Al-Azhar International Medical Journal

Volume 4 | Issue 11 Article 2

2023

Section: Obstetrics and Gynecology

Evaluation of Cervical Gland Area as Sonographic Predictor of Preterm Labor

Abdel Moneim Mohamed Zakaria
Department of Obstetrics and Gynecology, Faculty of Medicine for boys, Al-Azhar University, Cairo, Egypt.

Yasser Mohamed Said Kamel Diab
Department of Obstetrics and Gynecology, Faculty of Medicine for boys, Al-Azhar University, Cairo, Egypt.

Mohamed Hisham Salah Ahmed Aboul Fotouh
Department of Obstetrics and Gynecology, Faculty of Medicine for boys, Al-Azhar University, Cairo, Egypt., moheshsm5593@gmail.com

How to Cite This Article

Zakaria, Abdel Moneim Mohamed; Diab, Yasser Mohamed Said Kamel; and Fotouh, Mohamed Hisham Salah Ahmed Aboul (2023) "Evaluation of Cervical Gland Area as Sonographic Predictor of Preterm Labor," *Al-Azhar International Medical Journal*: Vol. 4: Iss. 11, Article 2.
DOI: https://doi.org/10.58675/2682-339X.2075

ORIGINAL ARTICLE

Evaluation of Cervical Gland Area as Sonographic Predictor of Preterm Labor

Abdel Moneim Mohamed Zakaria, Yasser Mohamed Said Kamel Diab, Mohamed Hisham Salah Ahmed Aboul Fotouh*

Department of Obstetrics and Gynecology, Faculty of Medicine for Boys, Al-Azhar University, Cairo, Egypt

Abstract

Background: **Cervical assessment is a principal part of the prediction of preterm labor (PTL). The majority of tests assess cervical length and funnelling. The diminution in cervical length is an essential PTL criterion. The cervical gland area (CGA) is a unique ultrasonographic predictor of preterm birth. Collagen and proteoglycans are modified by the maturation of the cervical mucosa. Collagen disorganization, decreased collagen concentration, and amplified water content are hallmarks of the development of the cervix. CGA vanishes from ultrasound imaging as a result of metabolic and water changes. In the second trimester, the absence of these glands can signify cervical maturity and preterm birth.**

Aim: **The purpose was to research to assess the link among the lack of CGA in ultrasonography and risk of preterm delivery.**

Patients and methods: **The research took place at Al-Hussien University Hospital's Obstetrics and Gynecology division. A total of 100 expectant mothers participated in the study.**

Results: **The cervical length of the group without CGA was considerably shorter than the cervical length of the group with CGA. While prevalence of preterm was significantly higher. Cervical length was significantly lower in preterm group matched to term group, while funneling was significantly higher. Cervical length and CGA were showed to be significant markers of preterm delivery.**

Conclusion: **According to our findings, there is a strong correlation among the lack of CGA between weeks 14 and 28, and spontaneous PTL among weeks 35 and 37 of pregnancy. Further study is needed to confirm whether or not an absence of CGA is a major predictor of PTL.**

Keywords: Cervical gland, Preterm labor, Spontaneous preterm labor

1. Introduction

Initiation of labor after the viability window (20−24 weeks) but before 37 weeks of pregnancy is considered preterm labor (PTL).[1] Common causes of preterm birth include uterine contractions caused by illness or the premature onset of physiological uterine contractions, while the specific mechanism of PTL is yet unknown.[2]

Up to 70−80 % of neonatal illness and mortality can be attributed to preterm birth, making it a major public health issue. Newborns born after 34 weeks of gestation have a better chance of survival thanks to recent developments in fetomaternal medicine.[3]

Cervical gland area (CGA) is a new ultrasonographic marker that has been proposed for preterm birth prediction. The term 'cervical mucosal glands' is used to describe the hyperechoeic or hypoechoeic region of an ultrasonogram that is typically found near the cervical mucosa.[4]

Cervical ripening, which occurs physiologisch, is linked to modifications in collagen and proteoglycan composition. Collagen disorganization, reduced collagen concentration, and amplified water content are all signs of cervical maturation.[5] CGA disappears from ultrasound images due to factors like a rise in water content and metabolic changes. The failure to develop these glands before the end of the

Accepted 30 May 2023.
Available online 15 December 2023

* Corresponding author.
E-mail address: moheshsm5593@gmail.com (M.H. Salah Ahmed Aboul Fotouh).

https://doi.org/10.58675/2682-339X.2075

second trimester is a risk factor for preterm birth, which is also a signal for cervical maturity.[6]

2. Patients and methods

Al-Hussien University Hospital's Obstetrics and Gynecology Department hosted the research.

