Comparison between ultrasound measurement of uterocervical angle and cervical length for diagnosis of pretem labour

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Abstract: Background: Ultrasonic measurement of cervix length is the most commonly used method to predict premature birth featured as gradual change, easy to operate, and high sensitivity and specificity. For a long time, new diagnostic methods are tried to predict preterm births. Nicole Sochacki-Wojcicka proposed a new concept anterior uterocervical angle (ACA) referring to the angle between the line of internal cervix and lower segment of anterior uterine wall and the ligature between internal and external cervix. Previous investigations of ACA indicate that it may be a useful parameter to monitor the progression of the cervix towards a labor phenotype. **Aim of the work:** To evaluate whether uterocervical angle (UCA) can diagnose risk of preterm birth in singletons and to evaluate its performance for diagnosing preterm birth (PTB) in comparison to cervical length (CL). **Patients and Methods:** This study was conducted on 106 pregnant women at (16-23) attending antenatal care unite or admitted to Obstetrics and Gynecology Department at Al zahraa University Hospital from Dec 2016 to Oct 2018. Age, last menstrual period, week of gestation, gravida, parity, abortion, preterm labor history, previous cervical surgery, body mass index, and presence of chronic disease, were investigated, their Bishop scores were calculated, and cervical length and UCA measurements were performed by transvaginal ultrasound examination under optimal conditions. The patients were discharged after observation, examination and treatment processes. After the delivery, the week of gestation, delivery type, newborn's birth weight, sex and the need for intensive care unit were investigated. The pregnant women were divided into preterm group and mature group according to the pregnancy outcomes. **Results:** A total of 106 women were studied. The rate of PTB in this cohort was 33.1% for delivery <37 weeks and 66.9 for<37 weeks. ROC curve of UCA and CL was conducted for discrimination between term and preterm labor (at 37 weeks). Fair AUC for UCA was found (AUC = 0.716, p<0.001). At cut off value of 94.95, sensitivity was 51.4%, specificity was 94.4%, PPV was 81.8%, NPV was 79.8% and accuracy was 80.2%. Poor AUC for CL was found (AUC = 0.614, p=0.018). At cut off value of 3.85, sensitivity was 71.4%, specificity was 59.2%, PPV was 46.38%, NPV was 80.8% and accuracy was 63.2%. UCA was considered to be significantly better than CL for discrimination between term and preterm labor (at 37weeks) (p=0.048). Regression analysis revealed a significant association of BMI at delivery, prior preterm delivery, prior D & C, Incidence of CS and NICU admission with PTB and UCA. There was no correlation identified between maternal age, parity, natural conception and obesity at delivery on sPTB and UCA. **Conclusion:** The UCA is an objective and effective indicator to predict preterm birth in the second trimester measured by transvaginal ultrasound. The diagnostic value of measuring the UCA was better than that of measuring the cervical length in the same period.

1. Introduction:

Preterm labour is the presence of uterine contractions of sufficient frequency and intensity to affect progressive effacement and dilatation of the cervix prior to term gestation (between 20 and 37 wk).

Preterm labor precedes almost half of preterm births[1].

Preterm birth is the leading cause of neonatal morbidity and mortality worldwide. It accounts for 75% of neonatal deaths and 50% of long-term morbidity (including respiratory distress syndrome, intra ventricular haemorrhage and necrotizing enterocolitis) and long term compromise affecting mainly neurological system which are inversely related to the gestational age at birth[2].

According to WHO, 2016 (Nov), an estimated 15 million babies are born too early every year and almost 1 million children die each year due to complications of preterm birth[3].

Early prediction and diagnosis of preterm labor helps in proper management and decreases complications[4].

Markers such as cervix length are routinely used and the most commonly used method to predict premature birth featured as gradual change, easy to operate, and high sensitivity and specificity and a good guide for the initiation of interventions such as vaginal progesterone or cerclage. Other predictors such as fetal fibronectin have not demonstrated similar benefits[5].

Likewise, with the exception of prior PTB, all of the known historical risk factors associated with PTB (e.g., obesity) also have limited predictive accuracy.5 Therefore, research continues to be directed toward identifying alternative diagnostic methods for recognizing women at risk of PTB[5].

