

PREDICTION OF PROLONGED PREGNANCY IN NULLIPAROUS WOMEN BY TRANSVAGINAL ULTRASOUND MEASUREMENT OF CERVICAL LENGTH AT 37 WEEKS OF PREGNANCY

By

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ABSTRACT

Background: Prolonged pregnancy occurs in approximately 10% of all singleton pregnancy and is associated with an increased risk of foetal macrosomia, intrapartum fetal cardiac abnormalities, meconium staining, perinatal death, and cesarean delivery.

Objective: To detect the relationship between transvaginal ultrasound measurement of cervical length at 37 weeks of pregnancy and prolonged pregnancy in nullipara.

Patients and Methods: This was a prospective study of women attending Mataria teaching hospital was conducted from January 2019 to December 2019. The study included 120 women at 37 weeks of gestation observed till time of delivery. Gestational age was determined from the menstrual history and confirmed by an ultrasound scan and measurement of the crown–rump length in the first trimester, or the head circumference in the second trimester.

Results: This study showed that cervical length at weeks can predict the likelihood of prolonged pregnancy and is associated with the gestation at spontaneous onset of labor in low-risk nulliparous women and the best cut-off value for prediction of prolonged pregnancy was 3.3cm with a sensitivity of 80% and specificity of 83.1.

Conclusions: Transvaginal ultrasound measurement of cervical length at 37 weeks of pregnancy is important for prediction of the duration of pregnancy in primigravidae.

Key words: Prolonged Pregnancy, Cervical Length, 37-week Scan Ultrasonography.

INTRODUCTION

Prolonged pregnancy is a common obstetrical problem and it is one of the causes of anxiety for women and obstetricians. It is a common situation and is perceived as being a cause of increased fetal, maternal and neonatal risks. It is defined by the world health organization

and the international federation of gynecology and obstetrics (FIGO) as pregnancy of more than 294 days from the last menstrual period (more than 42 completed weeks) (David *et al.*, 2010). Prolonged pregnancy is associated with an increase in perinatal mortality and morbidity (Rane *et al.*, 2011 and Oberg *et al.*, 2013).

Prolonged pregnancy is associated with increased risk of meconium aspiration, intrapartum fetal distress and fetal trauma due to fetal macrosomia (*Keith, 2012*). An early prediction of this condition is important; therefore there has been considerable interest in the development of tests for the prediction of prolonged pregnancy. These tests include fetal fibronectin, cytokine, or nitric oxide concentrations in cervicovaginal secretions and cervical length as determined by ultrasonography (*Ramanathan et al., 2010*). Cervical length is the distance between the internal os and external os and transvaginal ultrasound is the most amenable method to provide the highest degree of consistency for cervical measurement. Cervical length may vary in different populations depend on parity, gestational age, race, nutritional state, and obstetric complications (*Boon et al., 2012* and *Kortekaas et al., 2015*).

The aim of the present study was to detect the relationship between transvaginal ultrasound measurement of cervical length at 37 weeks of pregnancy and prolonged pregnancy in nullipara.

PATIENTS AND METHODS

This was a prospective study conducted at Mataria teaching hospital between January 2019 and December 2019. On 100 pregnant women attending the antenatal clinic were enrolled at 37 weeks.

Inclusion criteria nulliparas Singleton, uncomplicated pregnancy (no hypertension, diabetes, cardiac problem) Without gross congenital anomalies, gestational age 37 completed weeks,

absence of labor with no history of cervical dilation, live fetus with vertex presentation intact amniotic membrane and no history of uterine surgery use of progesterone, no polyhydramnios, no uterine anomalies, and no history of cervical operations.

Exclusion criteria include multi gravida patient, a patient had risk factor as hypertension, diabetes, cardiac problems, pre-mature rupture of membrane, patient in labor, mal presentation, congenital anomalies, dead fetus, history of uterine surgery, history of cervical operations, and history of progesterone use.

This study was approved by the institutional review board of our Mataria teaching hospital. Informed consent was obtained prior to enrollment in the study from every patient. The work was carried out for studies involving humans in accordance with the World Medical Association's Code of Ethics (Helsinki Declaration).

All selected participants were subjected to full detailed medical history, complete clinical examination, and laboratory investigations (CBC, BG, RH& Urine analysis, RBS). Gestational age was determined from the menstrual history, and confirmed by an ultrasound scan and measurement of the crown-rump length in the first trimester or the head circumference in the second trimester. Ultrasound examination was carried out routinely at 11-14 weeks and at 20-24 weeks of gestation. Scan was carried out at 20-24 weeks including fetal examination, and the option of having a transvaginal scan to measure cervical length as a screening test for spontaneous preterm delivery.