A total of 100 expectant mothers participated in the research. Women who had regular menstrual cycles and/or a large crown-rump-length at the beginning of pregnancy had their gestational age calculated from the date of their last menstrual period.

2.1. Inclusion criteria

Age between 18 and 40 is acceptable. Lower abdomen pain accompanied by uterine contractions, a history of SPTL or a second-trimester abortion in a previous pregnancy, or a current pregnancy that is a singleton. 14–28 weeks of pregnancy is considered full-term.

2.2. Exclusion criteria

Gestational age more than 28 weeks of gestation, multiple pregnancy, premature rupture of membrane, vaginal bleeding, placental abruption or placenta previa, cervical cerclage, intrauterine growth restriction, polyhydramnios or oligohydramnios, fetal malformation, maternal systemic disease (hypertension, diabetes, SLE, etc.), and uterine contraction and nonspontaneous (iatrogenic PTL).

2.3. Methods

All patients were required to give their informed consent before they could take part in the study. Preserving the past: between weeks 14 and 28, pregnant women will have one transvaginal ultrasound to check for cervical length, cervical funnelling, and CGA. The GE Voluson S6 Ultrasound Philips, 2512 SW 30th Ave, Hallandale Beach, FL 33009 HD5machine will be used for all diagnostic ultrasounds. When the CGA is present, the internal and exterior orifices can be seen in the same plane, bladder deflation permits accurate measurement of cervical length. The smallest distance between the exterior and internal orifices was reported from three separate cervical length measurements. When the internal aperture of the neck widens to more than 5 mm, this condition is known as cervical funneling. Histological CGA was matched to a hyperechoic or hypoechoic zone around the cervical canal. If an ultrasound reveals a hypoechogenic or echogenic area surrounding the cervical canal, CGA are present. This theory postulates that pregnant women can be roughly classified into two groups: those with and without CGA. Women who were pregnant were tracked up until they gave birth.

Ethical approval code: 00000430.

Ethics committee approval was obtained in December 2021.

2.4. Statistical analysis

The following methods were utilized to gather data: SPSS 22.0 for Windows (SPSS Inc., Chicago, Illinois, USA). To determine if the data were normally distributed, the Shapiro–Wilk test was performed. The qualitative information was represented by frequencies and relative percentages. χ^2 and Fisher exact tests were used to calculate the differences between qualitative variables as specified. Quantitative information with a normal distribution was given as mean ± SD, while information outside of this distribution was shown as a median and a range. The independent *t*-test was utilized to match quantitative variables with known distributions, whereas the Mann–Whitney *U* test was utilized to match continuous variables with unknown distributions. A receiver operating characteristic (ROC) curve was built to help choose cutoff values for tests and evaluate various approaches to testing. Cantor's approach was utilized to calculate ROC area and standard error, and normal distribution testing was utilized to evaluate results after accounting for possible correlation between observations from different cases.

The range of acceptable results for an area under the curve is 0.90–1 for excellent, 0.80–0.70 for good, 0.60–0.60 for fair, 0.50–0.50 for bad, and 0.50 for failure. Maximum accuracy was used to define the best possible threshold. Potential predictors of preterm birth were identified using binary logistic regression analysis and the stepwise technique. All tests for statistical significance were performed with two-tailed statistics. When comparing two groups, a *P* value of less than 0.05 is considered significant, while a *P* value of less than 0.001 is considered to be very significant.

3. Results

Table 1 showed that a statistically significant variation in BMI across the groups. Examining differences in age, parity, pregnancy, and GA did not reveal any statistically significant differences.

Table 2 showed that there was no statistically significant difference in the incidence of premature

Table 1. Clinical and demographic data from the groups being studied.

