

Meconium Aspiration Syndrome at Srinagarind Hospital : A review of five-year period

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ภาวะการสูดสำลักขี้เทาของทารกในโรงพยาบาลศรีนครินทร์

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ภาควิชากุมารเวชศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น

ได้ศึกษาย้อนหลังจากรายงานทารกแรกเกิด ที่มีภาวะสูดสำลักขี้เทาที่ได้รับไว้รักษาที่หน่วยทารกแรกเกิด ภาควิชากุมารเวชศาสตร์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น ตั้งแต่เดือนสิงหาคม 2525 ถึงเดือนกรกฎาคม 2530 รวมเวลา 5 ปี จำนวนทั้งสิ้น 15 ราย อัตราส่วน ชาย : หญิง = 1.1 : 1 ทารกมีน้ำหนักเฉลี่ย 2,672 กรัม อายุครรภ์เฉลี่ย 39.12 สัปดาห์ ร้อยละ 73 ของมารดาตั้งครรภ์ เกิน 1 ครั้ง กลอดโดยผ่าตัดออกทางหน้าท้องร้อยละ 40 Apgar score ที่ 1 และ 5 นาที เท่ากับ 4.6 และ 7.5 ตามลำดับ ทารกส่วนใหญ่จะมีอาการหายใจเร็ว ร้อยละ 66.67 ของทารกจะเขียวเมื่อแรกคลอด ฟังปอดได้เสียงผิดปกติร้อยละ 33.33 ภาพถ่ายรังสีปอดมี pulmonary infiltration ร้อยละ 60 พบ pneumothorax เพียง 1 ราย ร้อยละ 60 ทารกหายใจเองในบรรยากาศที่มีออกซิเจนเพิ่มขึ้น 2 รายที่ต้องใช้เครื่องช่วยหายใจเป็นรายที่มี pneumothorax และรอดชีวิต ส่วนอีก 1 รายเสียชีวิตเมื่ออายุ 23 ชั่วโมง ทารกทุกรายได้รับยาปฏิชีวนะ ภาวะแทรกซ้อนที่พบร่วมได้แก่ ชักไม่ทราบสาเหตุและภาวะน้ำตาลในเลือดต่ำร่วมกับภาวะแคลเซียมในเลือดต่ำอย่างละ 1 ราย ภาวะตัวเหลือง และอุจจาระร่วงอย่างละ 3 ราย มี 1 รายที่ยังมีการหายใจลำบากเล็กน้อยร่วมกับ persistent hyperaeration ของปอดข้างขวาเมื่ออายุ 26 วัน

จากการศึกษานี้ สนับสนุนว่าการสูดขี้เทาออกจากหลอดลมทารกทันทีหลังคลอดเป็นสิ่งสำคัญที่จะช่วยลดอัตราการเกิดโรค และอัตราการตายจากภาวะหายใจลำบากในทารกที่เกิดจากการสูดสำลักขี้เทาองได้ และควรทำด้วยความระมัดระวัง

The infants with meconium aspiration over a five-year period at Srinagarind Hospital were retrospectively analysed. There were fifteen infants with 2,672 gm average birth weight and 39.12 weeks average gestational age. Forty percent were delivered by cesarean section due to fetal distress. Moderate to severe birth asphyxia was noted in 53 percent. Almost all of the patients manifested tachypnea with 33.33 percent abnormal lung signs and pulmonary infiltrations were noted in 60 percent. There were only two infants who needed mechanical ventilation. One with bilateral pneumothorax required chest drainage and survived; the other one was expired at 23 hours of age. Persistent hyperaeration of the right lung with mild sternal retraction were noted in one infant at 26 days old. We agreed and emphasized that immediate tracheal suction significantly lowers the morbidity and mortality of infants with meconium-stained amniotic fluid. -X-

INTRODUCTION

Meconium aspiration syndrome (MAS) is one of the common respiratory distress in the newborn which varies from mild transient tachypnea to respiratory failure. Characteristically, the infant with meconium aspiration syndrome is term or postterm with a birth weight more than 2,500 gm.⁽¹⁻⁴⁾ The incidence of meconium stained amniotic fluid is approximately 8-29 percent of all pregnancies^(1,2,5). Fifty six percent of infants born through meconium-stained amniotic fluid can demonstrated meconium in their trachea⁽¹⁾ which 35 percent of those develop respiratory symptoms^(1,2,5). In severe cases, respiratory failure usually occur within 24 hours after birth and the prognosis is poor.