Recently, there was a new concept anterior uterocervical angle (ACA) referring to the angle between the line of internal cervix and lower segment of anterior uterine wall and the ligature between internal and external cervix and reported as a novel predictor of PTB in a large group of women with singleton pregnancies[6].

A wide, or obtuse, uterocervical angle (UCA) lends a more direct, linear outlet of uterine contents onto the cervix. A narrower, or acute, UCA supports an anatomical geometry that would exert less direct force on the internal os, which may be protective from cervical deformatio[7].

As early as the 1950's, pessaries were thought to create an immunological barrier and mechanically change the inclination of the cervical canal, thereby distributing pelvic force away from the cervix[7].

2. Patients and methods:

This study was conducted on 106 pregnant woman attending ante natal care unit or admitted to Obstetrics and Gynecology Department at Al zahraa University Hospital from Dec 2016 to Oct 2018.

The included 106 pregnant women at gestational age 16-23 weeks divided into 2 groups;

Group I: consisted of 71 women as control group not suffering from labour pain.

Group II: consisted of 35 women with symptoms suggest PTL.

All studied cases were subjected to the following:

A) Complete history taking including:

• Demographic data as patient age, parity, occupation, conception method.

• Menstrual history as LMP and gestational age.

• obtetric history as previous preterm labour, history of preterm premature rupture of membranes (PPROM).

• Family hisyort especially partens.

• Past medical and surgical history.

B) Complete physical examination including:

• General examination as pulse, blood pressure, height, temperature, weight, BMI.

• Obstetric examination as fundal level and uterine contraction.

C) Laboratory investigations:

Routine laboratory investigations:

-Complete Blood Count (CBC), blood group, RH.

-Urine analysis.

-Fasting and post prandial blood sugar.

D) Ultrasound examination:

• Abdominal ultrasound to detect: gestational age, viability and liqour amount

• Trans vaginal ultrasound

For measuring of cervical length (CL)

CL was performed in a uniform fashion according to Cervical Length Education and Review (CLEAR) criteria by RMDS, tracing a single straight line from the internal to external os. With this method, apart from cervix length, it is possible to do structural and functional evaluations such as condition and appearance of internal os (i.e. its funneling), cervical dilatation together with membrane herniation, and cervical responses to uterine contractions and fundal pressure.

For measurement of uterocervical angle (UCA):

Uterocervical angle is the angle measured on the triangle which is between the anterior uterine segment and cervical canal. For this, certain straight lines should be obtained; first straight line was drawn through endocervical canal between internal os and external os. The first line drawn between internal os and external os was considered a straight line even though cervical canal was curved. The second line was drawn ideally 3 cm from internal os through anterior uterine segment.

In this way, the angle obtained between two straight lines was considered as UCA. In shape changes (Yor U-like shape changes) corresponding to the early periods of funneling or the dilatation, cervical canal measurement between them was also considered as first straight line. The line drawn from the innermost point of cervical canal to anterior uterine segment was considered as the second straight line and the angle was measured.

All the previous examinations were done from 16to 24 weeks gestation, and follow up of the patients was done to see which of these patients proceeded to PT birth and which continued to term gestation.

Statistical analysis:

The collected data was revised, coded, tabulated and introduced to a PC using Statistical package for Social Science (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). Excel (Microsoft office) and Prism7 (GraphPad Software, La Jolla, California) were used

for producing some graphs. Data were presented and suitable analysis was done according to the type of data obtained for each parameter.

Descriptive statistics:

1. Mean, Standard deviation (± SD) for numerical data.

2. Frequency and percentage of non-numerical data.

3. Shapiro test was done to test the normality of data distribution. Significant data was considered to be nonparametric.

Analytical statistics:

• **Student T** Test was used to assess the statistical significance of the difference between two study group means.

• **Chi-Square test** was used to examine the relationship between two qualitative variables.