	Present CGA ($N = 94$)	Absent CGA ($N = 6$)	t	P
Age (years) (mean ± SD)	28.56 ± 4.73	30.11 ± 5.12	0.775	0.440
BMI (kg/m^2) (mean ± SD)	26.29 ± 2.39	28.6 ± 3.69	2.22	0.029
Parity (mean ± SD)	1.55 ± 1.02	2.12 ± 1.04	1.33	0.188
Gravidity (mean ± SD)	2.43 ± 1.32	3.31 ± 1.44	1.58	0.118
GA at examination (weeks) (mean ± SD)	20.76 ± 3.86	21.25 ± 4.13	0.301	0.765

CGA, cervical gland area; GA, gestational age.

Table 2. Different groups' histories and risk factors were analyzed.

	Present CGA ($N = 94$) [n (%)]	Absent CGA ($N = 6$) [n (%)]	χ^2	P
Preterm labor history	8 (8.5)	1 (16.7)	0.458	0.499
Abortion history	3 (3.2)	0	0.197	0.657
Abdominal pain	89 (94.7)	5 (83.3)	1.29	0.257

CGA, cervical gland area.

birth, abortion, or abdominal pain between the two groups, as shown in the table above.

Table 3 showed that the absence of CGA was associated with a shorter cervical length compared to the presence of CGA, as shown in the table below.

Table 4 showed that according to the data, births were more likely to occur prematurely when CGA was absent than when it was present.

Table 5 showed that there was no significant difference among preterm and term delivery regarding demographic data.

Table 6 showed that according to the data in the table, the cervical length of the preterm group was substantially less than that of the term group. But there was a lot more funneling in the premature group than in the full-term one.

Table 7 showed that admission rates to the neonatal ICU were all over the place, severe jaundice, and respiratory distress across the groups (Fig. 1).

Table 8 showed that both cervical length and CGA were showed to be statistically significant predictors of preterm delivery.

4. Discussion

Regarding comparing between presence of CGA group ($n = 94$) and absence of CGA group ($n = 6$), the average BMI also varies significantly between the groups. There is no discernible variation in age, parity, pregnancy status, or GA on physical exam.

Participants mean age in our research was consistent with that found by Marsoosi et al.[4] (27 ± 6 years). Between one and three pregnancies were recorded. The average gestational age at the time of the ultrasound was 20 weeks and 3.52 days. Age, gravidity, and gestational age at ultrasound exam were compared among the CGA-absent and CGA-present groups and no discernible differences were detected statistically.

Variables	AUC	SE	Significance	95 % confidence interval
Cervical length	0.811	0.052	0.000	0.704–0.918

Variables	Cutoff	Sensitivity	Specificity	PPV	NPV
Cervical length	≤24	100 %	72 %	64.3 %	100 %

Table 3. The results of the two groups in the ultrasound.

	Present CGA ($N = 94$)	Absent CGA ($N = 6$)	t	P
Cervical length (mm) (mean ± SD)	36.95 ± 7.43	23.51 ± 5.29	4.35	<0.001
Funneling [n (%)]	8 (8.5)	2 (33.3)	3.86	0.048

CGA, cervical gland area.

Table 4. Outcome of the two studied groups.

	Present CGA ($N = 94$) [n (%)]	Absent CGA ($N = 6$) [n (%)]	t	P
Preterm	5 (5.3)	2 (33.3)	6.8	0.009
Term	89 (94.7)	4 (66.7)		

CGA, cervical gland area.

Table 5. Clinical and demographic data comparing preterm and full-term births in group A.

	Preterm ($N = 7$)	Term ($N = 93$)	t	P
Age (years) (mean ± SD)	31.25 ± 4.45	28.97 ± 3.82	1.51	0.135
BMI (kg/m^2) (mean ± SD)	27.54 ± 2.87	25.82 ± 2.15	0.801	0.425
Parity (mean ± SD)	1.95 ± 0.845	2.1 ± 1.02	MU = 0.471	0.708
Gravidity (mean ± SD)	3.86 ± 1.56	3.97 ± 1.62	MU = 0.267	0.749

Table 6. Ultrasound findings between preterm and term delivery.

	Preterm ($N = 7$)	Term ($N = 93$)	t/χ^2	P
Cervical length (mm) (mean ± SD)	25.18 ± 3.68	35.24 ± 4.28	6.1	<0.001
Funneling [n (%)]	3 (42.9)	7 (7.53)	9.03	0.003

Table 7. Neonatal complications and outcome between preterm and term delivery.

