Sonographic Myometrial Thickness for Prediction of Latency Interval in Preterm Premature Rupture of Membrane

Shatha Sami Hussein* FICOG CABOG, **Manal Madany Abdulqadar*** FICOG CABOG,
Ekhlass Hussam Sabri Al-Rawi** FICOG CABOG

ABSTRACT

Background: Preterm labor still a main complication that may occur to the normal pregnancy in the presence of many risk factors and can lead to several health problems for both fetus and mother. Much effort done to prevent and decrease these complications.
Objective: To detect if measurement of myometrial thickness can be used to predict latency interval in preterm premature rupture of membrane.
Methods: Analytic-descriptive and case-control study conducted at Al-Yarmouk teaching hospital from the 1st of January, 2016 to the 1st of January 2017. Sixty pregnant women with gestational age from 28^{+0} - 40^{+6} weeks were involved in the study and were divided into two groups: (Group A) 30 pregnant women with PPROM, the case group, and (Group B) 30 term healthy pregnant women as control group. Amniotic membrane rupture was diagnosed by both speculum examination, and ultrasound proved the presence of oligohydramnios. Trans-abdominal ultrasound done for all patients by the same expert sonographist to measure the myometrial thickness at posterior, anterior and fundal uterine wall and amniotic fluid index. The interval from ultrasound time until delivery was calculated for all patient and result compared statistically.
Results: Descriptive analysis data between two groups revealed no significant differences regarding age, gravid, parity, while there was significant difference regarding gestational age P-value 0.0001. The difference between myometrial thicknesses between the two groups revealed that the mean of myometrial thickness in the mid anterior part of uterus was 10.64±0.60mm in preterm premature rupture of membrane group compared with 8.81±1.34 mm in group B (P-value 0.001). The mean of fundal myometrial thickness in group A was 11.23±0.88 compared with 8.41±1.12 in group B which was statistically significant (P-value 0.0001). The posterior myometrial was thicker in group A than group B. No significant relation with labor time and myometrial thickness in both studying group , p value were 0.062,0.061,0.776 for mid-anterior, fundal, posterior walls respectively in group A, while it was 0.443,0.191,0.475 for mid-anterior, fundal, posterior walls respectively in group B.
Conclusion: There was no significant correlation was found between myometrial thickness in fundal, anterior and posterior walls with latency period.
Keywords: Myometrial thickness, Preterm premature rupture of membrane, Latency period, Prematurity, Oligohydramnios.

Iraqi Medical Journal Vol. 65, No. 1, January 2019; p.7-13.

Premature rupture of membrane (PROM) is rupture of amniotic fluid membrane before the onset of uterine contraction or labor, and if it is occur before 37 completed weeks it is called preterm premature rupture of membrane (PPROM), with incidence of 3% of all pregnancies. About one third may end with preterm labor.

*Dept. of Obst. and Gyn., College of Medicine, Al-Mustansirya University, Baghdad.
**Dept. of Obst. and Gyn., Al-Yarmouk Teaching Hospital, Baghdad.

Preterm births account for approximately 70% of neonatal deaths, 36% of infant deaths and 25-50% of cases of long-term neurological impairment in children[(1)]. Appropriate assessment and early diagnosis and treatment are very helpful for improving neonatal outcomes.

Assessment of cervical dilation is done by using speculum rather than digital examination as this may be associated with an increased latency period and decrease adverse effect. There are different

strategies for treatment, which depend mainly on gestational age. Corticosteroids can improve lung maturity, decrease the incidence of respiratory distress syndrome and antibiotics had an important role for increasing the latency period (LP)[2].

PPROM may end with preterm labor[3] that commonly occur after a short period after rupture of membrane. Occasionally, when small amount of liquor leaked, infection may not developed, uterine contractions may not occur for a few days or longer. Usually, if PROM occurs late in pregnancy, the onset of labor occur early [4] with 6-8% incidence of preterm labour[5].

Many efforts done to decrease this complication, prolongation in LP to earn more time for lung maturity. One of the measures used through tocolytic drug and enhancement of lung maturity by administration of steroid[6]. LP is the time from membrane rupture until delivery[7].

Methods

It was analytic-descriptive and case-control study done in Al Yarmouk teaching hospital from 1st January 2016 to 1st of January 2017.