The ROC Curve (**receiver operating characteristic)** provides a useful way to evaluate the sensitivity and specificity for quantitative diagnostic measures that categorize cases into one of two groups. The optimum cut off point was defined as that which maximized the AUC value. The area under the ROC curve (AUC) results were considered excellent for

AUC values between 0.9-1, good for AUC values between 0.8-0.9, fair for AUC values between 0.7-0.8, poor for AUC values between 0.6-0.7 and failed for AUC values between 0.5-0.6. The calculation of a combined ROC curves, using maximum likelihood analysis to determine a combination rule for each ROC operating point. Multiple comparisons between ROC curves were used to perform pair wise statistical comparisons for two ROC curves.

Regression analysis:

Linear regression analysis was used for prediction of risk factors, using generalized linear models.

N.B: *p* is significant if <0.05 at confidence interval 95%.

3. Results:

Preterm labors were significantly associated with higher BMI at delivery, prior spontaneous births, prior D and C, CS, female gender neonates and higher frequency of NICU. Otherwise, no significant differences were found in studied data between term and preterm labors.

Table (1). Comparison of studied data between term and preterm labors:

			Subjects N=106	GA at delivery ≥ 37 N=71	GA at delivery < 37 N=35	*p*
Maternal age (year)		**Mean± SD**	29.7± 5.7	29.8± 5.9	29.4± 5.3	0.753^{Ť}
BMI at conception (kg/m2)		**Mean± SD**	26.4± 6.4	26.7± 6.3	25.7± 6.6	0.447^{Ť}
BMI at delivery (kg/m2)		**Mean± SD**	34.2± 8.9	32.7± 9.9	36.1± 6.8	**0.042^{Ť}**
Multipara		**N %**	95 89.6%	61 85.9%	34 %97.1	0.096^{Ć}
Nullipara		**N %**	11 10.4%	10 14.1%	1 2.9%	
Nutral conception		**N %**	83 78.3%	55 77.5%	28 80%	0.766^{Ć}
Prior spontaneous birth		**N %**	42 39.6%	21 29.6%	21 60%	**0.003^{Ć}**
prior D & C		**N %**	28 26.4%	14 19.7%	14 40%	**0.026^{C}**
CS		**N %**	65 61.3%	37 52.1%	28 80%	**0.006^{C}**
NVD		**N %**	41 38.7%	34 47.9%	7 %20	
Neonatal sex	**male**	**N %**	48 45.3%	38 53.5%	10 28.6%	**0.015^{Ć}**
	female	**N %**	58 54.7%	33 46.5%	25 71.4%	
NICU admission		**N %**	29 27.4%	6 8.5%	23 65.7%	**<0.001^{Ć}**

SD, standard deviation; Ť, t test; Ć, Chi square test.

Table (2). Comparison of GA, CL and UCA between term and preterm labors:

	GA at delivery ≥ 37 N=71	GA at delivery < 37 N=35	p
	Mean±SD	Mean±SD	
GA at transvaginal ultrasound (weeks)	22.3±3.1	22.9±3.8	0.418[T]
cervical length (cm)	4.2±1	3.7±0.8	**0.024**[T]
uterocervical angle (˚)	72.2±15.8	90.9±25.9	**<0.001**[T]

All studied pregnant females were examined by TVU at nearly the same gestational age (no significant differences in GA at time of TVU).

CL was significantly shorter (p=0.024), while UCA was significantly wider in pregnant females delivered prematurely (p<0.001).

Table (3). Area under ROC curve and performance criteria of UCA and CL for discrimination between term and preterm labor (at 37weeks):

	TVU		
	UCA	CL	UCA and CL
AUC (95% CI)	0.716 (0.598-0.834)	0.641 (0.530-0.752)	0.753 (0.644-0.863)
P1	<0.001	0.018	<0.001
Cut off	94.95	3.85	-
Sensitivity (%)	51.4	71.4	54.3
Specificity (%)	94.4	59.2	94.4
PPV (%)	81.8	46.3	82.6
NPV (%)	79.8	80.8	80.7
Accuracy (%)	80.2	63.2	81.1
P2	0.048		-
P3	0.270	0.035	-

Table (4). Area under ROC curve and performance criteria of UCA and CL for discrimination between term and preterm labor (at 34 weeks):