MATERIALS AND METHODS

The study was based on retrospective analysis of the newborn infants who were born at Srinagarind Hospital and had a history of meconium stained amniotic fluid with respiratory distress over a five-year period between August 1982 to July 1987. The criteria for diagnosis of meconium aspiration

syndrome included (1) history of meconium-stained amniotic fluid (2) positive tracheal or gastric aspiration of meconium (3) clinical evidence of respiratory distress and (4) radiological evidence of aspiration syndrome.

Tracheal aspiration was performed by using oral method of endotracheal suction⁽¹⁾, as soon as possible after birth. Repeated suction until no meconium obtained was required before giving positive pressure ventilation in the asphyxiated infants. Apgar scores were recorded at one and five minutes. The patients were transferred by the portable incubator to the neonatal unit, Department of Pediatrics, Faculty of Medicine, Khon Kaen University. The investigation in all except two included complete blood count, dextrostix, micro ESR, C-reactive protein and hemoculture in some cases. Chest roentgenograms and arterial blood gas were obtained as soon as the condition of the patients were stable. Oxygen was given when indicated by oxygen box or continuous positive airway pressure (CPAP) and mechanical ventilation was setting when respiratory failure occurred. All infants were started on a combination of penicillin and gentamicin during the first 24 hours of life for at least seven days.

Data collection included maternal age, gravida, mode of delivery and maternal complications.

RESULTS

Fifteen newborn infants; 8 males and 7 females were diagnosed as meconium aspiration syndrome, male and female ratio being 1.1 : 1. All but two were term with one preterm and one postterm infants. The relationship of the birth weight to the gestational age was shown in Table 1. The base line data of the infants were shown in Table 2. The average birth weight was 2,672 gm with 39.12 weeks for gestational age.

All perinatal factors related were shown in Table 3. Seventy-three percent of

Table 1 No. of infants with MAS by birth weight and gestational age

WT (gm) \ type baby	Preterm AGA	Fullterm SGA	Fullterm AGA	Postterm SGA	Total
< 2,500	-	5	1	1	7
> 2,500	1	-	7	-	8
Total	1	5	8	1	15

Table 2 Base line data of infants with MAS

	Mean \pm SD	Range
Birth weight (gm.)	2,672 \pm 569.86	1,590 - 3,690
Length (cm.)	48.7 \pm 3.19	43 - 53.5
Ponderal index	2.28 \pm 0.18	1.87 - 2.63
Gestational age (wk.)	39.12 \pm 1.71	36.5 - 42
Apgar score		
1 minute	4.66 \pm 2.64	1 - 9
5 minutes	7.53 \pm 1.81	4 - 10
Maternal age (yr.)	27.33 \pm 5.89	20 - 44
Time of hospitalization (d.)	12.93 \pm 7.22	7 - 27

Table 3 Perinatal factors related to MAS

	No.	%
Gravida		
Primipara	4	26.67
Multipara	11	73.33
Mode of delivery		
Normal, spontaneous vertex presentation	6	40.0
Face presentation	1	6.67
Forceps extraction	2	13.33
Cesarean section	6	40.0
Fetal distress		
Detected	6	40.0
Not detected	9	60.0
Meconium staining body and/or cord	5	33.33
Infants crying before tracheal suction	6	40.0
Positive pressure given before tracheal suction	5	33.33
Tracheal suction done	11	73.33
Meconium from trachea	6	40.0
Meconium from stomach	9	60.0
Maternal conditions		
Prolonged labor	1	6.67
Mild pre-eclampsia	1	6.67
Severe pre-eclampsia	1	6.67
Eclampsia	1	6.67
VDRL + ve	1	6.67

