THE JOURNAL OF OBSTETRICS AND GYNECOLOGY OF INDIA

The Journal of Obstetrics and Gynecology of India (November–December 2016) 66(6):431–435
DOI 10.1007/s13224-015-0711-z

ORIGINAL ARTICLE

Using Sonographically Estimated Myometrial Thickness in Prediction of Latency Interval in Cases of Preterm Premature Rupture of Membranes (PPROM)

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Received: 13 February 2015 / Accepted: 18 May 2015 / Published online: 11 July 2015

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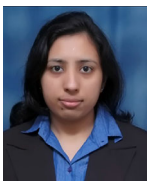

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Abstract

Objectives To study myometrial thickness (MT) sonographically as a predictor of latency interval in women with preterm premature rupture of membranes (PPROM).

Study design The data were collected in a prospective manner from the antenatal patients between November 2011 and June 2013 during the follow-up of patients in the Department of Obstetrics and Gynecology, Goa Medical College. 100 patients with the periods of gestation of 28–36 weeks were studied, out of which 50 were PPROM cases and 50 were controls, both not in labor. The demographic factors and MT of uterine wall are measured at four different levels: midanterior, posterior, lower uterine segment (LUS), and fundus, which are then compared with the latency interval which is defined as the time from the rupture of membranes to the time of delivery.

Results There was a significant inverse relation between the periods of gestation and latency interval, and positive correlation between anterior MT (p value 0.047), LUS thickness (p value 0.000), and latency interval implicating that the thicker the myometrium at admission in cases of PPROM the longer the latency period.

Conclusion MT appears a promising tool for obstetricians for predicting latency in cases of PPROM and guiding the management.

Keywords Myometrial thickness · PPROM · Latency interval · Chorioamnionitis

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Introduction

Preterm premature rupture of membranes (PPROM) and preterm delivery are very challenging obstetric problems. The main problem for an obstetrician in the management of PPROM is to predict when such a patient is likely to go in labor especially in cases of expectant management. Expectant management gives us the time for fetal lung maturity but with a risk of infection to both mother and the baby.

If there is some factor which can give us an idea about how long a pregnancy will continue after PPROM, it can be a boon for obstetricians to shift the patient to a better neonatal center and prepare her better psychologically. Hence, in this study, we were aiming to find out the relation between MT and PPROM and if we can predict the latency interval depending on them.

Study design The data were collected in a prospective manner from the antenatal patients between November 2011 and June 2013, in the Department of Obstetrics and Gynecology, Goa Medical College, a government tertiary care hospital in Goa. 100 patients with the periods of gestation (POG) of 28–36 weeks were studied, out of which 50 were PPROM cases and 50 were controls, not in labor. This study is a type of case–control prospective observational study.

The *inclusion* criteria considered to enroll patients in this study were antenatal patients with periods of gestation between 28 and 36 weeks with singleton pregnancy presenting with complaints of leaking per vaginum which was confirmed on clinical examination and ultrasound.

The *exclusion* criteria in this study included

(1) Fetal anomalies.
(2) Suspected intrauterine growth restriction (sonographic fetal weight <10 percentile for that gestational age).
(3) Any other medical or obstetric complication in the mother requiring immediate delivery or any contraindication for continuation of pregnancy.
(4) Patients already in labor at the time of their presentation to the hospital.
(5) Suspicion of chorioamnionitis.

A control group was selected from the same population presenting to Goa Medical College in the same time frame as the study group. These patients were randomly selected from among those patients followed up in OPD or admitted in ward.

Diagnosis of PPROM was confirmed by sterile speculum (Cusco's speculum) examination to reveal amniotic fluid leak through the cervical os and determination of amniotic fluid index (AFI). All patients were investigated for

(1) Hemoglobin.
(2) Total and differential counts.
(3) Blood group and Rhesus typing.
(4) Vaginal swab for culture and sensitivity for organisms.
(5) HIV, Hepatitis B, and VDRL.
(6) Obstetric Ultrasonographic examination.

In the absence of signs or symptoms of chorioamnionitis and/or abnormalities of fetal heart rate, PPROM was managed expectantly. All these patients were admitted in the ward and were given the expectant management practices which included mainly

(1) Bed rest.
(2) Antibiotics (Erythromycin 500 mg Q.I.D for 72 h followed by 250 mg Q.I.D for total of 2 weeks).
(3) Two doses of injection Betamethasone 12 mg intramuscular, 24 h apart for fetal lung maturity after ruling out any contraindication for its administration.

Tocolysis and digital examination were not permitted as patients suspected to be in labor were not included in our study. The ultrasound examination was done within 6 h of presentation. The growth parameters, estimated fetal weight, cervical length, internal os diameter, liquor quantity, placental localization, and MT were measured. The AFI was measured using the 4-quadrant technique.

