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MANAGEMENT OF THE BABY AFTER PROLONGED RUPTURE OF THE AMNIOTIC MEMBRANES*

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THE STUDY OF the prevention of illness in the newborn infant and the study of prevention of death in this group are much the same. Conditions which start as a mild illness easily merge into more serious states unless recognized early and promptly treated. It is with this in mind that lengthy and meticulous studies of infant mortality are amply justified. The study of the serious and indeed fatal conditions must find and illuminate the early stages of disease to justify the effort.

The cause of illness or death in a newborn infant is rarely simple and individual. It is usually complex having three contributory factors, a maternal, a delivery and an infantile partial cause being present. These factors should be assessed as to where treatment may be applied. As examples of maternal disease may be cited diabetes, toxemia, psychic states, and spontaneous premature labor. Treatment is clearly indicated to the mother. As illustrations of delivery complications may be listed placental separation, prolapse of the umbilical cord, disproportion often requiring a caesarian section, and prolonged rupture of the amniotic membranes. A few infantile conditions of great threat are deformities of the heart, infection, high bilirubin, and hyaline pneumonia. The object of this paper is to consider infection of the infant in relation to prolonged rupture of the membranes.

MATERIAL AND METHODS

One hundred consecutive deliveries were analyzed starting April 1, 1962, and showed five prolonged rupture situations of more than 20 hours. One thousand consecutive deliveries, between August 1960, and August 1961 were then analyzed for prolonged rupture of 20 hours or more. Among these there were 28 occurrences of such prolonged rupture. The incidence then of prolonged rupture time is small and is approximately 2.8 percent to 5 percent when 20 hours is used as the dividing point. The size of the group is important because the principle of prophylactic care is hard to accept unless the indications are very clear. Among the 100 consecutive deliveries of 1962, there were 12 instances of prolonged rupture of 10-20 hours, a comparatively large fraction of this obstetric census, which it would be unrealistic to subject to prophylactic treatment but needs precautionary observation. The total incidence in this series of such 20-hour rupture was three percent, a small number.

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Table I
Frequency of Prolonged Rupture

Cases	0-10 hrs.	10-20 hrs.	20 hrs. and over
100 (1962)	83	12	5
1000 (1960-61)	—	—	28
1100	—	—	33

There were then 33 infants born after prolonged rupture, and their complications were increased. Among these, 8 infants died, 1 was still-born, 9 were sick but recovered, and 15 infants were normal. Although it is again necessary to emphasize that every illness has many contributing factors, the number of complications in this group shows that every infant born after this degree of prolonged rupture merits special concentrated care.

Table II
Infants Born After Prolonged Rupture of Membranes of 20 Hours or More

Stillborn	1
Deaths	8
Illness with Recovery	9
Normal	15

Table III
Illness with Recovery in Infants Born After Prolonged Rupture Time of 20 Hours or More

Infections	5
Asphyxia	1
Brain Damage	1
Weak and Dehydrated	2

A different type of evidence of the effect of prolonged rupture was sought by analyzing all infections in one year in a nursery group. Twenty-five infections were found supported by some type of positive culture or x-ray. Among these 25 were found 8 infants born after prolonged rupture of 13 hours or more. Thus 28 per cent of our infected infants had been exposed to prolonged rupture which means prolonged exposure to infection. The infections in these infants were 4 cases of sepsis, 3 of pneumonia and 1 of conjunctivitis, and high bilirubin.

Table IV
Infections Related to Prolonged Rupture

Name	Diagnosis	Rupture Time	Birth Wgt.	Outcome
W	Sepsis	72 hrs.	1610	Recovery
S	Sepsis	72	1800	Recovery
W	Hyaline Pneumonia	Long	1598	Died
L	Pneumonia	96	2400	Died
B	Sepsis	18	2610	Recovery
E	Sepsis	15	3540	Recovery
H	Conjunctivitis, High Bilirubin, Mother Diabetes	14	1570	Recovery
T	Hyaline Pneumonia	13	1100	Died

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The individual infants present a variety in appearance which may be misleading. Temperature, vomiting, or leukocytosis are rarely present to indicate disease. In the newborn period loss of weight up to 10 percent of birthweight is expected. Often the first sign of illness is early or excessive jaundice. Paucity of signs is well recognized and is illustrated in Table V.