Transabdominal ultrasound study was applied for fetal biometry, measurement of the vertical distance of the deepest pool of amniotic fluid, determination of placental position and fetal presentation and examination by Doppler ultrasound to detect the end-diastolic flow in the umbilical artery.

Prolonged pregnancy was defined as a pregnancy that extended beyond 41 weeks and 2 days (289 days) patients who did not go into spontaneous onset of labor by that date. Week of gestation was defined as completed week; i.e., week 37 refers to 37.0 weeks to 37.6 weeks menstrual age.

Women were asked to empty their bladder and were placed in the dorsal lithotomy position. The probe was gently placed at the anterior fornix of the vagina to obtain a sagittal view of the complete cervix, including the internal os, external os, and endocervical canal.

All ultrasound measurements were performed by using VOLUSON 730 PROV, ultra-sound machine equipped with a 3.5-MHz convex transabdominal probe and 7.5-MHz vaginal probe. Ultrasound examinations were done by a single operator to avoid inter observer

variability. Cases were managed and followed up by their respective doctors according to protocol of Zagazig university hospital as induction of labor at 41 weeks+0 of pregnancy.

Statistical Methods:

Data collected throughout history, basic clinical examination, laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) software for analysis. According to the type of data qualitative represent as number and percentage, quantitative group represent by mean \pm SD median, and range, the following tests were used to test differences for significance; difference and association of qualitative variable by Chi square test (χ^2). Differences between quantitative independent groups by t test. P value was set at <0.05 for significant results. Receiver operating characteristic (ROC) curves were graphical plot which illustrates the performance of a binary classifier system as its discrimination threshold varied.

RESULTS

During the study period, 100 consecutive women met the inclusion criteria in this study. (84%) of them delivered at or before 42 weeks, 52 women (62%) delivered vaginally, 32 women (38%) delivered by CS due to failure of progress. In 16 women (16%) that remained undelivered beyond 42 weeks +0 day had induction of labor and

ended by CS due to failure of progress. Cervical length measured in all women and mean cervical length at 37 weeks were $27.67\text{cm} \pm 2.96\text{cm}$.

Age was distributed as 25.07 ± 2.5 with minimum 18 and maximum 29, GA was 38.6 ± 1.61 with minimum 37 and maximum 42, all of them were zero parity (**Table 1**).

Table (1): Age and GA distribution among studied group (N=100)

	Age	GA
Mean± SD	25.07±2.5	38.6±1.61
Median (Range)	26.0 (18-29)	38.0 (37-42)

There was 24% had post-partum hemorrhage (Table 2).

Table (2): Post-partum hemorrhage distribution

	N	%
Post hemorrhage	No	76
	Yes	24
	Total	100

Post term significantly associated with CS, post-partum Hemorrhage, Macrosomia, low APGAR and MAS (Table 3).

Table (3): Relation with POST term.

Parameters		Relations		Total	P
		Term	Post		
Type	CS	N	31	12	0.005*
		%	36.9%	75.0%	
	V	N	53	4	
		%	63.1%	25.0%	
Post heamorrhage	No	N	71	5	0.00**
		%	84.5%	31.2%	
	Yes	N	13	11	
		%	15.5%	68.8%	
Macrosomia	No	N	73	9	0.003*
		%	86.9%	56.2%	
	Yes	N	11	7	
		%	13.1%	43.8%	
Low APGAR	No	N	74	9	0.002*
		%	88.1%	56.2%	
	Yes	N	10	7	
		%	11.9%	43.8%	
MAS	No	N	78	11	0.005*
		%	92.9%	68.8%	
	Yes	N	6	5	
		%	7.1%	31.2%	
NICU	No	N	65	12	0.83
		%	77.4%	75.0%	
	Yes	N	19	4	
		%	22.6%	25.0%	
Total		N	84	16	
		%	100.0%	100.0%	100.0%

Inner to inner diameter significant lower in post term at 38 & 39, and

cervical length was significantly higher in post at all times (Table 4 & Figure 1).