The myometrium was sonographically identified as the echogenic homogeneous layer between the serosa and the decidua. The MT was noted at four different sites in millimeters (mm):

(1) Lower uterine segment (LUS) (approximately 2 cm above the reflection of urinary bladder).
(2) Midanterior uterine wall (1 cm above the maternal umbilicus).
(3) Uterine fundus (it was measured by keeping the scan probe above the uterine fundus).
(4) Posterior uterine wall (it was demarcated by using pulsations of maternal abdominal aorta as anatomic marker). This was the most difficult of all the four parameters as it was the furthermost measurement from the abdominal probe and obscured by fetal shadowing.

Each measurement was taken three times, and the mean value was taken for each uterine wall.

Patients with confirmed diagnosis of PPROM were monitored for evidence of chorioamnionitis. Also, biweekly total and differential counts were done to detect chorioamnionitis at an early stage. AFI was estimated periodically.

The latency interval is defined as the time period from the time of rupture of membranes (as reported by the patient) to the time of delivery.

Statistical analysis was done using student t test and Chi square test. A p value < 0.05 is considered significant.

Results

We have enrolled 100 cases, out of which 50 have presented as PPROM (28–36 weeks) and 50 were patients between 28 and 36 weeks without PPROM. In our study, maximum numbers of cases were in the age group of 20–25 years, accounting for 52 % of cases. Extremes of age accounted for 6 % of cases. Mean maternal age in our study was 26.2 ± 4.92 years. Relation between maternal age and PPROM was not found to be statistically significant (p value = 0.73) in our study.

In our study, PPROM occurred more in primigravidas (54 %) than multigravidas (46 %), but the difference was not statistically significant (p value = 0.68). In our study, 60.8 % of multigravidas were pregnant for the second time, 26.08 % for the third time, 8.69 % for the fourth time, and 4.34 % were grand multiparas. Mean parity was 1.18, and p value was 0.756 which was statistically insignificant.

In this study, 48 % patients presented at a gestational age between 28 weeks and 32 weeks, 34 % presented between 32 weeks plus 1 day and 34 weeks, and 18 % presented at gestational age beyond 34 weeks. Mean gestational age in our study was 32 weeks and 1 day.

We measured MT at four levels: anterior wall, posterior wall, fundus, and LUS in all 100 patients. Anterior wall (p value = 0.037) and fundal (p value = 0.035) MTs were found to be significantly thicker in PPROM cases than in controls as shown in Table 1. However, there was no significant difference between the LUS (p value = 0.129) and posterior wall thicknesses (p value = 0.059) in both groups.

In our study, we did not find any significant differences in cervical length between cases and controls. Mean cervical length in PPROM cases in our study was 3.58 ± 0.84 cm and in controls was 3.6 ± 0.79 cm, and the p value was 0.946 which is statistically insignificant.

Thirty-eight percent of our patients delivered within 24 h of leaking and 56 % within 48 h, 82 % in less than 7 days. Only 18 % patients continued pregnancy for 7 days and beyond. Mean latency interval in our study was 97.97 ± 153.78 h (4.08 ± 6.4 days). We observed that those patients who delivered within 48 h of PPROM had the mean gestation period of 32–34 weeks and those who delivered beyond 6 days had an average gestation period of 29.6 weeks. Hence, we found significant inverse relation between POG and latency interval (p = 0.001) implicating that the lesser the POG at the time of PPROM the longer the latency interval.

We also found a positive correlation between anterior wall MT (p value = 0.047), LUS thickness (p value = 0.000), and latency interval implicating that a thicker myometrium at admission in cases of PPROM predicts a longer latency period. However, no such relation was found between posterior wall (p value = 0.089) and fundal (p value = 0.519) MT. Table 2 shows that patients who delivered beyond 6 days had a thicker anterior wall and LUS compared to those who delivered early and compared to our controls. Also, the mean POG for the same group was 29.6 weeks, much less than for those who delivered within 12 h.

In our study, we did not find any significant relation between cervical length and latency interval in PPROM cases, p value = 0.261.

The relation between AFI and latency interval appears significant in this study implicating that PPROM cases with AFI more than 5 (n = 25, mean latency interval = 117.4 h) continued pregnancy for a longer time compared to their counterparts with AFI <5 (n = 25, mean latency interval = 78.54 h). However, this relation could not be proved significant statistically due to large variance in sample data, and hence, accurate p value could not be calculated.

Out of the 50 PPROM patients, 40 (80 %) went into spontaneous labor, and 8 (16 %) were induced with tablet misoprostol or oxytocin drip. Out of these 50 patients, 42 (84 %) delivered vaginally, and 8 underwent cesarean section. There were no instrumental deliveries. Maternal complications occurred in only 14 % cases of PPROM. 3 (6 %) patients had fever in the postnatal or post-op period. No case of frank chorioamnionitis was noted. It can be attributed to the fact that most of our patients reported early to the hospital, antibiotics were instituted early, and strict monitoring was done to detect any early sign of chorioamnionitis.