Sixty pregnant women with gestational age from 28^{+0} - 40^{+6} weeks were involved in the study and were divided into two groups: (Group A) 30 pregnant women with PPROM, the case group, and (Group B) 30 term healthy pregnant women as control group.

Exclusion criteria: patient with medical disease like hypertension, patients on tocolytic, pregnancies with fetal anomalies, intra-uterine growth restriction or antepartum hemorrhage were also excluded.

Detailed history was taken, body mass index (BMI) was measured, general, abdominal and speculum examinations were done for all participants.

Amniotic membrane rupture was diagnosed by both speculum examination which revealed leaking and pooling of fluid and ultrasound proved the presence of oligohydromnios.

Verbal consent was obtained from all patients enrolled in the study. Trans-abdominal ultrasound done for all patient by the same expert sonographist to measure the myometrial thickness at posterior, anterior, fundal uterine wall and AFI. The interval from ultrasound time until delivery (LP) was calculated for all patients and the results were compared statistically.

Analysis of data was performed by using statistical package of SPSS-24 (Statistical Packages for Social Sciences- version 24). Data were demonstrated as measurements of frequency, percentage, mean, standard deviation, and range. Student's-t-test used for detecting the significance of difference of different means (quantitative data) or two dependent means tested by using paired-t-test, ANOVA test for difference among more than two independent means. Pearson correlation was calculated for the correlation between two quantitative variables with its t-test for testing the significance of correlation. Statistical significance was considered whenever the P value was equal or less than 0.05.

Results

Sixty pregnant women with gestational age from 28^{+0} - 40^{+6} weeks were involved in the study and were divided into two groups: (Group A) 30 pregnant women with PPROM, the case group and (Group B) 30 term healthy pregnant women as control group.

Table 1 shows descriptive analysis to data between two groups which revealed no significant differences regarding age, gravid, parity, while logically there was significant difference regarding gestational age P-value 0.0001.

Figure 1 shows the differences between myometrial thickness between the two groups which revealed that the mean of myometrial thickness in the mid anterior part of uterus was 10.64±0.60 mm in group A compared with 8.81±1.34 mm in the group B (P-value 0.001).

The mean of fundal myometrial thickness in group A was 11.23±0.88 compared with 8.41±1.12 in group B which was statistically significant (P-value0.0001).

The posterior myometrial was thicker in group A than group B.

Table 2 shows correlation between myometrial thickness (mid anterior) in the two group with age, parity, gestational age, labor time and reveals no significant correlation between the two group, even with labor time according to p value. The P-value is 0.062 in relation to labor time in group A, while it is 0.443 in group B.

Table 3 shows correlation between fundal myometrial thickness in the two groups with age, parity, gestational age, labor time and reveals no significant difference between the two studying groups according to p value which is 0.061 in relation to labor time in group A and 0.191 in group B.

Table 4 shows correlation between posterior myometrial thickness in the two groups with age, parity, gestational age, labor time and reveals no significant difference between the two groups, with p value 0.776 in group A in relation to labor time while it's 0.475 in group B.

Table 1: Descriptive analysis of data.

		Group A (PPROM)	Group B (control)	P value
		No. (%)	No. (%)	
Age (years)	<20	1(3.3%)	4(13.3%)	0.610
	20-24	4(13.3%)	5(16.7%)	
	25-29	7(23.3%)	5(16.7%)	
	30-34	9(30.0%)	6(20.0%)	
	35-39	7(23.3%)	6(20.0%)	
	≥40	2(6.7%)	4(13.3%)	
	Mean ±SD(Range)	30.8±6.3 (19-42)	29.9±7.9 (17-42)	0.603
Gravida	1	1(3.3%)	5(16.7%)	0.155
	2	3(10.0%)	7(23.3%)	
	3	7(23.3%)	7(23.3%)	
	4	7(23.3%)	3(10.0%)	
	≥5	12(40.0%)	8(26.7%)	
	Mean ±SD(Range)	4.2±1.6 (1-8)	3.4±2.1 (1-8)	0.117
Para	Primi	1(3.3%)	8(26.7%)	0.162
	P1	7(23.3%)	5(16.7%)	
	P2	7(23.3%)	6(20.0%)	
	P3	6(20.0%)	5(16.7%)	
	P4 &more	9(30.0%)	6(20.0%)	
	Mean ±SD(Range)	2.6±1.5 (0-6)	1.9±1.6 (0-5)	0.085
Gestational age (weeks)	28- 29^{+6}	9(30.0%)	--	
	30- 31^{+6}	9(30.0%)	--	
	32- 33^{+6}	5(16.7%)	--	
	34- 36^{+6}	7(23.3%)	--	
	≥37	-	30(100.0%)	
	Mean ±SD(Range)	30.4±2.4 (27-35)	37.9±1.0 (37-40)	0.0001*

