PREDICTION OF RISK FOR PRETERM DELIVERY BY ULTRASONOGRAPHIC MEASUREMENT OF CERVICAL LENGTH AT HASAN SADIKIN HOSPITAL

***Budi Handono, Jusuf S. Effendi**

Department of Obstetrics and Gynecology Faculty of Medicine
Padjadjaran University/ Dr. Hasan Sadikin Hospital, Bandung
*Email: budihandono9@yahoo.com; Phone: +62 816 4865 380

ABSTRACT

Objective: To predict preterm delivery with accurate assessment of cervical length by transvaginal ultrasonography.

Design: Descriptive observational.

Methods: All patients who admitted with preterm labor and fullfilled the inclusion criteria were studied using transvaginal ultrasonography for cervical length measurement since January until December 2001. The relation between the length of cervix and the period of preterm delivery were evaluated.

Results: During the study period, there were 33 cases consisted mostly with primigravida. The mean of age was 25 (± 5) years old and the mean of gestational age was 32.8 (± 2.5) weeks. The mean of cervical length with funnelling was 2.25 (± 0.58) cm and without funnelling was 2.37 (± 0.54) cm. The overall mean of cervical length was 2.25 (± 0.55) cm. On this cervical length, there were 8 cases delivered equal or less than 7 days and 25 cases delivered more than 7 days. The cut off point of cervical length was less than 2 cm for preterm delivery equal or less than 7 days. A highly significant correlation was shown between length of delivery with cervical length and gestational age. Length of delivery increased as the cervical length got longer. Whereas, length of delivery decreased with the increasing of gestational age. The mean of length of delivery was 20.6 days for the mean of gestational age 32.8 weeks and cervical length 2.25 cm.
Conclusion: Cervical length has good positive correlation with the length of delivery.

Keywords: Preterm delivery, cervix, transvaginal

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INTRODUCTION

For many years, it has been recognized that preterm birth is an important cause of perinatal morbidity and mortality.[1-3] In the past 20 years, we have seen many advances in perinatal medicine, however there has been no appreciable reduction in the incidence of preterm birth.[4]

Several studies have noted that preterm delivery is more common among women with premature cervical effacement in which could be recognized by ultrasound examination.[1-3]

Ultrasound has been promoted as a tool that provides a more precise, objective, reliable, and repeatable measurement of cervical length.[5,6] With the invention of transvaginal ultrasonography, it is possible to measure cervical length without the confounding effect of bladder filing.[5]

Our earlier study showed that transvaginal ultrasonograpy could provide precise measurements of cervical length and improved image resolution, as it uses a higher frequency transducer adjacent to the cervix.[5,6] Because of these factors, transvaginal ultrasound obtains clearer and more reproducible images and therefore is the preferred method of assessing cervical length. [3,5,7]

Investigators have examined the use of transvaginal ultrasound for premature labor surveillance in patient to compare risk of preterm birth relative to cervical effacement.[1-3,5,6] We hypothesized that cervical effacement (funnelling) is associated with the increased risk of preterm delivery, and that transvaginal ultrasonography measurement of cervical length provides a better estimation of preterm delivery risk.

METHODS

During the period of January until December 2001, women with gestational ages between 20 and less then 37 weeks admitted to the antepartum service with the diagnosis of threatened preterm labor were approached for enrolment in the study. Suspected preterm labor was defined as regular uterine contraction with cervical change (dilatation, effacement, or change in consistency) noted on pelvic examination. Patients were recruited only after threatened preterm uterine contraction was detected (i.e., if intravenous tocolysis was used). Its course has been completed as contraction had resolved.

We excluded patients in advanced labour in whom the diagnosis of preterm labor was not in question. Other exclusion criteria included active vaginal bleeding, placenta previa, rupture of membranes, cervical cerclage, multiple gestation, known stillbirth, and cervical dilatation greater than 3 cm.

Transvaginal ultrasound was performed by one of investigators not involved in patient's care. After maternal bladder was empty, the cervical length was measured in the sagital plane after visualizing simultaneously the internal and external cervical os. Next suprapubic pressure was applied (displacing the presenting fetal part) to determine whether funnelling occurred, defined as a "v" or "u" shaped indentation of the internal os by the amniotic membranes.