Discussion

PPROM affects 3 % of pregnancies and is responsible for one third of preterm births. In our study, we have aimed to study factors which could influence the latency interval and hence affect the course of PPROM and fetal outcome, and interpret whether these factors can be used as predictors to estimate the probable prolongation of time of delivery so as to give time for fetal lung maturity.

Mean maternal age in our study was 26.2 ± 4.92 years. Relation between maternal age and PPROM was not found to be statistically significant (p value = 0.73) which is in concordance with the study by Hamdi et al. [1]. Mean maternal age in their study was 27.2 ± 4.96 years. However, in a study by Buhimschi et al. [2], PPROM was more common in older woman, where the mean maternal age was 29.2 ± 1.2 years and p value was 0.028.

We did not find any statistically significant correlation between parity and PPROM (p value 0.756) which was in concordance with the studies by Buhimschi et al. [2], Kalantari et al. [3], and Hamdi et al. [1]

Table 1 Average MT in cases and controls in our study

Uterine wall	Our study	
	Controls (mm)	PPROM cases (mm)
Anterior wall	7.29 ± 0.43	8.18 ± 2.95
Posterior wall	7.566 ± 0.55	8.36 ± 2.91
Fundus	8.2 ± 0.69	9.22 ± 3.3
LUS	5.86 ± 0.8	5.34 ± 2.28

Table 2 Relation between MT, POG, and Latency Interval

Latency period	Number of patients	POG (weeks)	Anterior wall*	LUS Thickness*
<12 h	7	33.6	7.5	4
12–24 h	12	32	6.92	4.63
25–48 h	9	33.3	7.44	4.63
49–144 h	13	31.5	8.56	5.16
>144 h	9	29.6	10.58	8.27

* In mm

In our study, anterior wall (p value = 0.037) and fundal (p value = 0.035) MT were found to be significantly thicker in PPROM cases than in controls. Our results were supported by Buhimschi et al. [2] who reported that myometrium was significantly thicker in PPROM cases compared with preterm controls at anterior wall and fundus. K. Hamdi et al. [1] reported no significant difference in MT between PPROM cases and controls.

Mean latency interval in our study was 97.97 ± 153.78 h (4.08 ± 6.4 days) which was comparable to Buhimschi et al. [2] study done in Yale University, U.S.A, who reported a median latency interval of 4 days (96 h). Also, a study done by Seema et al. in India [4] shows a similar mean latency period of 4.84 ± 6.55 days.

As shown in Table 3, we found a significant inverse relation between POG and latency interval implicating that lesser the gestation age at the time of PPROM the longer the latency interval, which is supported by studies of Buhimschi et al. [2] and Seema et al. [4]. However, Hamdi et al. [1] did not find any significant relation between the two.

We found a positive correlation between anterior wall MT, LUS thickness, and latency interval. However, no such relation was found between latency interval and posterior wall and fundal MT as shown in Table 4.

The study by Buhimschi et al. [2] showed that thick myometrium in nonlaboring patients with PPROM is associated with longer latency interval. A study by Atarjavdan L et al. [5] proved a positive correlation between latency interval and the MT of fundus, mid anterior uterine wall, and LUS supporting our results. Hamdi [1] (p value > 0.05) and Kalantari [3] (p value > 0.2) found no significant relation between MT and latency period. Our study showed a direct correlation between AFI and latency interval similar to studies by Buhimschi et al. [2] and Caughey et al. [6], which is in contrast with Hamdi et al. [1] (p value = 0.217) and Seema et al. [4] (p value = 0.45).

Table 3 p Values of relation between POG and latency period in different studies

Study	p Value
Present study	0.001
Seema et al.	0.002
Hamdi	0.848

Table 4 p Values on comparison of MT and latency interval in different studies

Study	Anterior wall	Posterior wall	Fundus	LUS
Present study	0.047	0.089	0.519	0.000
Buhimschi et al. [2]	<0.001	0.05	0.001	–
Atarjavdan et al. [5]	0.001	–	0.02	0.001

We had maternal complications in 14 % cases of PPROM. PPROMEXIL -2 Trial [7] reported that the incidence of chorioamnionitis was higher in PPROM cases who underwent expectant management (31 %) compared to those who delivered or were induced to deliver immediately (18 %).

Conclusion

As the etiology of PPROM remains obscure, prevention is difficult, and hence, one has to concentrate more on its management where the antibiotics and steroids play a major role. In the present study, we found that the lesser gestational age at PPROM coupled with more AFI (>5) and thicker myometrium at anterior wall and LUS predict a longer latency interval so that the fetus can remain inside the best incubator known to mankind which is the maternal womb. Myometrial thickness has emerged as a promising tool to predict the latency interval and might be approved for regular use in future for the same.

Compliance with ethical requirements and Conflict of interest The research is in compliance with ethical standards. Permissions have been taken and is approved by the institutional ethical committee. The authors declare that they have no conflict of interest.

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