Case report

Crit Care Shock (2023) 26:181-186

Pneumothorax due to meconium aspiration syndrome: A case report

Simon Nanlohy[1], Yoke Kinanthi Putri[2]

Abstract

Meconium is the first stool passed by a newborn within the first 24-48 hours of life. In certain circumstances, meconium can be expelled while the fetus is still in the uterus, resulting in contamination of the amniotic fluid. Newborns may develop meconium aspiration if they possess risk factors such as the presence of thick meconium, abnormal cardiotocographic trace, fetal acidosis, cesarean section (CS), the requirement for intubation at birth, and low Apgar scores. Meconium aspiration syndrome (MAS) can give rise to a range of complications, varying in severity.

This article presents a case report involving a newborn diagnosed with MAS who also experienced pneumothorax complications. Fortunately, the newborn survived without encountering more severe complications.

Introduction

Meconium is the initial stool excreted by newborns. It appears as a dark green, thick, and sticky substance, consisting of water, skin, and intestinal cells shed during development, gastrointestinal secretions, bile, pancreatic juices, mucus, lanugo, vernix, blood glycoproteins, and amniotic fluid. (1,2) Usually, meconium is expelled by neonates within the first 24-48 hours of life. However, in certain cases, meconium can be released while the fetus is still in the uterus. (1) This results in the contamination of the amniotic fluid with meconium.

When babies are born through natural delivery, they may encounter meconium aspiration if the labor process is prolonged and not smooth. (1) Risk factors for meconium aspiration syndrome (MAS) include the presence of thick meconium, pathological cardiotocographic readings, fetal acidosis, the need for intubation immediately after birth, low Apgar scores, and cesarean section (CS). (3)

We recently treated a baby who was delivered via CS and developed meconium aspiration, which further led to a pneumothorax, as described in our report below.

Case presentation

A 36-year-old pregnant woman presented to our Emergency Room (ER) with the complaint of going into labor. The attending ER doctor diagnosed her as a second-time pregnant woman at 38 weeks gestation with a single fetus. As per the patient's preference for a spontaneous birth, she was subsequently transferred to the maternal unit. However, during observation, it was noted that the first stage of labor was progressing slowly despite the prema-

[1.] Intensive Care Unit, Eka Hospital Bekasi, Bekasi 17214, Indonesia
[2.] Pediatric Department, Eka Hospital Bekasi, Bekasi 17214, Indonesia

Address for correspondence:
Simon Nanlohy
Intensive Care Unit, Eka Hospital Bekasi
Kota Harapan Indah Blok I2-9 No. 9, Bekasi 17214, Indonesia
Tel: +622150935577
Mobile: +628129193031
Email: simonnanlohy@yahoo.com

ture rupture of membranes. Therefore, an induction was performed. Once the patient started experiencing regular contractions, she was transferred to the delivery room. However, due to dystocia, the fetus was not delivered successfully after one hour in the second stage of labor. Consequently, the doctor promptly decided to perform an emergency CS.

In the operating room, upon opening the uterus, it was observed that the amniotic fluid was thick and green, indicating contamination with meconium. A baby boy was delivered immediately and began crying. He weighed 3265 grams, measured 51 cm in length, and had a significant caput succedaneum and meconium-stained umbilical cord. The Apgar score at one minute was 8. Following standard protocols, the necessary measures were taken, and the baby's chest retractions and moaning diminished. The Apgar score at the fifth minute improved to 9. The baby was promptly administered nasal continuous positive airway pressure (NCPAP) with a pressure of +7 cmH2O and an inspired oxygen fraction (FiO2) of 21-30%. Retractions subsided, and peripheral capillary oxygen saturation (SpO2) reached 99%. Subsequently, the baby was transferred to the Neonatal Intensive Care Unit (NICU) for further monitoring and treatment.

From physical examination in NICU, it was found that respiration rate 58/min, heart rate 140/min, SpO2 96% using NCPAP +7 cmH2O with FiO2 21%, extensive cephalic hematoma, subcostal and intercostal retractions, but no heart murmurs.

Chest X-ray (CXR) examination showed a right pneumothorax with partial atelectasis of the right lung (**Figure 1**). Based on the available data, the diagnosis of MAS with complications of right pneumothorax was made. In addition to continuing NCPAP, the baby was also given antibiotics after blood was taken for culture.

After 16 hours in the NICU, signs of respiratory distress diminished and CXR evaluation showed improvement **(Figure 2).** After 40 hours, the NCPAP could be removed, and the patient could breathe room air without finding any respiratory distress. He was discharged from the hospital at the age of 4 days in good condition. Unfortunately, we were not able to conduct an evaluation at the children's clinic because he was never controlled after returning home.

