

REVIEW ARTICLE

PREMATURE RUPTURE OF MEMBRANES: A REVIEW

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SUMMARY

Premature rupture of membranes (PROM), resulting from array of Pathological mechanisms, is a recognized complication of pregnancy and its management is usually of concern to the obstetricians because of the possible lethal associated complications. PROM can occur at term or before term with the preterm type constituting greater risks to the fetus and the mother. Numerous controversies exist regarding the best methods of clinical assessment and management of the gravida and the fetus after PROM.

These controversies which have plagued this disorder for many decades appear of recent to be taking a more consensus outlook among the authorities involved.

The Management now generally hinges on evaluation of the relative risks of infection, umbilical cord accident, operative or expectant delivery and the gestational age in-patients not in labour. A literature review on PROM has thus been carried out, throwing some lights on the current understanding of this condition based on published data, consensus and expert opinion. The possible aetiology, diagnosis, complications and management are discussed. Some management guidelines are proffered.

KEY WORDS: Premature, Rupture, s Membranes, Diagnosis, Management, Review.

INTRODUCTION

Premature rupture of the membranes (PROM) in this review is defined as spontaneous rupture of the amniochorionic membranes prior to the onset of labour. It is reported to be a complication of about 25-33% pregnancies and preterm births¹⁻⁶. When the membrane rupture occurs before 37 weeks of gestation, it is referred to as preterm PROM. PROM is a recognized complication of pregnancy and can result from a wide array of pathological mechanisms acting individually or in concert; the condition is of variably reported frequency, the cause sometimes unknown and of only partially satisfactory management^{1-7,10}.

Because of the possible complications that can often arise from PROM, the management is of constant concern to the obstetricians. Interest in this problem is stimulated periodically by published or spoken pronouncements of various obstetric authorities, which often provoke a series of controversial response or dissenting views. Indeed professional interest in this subject is perpetually simmering.

Meanwhile, the problem remains unresolved and its incidence has not greatly declined in the past decades despite the sometimes acrimonious dissensions and proposals concerning the aetiology and treatment. Hence

the need for the periodic or occasional review of this subject as no single entity in obstetric practice is so fraught with divergent views regarding causation and management.

The objective of this paper therefore, is to focus more attention on the aetiological factors, the diagnosis, the consensus of the expert opinion on the divergent management views, the complications and proffer as much as possible some management guidelines of PROM at some stages of gestation.

AETIOLOGY OF PROM

Although spontaneous premature rupture of membranes can be attributable to a variety of factors, it is believed to occur more frequently in patients of lower socio-economic status, who have frequent pregnancies at short intervals, unstable home, unstable environments and of less optimal health-care^{1,7,8,12,13}. Weakening of the membranes resulting from physiological changes due to ageing combined with the shearing forces created by uterine contractions preparatory to the possible onset of labour has been associated with PROM, particularly at term¹⁴. Apart from this and lower socio-economic status, other factors associated with PROM include sexually transmitted infections or cervicitis and previous preterm delivery (particularly due to PROM).

Cervical incompetence is a recognized cause of

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PROM while vaginal bleeding and cigarette smoking during pregnancy have been incriminated by some authors^{2,5,9,13}.

Intrauterine infection has been shown to play an important role in preterm PROM especially at earlier gestational ages^{4,10,15,16}. Uterine distension from polyhydramnios and multiple pregnancy (twins), prior antepartum antibiotic treatment and previous preterm labour have also been reported to be associated with premature rupture of membranes^{5,9,10}. Congenital weakness in the tensile strength of the membranes or weakness of the part of the membranes lying over the cervical OS have been postulated as other possible causes of PROM. However, in many cases, the disorder may occur in the absence of any recognized predisposing factors mentioned above.

DIAGNOSIS OF PROM

Because of the potential risks posed to the woman and the fetus, an accurate diagnosis of PROM is crucial for its proper management. The diagnosis of this disorder in most cases is based on the history and observation of watery discharge per vaginam on physical examination^{1,2,9,12,17}. It should always be borne in mind the other possible causes of vaginal discharge like urinary leakage (due to incontinence), excess vaginal discharge in amniotic membrane prolapse as often seen in cervical dilation, bloody show, vaginal douches, cervicitis, semen in vagina, vaginal trichomoniasis or candidiasis. Patients with symptoms suggestive of PROM should be considered and confirmed. In centres with adequate facilities, the diagnosis can be made by amnioscopy¹².