Table 4 Clinical manifestations of infants with MAS

	No.	%
Onset of respiratory distress		
At birth	10	66.67
< 1 hours after birth	4	26.67
1-6 hours after birth	1	6.66
Tachypnea	13	86.67
Dyspnea	8	53.33
Cyanosis		
Central	7	46.67
Peripheral	3	20.0
Lung signs		
Crepitation	4	26.67
Rhonchi	1	6.66
Transmitted sound	6	40.0
No.	4	26.67

Table 5 Roentgenographic Findings and Respiratory Managements

	No.	%
Chest Roentgenogram		
Bilateral infiltration	7	46.67
Right Upper Lung infiltration	1	6.66
Left Upper Lung infiltration	1	6.66
Hyperaeration	4	26.67
Atelectasis	2	13.33
Bilateral pneumothorax	1	6.66
Normal chest	3	20.0
Respiratory Managements		
Oxygen box	9	60.0
CPAP	2	13.33
Mechanical ventilation	2	13.33
None	2	13.33
Duration of Oxygen therapy		
< 24 hours (dead)	1	6.66
24-72 hours	6	40.0
3-7 days	6	40.0

Table 6 Complications and other conditions

	No.
Pneumothorax (+ subcutaneous emphysema)	1
Persistent hyperaeration of right lung	1
Convulsion	1
Hypoglycemia and Hypocalcemia	1
Hyperbilirubinemia	3
Diarrhea	3
Conjunctivitis	1
Total	11

the mothers were multipara. Forty percent were delivered by cesarean section due to fetal distress. There were meconium stained amniotic fluid in all cases. As much as 60 percent of the fetal distress were missed but 5 out of 9 were moderate to severe birth asphyxia who need prompt resuscitation. Forty percent of the cases could established spontaneous respiration and another one-third were given positive pressure prior to airway suctioning. As well as the meconium was obtained from the trachea of 6 infants, nine had the meconium in the stomach.

Clinical manifestations of MAS were summarized in Table 4. Roentgenographic findings and respiratory managements were shown in Table 5. Forty-six percent had bilateral pulmonary infiltration, 26.67 percent with hyperaeration. Bilateral pneumothorax was detected in one case at six hours after birth. Sixty percent of the cases were given oxygen via box and two required mechanical ventilation. Complications and other conditions were in Table 6.

Complete blood count were done in 13 out of 15 cases and showed normal range. Blood and gastric content cultured were performed in only six cases with no bacterial growth reported.

In this study there was only one infant died at 23 hours of age. She was postterm asymmetrical SGA infant whose weighed 1,950 gm. Fetal distress was not detected before, the Apgar score at 1 and 5 minutes were 4 and 8 respectively. The meconium was stained over the body and umbilical cord. Tracheal suction after positive pressure ventilation showed no meconium but present in the stomach. Blood gas analysis revealed severe hypoxia and metabolic acidosis. Chest roentgenogram showed atelectasis of the right lung. Despite mechanical ventilation was given she had rapidly deteriorated and expired at 23 hours after birth. Autopsy was not done.

DISCUSSION

The appearance of meconium in amniotic fluid has been associated with fetal distress from hypoxia. The meconium is passed in utero when oxygen saturation in the umbilical vein falls below 30 percent, approximately half of the normal level at term⁽⁵⁾. Other explanations of fetal meconium passage in the absence of fetal distress are compression of the umbilical cord elicits a vagal response and normal physiologic function of a term or postterm fetus⁽⁵⁾.

From this study, the gestational ages of the infants born with MAS are nearly similar to those reported by others⁽¹⁻⁵⁾. The response to stress by the passage of meconium in utero has never been observed prior to a gestational age of 34 weeks⁽⁶⁾. In this study there was only one preterm infant whose gestational age was 36.5 weeks.

Unlike those reports, there was nearly fifty percent of low birth weight infants of which 5 out of 7 were fullterm small for gestational age infants and 7 out of 8 were full-term infants with weighed more than 2,500 gm.