The primary outcome of the study was spontaneous premature delivery (at less than 37 weeks of gestation). Gestational age was determined by known last menstrual period. The sample size for this study comprises all patients that admitted with preterm labour and fulfilled inclusion criteria during the period of study.

For statistical analysis, variables were described and compared with Student *t* test. Comparisons were conducted between the funnelling (+) group and funnelling (-) group in

association with the time of delivery before or after seven days of observation, the cut off point in cervical length was determined. Regression correlation was used to determined the relationship between the time of labour, gestational age, and funnelling. $P < 0.05$ was considered to indicate statistical significant. A regression formula is then extracted to predict the time of preterm delivery.

RESULTS

Table 1. Characteristics of study subjects

	N	%
Age (year)		
< 20	3	9.1
20 – 24	12	36.4
25 – 29	13	39.4
> 30	5	15.1
X (SD)	25.2 (5.1)	
Range	17 – 38	
Parity		
0	20	60.6
1	9	3
> 2	4	36.4
Gestational age (weeks)		
< 30	5	15.2
31 – 34	14	42.4
> 34	14	42.4
X (SD)	32.8 (2.5)	
Range	27 – 35	

The age range of study subjects were 27-35 years old, with the mean of age was 25.2 years old and most of subjects were in 25-29 groups (Table 1). Most of cases were primigravida with the gestational age ranged 27-35 weeks and the mean of gestational age was 32.8 weeks.

Cervical length by transvaginal ultrasonography ranged in 0.95-3.09 cm with the median value of 2.25 (Table 2). In the case of funnelling (+) the median value was 2.13 and funnelling (-) was 2.37. Labour less the 7 days occurred in 8 cases and more than 7 days occured in 25 cases. Range of time labor in days was 3-96 days with the median value of 24 days.

Table 2. Cervical length by transvaginal ultrasonography and time of labor

	Result
1. Funnelling (+)	
X (SD)	2.13 (0.58)
Range	0.90 – 2.98
2. Funnelling (-)	
X (SD)	2.37 (0.54)
Range	1.00 – 3.20
Cervical length (mean)	
X (SD)	2.25 (0.55)
Range	0.95-3.09
3. Time of labor (days)	
X (SB)	28 (21)
Median	24
Range	3 – 96
< 7 days	8
> 7 days	25

X (SD) : mean and standard deviation

Table 3. Length of cervix and time of labor

Transvaginal USG	Time of labor (days)	
	< 7	> 7
1. Funnelling (+)		
< 1.5	5	1
1.5 – 2.0	3	1
2.1 – 2.5	-	14
> 2.5	-	9
X (SD)	1.35 (0.38)	2.38 (0.36)
Range	0.9 – 1.84	1.2 – 2.98
2. Funnelling (-)		
< 1.5	3	1
1.5 – 2.0	5	-
2.1 – 2.5	-	11
> 2.5	-	13
X (SD)	1.68 (0.39)	2.48 (0.36)
Range	1.00 – 2.00	1.35 – 3.09
Mean of Funnelling (+) & (-)		
< 1.5	3	1
1.5 – 2.0	5	-
2.1 – 2.5	-	11
> 2.5	-	13
X (SD)	1.51 (0.37)	2.48 (0.36)
Range	0.95 – 1.92	1.35 – 3.09

In the group of funnelling (+), labor less than 7 days happened in 1.35 days as median value, and labor more than 7 days happened in 2.38 days as median value (Table 3). In the group of funnelling (-), labor less than 7 days happened in 1.68 days as median value and labor more than 7 days happened in 2.48 days. From table above the cut off point for funnelling that predicts labor of prematur delivery < 7 days was < 2 cm.