Sterile speculum examination is helpful and informative. The observation of clear (amniotic) fluid passing from the cervical canal or a collection of amniotic fluid in the posterior vaginal fornix confirms the diagnosis of membrane rupture. If the diagnosis still remains in doubt, the pH of the fluid pool or of the vaginal side-walls can be assessed. The pH of the amniotic fluid is usually 7.1 - 7.3, while that of the vaginal secretions is generally 4.5 - 6.0. The use of Nitrazine paper (stick) test which turns blue in the presence of amniotic fluid is reported to give false-positive results in presence of semen or blood contamination, bacterial or trichomonal vaginitis, alkaline antiseptic or soap douching, alkaline urine and false-negative results may occur with prolonged leakage and minimal residual amniotic fluid^{11,2,9,12}. More information can be used by taking fluid sample from the posterior vaginal fornix (avoiding cervical mucus) and allowing this to dry on a microscope slide. The presence of positive ferning (arborization) under microscopic visualization is a further suggestion of membrane rupture^{1,2,7,9,18}.

If the clinical history and or physical examination remain equivocal, particularly in preterm PROM, ultrasonographic examination may be used to document oligohydramnios, which in the absence of fetal urinary tract anomalies or significant intrauterine growth retardation (IUGR), is suggestive of PROM^{1,9,12}.

Of recent, the diagnosis of PROM can be made unequivocally by ultrasonographically guided transabdominal instillation of indigo carmine dye (1ml in 9ml normal saline) intraamniotic followed by observation of passage of blue fluid per vaginam within 30 minutes of the amniocentesis^{1,12}.

Other intraamniotic dye injection reported to have a high diagnostic value in PROM are Evans blue¹⁹, Methelene blue²⁰, Fluorescein¹⁸, and phenol-sulphonphthalein¹². However it has been reported that with Evans blue method, it is difficult to distinguish between the dye and meconium¹⁹. There have been reports of haemolytic jaundice, haemolytic anaemia, hyperbilirubinaemia in the fetus after the use of methelene blue^{18,21}, while Fluorescein use has been reported to produce maternal side effects like nausea, vomiting, allergic reactions and photosensitivity^{12,18}. However, no clinical side effects have been reported yet with the use of phenol sulfonphthalein¹².

MANAGEMENT OF PROM

Once premature rupture of membranes has been confirmed, it becomes necessary to determine the fetal status by fetal heart rate monitoring and or fetal kicks; the gestational age should be assigned by dating criteria and fetal presentation determined because all aspects of subsequent management will virtually depend on these information, that is, whether to adopt expectant management or induce labour. In term PROM gawida, after assessing the fetal status, presentation and gestational age, delivery should be achieved by induction of labour or by caesarean section. The decision to induce labour requires an assessment of the relative risks of infection or fetal compromise (which increase with the duration of PROM). It should also be borne in mind the risk of failed induction necessitating an operative delivery^{23,25}. If the option is for induction, this could be immediate or one may have to observe the patient for 24-72 hours for a possible spontaneous onset of labour^{23,24}. During this waiting period, prophylactic broad spectrum antibiotic cover is advisable. However, in cases of PROM with evidence of intrauterine infection, fetal compromise or abruptio placentae, expeditious delivery is the best care.

In the absence of any indication for immediate delivery, then expectant management should be adopted

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if it is preterm. In this regard, the general approach consists of bed rest to potentially enhance reaccumulation of the amniotic fluid and avoid infection. The ruptured membranes may reseal². Periodic assessment of the patient for evidence of infection or labour is necessary. In the preterm gravida with PROM, vaginal examination should be done in such a way that will minimise the risk of introducing infection. Since digital vaginal/cervical examinations increase the risk of infection, sterile speculum examination is more preferable. Also, unless prompt labour and delivery are anticipated, it is strongly advisable to avoid digital vaginal examination^{3,13,26,27}.

The sterile speculum examination will allow the confirmation of the diagnosis of PROM as well as provide the opportunity to inspect for cervicitis, umbilical cord prolapse, or fetal prolapse, assess cervical dilatation and effacement and obtain samples for culture if necessary^{1,2,12,16}.

Many investigators^{4,5,13,17,28} agree that fever (temperature 38.0°C) with uterine tenderness and maternal or fetal tachycardia are more indicative of maternal infection than fever alone in preterm PROM, while leukocyte counts are unreliable. If intraamniotic infection is suspected, amniocentesis for additional diagnostic confirmation is necessary. Amniotic fluid glucose concentration of less than 20mg/dl, a positive gram stain or a positive amniotic fluid culture are considered indicative of infection, while the presence of interleukin-6 is considered the only test of significance in predicting neonatal complications by many investigators^{1,2,6,11,14,16,29}.