Discussion

Meconium-stained amniotic fluid (MSAF) is a relatively common occurrence in newborns. Research conducted by Lee KA et al. has shown that MSAF is eight times more likely to be present in women who deliver after the onset of labor compared to those who undergo elective CS. (4) In term singleton pregnancies, the risk of developing MSAF increases with longer delivery times. Several factors contribute to the presence of MSAF, including postterm pregnancy, difficult and prolonged labor, maternal comorbidities like hypertension and diabetes, fetal hypoxia, preeclampsia, oligohydramnios, peripartum infections, and maternal medication use. (1,5,6) Approximately 10-15% of newborns are estimated to be born with MSAF, of which 3-9% develop MAS. (7)

MAS refers to respiratory failure that occurs in newborns born with MSAF, exhibiting symptoms that cannot be attributed to other causes and displaying typical radiological characteristics. (3) Factors associated with the occurrence of MAS in infants with MSAF include thick consistency of meconium, nonreassuring fetal heart tracing, fetal acidosis, CS, presence of meconium below the umbilical cords, need for intubation at birth, and low Apgar scores. (8) Aspiration of meconium can occur while the fetus is still in the uterus with fetal gasping or after birth when the baby takes his/her first breath. (6)

From the above-mentioned description, it is evident that MAS occurs in approximately 0.1% of newborns. However, due to the potential for oxygenation and ventilation problems, early diagnosis and prompt treatment of MAS are necessary.

In our case, we identified several risk factors for MSAF, including delivery after the onset of labor, the prolonged second stage of labor, and oligohydramnios. Additionally, the thicker consistency of the meconium and the cesarean section were the risk factors for MAS. Considering these risk factors, along with the presence of a meconium-stained umbilical cord, it was reasonable to conclude that the baby in this case had MAS. Fortunately, the Apgar scores of 8 and 9 at the first and fifth minutes, respectively, indicated that the baby's overall condition was good. However, the presence of respiratory distress signs, such as retractions and groaning, led us to provide NCPAP assistance. It is worth noting that nearly half of the babies with MAS require ventilator support, with a mortality rate of around 4.6%. (2) Fortunately, our baby did not require invasive ventilator support.

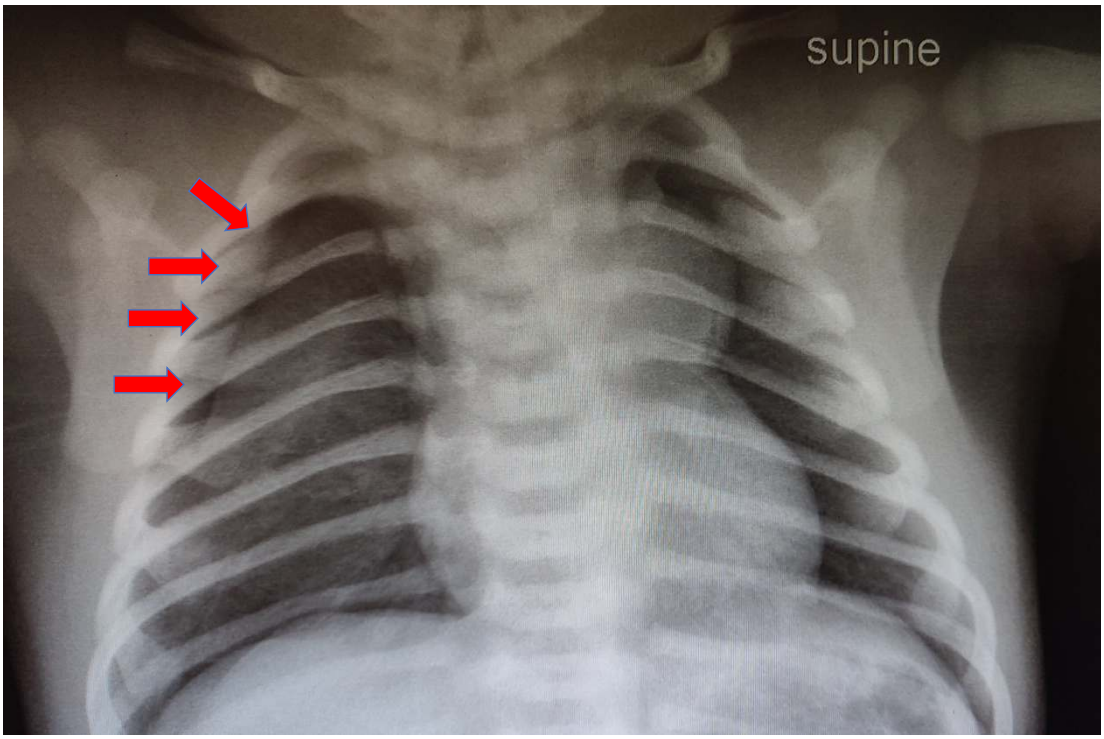
The subsequent challenge we encountered was the presence of a pneumothorax (**Figure 1**). According to the literature we reviewed, pneumothorax is one of the known complications of MAS. (1,3,8) In fact, a review article by Monfredini C. et al. states that pneumothorax complications occur in 15-33% of MAS cases. (3) Pneumothorax can develop due to

airway obstruction by meconium plugs, leading to increased airway resistance and air trapping. The occurrence of pneumothorax depends on the consistency and quantity of aspirated meconium. Trapped gas may rupture, resulting in a pneumothorax. (3,8) In our case, we observed a pneumothorax, which fortunately did not progress or worsen the baby's condition, as evidenced by the follow-up chest X-ray (**Figure 2**). As a result, after 40 hours of birth, the baby was able to breathe room air without any respiratory distress.