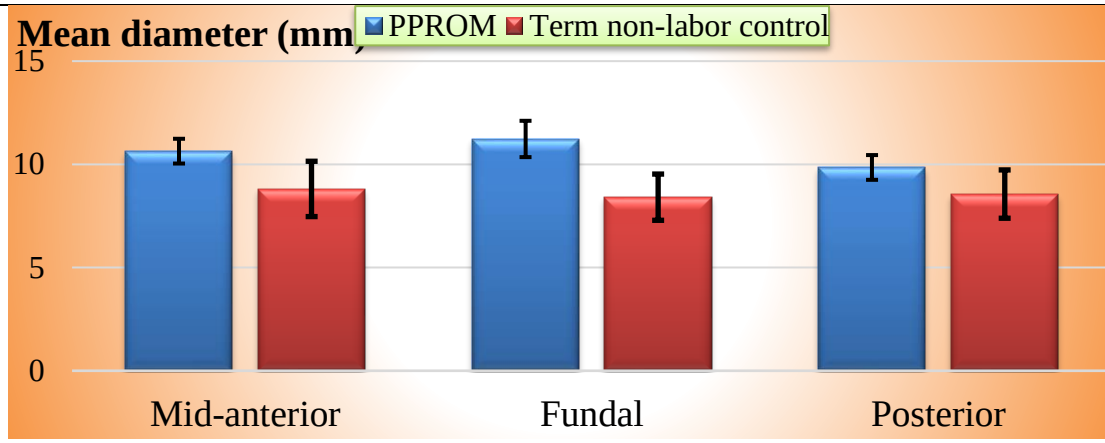

Figure 1: Mean of myometrial thickness in the studying group.

Table 2: Correlation between mid-anterior myometrial thickness in the two groups with age, parity, gestational age, labor time.

		Group A (PPROM)		Group B (control)	
		Mid-anterior		Mid-anterior	
		No.	Mean ±SD	No.	Mean ±SD
Age (years)	<20	1	10.00±	4	8.88±1.65
	20-24	4	10.83±0.93	5	8.98±1.78
	25-29	7	10.40±0.57	5	9.00±1.58
	30-34	9	10.78±0.66	6	8.17±1.03
	35-39	7	10.70±0.41	6	9.17±1.47
	≥40	2	10.55±0.35	4	8.73±.68
Gravida	1	1	10.00±	5	7.86±1.38
	2	3	10.57±0.51	7	9.21±1.41
	3	7	10.94±0.68	7	8.93±1.10
	4	7	10.54±0.82	3	9.67±1.53
	≥5	12	10.58±0.40	8	8.63±1.33
Para	Primi	1	10.00±	8	8.29±1.51
	P1	7	11.00±0.61	5	9.30±1.21
	P2	7	10.50±0.44	6	8.58±1.11
	P3	6	10.63±0.87	5	9.40±1.52
	P4 & more	9	10.53±0.44	6	8.83±1.37
Gestation age (weeks)	<28	3	11.03±0.95	-	-
	28-	9	10.47±0.41	-	-
	30-	8	10.75±0.39	-	-
	32-	5	10.66±0.84	-	-
	34-	5	10.50±0.78	-	-
	≥37	-	-	30	8.81±1.34
Labor Time (hours)	24-	3	9.97±0.42	10	8.52±1.51
	48-	6	10.62±0.84	3	8.00±1.73
	72-	7	10.39±0.46	7	9.01±1.46
	96-	7	10.73±0.26	4	8.63±0.75
	120-	3	11.27±0.64	2	8.75±0.35
	≥144	4	10.98±0.37	4	10.00±0.82

Table 3: Correlation between fundal myometrial thickness in the two groups with age, parity, gestational age, labor time.

