The risk of neonatal infection following prolonged rupture of the fetal membranes

N.Y. Boo, MRCP (UK)
Associate Professor
Department of Paediatrics,
Faculty of Medicine,
Universiti Kebangsaan Malaysia, Kuala Lumpur

Summary

Over a seven month period in 1986, 164 (1.1%) of a total 15,131 neonates delivered in the Maternity Hospital, Kuala Lumpur were born to mothers with prolonged rupture of the fetal membranes. Septic work-ups were performed on 163 of these babies shortly after birth, 77 of them had no bacteriological, radiological or other clinical evidence of infection. The remaining 86 had additional history of illness. Nine of these 86 babies had proven infection: four with septicemia, one with meningitis and four others with congenital pneumonia. This study showed that neonates had risk of infection only when maternal history of prolonged rupture of the fetal membranes was associated with other clinical evidence of infection. However, even in this group of neonates at risk, 89.5% of them were not infected. Therefore, there is still a need to develop a simple, rapid, reliable and cheap laboratory method to help early identification of the infected from the non-infected neonates in order to prevent unnecessary antibiotic treatment and hospital stay.

Key words: Prolonged rupture of the fetal membranes, neonates, infections.

Introduction

Prolonged rupture of the fetal membranes is defined as rupture of the amniotic sac for more than 24 hours prior to delivery. In the presence of prolonged rupture of fetal membranes, the fetus can become infected in utero by pathogens from the mother's vagina or perineum.[1,2,3,4,5,6] A number of prospective[1,2,5,7,8,9,10] and retrospective[3,4,6,11,12] studies had been published on the rate of infection in neonates born to this group of mothers. These studies were done on the cardiac blood cultures of stillbirths,[7] peripheral blood cultures of liveborns,[2,4] umbilical cord blood culture,[1] as well as gastric aspirate culture, and nasopharynx and umbilical swab cultures.[5] Because of the designs of these studies were different and limited by various factors that the exact risk of infection was still uncertain. As a consequence, there is controversy as to whether antibiotic prophylaxis is indicated in this group of neonates.[13]

In the Maternity Hospital, Kuala Lumpur, it had been the practice to subject these neonates to full septic work-up and antibiotic treatment after birth until culture results were known. During this period of three to five days, these babies had to be kept in the hospital with resultant overcrowding of both the Special Care and postnatal nurseries. The questions which arise regarding this practice are: a) whether it is necessary to treat all these babies, b) whether there are any additional clinical criteria at birth which can help early identification of the infected from the non-infected newborns.

The objectives of the present study were: To determine the number of neonates who had proven septicemia, meningitis and/or pneumonia following birth to mothers who had history of prolonged rupture of membranes, and to identify the additional clinical features which were present at birth in the infected neonates.

Methodology

This study was carried out over a period of seven months between 1st of June, 1986 to 31st of December, 1986 in the Maternity Hospital, Kuala Lumpur. All neonates who fulfilled the following criteria were referred to us by the labour room staff and were included in the study: Whose mothers were admitted in labour with a history of leaking of liquor for more than 24 hours before delivery; or whose mothers had history of absence of amniotic membrane over the presenting part of the fetus for more than 24 hours during the antepartum and/or intrapartum period as was detected by the Obstetric doctors during vaginal examinations. Antibiotic prophylaxis was given to mothers only when they had fever and/or foul smelling liquor. Presence or absence of the following features were documented in each case: Maternal pyrexia (temperature more than 37.2 degrees centigrade) during intrapartum period; foul smelling liquor at time of delivery; meconium stained liquor at time of delivery; Apgar score at one and five minutes after birth, and any symptoms and signs suggestive of neonatal infection during the first 48 hours after birth.

All neonates included in the study had the following investigations done on them shortly after birth (as was the routine practice): peripheral blood count, blood culture (from peripheral veins under aseptic technique), cerebrospinal fluid for culture, chest X ray, and gastric aspirate for culture. Penicillin G (100,000 u/kg/day in two divided doses) and Gentamicin (5 mg/kg/day in two divided doses) given either intramuscularly or intravenously were commenced after septic work-up. When infection was confirmed by culture results, treatment was continued for 14 days in patients with septicemia and 21 days in patients with meningitis. Patients whose culture results were negative, chest X rays normal, and who remained well during the hospital stay, were discharged home at three to five days of age.

Congenital pneumonia was diagnosed when the babies had respiratory distress shortly after birth with the chest X rays showing uniform opacity and air bronchogram signs, and gastric aspirate culture was positive for organisms. Respiratory distress was diagnosed to be present in a neonate when at least two of the following three signs were present: tachypnea of 60 per minute or more, intercostal recession and/or expiratory grunt. Amnionitis was diagnosed clinically to be present when the liquor was foul smelling. Apgar score less than eight was considered abnormal.

Results

During the seven months period, 15,206 neonates were delivered in this hospital. One hundred and sixth four (9 per 1000 livebirths) were born to mothers with history of prolonged rupture of membrane. All except one of the 164 babies had full septic work-up. Septic work-up was not done on this term baby with birthweight 3.175 kg because he was severely asphyxiated at birth and died within half an hour in the labour room. This baby was excluded from the study.

