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Case Report

Meconium-stained Amniotic Fluid and Newborn Respiratory Distress: A Case Report

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ABSTRACT

Meconium-Stained Amniotic Fluid (MSAF) and the resulting Meconium Aspiration Syndrome (MAS) present significant challenges in neonatal care. This case report illustrates the multifaceted approach to managing a newborn with MSAF and highlights the pathophysiology associated with MAS. The case involves a neonate born in emergency circumstances, emphasizing the importance of immediate intervention. Management, including respiratory support, ventilation, inhaled nitric oxide, antibiotics, and steroids, are discussed. While advances in obstetrical and neonatal care have reduced morbidity and mortality associated with MAS, the lack of standardized management guidelines in developing countries remains a concern.

Keywords: Meconium-stained amniotic fluid, Meconium aspiration syndrome, Fetal distress, Respiratory distress, Neonatal management.

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INTRODUCTION

Meconium, the initial fecal material excreted by a newborn, can sometimes be found in the amniotic fluid surrounding the fetus during the course of labor, leading to a condition known as Meconium-stained Amniotic Fluid (MSAF).[1] Normally, meconium does not enter the amniotic fluid until after birth. However, in certain instances, a baby may void meconium into the amniotic fluid either before or during labor.[2] The presence of meconium in the amniotic fluid can serve as an indicator of fetal distress or underlying issues.[3]

When MSAF is identified, healthcare professionals closely monitor the baby's well-being throughout labor, as it may suggest that the infant experienced stress or distress in utero. Notably, meconium that is thick or green in color may have been passed by the baby earlier in the pregnancy, which raises concerns about potential complications. In such situations, healthcare providers may take additional measures to ensure the infant's safety, such as immediate airway suctioning upon birth to clear any meconium present. However, it is essential to recognize that some babies may pass meconium into the amniotic fluid without adverse consequences. Thus, the presence of MSAF does not necessarily signify a problem, underscoring the importance of a thorough evaluation and appropriate actions by medical personnel to protect the baby's well-being both before and after delivery.[4]

The pathophysiology of MSAF involves several key mechanisms:[3-6]

Fetal Distress

Meconium-stained amniotic fluid often signifies fetal distress. It can occur in response to various stressors, including fetal hypoxia (inadequate oxygen supply), acidosis (low pH), or other conditions that threaten fetal well-being. In some cases, fetal distress triggers reflex bowel movements in utero, leading to the release of meconium into the amniotic fluid.

Fetal Intestinal Maturity

Meconium typically exits the fetal body after birth. However, in certain situations, meconium may enter the amniotic fluid before delivery due to increased fetal intestinal maturity. This can be observed in cases of fetal gastrointestinal disorders or post-term pregnancies.

Aspiration

The presence of meconium in amniotic fluid increases the risk of Meconium Aspiration Syndrome (MAS) in the newborn. When the fetus inhales or aspirates meconium-tainted amniotic fluid, it can lead to respiratory distress, airway obstruction, and inflammation. Meconium's thick and heavy nature can obstruct small airways, impede gas exchange, and compromise respiratory health.

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Lung Injury

Aspiration of meconium can result in lung injury. Meconium contains particles and enzymes that can chemically irritate and inflame the lungs. This can trigger the release of inflammatory mediators, potentially causing surfactant dysfunction and pulmonary hypertension. These factors can exacerbate respiratory distress in newborns and impair their ability to breathe effectively.

CASE REPORT

A female newborn was delivered by emergency cesarean section (C-section) at 40 weeks of gestation. The amniotic fluid was green, and the umbilical cord was wrapped around the neck three times. The birth weight was 3 kilograms (kg). Immediate resuscitation was required due to the presence of MSAF. Cardiopulmonary resuscitation was initiated promptly, and the baby's heart rhythm was restored, albeit with bradycardia. A chest X-ray revealed bilateral lung opacities. Lung auscultation indicated symmetrical breathing with bilateral crackles. Nasal oxygen therapy was initiated, and the newborn was transferred to a Special Newborn Care Unit of Civil District Hospital in Dharashiv, Maharashtra, India.

The mother of the child is 26-years-old and weighed 56 kg at the time of delivery. She had been married for 2 years and was at 38 weeks of gestation. Her hemoglobin level during pregnancy was approximately 11.9 g/dL, and her blood type is B-positive. There were no antepartum hemorrhage or gestational diabetes mellitus. Tests for Venereal Disease Research Laboratory, Hepatitis B surface antigen, and Human immunodeficiency viruses were negative. The amniotic fluid volume was found to be adequate.

Throughout labor, the mother did not receive any steroid medications, and there were no signs of foul-smelling discharge or uterine tenderness. A lower-segment C-section was performed.

At birth, the baby weighed 3.9 kg and exhibited respiratory distress with MSAF. The baby underwent several laboratory investigations during treatment, including serum C-reactive protein level of 3.70 mg per liter, and the complete blood count was within the normal range, and other investigations as detailed in Table 1.

The baby received several treatments upon admission to address the respiratory distress and potential complications associated with meconium aspiration syndrome. Oxygen therapy was initiated through the nasopharyngeal route at a rate of 3 liters, aimed at improving oxygenation. Additionally, 1 milligram (mg) of Vitamin K was administered intravenously to support clotting function.