	TVU		
	UCA	UCA	UCA and CL
AUC (95% CI)	0.991 (0.974-1)	0.644 (0.492-0.797)	1 (1-1)
P1	<0.001	0.074	<0.001
Cut off	103.5	3.5	-
Sensitivity (%)	100	66.7	100
Specificity (%)	98.9	71.4	100
PPV (%)	93.8	27.8	100
NPV (%)	100	92.9	100
Accuracy (%)	99.1	70.8	100
P2	<0.001		-
P3	0.091	<0.001	-

ROC, receiver operating characteristic curve; AUC, area under ROC curve; PPV, positive predictive value; NPV, negative predictive value; UCA, uterocevical angle; CL, cervical length; TVU, tansvaginal ultrasound; p1, probability of AUC; p2, comparison between AUC of UCA and CL; p3, comparison between AUCs versus AUC of both UCA and CL.

ROC curve of UCA and CL was conducted for discrimination between term and preterm labor (at 37weeks). Fair AUC for UCA was found (AUC =

0.716, p<0.001). At cut off value of 94.95, sensitivity was 51.4%, specificity was 94.4%, PPV was 81.8%, NPV was 79.8% and accuracy was 80.2%. Poor AUC for CL was found (AUC = 0.614, p=0.018). At cut off value of 3.85, sensitivity was 71.4%, specificity was 59.2%, PPV was 46.38%, NPV was 80.8% and accuracy was 63.2%.

UCA was considered to be significantly better than CL for discrimination between term and preterm labor (at 37weeks) (p=0.048).

UCA performed better than CL (p=0.048), with a higher specificity and PPV for prediction of sPTB. These data imply that when a patient has less UCA measurement, it is unlikely that she will go on to have a sPTB and may not require additional cervical monitoring.

However, combining UCA and CL was better than CL alone (p=0.035), but did not do much better than UCA alone (p=0.270) for prediction of SPTB at 37 weeks.

ROC curve of UCA and CL was conducted for discrimination between term and preterm labor (at 34 weeks). Excellent AUC for UCA was found (AUC = 0.991, p<0.001). At cut off value of 103.5, sensitivity was 100%, specificity was 98.9%, PPV was 93.8%, NPV was 100% and accuracy was 99.1%. Poor AUC for CL was found (AUC = 0.644, p=0.074). At cut off value of 3.5, sensitivity was 66.7%, specificity was

71.4%, PPV was 27.8%, NPV was 92.9% and accuracy was 70.8%.

UCA was considered to be significantly better than CL for discrimination between term and preterm labor (at 34 weeks) (p<0.001).

UCA performed better than CL with a higher sensitivity, specificity, PPV, NPV and accuracy for prediction of sPTB. These data imply that when a patient has less UCA measurement, it is unlikely that she will go on to have a sPTB and may not require additional cervical monitoring. In addition, when a patient has more UCA measurement, it is likely that she will go on to have a sPTB and may require additional cervical monitoring.

However, combining UCA and CL was better than CL alone (p<0.001), but did not do much better than UCA alone (p=0.091) for prediction of SPTB at 34 weeks.

Table (5). Linear regression analysis of potential confounders on UCA:

	Beta coefficient	*p*
Maternal age	-0.08	0.859
Nulliparity	-0.14	0.157
BMI at conception	-0.69	0.080
prior spontaneous birth	4.08	0.462
Natural conception	-8.69	0.123
Prior D & C	-3.47	0.553
Prior CS	0.23	0.044
CL	7.46	0.007

Linear regression was performed to evaluate for confounders to UCA. Analysis revealed a significant association between prior CS, and CL with UCA. However, other factors did not imply a strong level of association between variables. There was no correlation identified with maternal age, nulliparity, BMI at conception, prior spontaneous birth, natural conception, prior cervical leep, cervical conization, prior D and C.

4. Discussion:

Our study show that Age distributed as 29.7± 5.9 in term group and 29.8± 5.3 in preterm group with no significant difference among groups (p=0.753) (as shown in table 1).