There were controversies in the past, when PROM occurs at 36 weeks gestation or less, on whether or not one should elect expectant delivery^{4,7} but it is now the view of many investigators that delivery could be considered at 32-36 weeks gestation if PROM occurs believing that serious neonatal morbidity due to prematurity and respiratory distress syndrome (RDS) are not common at this gestational age^{7,30,38,40}. The authors stressed that the delivery should be considered based on the facilities available, the neonatal risks with early delivery, the relative fetal and maternal risks, the potential neonatal benefits from expectant management.

For the assessment of fetal lung maturity, if in doubt, amniotic fluid collected from the vaginal pool or by amniocentesis can be used for assessing the lecithin/sphingomyelin (L/S) ratio. Once the fetal lung maturity is ascertained (L/S ratio ≥ 2), immediate induction of labour is advisable; further delay increases the risk of chorioamnionitis, neonatal death and the duration of hospitalization with the attending extra cost.

In centres with good neonatal intensive units, the gravida with PROM at 24-32 weeks gestation but with

stable condition should be offered expectant management and the prophylactic use of antinotics and antenatal corticosteroids are advisable to reduce the risk of gestational age-dependent neonatal morbidity. In recent studies of antenatal use of corticosteroids in preterm PROM, some authors have reported a significant reduction in respiratory distress syndrome, intraventricular haemorrhage, necrotising enterocolitis and deaths in the neonates^{11,16,18,28,33}. Some of these authors also reported better neonatal results if the corticosteroids therapy is combined with prophylactic antibiotics^{28,32,33}.

Prospective studies of the use of combined antibiotics (ampicillin and erythromycin, ampicillin and sulbactam or amoxillin and erythromycin) in the expectant management of preterm PROM by some investigators, showed that prophylactic antibiotics produced significant prolongation (latency period) of pregnancy, reduced chorioamnionitis, postpartum endometritis, neonatal sepsis, pneumonia and intraventricular haemorrhage. It is advisable to give the drugs intravenously for the first 48 hours followed by oral therapy for another 5 days if delivery did not occur.

Since antenatal corticosteroids and prophylactic antibiotics have been found useful in the management of preterm PROM, the use of prophylactic tocolysis after preterm PROM has also been found beneficial in prolonging the latency period and thus permit enough time for the antibiotics and antenatal corticosteroids administration³¹⁻³⁴. It is necessary to state here that prophylactic tocolysis has been found to prolong latency period only before the onset of contractions while instituting tocolysis after the onset of uterine contraction (i.e. therapeutic tocolysis) has not been shown to prolong the latency period.

In gravida with preterm PROM and cervical cerclage in situ, it is the view of many investigators^{12,36} that as much as the cerclage can prolong the pregnancy, but it also increases the maternal and perinatal morbidity and perinatal mortality if the cerclage is left in place. Hence, immediate removal of the cerclage after PROM is advisable. A gravida with preterm PROM is best managed in hospital for bed rest, for close fetal and maternal monitoring, intrauterine and fetal infection may occur suddenly, there is the risk of fetal umbilical cord compression and sudden onset of labour resulting in the delivery of a premature baby which is better managed in the hospital than at home. The best incubator for carrying a premature baby is the uterus.

COMPLICATIONS OF PROM

Table I shows the list of complications associated with PROM.

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TABLE I: Complications of PROM

A. Preterm PROM

1. Premature delivery
2. Intraamniotic infection/chorioamnionitis
3. Postpartum infection
4. Fetal malpresentation
5. Abruptio placenta
6. Respiratory distress syndrome
7. Neonatal infection
8. Intraventricular haemorrhage
9. Necrotizing enterocolitis
10. Umbilical cord accident
11. Oligohydramnios
12. Neonatal death
13. Endometritis
14. Retained placenta
15. Postpartum haemorrhage
16. Infertility as long term effect.

B. Term PROM

1. Spontaneous labour and delivery
2. Intrauterine infection
3. Risk of ascending infection
4. Umbilical cord compression
5. Umbilical cord prolapse.