Table V
Clinical Course of Infants Born After Prolonged
RUPTURE OF AMNIOTIC MEMBRANES

	Baby L.	Baby W.	Baby S.	Baby B.	Baby E.	Baby T.
<i>Maternal Factors</i>						
Age	29	35	36	21	37	27
Previous disease	none	none	none	none	para 0	para 0
Gravida	I	VII	IV	I	VI	VII
Type delivery	Forceps	Spon.	Spon.	Spon.	Spon.	Spon.
Rupture time	4 days	49'30"	36'	17'57"	12'50"	11'2"
Duration labor	4'26"	1'30"	7'36"	10'1"	12'27"	4'26"
<i>Infantile Factors</i>						
Birth Weight	2400	1610	1800	2610	3540	1100
Suspected infection	1st day	1st day	3rd day	5th day	3rd day	4th day
First symptom	1st day	1st day	3rd day	5th day	3rd day	4th day
Achromycin started	1st day	1st day	2nd day	5th day	3rd day	4th day
Bilirubin elevated	no	yes	yes	yes	yes	no
Blood culture	no	positive	positive	positive	positive	no
Exch. transfusion	no	yes	yes	yes	yes	no
Outcome	died	recovered	recovered	recovered	recovered	died
Diagnosis	pneumonia	sepsis	sepsis	sepsis	sepsis	pneumonia

DISCUSSION

Another avenue by which infection may reach the fetus is via the mother's blood stream. It is well known that certain types of virus, if present in the mother easily pass the placenta. As illustrations may be cited rubella, salivary gland virus causing cytomegalic inclusion disease, rubeola and smallpox.¹ Bacterial infections cannot be classed together but the spirochaeta pallida easily passes the placenta, the pneumococcus occasionally and the tubercle bacillus practically never. Infection, however, from the mother's blood stream is a definite possibility, and must be considered.

Infection of the fetus by way of the birth canal, through the intact membranes, depends somewhat on the length of labor, but it may be said that after 24 hours of labor even with membranes intact, the amniotic fluid is infected.² The fluid may be infected after 6 hours of labor.³ When membranitis or vasculitis of the umbilical cord is used as an index of infection, it is not justified to say this is synonymous with infection of the infant, but it is suggestive. Usually any local infection is paralleled by some increased hazard to the infant. The incidence of membranitis definitely increases with prolonged rupture as shown by Siddall⁴ and by McIlwaine.⁵

Table VI

Incidence of "Membranitis" in Relation to Duration of Labor after Rupture of the Membranes*

Incidence of "membranitis" (%)	Duration of labor after rupture (hours)		
	0-6	6-24	24
Siddall (1928)	2.6	6.3	22.1
McIlwaine	3.3	16.3	51.7

*After Morison, J. E.

The correlation is impressive between duration of prolonged rupture of membranes and vasculitis of the umbilical cord as shown by Pryles and Gillis.⁶

Table VII

Correlation of Duration of Premature Rupture of Membranes and Incidence of Umbilical Cord Vasculitis⁶

Duration of Premature Rupture	No. of Cases	No. showing Vasculitis (%)
12-35 hours	62	12 (19.3)
36-71 hours	33	11 (33.3)
3 days — 6 weeks	23	10 (43.4)
Controls	71	4 (5.6)
Total	189	37

Among 33 infants where the umbilical cord showed vasculitis, 8 became ill showing the threat of infection of approximately 25 per cent.

The correlation of time of prolonged rupture to positive blood culture in the infant has been studied by serial blood cultures from the umbilical vein, and is striking.⁷

Table VIII

Relationship Between Rupture of the Membranes and Positive Culture of the Cord Blood*

Group**	I	II	III	IV	V	VI	VII	Total
No. Pairs (Control and Study) in each Group	53	44	40	19	12	7	4	179
Duration of Rupture of Bag of Waters in each Group	12-23 hrs.	24-35	36-55	56-84	4-5 days	7-14 days	3-6 wks	
Positive Culture of Infant's Cord Blood:								
Study	23(43)***	21(52)	20(50)	5(26)	8(66)	6(85)	1(25)	54(46.9)
Control	15(28)	17(38)	17(42)	7(36)	5(41)	4(57)	1(25)	66(36.8)

*Pryles, C., et al: Unpublished data, Boston City Hospital.