This is similar to the study of **(Dziadosz et al.,2016)** who studied Uterocervical angle: a novel ultrasound screening tool to predict spontaneous preterm that Age distributed as 33± 5in term group and 33± 5 in preterm group with no significant difference among groups (p=1), the rate of sPTB <37 weeks was 9.6% (n=84) and 4.5% (n=43) at <34 weeks. Women who delivered preterm were similar to those who delivered ≥37 weeks with respect to age, race, nulliparity, mode of conception, smoking,

cervical procedures, maternal diabetes, and maternal HTN[13].

Also this agreement with study conducted by **(Shi et al., 2018)** who studied the predictive role of transperineal ultrasound measuring anterior uterocervical angle and cervical length on preterm birth. And reported that Age distributed as 28.4± 4.3 in term group and 28.7± 4.9 in preterm group with no significant difference among groups (p=.86)[14].

In our study, there is significant difference in BMI at delivery between term)32.7±9.9(and preterm groups (36.1±6.8) (p=0.042) as shown in table (1).

This agree with (**Dziadosz et al., 2016**) who reported that also there was significantly difference associated with higher BMI at delivery between term 29 (± 13) and preterm groups 33 (± 30) (p= 0.04)[13].

In contrast to our study **(Bafal› O et al.,2018)** who reported that there was no significant difference associated with higher BMI between term (27.35±3.77) and preterm groups (27.12±4.70)[15].

Also in contrast to our study **(Llobet et al., 2017)** who studied The uterocervical angle and its relationship with preterm birth Delivery and reported that there was no significant difference associated with BMI between term 24.9 (±4.4) and preterm groups

24.1 (±3.5) (P=0.32)[16].

In our study, there was significant difference associated with Previous history of sPTD between term group 21(29.6%) and preterm group 21(60%) (p=0.003Ć) as shown in table (1).

This agree with **(Shi et al., 2018)** who reported that statistically significant difference associated with prior sPTB between term 64 (6.53%) and preterm groups 17 (20.24%) (p=0.005)[14].

Also agree with **(Llobet et al., 2017)** who reported that also there was significantly difference associated with previous PTB between term group (3,5%) and preterm group (25%) (p=<0.001)[16].

In contrast to our study **(Knight et al., 2017)** who studied Uterocervical Angle Measurement Improves Prediction of Preterm Birth in Twin Gestation and reported that there was no significant difference in previous history of PTB between term (11) and preterm groups (11) (p= 0.61)[11].

In our study, history of prior dilatation and curettage was statistically significant difference between term 14(19.7%) and preterm groups 14(40%) (p=0.026C) as shown in table (1).

This agree with **(Shi et al., 2018)** who reported that statistically significant difference associated with prior D & C between term (19.29%) and preterm groups. (30.95%) (p=0.01)[14].

Also this agree with **(Dziadosz et al.,2016)** who reported that also there was significantly difference associated with prior D & C between term (19%) and preterm groups (30%) (p=0.01)[13].

But in contrast to our study **(lynch et al.,2016)** who studied Ultrasonographic Change in Uterocervical Angle is not a Risk Factor for Preterm Birth in Women with a Short Cervix and reported that there was no significant difference in history of previous D & C between term (17.8%) and preterm labours (23.3%) (p= 0.37)[17].

In the current study as regard mode of delivery between term and preterm labors, the Preterm group have higher incidence of C.S (80%) compared with full term group (52.1%), this difference is statistically significant (P=0.006) as shown in table (1).

This observation was found to be in agreement with that reported by **(Shi et al., 2018)** who reported that the Preterm group have higher incidence of C.S (54.8%) compared with full term group (30.8%), this difference was statistically significant (P=< 0.01)[14].

Also **(Dziadosz et al., 2016)** reported that preterm group have higher incidence of C.S (54%) compared with full term group (33%), this difference was statistically significant (P=<0.001)[13].

In contrast to our study (**Lynch et al., 2016)**) who reported that there was no significant difference in incidence of CS between term (16.6%) and preterm groups (20.9%) (p=0.47)[17].

Also **(Bafal› O et al.,2018)** reported no statistically significant difference associated with incidence of CS between term (34%) and preterm groups (43.8%)[15].

Whether or not a neonate is admitted to the neonatal intensive care unit (NICU) at the time of delivery is a well-known and utilized indicator for neonatal outcome. There is increasing concern regarding late preterm births (LPB) and their contribution to neonatal morbidity (**Carter et al., 2011**)[18].