In premature rupture of membranes prior to term, delivery within a week is most likely to occur regardless of the clinical presentation or management^{1,6}. However, with expectant management, cessation of fluid leakage can occur in about 2.8 – 13% of the women^{3,4,18}. Clinical evidence of intraamniotic infection in 13 – 60% and 2–13% postpartum infection can occur in women with preterm PROM^{2,4,26} and the incidence of infection increases with digital examination and the prolongation of PROM before delivery^{26,27,37–40}. *Staphylococcus aureus* was the organism reported to be most commonly associated with infection and infection as a whole was responsible for a significant fetal morbidity and mortality and maternal morbidity^{38–40}. However, serious maternal and neonatal complications are uncommon with timely appropriate management^{4,10,15,25,30}.

Fetal malpresentation increases with preterm PROM, while 4–12% of the pregnancies are complicated by abruptio placentae^{1,2}.

At all preterm gestational ages, respiratory distress

syndrome (RDS) is reported by many authors to be the most common complication in the fetus of PROM^{4,10,37,38}. Other serious forms of neonatal morbidity include intraventricular haemorrhage, necrotizing enterocolitis due to prematurity and neonatal infection from chorioamnionitis. Infection, umbilical cord accident, prematurity with its complications account for about 1–2% risk of the fetal demise following PROM^{6,7,15,37–40}.

In cases of midtrimester PROM, oligohydramnios or fetal lung compression or both can result in pulmonary hypoplasia. Prolonged oligohydramnios can result in umbilical cord compression in utero, abnormal facial features and limb position abnormalities^{1,15,30,37}. In developed countries where adequate facilities are available coupled with advances in neonatal intensive care over the past two decades, neonates are surviving at increasingly younger gestational ages^{9,10,13,15,22,25,31}. However, reported maternal morbidity of midtrimester PROM include intraamniotic infection, endometritis, abruptio placentae, and postpartum haemorrhage (PPH), while maternal sepsis may result in infertility as a long term effect^{2,5,14,30}.

PROM at term is reported to complicate about 8% of pregnancies and is generally believed to carry better prognosis for the fetus and the woman, as it is generally followed shortly by the onset of labour and delivery^{1,12,24,25}. Many studies have shown that in expectantly managed term premature rupture of membranes, 50% of the women delivered within 5 hours and 95% delivered within 28 hours of the membrane rupture while about 5% go into labour and deliver after 24 hours of PROM^{6,23,25,26}. However, intrauterine infection is generally accepted as the most significant maternal risk in PROM at term and this risk is said to increase with the duration of the membrane rupture, while the fetal risks associated with this include ascending infection, pneumonia and cord compression^{2,3,5,18,23,24,25,38}.

CONCLUSION

Premature rupture of membranes is a recognized possible complication of pregnancy and must be managed as such. To regard it as a "natural course of events" or a nontreatable condition is to invite disaster in the long run. It should be accepted that PROM is a serious and potentially lethal threat to both the mother and the fetus. The fact that about 90–95% of these occurrences present no problem should not deny concerned management to the other 5–10% in whom life itself or future reproductive potential may be seriously threatened. Since PROM cannot be eliminated or prevented completely, it is therefore necessary to promptly institute the appropriate management to prevent or minimise the development of

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...led complications of sepsis.
...the following management guide lines are
...by these authors who are mindful of the
...in practice which may be warranted based on
...of individual patient, available resources and
...peculiar to the institution of the type of practice.

...ients with PROM who are not in labour and in
...immediate labour induction is not planned
...igital vaginal or cervical examination is not
...advisable.

...PROM at term, patients may be observed for 24-
...hours for possible spontaneous onset of labour or
...may be induced at the time of presentation.

In preterm PROM at 32-36 weeks gestation, if the
...amniotic fluid lecithin/sphingomyelin (L/S) ratio is
...2, labour may be induced, if the L/S ratio is <2
...antenatal antibiotics and corticosteroids should be
...administered to prolong the latency period and
...improve the perinatal outcome if expectant
...management is to be pursued.

Gravidas with preterm PROM at 24-32 weeks
...gestation should be managed conservatively in the
...absence of any maternal or fetal complications in
...institutions with facilities for neonatal intensive care.
...Antenatal corticosteroids and antibiotics should be
...administered to prolong the latency period of the
...pregnancy and to reduce the risks of gestational age-
...dependent neonatal morbidity and mortality. To permit
...the administration of the antibiotics and the
...corticosteroids, prophylactic tocolysis may be used.

Patients with preterm PROM should be counselled
...on the impact of immediate delivery and the potential
...risks and benefits of expectant management. Attempts
...should be made to provide the patients with the most
...up-to-date information possible as morbidity and
...mortality rates continue to improve with advances in
...perinatal care.

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