**According to duration of ruptured amniotic membranes prior to delivery.

***Numbers in parentheses indicate percentages.

The incidence of sepsis in the infant has been studied by Tenney and Little⁸ in relation to duration of labor and prolonged rupture using 6 hours as the critical time

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and showed that even this short period of labor in the presence of rupture carried a hazard of 8 in 31, or approximately 25 per cent.

Table IX
Influence of Duration of Active Labor in the Presence of Prematurely Ruptured Amniotic Membranes on the Development of Sepsis in Infants (Pryles et al.)

Study Group	No. in Labor Less than 6 hours	No. in Labor more than 6 hours
Clinical Sepsis	31 15 premature 16 full-term	25 9 premature 16 full-term
Sepsis Proved Bacteriologically	8 5 premature 3 full-term	7 5 premature 2 full-term
Control Group Clinical Sepsis	6 3 premature 3 full-term	4 (all full-term)
Sepsis Proved Bacteriologically	2 (both full-term)	0

The conclusion of Tenney⁹ seems very acceptable, and is that any maternal fever, purulent amniotic fluid, or fetal heart rate over 160 during labor and prolonged rupture should indicate antibiotic drugs to the mother in twice-therapeutic dose to penetrate the uterine cavity and cross the placenta. Even a 1000 to 1350 gram infant has a chance of living and minimum sedation should be used, with all aid to fetal oxygenation.

The chief threat to the infant is the "breathing" in and out of infected amniotic fluid, which becomes more of an exposure as time passes. Two types of pneumonia at least are recognized, intrauterine pneumonia which is histologically peculiar in that it consists of massive diffuse infiltration by polymorphonuclear leukocytes which are found in air sacs without fibrin formation. This contrasts with the appearance of hyaline pneumonia where the air sac is lined with fibrin.

The signs of infection in the newborn are often minor. They are such observations as lack of vigor, poor sucking, weak or high pitched cry, prolonged feeding time, vomiting, diarrhea, apathy or irritability, or loss of weight. More serious signs are fever, increased respiratory rate above 50 per minute, petechiae, ecchymoses, or neurologic signs of twitching or convulsions. Positive cultures are most likely in the infant after prolonged rupture. Cultures should be taken of any exudate, of the nose and throat, and of the blood, and a chest film should be taken. Then for 3 days or until a specific organism is identified achromycin should be given in dosage of 50 mg per kilo per day. Prophylactic treatment should be used but only with discretion. We note that prophylactic care has given distressing results with oxygen, sulfisoxazole, vitamin K in dosage of over 5 mg, and chloromycetin. However, we must face the fact that if prolonged rupture has been present over 20 hours,

43 to 52 percent of newborn infants will have a positive cord blood culture, and a high percent of these estimated at 25 percent will have a rising bilirubin from sepsis, and counting deaths and all serious incidents 54 percent of our cases were in trouble.

SUMMARY AND CONCLUSIONS

1. A group of 1100 consecutive patients showed the incidence of prolonged rupture of the amniotic membranes of 20 hours or more to be 3 percent.
2. Among the 33 instances of such prolonged rupture, there were 18 instances of death, stillbirth and disease.
3. Among 25 consecutive infections there were 8 instances of prolonged rupture of 13 hours or more.
4. Infants may not show any striking signs to indicate serious trouble even to the fourth day, therefore, blood culture, nasal culture and chest x-ray should be taken soon after birth when rupture of 20 hours or more has been present.
5. Prophylactic treatment to this small group of 3 percent of the obstetric census is justified by the 54 percent risk of infection or disease. Prophylaxis *at present* may consist of achromycin 50 mg per kilo per day for the first 3 days or until a specific organism is identified.
6. The same cautious constant observation and hourly care is indicated as is given every ill or suspiciously weak infant which entails fluid and feeding care, bilirubin regulation, observation for infection as well as mild to severe respiratory failure, and birth injury and appropriate therapy for each condition.
7. In conclusion it is to be emphasized that there is always a maternal, a delivery, and an infantile factor which must be considered if the greatest number of newborn infants is to be saved.

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