Table 4. Correlation between time of labor, gestational age and funnelling

Correlation between variabel	Regresion Formula
1. Time of labor, gestational age and Funnelling (-)	Log TL = 1.7614-0.0497 GA + 0.4867 F(-) (r = 0.704 ; p < 0.001)
2. Time of labor, gestational age and Funnelling (+)	Log TL = 1.8494-0.0471 GA + 0.4726 F(+) (r = 0.726 ; p < 0.001)
Time of labor, gestational age and mean of Funnelling	Log TL = 1.7988-0.0483 GA + 0.4882 F (r = 0720 ; p < 0.001)

TL = Time of labor
GA = Gestational Age (weeks)
F = Funnelling
r = Coefficient correlation multiple

Table 5. Prediction time of labor from various combination of gestational age and funnelling

Gestational age (weeks)	Funnelling (mean)*	Prediction time of labor (days)
28	1.5	15.1
	2.0	26.5
	2.5	46.4
	3.0	81.5
30	1.5	12.1
	2.0	21.2
	2.5	37.2
	3.0	65.2
32	1.5	9.7
	2.0	17.0
	2.5	29.9
	3.0	52.2
34	1.5	7.7
	2.0	13.6
	2.5	23.8
	3.0	41.8
35	1.5	6.9
	2.0	12.1
	2.5	21.3
	3.0	37.4

* Mean of Funnelling (+) dan (-)
For gestational age mean 32.8 weeks and funnelling mean 2.25 weeks
Log TL = 1.7988-0,0483 GA + 0.4882F
Log TL = 1.7988-0.0483(32.8)+ 0.4882(2.25)
TL (mean time of labor) = 20.6 days

Table 4 shows a significant correlation between time of labor with gestational age and funnelling. The formula is Log TL = 1.7614-0.0497 GA + 0.4867 F(-) (r = 0.704 ; p < 0.001) for the correlation between time of labor, gestational age, and funnelling (-) respectively (Table 5). For the time of labor, gestational age, and funnelling (-), the formula is Log TL = 1.8494-0.0471 GA + 0.4726 F(+) (r = 0.726 ; p < 0.001). If the funnelling is longer, the time of labor is also longer and the more advanced gestational age, the time of labor is reduced. Based on multiple regression formula (Table 4), premature delivery and time of labor from various gestational ages and length of funnelling could be predicted.

DISCUSSION

This study has demonstrated that measurement of cervical length provides sensitive prediction for preterm delivery. During the study period, there were 33 cases consisted mostly with primigravida with the mean of age 25 (± 5) years old and the mean of gestational age 32.8 (± 2.5) weeks. The mean of cervical length with funnelling was 2.25 (± 0.58) cm and without funnelling was 2.37 (± 0.54) cm. The overall mean of cervical length was 2.25 (± 0.55) cm. On this cervical length, there were 8 cases delivered equal or less than 7 days and 25 cases delivered more than 7 days. The cut off point of cervical length was less than 2 cm for preterm delivery equal or less than 7 days. Compared to previous study, it is supported that the cervical length distribution was skewed toward shorter length and median value around 38 mm.[3] A highly significant correlation was shown between length of delivery with cervical length and gestational age. Length of delivery increased as the cervical length got longer. Whereas, length of delivery decreased as the increasing of gestational age. The mean of length of delivery was 20.6 days for gestational age of 32.8 weeks and cervical length 2.25 cm. Other studies showed that sensitivity of cervical length to predict spontaneous preterm delivery was 100%, 80%, 47%, and 35% for 28, 30, 32, and 34 weeks, respectively, for cervical length up to 25 mm.[3] It is quiet the same with our findings that the median value of cervical length is 2.25 cm.

Our previous study demonstrated that cervical length was associated with ethnic group, maternal age, ponderal index, and past obstetric history.[7] Survival of preterm infants depends mainly on gestational age at delivery; survival increases form less than 5% for those who were born at 23 weeks of gestation to more than 95% for those who were born at 32 weeks of gestation.[2-3].The risk of severe handicap in survivors decreases from more than 60% for those who were born at 23 weeks of gestation to less than 5% for those who were born at 32 weeks of gestation.[3,5] Hence, it is extremely important to predict the risk of preterm delivery. We found that the only contributor in predicting early preterm delivery is cervical length, and it could be predicted before the time of delivery. Consequently, cervical assessment provides sensitive prediction of spontaneous delivery.[3,5,7] These findings support the previous studies which showed that the cervix maintained its physiological role as an effective barrier to early preterm delivery until its length was shortened to less than one third of the average.[1-3]

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