	Preterm ($N = 7$) [n (%)]	Term ($N = 93$) [n (%)]	χ^2	P
Admitted to NICU	7 (100)	4 (4.3)	60	<0.001
Severe jaundice	6 (85.4)	7 (7.5)	35	<0.001
Respiratory distress	5 (71.4)	5 (5.4)	32	<0.001

NICU, neonatal ICU.

No statistically significant differences were showed in the current research among presence of CGA group and absence of CGA group regarding PTL history, abortion history, and abdominal pain.

Our findings corroborated those of Marsoosi et al.,[4] who found that 169 (84.5 %) of pregnant female experienced lower abdominal pain during their present pregnancy; 10 (5.0 %) of these females had a prior PTL or second-trimester abortion; and 21 (10.5 %) had experienced both. PTL, abortion, and abdominal pain were not significantly different among the groups where CGA was present and those where it was not.

The recent research found that the absence of CGA was linked with a shorter cervical length.

Consistent with our findings, Marsoosi et al.[4] found that the cervical length was considerably shorter in the CGA-negative group matched to the CGA-positive group.

Preterm birth rates were shown to be considerably greater in the absence of CGA compared with the presence of CGA in the study at hand.

Our consequences were reinforced by research of Marsoosi et al.[4] as univariate and multivariate precise logistic regressions demonstrated an elevated risk of PTL in pregnant female with absent CGA. However, the incidence of missing CGA varies greatly between searches. For instance, Yoshimatsu et al.[7] reported an incidence of 0.36 % between weeks 16 and 19, while other studies found a far lower prevalence of 0.0 %. Pires et al.[8] reported 2.7 % between 21 and 24 weeks of pregnancy, and our research found 5.5 % between 14 and 28 weeks. Possible explanations for the discrepancy in reported

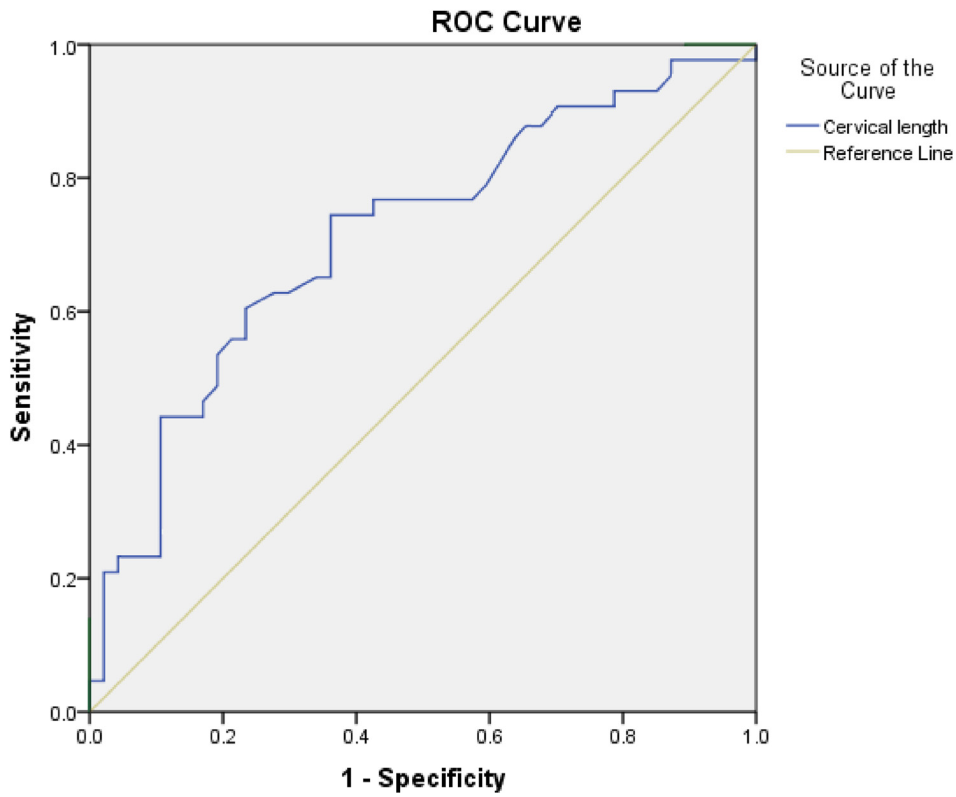

Fig. 1. Predicting preterm birth using cervical length: a ROC curve. ROC, receiver operating characteristic.