Intravenous antibiotics, in the form of amoxiclav, were provided at a dosage of 60 mg twice daily to prevent or manage potential infections. Aminophylline, administered intravenously at a rate of 0.1 cubic cm 3 times a day, was employed to address respiratory symptoms and promote bronchodilation, which can be particularly important in cases of meconium aspiration.

These therapeutic measures were undertaken to address the respiratory challenges and other potential complications arising from MSAF and to ensure the well-being of the newborn.

DISCUSSION

In recent years, significant strides have been made in unraveling the pathophysiology of MSAF and the resulting MAS. Emerging therapeutic approaches have been explored to both prevent and manage MAS.[7] Traditionally, there was a prevailing belief that airway obstruction played a central role in the pathogenesis of MAS, leading to recommendations for suction interventions to remove meconium from the airways, with the aim of reducing the incidence and severity of MAS.[8]

Table 1: Laboratory Investigation Report.

Investigation	Result	Unit	Normal Range
C-reactive Protein	3.70	Mg/dL	0-6
Hemoglobin Count	17.1	gm/dL	14-22
Total RBC Count	5.03	Million/Cumm	5-7
Total WBC Count	23700	Cells/Cumm	10000-26000
Platelet Count	1.49	Lakh/Cumm	1.0-4.5
Polymorph	38	%	42-80
Lymphocytes	54	%	19-29
Monocytes	06	%	5-7
Eosinophils	02	%	0-2

CRP: C-reactive protein; **Cumm:** Cubic millimeter; **gm/dL:** gram per deciliter; **mg/dL:** milligram per deciliter; **RBC:** red blood cells; **WBC:** white blood cell.

Meconium aspiration syndrome, a consequential complication of MSAF, typically afflicts term newborns, affecting approximately 5% of cases. It results from a combination of mechanical and chemical effects due to the aspiration of meconium, coupled with localized and systemic fetal inflammation. Nevertheless, the routine practice of naso/oropharyngeal suctioning and tracheal intubation in cases of MSAF has not demonstrated clear benefits and is no longer advocated in obstetrical practice.[9]

The recent guidelines from the Neonatal Resuscitation Program advise against suctioning but emphasize the importance of prompt resuscitation through positive pressure ventilation for non-vigorous neonates with MSAF. This approach aims to prevent delays in resuscitation and minimize the hypoxia-ischemia that is often associated with MSAF.[10]

Currently, endotracheal suctioning is recommended solely for non-vigorous neonates born with MSAF. The criteria for mechanical ventilation in infants with MAS remain somewhat subjective. Surfactant administration may play a role in ameliorating the severity of MAS. However, bronchoalveolar lavage with surfactant in infants with MAS is considered a risky procedure and is not routinely recommended.[11]

In this case report, we highlight the prophylactic use of antibiotics, steroids, inhaled nitric oxide, surfactant, supplemental oxygen, respiratory support, ventilation, and intubation in managing MSAF-induced aspiration. These interventions are essential in improving outcomes for neonates affected by MSAF and MAS.

CONCLUSION

The advancements in obstetrical and neonatal management practices have undeniably contributed to a substantial reduction in morbidity and mortality associated with MAS. However, it is imperative to acknowledge that the lack of innovative therapeutic resources and standardized management guidelines remains a significant challenge, particularly in developing countries.

Supportive care remains the cornerstone of MAS management, and with its judicious application, even infants with severe MAS can achieve survival outcomes with an acceptable burden of short- and long-term morbidity. The success of such management underscores the importance of a holistic approach that encompasses various treatment modalities and considerations.

To further enhance our understanding of the intricate pathophysiology of MAS and to explore potential novel therapies, there is a pressing need for additional research and clinical investigations. These studies should delve deeper into the underlying mechanisms of MAS and evaluate emerging therapies, building upon the promise shown in preliminary research.

As we continue to refine our knowledge and management strategies, the goal remains clear: to ensure the best possible outcomes for neonates affected by MAS. Future endeavors in research and healthcare delivery will play a pivotal role in advancing the care and well-being of these vulnerable infants, not only in developed nations but also in resource-limited settings.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

C-section: Cesarean section; **Kg:** Kilogram(s); **MAS:** Meconium aspiration syndrome; **mg:** Milligram; **MSAF:** Meconium-stained amniotic fluid; **X-ray:** X-radiation.

SUMMARY

This case report details the emergency cesarean delivery of a newborn with Meconium-Stained Amniotic Fluid (MSAF) and subsequent respiratory distress. The infant, born at 40 weeks with a wrapped umbilical cord, required immediate resuscitation and exhibited bilateral lung opacities. Laboratory investigations showed elevated C-reactive protein levels. Treatment involved oxygen therapy, vitamin K administration, intravenous antibiotics, and aminophylline. The discussion emphasizes evolving approaches in managing MSAF-induced aspiration, challenging traditional suctioning practices. Despite advancements, the case underscores the need for ongoing research and standardized guidelines, particularly in resource-limited settings.

PATIENT CONSENT

The patient referenced in this case report has provided consent for publication, acknowledging the report's nature and understanding that their identity will be kept confidential.

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