		Group A(PPROM)		Group B (control)	
		Fundal		Fundal	
		No.	Mean ±SD	No.	Mean ±SD
Age (years)	<20	1	11.20±	4	8.23±0.52
	20-24	4	11.13±0.75	5	8.88±1.60
	25-29	7	11.14±1.04	5	8.74±0.85
	30-34	9	11.38±0.97	6	8.10±1.30
	35-39	7	10.99±0.93	6	8.22±1.16
	≥40	2	11.95±0.07	4	8.38±1.21
Gravida	1	1	11.40±	5	8.68±1.10
	2	3	12.20±0.61	7	8.81±1.19
	3	7	11.34±0.75	7	7.89±0.86
	4	7	11.13±1.01	3	9.20±0.69
	≥5	12	10.97±0.88	8	8.06±1.26
Para	Primi	1	11.40±	8	8.79±1.27
	P1	7	11.49±1.08	5	8.54±0.81
	P2	7	11.49±0.81	6	8.02±1.01
	P3	6	10.93±0.80	5	8.66±0.82
	P4 & more	9	11.01±0.90	6	8.00±1.48
Gestation age (weeks)	<28	3	11.03±0.71	-	-
	28-	9	11.39±0.97	-	-
	30-	8	10.90±0.76	-	-
	32-	5	11.42±0.96	-	-
	34-	5	11.40±1.08	-	-
	≥37	-	-	30	8.41±1.12
Labor Time (hours)	24-	3	11.33±0.83	10	8.89±0.93
	48-	6	11.72±0.77	3	7.97±0.06
	72-	7	11.50±0.56	7	7.70±1.04
	96-	7	10.70±1.15	4	7.98±0.82
	120-	3	10.30±0.52	2	8.80±0.42
	≥144	4	11.58±0.51	4	9.05±1.86

Table 4: Correlation between posterior myometrial thickness in the two groups with age, parity, gestational age, labor time.

		Group A(PPROM)		Group B (control)	
		Posterior		Posterior	
		No.	Mean ±SD	No.	Mean ±SD
Age (years)	<20	1	10.20±	4	8.88±0.83
	20-24	4	9.35±0.47	5	8.74±1.41
	25-29	7	9.81±0.61	5	8.82±0.92
	30-34	9	10.09±0.56	6	8.18±1.00
	35-39	7	9.81±0.74	6	8.62±1.70
	≥40	2	9.90±0.14	4	8.15±1.18
Gravida	1	1	9.30±	5	9.00±1.00
	2	3	10.00±0.53	7	8.03±1.21
	3	7	9.86±0.66	7	8.17±0.90
	4	7	9.91±0.67	3	9.03±1.12
	≥5	12	9.83±0.61	8	8.90±1.39
Para	Primi	1	9.30±	8	9.03±0.90
	P1	7	9.96±0.59	5	7.36±0.67
	P2	7	9.73±0.61	6	8.57±1.19
	P3	6	10.00±0.69	5	8.34±0.86
	P4 & more	9	9.83±0.61	6	9.10±1.48
Gestation age (weeks)	<28	3	10.30±0.46	-	-
	28-	9	9.74±0.49	-	-
	30-	8	9.63±0.71	-	-
	32-	5	9.96±0.83	-	-
	34-	5	10.04±0.30	-	-
	≥37	-	-	30	8.56±1.17
Labor Time (hours)	24-	3	10.03±0.59	10	8.94±1.06
	48-	6	10.02±0.63	3	8.53±1.33
	72-	7	9.76±0.39	7	7.83±1.28
	96-	7	9.89±0.78	4	8.68±0.59
	120-	3	10.00±0.69	2	8.10±1.56
	≥144	4	9.48±0.61	4	9.00±1.41

Discussion

PPROM is responsible of about one third of preterm labors that can result in a significant fetal adverse effects and mortality. The value of this study is that we tried to find valuable tool to predict preterm delivery in pregnant women with PPROM without increasing maternal or perinatal risk.

In this study, we use ultrasound, which is a simple, available, non-invasive tool to assess the myometrial thickness (MT) at mid-anterior, fundal and posterior walls of uterine body.