Table (4): Inner to inner diameter and cervical length diameter distribution between post and normal term

	Post term	Normal term	P
INER_diameter37	38.87±1.78	39.46±2.88	>0.05
INER_diameter38	39.81±1.68	41.36±3.35	>0.05
INER_diameter39	40.68±1.7	43.38±4.0	0.01

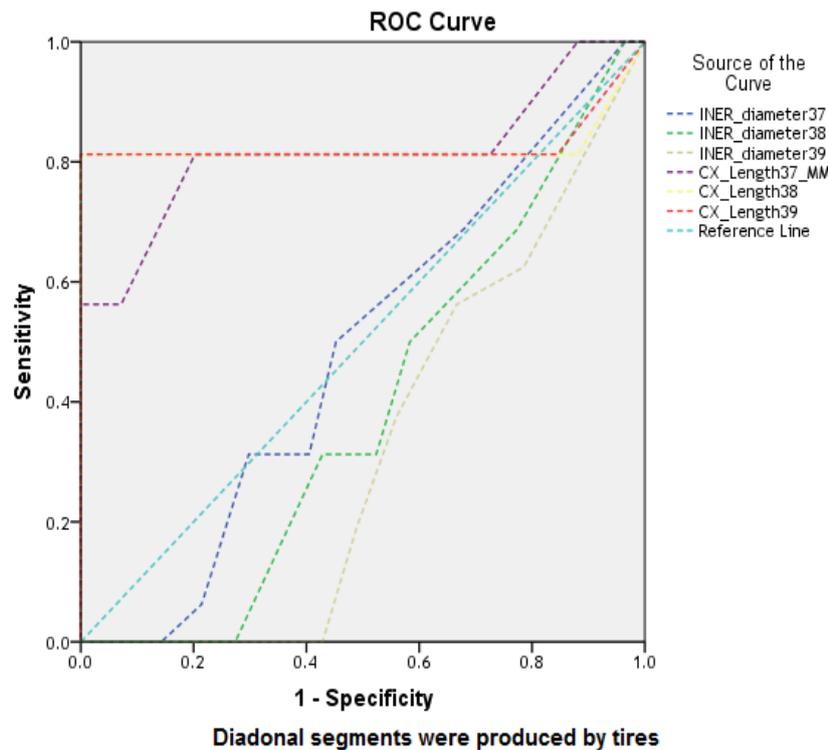


Figure (1): ROC curve for determination of cutoff of Inner to inner diameter and Cervical length regard post term

DISCUSSION

This study was conducted to assess the transvaginal measurement of cervical length at 37 weeks of gestation as a predictor of prolonged pregnancy. Age was distributed as 25.07±2.5 with minimum 18 and maximum 29, GA was 38.6±1.61 with minimum 37 and maximum 42, and all of them were zero parity. It was observed that mean cervical length of women delivered at or less than 41 weeks was significantly shorter than those delivered after 41 weeks. It was

observed also that cervical length was significantly longer in patients who had cesarean section after 41 weeks. In addition it was observed that cervical length is significantly shorter in women who delivered vaginally than those delivered by cesarean section before 41 weeks. This means that the longer cervix the more possibility for prolonged pregnancy and cesarean section. This could be useful in prediction of time of delivery and even in prediction of occurrence of cesarean section. In addition

this is can of great importance in counseling of the patients.

Similar observations were noted by *Suh et al. (2010)*, in their study which included 140 women they demonstrated that measurement of cervical length by TVS at 37 weeks, can predict prolonged pregnancy. Similar observations were noted by *Miura et al. (2010)*. They performed serial ultrasound examination of 234 women weekly from 37-40 weeks. They observed that there is progressive shortening and funneling of the cervix before onset of labor.

Digital cervical assessment using Bishop Score has been used to assess the cervical state in antenatal assessment at term or post-term because it is inexpensive and requires no equipment. However it may be subjected to inter-observer variability and ultrasound assessment may be objective and transcervical measurement is more predictive of success of induction of labor. However, the cut-off value of cervical length is debatable (*Miura et al., 2010* and *Park et al., 2011*).

In this study, Transvaginal ultrasound assessment of cervical length was highly accurate than digital assessment using the Bishop score and it was highly associated with occurrence by vaginal delivery greater than CS when the cervical length recorded " 2.48 cm, 3.7 cm and 4.5cm". these finding agrees with these reported by *Park et al. (2011)*, which reported that CL measurement by transvaginal ultrasound are better indicator for the risk of CS than digital vaginal examinations.

In the present study doing correlation between the three variables; "age, cervical length and time" of delivery, it was

observed that there significant correlation between age and cervical and time of delivery in women delivered by cesarean section. Women who had cesarean section were significantly older than those delivered vaginally.

However this was not observed in patients who delivered vaginally. Women who had vaginal delivery were only affected by the cervical length.

This may denote that shorter cervix is more predictive of vaginal delivery and the opposite is totally true. The longer cervix is predictive of cesarean section in addition to other factors like age.