Conclusion

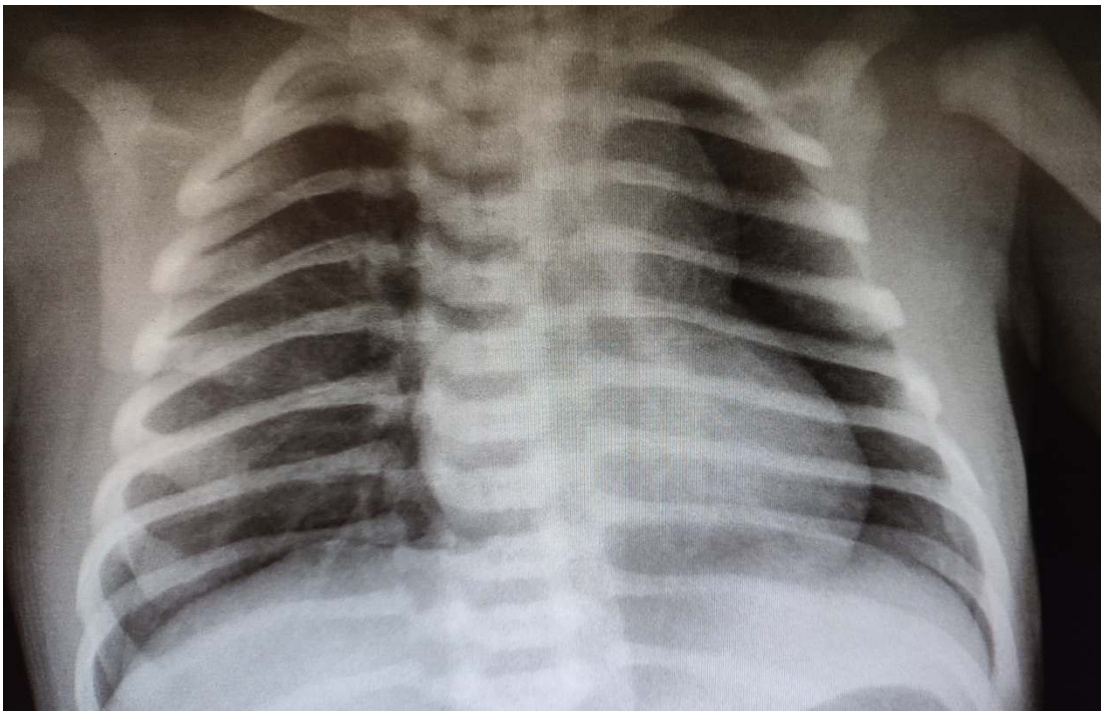
Although the incidence of MAS in newborns is relatively low, it is crucial for all birth attendants to be aware of the condition, especially when encountering risk factors. Prompt management of MAS in newborns is essential to ensure optimal outcomes and reduce the potential for adverse effects. Therefore, maintaining awareness of MAS and its associated risk factors is vital for birth attendants to provide timely and effective care, ultimately minimizing the impact on the newborn's health.

Figure 1. Pneumothorax due to MAS (red arrows)



Legend: MAS=meconium aspiration syndrome.

Figure 2. Pneumothorax resolved after 16 hours



References

1. Tim Promkes RSST - RSUP dr. Soeradji Tirtonegoro Klaten. Aspirasi mekonium [Internet]. 2022 Jul 21 [cited 2023 Jun 06]. Available from: https://yankes.kemkes.go.id/view_artikel/366/aspirasi-mekonium#:~:text=Mekonium%20adalah%20feses%20pertama%20bayi,saat%20masih%20di%20dalam%20rahim
2. Fischer C, Rybakowski C, Ferdynus C, Sagot P, Gouyon JB. A Population-Based Study of Meconium Aspiration Syndrome in Neonates Born between 37 and 43 Weeks of Gestation. Int J Pediatr 2012;2012:321545.
3. Monfredini C, Cavallin F, Villani PE, Paterlini G, Allais B, Trevisanuto D. Meconium Aspiration Syndrome: A Narrative Review. Children 2021;8:230.
4. Lee KA, Lee SM, Yang HJ, Park C-W, Mazaki-Tovi S, Yoon BH, et al. The frequency of meconium-stained amniotic fluid increases as a function of the duration of labor. J Matern Fetal Neonatal Med 2011;24:880-5.
5. Skelly CL, Zulfiqar H, Sankararaman S. Meconium [Internet]. 2022 Jul 25 [cited 2023 Jun 06]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK542240/
6. Mundhra R, Agarwal M. Fetal Outcome in Meconium Stained Deliveries. J Clin Diagn Res 2013;7:2874-6.
7. Wiswell TE. Appropriate Management of the Nonvigorous Meconium-Stained Neonate: An Unanswered Question. Pediatrics 2018;142: e20183052.
8. Swarnam K, Soraisham AS, Sivanandan S. Advances in the Management of Meconium Aspiration Syndrome. 2012;2012: 359571.

This page is intentionally left blank