In this study, the median latency period (LP) was 68.6 ± 93.3 h in PPROM group that is higher than Gire et al[8] (2002) that was 48 h and lower than Hamdi et al[9] (2010) that was 10 days. Although the

median latency interval in term non labor control group was 85.7± 64.2 h which is not significantly shorter than that in control group, it was revealed a significant inverse correlation with the gestational age (GA), so the shorter GA associated with the longer LP and its comparable to Gupta et al[10] (2016) study.

Pregnant women in PPROM group in this study revealed a uniform thickness of uterine body with a median mid-anterior uterine thickness was 10.64 ±0.60 mm, median fundal thickness was 11.23 ± 0.88 mm, and the median posterior wall thickness was 9.85 ± 0.6 mm that were significantly thicker compared to the term control group (p value= 0.0001). These result is similar to that obtained by Buhimschi et al[11] (2005) study.

This study revealed no significant relation between LP and MT in mid-anterior, fundal, and posterior wall which was comparable with Kalantari et al[12] (2010) and Hamdi et al (2010) finding, but it didn't comply with Buhimschi et al (2005) finding that has been hypothesized that a thickened myometrium at the time of PPROM, a longer LP and then supported by Merdun et al[13] (2014) and Gupta et al (2016) that found a positive correlation between MT and LI (p value = 0.000), so further larger studies are needed for judgment

In conclusion; There was no significant correlation was found between myometrial thickness in anterior, posterior and funds with latency interval.

References

1. American college of Obstetricians and Gynecologists. Practice bulletin no. 159: management of preterm labour. Obstet Gynecol. 2016 Jan.127(1):e29-38.
2. Caughey AB, Robinson JN, Norwitz ER. Contemporary diagnosis and management of preterm premature rupture of membranes. Reviews in Obstetrics & Gynecology. 2008;1(1):11-22.
3. Mercer BM. Preterm Premature Rupture of the Membranes: Diagnosis and Management. Clin Perinatol 2004; 31(4):765–782, vi.
4. Behrman RE, Butler SA. Preterm birth: Causes, consequences, and prevention. National Academic Press, ISBN, Washington, DC. 2007.
5. Dewhurst, John, Edmonds, D. Keith, Dewhurst's Textbook of Obstetrics & Gynaecology.preterm labour 2012, 8th ed.338.
6. Haas DM,ImperialeTF,Kirkpatrick PR,Klein RW,Zollinger TW, Golichowski AM. Tocolytic therapy: a meta-analysis and decision analysis. Obstet Gynecol 2009;113:585-94.
7. Gopalani S, Krohn M, Meyn L, Hitti J, Crombleholma WR. Contemporary management of preterm premature rupture of membranes: determinants of latency and neonatal outcome. Obstet Gynecol 2005;60:16-7.
8. Gire, C., P. Faggianelli, C. Nicaise, R. Shojai and A. Fiori et al. Ultrasonographic evaluation of cervical length in pregnancies complicated by preterm premature rupture of membranes. Ultrasound Obstet Gynecol 2002; 19: 565-9.
9. Hamdi K, Bastani P, Saheb-Madarek EO, et al. Prediction of latency interval in preterm premature rupture of membranes using sonographic myometrial thickness. Pak J Biol Sci 2010;13(17):841-6.
10. Richa Gupta, Ajit Nagarsenkar. Using sonographically estimated myometrial thickness in prediction of latency interval in cases of preterm premature rupture of membranes (PPROM). J Obstet Gynaecol India 2016; 66(6): 431-5.
11. Buhimschi, CS, IA Buhimschi, ER Norwitz, AK Sfakianaki, B Hamar et al. Sonographic myometrial thickness predicts the latency interval of women with preterm premature rupture of the membranes and oligohydramnios. Am J Obstet Gynecol 2005; 193: 762-70.
12. Kalantari M, et al. Correlation between myometrial thickness and the latency interval in preterm premature rupture of membranes. Iran J Radiol 2010;7(4):215-9.
13. Z. Merdun, I Mendilcioglu, CY Sanhal, M. Diagnostic value of myometrial thickness in pregnancies with threatened preterm labour 2014; 44: 75.