Our study shows that statistically significant difference in NICU admission between term and preterm groups. The incidence of NICU (65.7%) in preterm group compared with full term group (8.5%), this difference is statistically significant (p<0.001) as shown in table (1).

This is in consistence with **(Shi et al., 2018)** who reported that higher incidence of NICU (64.29%) in preterm group compared with full term group (10.20%), this difference is statistically significant (p=< 0.01)[14].

A similar results obtained by **(Dziadosz et al., 2016)** who reported that preterm group have higher incidence of NICU (64%) compared with full term group (11%), this difference is statistically significant (p= <0.001)[13].

In our study showed that all studied pregnant females were examined by TVU at nearly the same gestational age (16-24) (no significant differences in GA at time of TVU).

Also in the current study, CL was significantly shorter in preterm group (p=0.024) (3.7±0.8) than full term group (4.2±1), while UCA was significantly wider in pregnant females delivered prematurely (p<0.001) (mean 90.9±25.9) compared to control group (mean 72.2±15.8) as shown in table (2).

Our results was found to be in agreement with that reported by **(Shi et al., 2018)** who reported that the mean ACA in preterm group was 112.48° ± 15.83° (94°-135°), which was significantly larger than that of ACA in mature group as 98.52° ± 13.78° (P < 0.05). Also the cervical length was 30.94 ± 6.32 (15-37) mm in preterm group, which was obviously shorter than that in mature group as 37.28 ± 6.74 (21-45) mm (P < 0.05)[14].

This also agree with **(Dziadosz et al., 2016)** who reported that mean ACA in preterm group was 120° ± 27°, which was significantly larger than that of ACA in mature group as 93° ± 25° (P < 0.05). Also, the cervical length was 36 ± 9 mm in preterm group, which was obviously shorter than that in mature group as 40± 7 (P < 0.001)[13].

Similar finding reported by (**Lynch et al., 2019)** who found that mean UCA was 117.9° (SD 27.1°) for delivery ≥37 weeks and 133.1° (SD 23.1°) <37 weeks

(p = .002). A wider mean UCA was also associated with sPTB <34 weeks (sPTB≥34 weeks: 120.9° [SD 26.5°] vs. <34 weeks: 133.0° [SD 22.8°], p = .025) and sPTB<32 weeks   (sPTB≥32 weeks:121.2°[SD25.9°] vs.<32 weeks:135.0°[SD 24.0°], p = .018)[19].

The effectiveness of measurement is commonly measured in terms of their sensitivity, specificity and by creating receiver operating characteristic (ROC) curves, which allow for the calculation of the AUC. Sensitivity is often defined as the proportion of a population with a disease in whom the test in question gives a positive result. Specificity is the proportion of that population without the disease in whom the test gives a negative result. Biomarkers that are highly sensitive have low false-negative rates and those that are highly specific have low false-positive rates. Optimally, a good measurement will be both sensitive and specific. It is very rare that a diagnostic biomarker is strictly present or absent. Much more commonly, the presence of a measurement is measured as a continuous variable and cutoffs are defined along that continuum to establish the presence or absence of disease[20] **(Standage et al., 2011)**.

So that In order to verify the predictive efficacy of ACA in predicting preterm birth, the ROC curve of UCA and CL was conducted for discrimination between term and preterm labor (at 37weeks). Fair AUC for UCA was found (AUC = 0.716, p<0.001). At cut off value of 94.95, sensitivity was 51.4%, specificity was 94.4%, PPV was 81.8%, NPV was 79.8% and accuracy was 80.2%. Poor AUC for CL was found (AUC = 0.614, p=0.018). At cut off value of 3.85, sensitivity was 71.4%, specificity was 59.2%, PPV was 46.38%, NPV was 80.8% and accuracy was 63.2%. UCA was considered to be significantly better than CL for discrimination between term and preterm labor (at 37weeks) (p=0.048).

Also UCA performed better than CL (p=0.048), with a higher specificity and PPV for prediction of sPTB. These data imply that when a patient has less UCA measurement, it is unlikely that she will go on to have a sPTB and may not require additional cervical monitoring.

