delhi, India

Meconium-stained liquor (MSL) has also been classified by visual examination after spontaneous or artificial rupture of membranes as:

(a) Grade I—MSL is translucent, light yellow-green in colour.
(b) Grade II—MSL is opalescent with deep green and light yellow in colour.
(c) Grade III—MSL is opaque and deep green in colour.

Thick MSL but not thin is associated with poor perinatal outcome [1, 2].

28.2 Incidence

Fetal passage of meconium before or during labour is common with incidence ranging from 12 to 20%. The incidence during labour increases with gestational age also—30% at 40 weeks and 50% at 42 weeks [3]. Presence of meconium below vocal cord is known as meconium aspiration. It occurs in 20–30% of all infants with meconium with approximately 12% mortality [4].

28.3 Pathophysiology

Three theories have been proposed to explain meconium passage by fetus:

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1. Pathological explanation proposes that fetus pass meconium when hypoxia stimulates arginine vasopressin (AVP) release from fetal pituitary gland. AVP stimulates colonic smooth muscle to contract, resulting in intraamniotic defecation.
2. Physiological explanation—meconium passage represents normal gastrointestinal tract maturation under neural control.
3. Final theory suggests that meconium passage follows vagal stimulation from common but transient umbilical cord compression with resultant increased bowel peristalsis.

The effects of meconium in amniotic fluid are well reported [5]. Meconium decreases the antibacterial activity of amniotic fluid by altering levels of zinc which subsequently increases the risk of perinatal bacterial infection. Then, meconium acts as irritant to fetal skin and thus increases the incidence of erythema toxicum. Aspiration of meconium is the most severe complication before, during and after birth. It induces hypoxia via four major pulmonary effects: airway obstruction, pulmonary hypertension, chemical pneumonitis and surfactant dysfunction.

28.4 Causes

Risk factors promoting the passage of meconium in utero include the following:

Maternal risk factors:

- Preeclampsia and eclampsia.
- Placental insufficiency.
- Gestational diabetes mellitus.
- Post-term pregnancy.
- Maternal chronic respiratory or cardiovascular diseases.
- Drug abuse, especially tobacco and cocaine.
- Chorioamnionitis/maternal infection.

Fetal risk factors:

- Oligohydramnios.
- Intrauterine growth restriction (IUGR).
- Poor biophysical profile.

28.5 Complications

Moderate and thick meconium is associated with meconium aspiration syndrome, increased risk of birth asphyxia, increased operative interference, low Apgar scores, decreased umbilical cord pH and overall increased perinatal mortality. However, thin MSL is associated with low risk of perinatal complications.

MSL has also been associated with increased rate of admission to neonatal intensive care unit (NICU), cerebral palsy, neonatal sepsis and seizures [6–8]. Moreover, it is cited that the presence of MSL is linked with intrapartum chorioamnionitis [9] and postpartum endometritis [10].

Children with meconium aspiration syndrome may develop chronic lung disease from intense pulmonary intervention.

Infants with meconium aspiration syndrome have a slightly increased incidence of respiratory tract infections in the first year of life because the lungs are still in recovery phase.

28.6 Identification and Management of MSL

Antenatal identification of women at risk for meconium passage in utero is important so that intrapartum surveillance can be improved. Once meconium is identified during labour, close monitoring of the fetus clinically or with CTG becomes obligatory. The woman should be informed of the significance of MSL. A risk assessment should be done to include the stage of labour (per vaginal examination), parity, whether the meconium staining is significant or light and current fetal wellbeing. Presence of meconium in absence of fetal heart rate abnormalities is not always indicative of fetal compromise [11]. The woman is nursed in left lateral position with oxygen inhalation. Hydration is maintained. After the initial hypoxic insult initiating the passage of meconium, subsequent repetitive episodes due to prolonged labour or abnormal uterine activity may cause severe asphyxia [12]. Such repetitive episodes can be avoided by vigilant fetal monitoring, active management of labour and optimal

care after birth. This would prevent unnecessary caesarean sections in all cases of meconium-stained liquor in the absence of a definitive indication.