As many as 65 percent of small for gestational age (SGA) infants are likely to present in the delivery room with life-threatening problems including asphyxia which occur most commonly among term SGA infants who have a low ponderal index⁽⁷⁾. (Ponderal index = $100 \times \text{weight in gm} / \text{length in cm}^3$) Weight/length ratio or ponderal index at or below the tenth percentile indicated asymmetrically growth retarded or dysmature SGA infants with meconium staining of the skin, nails and umbilical cord is common.

Forty percent of the infants in this study were SGA. By using the ponderal index, four infants out of five were asymmetrical growth retardation with three had meconium staining of the skin, nails and umbilical cord.

The presence of more than 1 ml of thick meconium in the trachea or of 2 ml in the mouth significantly increased the risk of respiratory distress⁽¹⁾.

This study is only clinical observation and small number of the infants were observed. It was found that the tracheal suction was performed before positive pressure were given in only 2 out of 11 infants. The meconium was found in the trachea in one infant who developed mild tachypnea with bilateral infiltration and hyperaeration in chest roentgenogram. In the other one, no meconium was obtained in the trachea but in the stomach, the chest roentgenogram was normal.

More than 80 percent of the infants, positive pressure ventilation were given and/or spontaneous breathing were occurred prior to tracheal suction. Five out of nine infants had meconium in the trachea and all but one had abnormal chest roentgenogram. The only one infant who died was in this group. In the four infants with tracheal suction was not done, abnormal chest roentgenogram were found in three.

In previous retrospective analysis of the efficacy of tracheal suction in MAS, Ting and Brady found that the incidence of symptomatic aspiration and mortality was significantly increased in infants received no immediate tracheal suctioning in the delivery room⁽²⁾. The mortality was 25 percent (7 of 28) in unsuctioned infants, compared with 1 percent (1 of 97) in infants who received suctioning.

Despite the presentation of respiratory distress after tracheal suction in both cases of this study, it should be however, agreed with them that all infants born through thick meconium-stained amniotic fluid should have their trachea aspirated immediately after birth by the most experienced person in the delivery room.

It was noticed that in the cases of tracheal suction, hospitalization was not more than 10 days except three infants who had

other condition and complications. One developed convulsion with unknown cause, bilateral pneumothorax followed by subcutaneous emphysema, and one infant still had hyperaeration of the right lung with mild sternal retraction and persisted until discharged.

It was demonstrated in puppies that meconium moved progressively into the periphery of the lung with breathing⁽⁵⁾. This is consistent with the observation that many infants with meconium aspiration are well for a few hours after birth before developing progressive respiratory distress.

There is 10-20 percent incidence of pneumothorax in the previous studies^(1,4). In this study there was only one infant who developed bilateral pneumothorax at 6 hours of age which required chest tube drainage and survived.

Vidyasagar et al⁽³⁾ reported a 53 percent incidence of respiratory failure in MAS and all developed before 12 hours of age. In this study there was one who developed respiratory failure and died at 23 hours after birth. Hypoxemia can be treated with environmental hyperoxia, if there is no response, end expiratory pressure may stabilize collapsing terminal airways to enhance oxygen exchange⁽⁸⁾.

The use of antibiotics has been recommended by several authors based on observation of enhanced bacterial growth^(5,6,9).

In reviewing the previous reports, the common factor affecting the morbidity and the mortality was immediate tracheal suction. The importance of tracheal suction has been emphasized by previous reports, even without meconium stained secretions present in the mouth^(1-3,10). When no meconium is visualized in the larynx and trachea, the stomach should be emptied to prevent further aspiration⁽³⁾.

With the hazards of using oral methods of endotracheal suction has been reported⁽¹¹⁾, great caution should be exercised when using

the mouth to tube method or that alternative methods of suctioning the neonatal airway should be adopted⁽¹²⁾.

In conclusion, intrapartum monitoring of the high risk infants, recognition of meconium-stained amniotic fluid and immediate tracheal suction before positive pressure breathing are significantly lowered the morbidity and mortality from meconium aspiration syndrome.

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