However, combining UCA and CL was better than CL alone (p=0.035), but did not do much better than UCA alone (p=0.270) for prediction of SPTB at 37 weeks.

ROC curve of UCA and CL was conducted for discrimination between term and preterm labor (at 34 weeks). Excellent AUC for UCA was found (AUC = 0.991, p<0.001). At cut off value of 103.5, sensitivity was 100%, specificity was 98.9%, PPV was 93.8%, NPV was 100% and accuracy was 99.1%. Poor AUC for CL was found (AUC = 0.644, p=0.074). At cut off value of 3.5, sensitivity was 66.7%, specificity was 71.4%, PPV was 27.8%, NPV was 92.9% and

accuracy was 70.8%.

UCA was considered to be significantly better than CL for discrimination between term and preterm labor (at 34 weeks) (p<0.001).

UCA performed better than CL with a higher sensitivity, specificity, PPV, NPV and accuracy for prediction of sPTB. These data imply that when a patient has less UCA measurement, it is unlikely that she will go on to have a sPTB and may not require additional cervical monitoring. In addition, when a patient has more UCA measurement, it is likely that she will go on to have a sPTB and may require additional cervical monitoring.

However, combining UCA and CL was better than CL alone (p<0.001), but did not do much better than UCA alone (p=0.091) for prediction of SPTB at 34 weeks.

This finding in agreement with that reported by **(Shi et al., 2018)** who reported that the AUC was 0.882 for ACA and 0.664 for the cervical length. In addition, the sensitivity and specificity for best critical value of ACA and cervical length was 86.9%, 71.43%, 75% and 62.14%, respectively. It indicated that transperineal ultrasound measurement of ACA in the middle gestational period showed better diagnostic value than cervical length measurement in the same period for the prediction of pretermbirth[14].

Also this agree with study conducted that **(Dziadosz et al., 2016)** who reported that ROC curves for CL measurement in these condtrimester and sPTB <37 weeks and <34 weeks resulted in areas under the curve of 0.372 and 0.315 respectively, indicating a poor performance of this test in our population. CL ≤25mm was found to be associated with sPTB <37 weeks with a sensitivity of 15% and a specificity of 98% (p<0.001, RR 6.7, PPV 46%, NPV 92%). A CL ≤25mmin the second trimester was also associated with sPTB <34 weeks (p<0.001, RR 7.7, sensitivity 19%, specificity 98%, PPV 29%, NPV 96%)[13].

Linear regression was performed to evaluate for confounders to UCA. Analysis revealed a significant association between prior CS, and CL with UCA. However, other factors did not imply a strong level of association between variables. There was no correlation identified with maternal age, nulliparity, BMI at conception, prior spontaneous birth, natural conception, prior cervical leep, cervical conization, prior D and C.

Dziadosz et al., (2016) reported that there was a significant association noted between a more narrow UCA and a history of prior cesarean delivery, however this association was excluded with stepwise linear regression. There was no correlation identified with short CL, prior preterm birth, However, limited sample size and single center study made the selection and calculation of best cut-off value inaccuracy.

Multi-center larger size research may help construct the normal reference range of ACA in the second trimester.

Also due to its retrospective nature, there is potential for both selection and information bias. Since the information was gathered from computerized charts, data is dependent on the accuracy of information input by medical personnel. We were also limited to previously obtained TVU images for a wide range of gestational ages in the second trimester. Since we only evaluated UCA at one point in time in each pregnancy, it is unknown whether serial evaluation of the UCA would correlate more strongly with risk of sPTB.

The syndrome of sPTB is a multifactorial phenomenon. It encompasses maternal risk factors such as race and parity that are not modifiable. However, it also includes clinical conditions, such as cervical insufficiency, for which we may screen, intervene and initiate treatment.

In conclusion, compared with the length of the cervix, ACA in the second trimester of pregnancy is a sensitive and specific detection method for the prediction of preterm birth.

It is worth of promotion because of its objective and effective. Also we conclude that measurement of the UCA may contribute to risk assessment for sPTB in women with singleton gestations.

An acute UCA may reflect cervical competence and resistance to passage of the fetus through the cervical outlet.

7/29/2019

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