Thin MSL—If no fetal heart rate abnormalities, active management of labour is done. Caesarean section is indicated if abnormal CTG and other obstetric reasons, if any.

Thick MSL—Suggest prompt intervention, need for presence of skilled paediatrician at the time of delivery and need for intensive care in the neonatal period to give a positive outcome.

Pre-labour rupture of membranes—Any woman reporting to labour room with spontaneous rupture of membranes with meconium staining should be advised admission for assessment. If MSL is confirmed, continuous electronic fetal monitoring (CEFM) should be commenced, and a plan is made for mode of delivery according to department protocols.

Low-risk intrapartum woman in the community setting—If during labour, MSL becomes evident, a risk assessment should be undertaken including transfer time. If transfer to a unit with neonatal facilities can be achieved before delivery, the woman should be advised to transfer, by ambulance. If birth is expected before transfer can be facilitated, preparations should be made for resuscitation of the newborn and ambulance for transfer of the baby, following birth.

28.7 Prevention of Meconium Aspiration Syndrome (MAS)

Prevention of MAS is paramount. Fetal status should be closely monitored in an attempt to identify fetal distress.

28.7.1 Role of Amnioinfusion

Amnioinfusion is theoretically beneficial to dilute meconium and thus reduce the risk and severity of meconium aspiration. Warm saline or Ringer's lactate is infused transcervically through a catheter or infant feeding tube into the uterine cavity or transabdominally through a spinal needle when membranes are intact. Thick meconium suggests oligohydramnios, as meconium passed into a normal volume of amniotic fluid will usually appear thin. Amnioinfusion may therefore correct oligohydramnios, relieving umbilical cord compression.

Nonetheless, current evidence does not support routine amnioinfusion to prevent meconium aspiration syndrome [13–15].

28.7.2 Role of Antibiotics

There is currently no evidence to support the routine administration of antibiotics during labour to women with MSL.

28.8 Management of Baby Born Through MSL

- Resuscitation equipment should be checked prior.
- Paediatrician should be called for delivery.
- Current recommendations no longer advise routine intrapartum suctioning for infants born to mothers with MSL [16, 17].
- When meconium aspiration occurs, intubation and immediate airway suctioning can remove much of the aspirated meconium.
- There are no clinical trials to justify suctioning of airway based on the consistency of meconium.
- Do *not* perform the following in an attempt to prevent aspiration:
  - Squeezing the chest of the baby.
  - Inserting a finger into the baby's mouth.
- The American Academy of Pediatrics Neonatal Resuscitation Program Steering Committee and the American Heart Association have published the guidelines for management of the baby exposed to meconium. The guidelines are as follows [18]:
  - If the baby is not vigorous (defined as depressed respiratory effort, poor muscle tone and/or heart rate <100 beats/min): Use direct laryngoscopy, intubate, and suction the trachea immediately after delivery.

Suction for no longer than 5 s. If meconium is not retrieved, do not repeat intubation and suction. If meconium is retrieved and no bradycardia is present, reintubate and suction. If the heart rate is low, administer positive pressure ventilation and consider suctioning again later.
  - If the baby is vigorous (defined as normal respiratory effort, normal muscle tone and heart rate >100 beats/min): Do not electively intubate. Clear secretions and meconium from the mouth and nose with a bulb syringe or a large-bore suction catheter. Injury to the vocal cords is more likely to occur when an attempt is made to intubate a vigorous newborn.
  - In both cases, the rest of the initial resuscitation steps should ensue, including drying, stimulating, repositioning and administering oxygen as necessary.
- All observations must be documented in a timely manner.
- If the baby's condition causes concern at any time, a review by the neonatal team should be requested and baby shifted to NICU.

28.9 Conclusion

Meconium-stained liquor by itself is not associated with an adverse neonatal outcome. Most of the babies remain asymptomatic and need only routine care. Association of MSL with abnormal CTG is associated with poor outcome, increased caesarean section rate and increased neonatal complications.

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