These finding are in coincidence with those reported by *Suh et al. (2010)*, and with those reported by *Park et al. (2011)*.

Studying the correlation between the mode of delivery and CL. measured by Transvaginal ultrasound at 37weeks. This study showed that vaginal delivery was associated with a shorter cervical length rather than these associated with CS. Delivery (CL, 38.5, 40.8 mm respectively) these findings agrees with the results reported by *Miura et al. (2010)* who reported significant association between shorter CL. And funneling of cervix with the occurrence of vaginal delivery.

In this study, the cut off level value of cervical length which predicts time delivery at 41 weeks or more was 3.95 cm with a sensitivity of 90.9% and specificity of 77.1%. These results are different from these which reported by *Suh et al. (2010)* as sensitivity of 78% and specificity as 62% only. This was explained on the ground that, a cut off value of 30 mm, while it was 3.95 mm in our study. This can be explained by lower sensitivity and

specificity observed in their study which is 78% and a specificity of 62%.

CONCLUSION

Transvaginal ultrasound for measurement of cervical length at 37 weeks of gestation can predict prolonged pregnancy and prevent it by induction of labor prior to 42 weeks gestation. The presence of longer cervical length assessed by transvaginal ultrasound at 37 weeks is a good indicator for prolonged pregnancy.

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التنبؤ بالحمل المطول بقياس عنق الرحم بالموجات فوق الصوتية المهبلية فى الأسبوع 37 من الحمل للحالات التى لم تلد من قبل

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خلفية البحث: يعتبر الحمل المطول مشكلة شائعة وهى واحدة من أسباب القلق بالنسبة للنساء والأطباء. وهو حالة شائعة، ينظر إليها على أنها سبب لزيادة المخاطر على الجنين وصحة الأم. ويصاحب الحمل المطول زيادة فى معدلات الوفاة والإعاقة لدى حديثى الولادة. ويعتبر التنبؤ المبكر بالحمل المطول ذو أهمية, ومن ثم الإهتمام بتطوير إختبارات للتنبؤ بالحمل المطول مثل قياس طول عنق الرحم بالسونار المهبلية.

الهدف من البحث: فحص طول عنق الرحم بالموجات فوق الصوتية المهبلية فى الأسبوع 37 من الحمل وذلك لتوقع قرب موعد الولادة أو تأخره عن مواعده المتوقع.

المريضات وطرق البحث: تمت هذه الدراسة بمستشفى المطرية التعليمي بقسم التوليد وذلك فى الفترة من يناير 2019 وحتى ديسمبر 2019، وقد شملت الدراسة علي 100 حالة من الحوامل البكريات في الأسبوع 37 من الحمل حيث تم عمل الأتى لهن:

- فحص طول عنق الرحم باستخدام المجس المهبلية للموجات فوق الصوتية.
- متابعة الحمل حتى نهاية الاسبوع 42 من الحمل.
- حصر الحوامل اللاتي وضعن قبل 42 اسبوع وذلك اما بحدوث ولادة مهبلية تلقائية أو من خلال أحداث تحفيز للولادة أو إجراء عملية قيصرية، كما تم متابعة حديثى الولادة وتسجيل أى مضاعفات صحية لهم.

نتائج البحث: أوضحت قياسات طول عنق الرحم باستخدام المحبس المهبلية للأشعة التلفزيونية من الأسبوع 37 للحمل ان السيدات اللاتى وضعن قبل الأسبوع 42 كانت متوسط طول عنق الرحم أقصر (26.92 ± 1.96 مم) بدلالة إحصائية عن اللاتى وضعن بعد 42 أسبوع (31.56 ± 4.8 مم). كان طول مقياس عنق الرحم فى الاسبوع 37 من الحمل مؤشرا ذو دلالة إحصائية على طول مده الحمل، وفشل تحفيز الولاده، وزيادة نسبة حدوث العملية القيصرية. وكانت هناك علاقة طردية بين السن ومعدل حدوث الولادة القيصرية حيث وجد ان السيدات الحوامل الأكبر سناً خضعن لولادة قيصرية أكثر من السيدات الأصغر سناً.

الاستنتاج: استخدام قياس طول عنق الرحم عند الاسبوع 37 للحمل للسيدات البكرات عن طريق المجس المهبلية للأشعة التلفزيونية طريقة فعالة فى التنبوء بطول مدة الحمل والتشخيص المبكر لاستطالة الحمل.

الكلمات الدالة: الحمل المطول، قياس عنق الرحم، الموجات فوق الصوتية المهبلية فى الأسبوع 37 من الحمل.