Among the 163 neonates with maternal history of prolonged rupture of fetal membranes, 56% were males and 44% were females. Malays formed 56% of the group, Chinese 26%, Indians 16% and other racial groups 2%. Most of the patients (53%) were delivered by spontaneous vaginal delivery, 31% by lower segment Caesarean section, 7% by forceps delivery, 8% by vacuum

extraction and 1% by assisted breech delivery. 76% of the babies weighed more than 2499 gram. 87% were term babies.

Only nine out of the 163 babies (5.5%) had bacteriological evidence of infection on day one of life. 77/163 (47.2%) of the babies had no associated history of maternal pyrexia during intrapartum period, meconium stained liquor, amnionitis, low Apgar score or clinical features of infection shortly after birth (Table I). None of them had radiological or bacteriological evidence of infection. All of them remained well during their hospital stay and were discharged home.

Table I

The relationship between clinical features during the perinatal period and the presence of neonatal septicemia or meningitis after birth

Clinical features	No. of patients with			Total no.
	Both blood and CSF cultures negative	Blood culture positive	CSF culture positive	
PROM only	77	0	0	77
PROM + maternal pyrexia	55	1	1	57
PROM + maternal pyrexia + amnionitis	8	2	0	10
PROM + amnionitis	3	0	0	3
PROM + meconium stained liquor + Apgar score < 8 at 1 minute	15	1	0	16
Total (%)	158 (96.9)	4 (2.4)	1 (0.6)	163 (100)

PROM = history of mother with prolonged rupture of fetal membranes.

On the other hand, the additional clinical features mentioned above were present in 86/163 (52.8%) of the babies. Nine of them (9/86 or 10.5%) were infected: four with septicemia, one with meningitis and four with congenital pneumonia. Three patients died: one from septicemia, and two from congenital pneumonia (Table II).

Discussion

Admission to the Special Care Nursery has to be justified to prevent overcrowding. Yet, one has to be careful that sick neonates are not overlooked and deprived of appropriate care. The problem of mothers with prolonged rupture of membrane is not uncommon in our hospital, as shown in this study. The previous routine practice of doing septic work-up on all neonates born to these mothers followed by antibiotic treatment to these babies while awaiting culture results really taxed the limited neonatal resources and manpower of our hospital.

The findings of our study showed that when prolonged rupture of fetal membranes was not associated with maternal pyrexia, amnionitis, meconium stained liquor, low Apgar score or any clinical signe suggestive of neonatal infection, the risk of infection in the neonates was nil. However, when any of these additional clinical features were present, there was a definite risk.

Table II

Outcome of the 9 patients with infection

Patient no.	Sex	Race	Gestation (weeks)	Birthweight (grams)	Mode of delivery	Type of infection	Outcome
1	Male	Chinese	40	3515	LSCS	Acinetobacter septicemia	alive
2	Male	Chinese	43	2710	LSCS	Staph. epidermidis septicemia	alive
3	Male	Malay	39	1520	LSCS	Staph. epidermidis septicemia	alive
4	Male	Malay	40	3420	LSCS	Staph. epidermidis septicemia	died
5	Female	Malay	40	3005	LSCS	Klebsiella meningitis	alive
6	Male	Malay	40	2840	SVD	Staph. aureus pneumonia	alive
7	Male	Indian	40	3240	Forceps	Staph. epidermidis pneumonia	died
8	Male	Malay	30	1340	LSCS	Klebsiella pneumonia	died
9	Male	Malay	40	2770	LSCS	Staph. aureus pneumonia	alive

LSCS = lower segment Caesarean section. SVD = spontaneous vaginal delivery

As a result of this study, we are now treating only those neonates who have one or more of the above clinical features in addition to the presence of a maternal history of prolonged rupture of fetal membranes. As our study showed that even in this group of neonates, the risk of infections was not high, only 10.5%. This means that despite the "new" practice of using the additional clinical features to exclude many non-infected neonates, we will still be investigating and administering antibiotics unnecessarily to a large number of well neonates. There is, therefore, a need to develop a simple, rapid, reliable yet cheap laboratory method to help early identification of the infected neonates after birth, preferably within the first 24 hours of life.

Tests like white cell count, band: neutrophil ratio, gastric aspirate smears, platelet counts, IgM levels, mini erythrocyte sedimentation rate had low positive predictive accuracy.[14] Other techniques like using acridine orange-stained buffy coat smears, though quick, required expertise in the interpretation of results.[15,16] Countercurrent immunoelectrophoresis provides simple, rapid and accurate means of detecting bacterial antigens in blood, urine and cerebrospinal fluid.[15,17] However, limitations of these laboratory procedures include a lack of available antisera for all bacterial pathogens and high cost. Measuring C-reactive protein is quick and easy in detecting septicemia.[18] However, the test is still very costly to run.

As 87% of the neonates in our study were term neonates, earlier delivery of term babies with maternal history of rupture of fetal membranes may help to reduce the incidence of neonatal sepsis and the cost of neonatal care.

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