Table 8. Preterm birth risk factors: a multivariate logistic regression study.

	OR	SE	Significance	95 % confidence interval for OR
Age	0.242	0.215	0.663	0.160–0.550
BMI	0.148	0.156	0.095	0.116–0.541
Parity	1.537	0.382	0.103	0.737–2.338
Gravidity	0.163	0.107	0.176	0.075–0.378
Cervical length	1.231	0.046	0.001*	0.280–1.838
Funneling	3.725	0.055	0.091	0.117–8.321
CGA	15.249	0.062	<0.001	7.325–22.523

CGA, cervical gland area; OR, odds ratio.

rates of CGA absence between studies include variations in study design and subject selection. In 2013, Kahyaoglu et al.[9] looked at 85 women showing signs of potential PTL. In contrast to our findings, they showed that transvaginal ultrasonographic evidence of echogenic (as opposed to echolucent) CGA is linked with PTL in patients with a short cervix. Nonetheless, they had a small sample size. According to our findings, statistically, no difference can be shown among preterm and term delivery in terms of demographic characteristics and clinical data in group A.

Our consequences were supported by research of Maia et al.[10] as they showed that age, parity, and gestational age at admission were comparable across preterm and full-term births, the three clinical factors considered predictive.

According to this research, the cervical length of premature babies is substantially shorter than that of full-term babies. While funneling was more common in the preterm than the term group. In a ROC analysis of cervical length and its ability to predict preterm birth, a cutoff of ≤24 was shown to have 100 % sensitivity and 72 % specificity. Our consequences were reinforced by several studies conducted by Cahill et al.,[11] Werner et al.[12] have reported that the chance of having a baby prematurely rises when transvaginal sonographic CL shortens over time.

Predictive value of short cervix in early second trimester (16–19 weeks) and whether serial measurements improved identification and prediction of sPTB for up to 24 weeks were investigated in an observational study of CL surveillance by Parry et al.[13] in 183 women with a history of one or more sPTBs. When compared with the other 130 female, the cervixes of the women who had a sPTB at 35 weeks shrank at a median pace of 2.5 mm per week ($P = 0.03$). Cervical shortening (as assessed by cervical slope) was revealed to be an independent risk factor for sPTB among females who gave birth prematurely during the course of the surveillance period. A steeper cervical slope was connected with the likelihood of sPTB, even after adjusting for an initial shorter CL.

In addition, Berghella et al.[14] studied the risk for PTB 35 weeks of gestation in 109 females who had previously undergone surgical treatment for CIN by conducting CL surveillance among 16 and 24 weeks of pregnancy. A CL limit of less than 25 mm was used as the categorization criteria for a short cervix in the calculation of CL's predictive value. The PPV, NPV, NPV, and NPV for sPTB were 64, 78, 30, and 94 %, respectively. The current study showed that cervical length and CGA were significant markers of preterm delivery.

Similarly, Maia et al.[10] found that CL in millimeters was an independent predictor of delivery within 7 days [odds ratio (OR) 0.918, 95 % confidence interval (CI) 0.862–0.978, $P = 0.008$], lending credence to our findings. Gestational age at admission was a predictor for birth before 34 weeks (OR 0.683, 95 % CI 0.539–0.866, $P¼ = 0.002$, and the presence of cervical funneling was a predictor for birth before 37 weeks (OR 3.778, 95 % CI 1.460–9.773, $P = 0.006$). Good accuracy (88 %) was achieved when using a CL 15 mm to predict delivery within 7 days, with sensitivity and specificity values of 77 and 77 %, respectively.

There is no universally accepted threshold for a 'short cervix' when measuring cervical length. They determined a threshold of 18 mm for PTL prediction, with the range spanning from under 15 mm to over 35 mm. Also, cervical funneling is not a reliable indicator of PTL because it is frequently caused by uterine contractions. In contrast to funneling, CGA more accurately measures cervical maturity and is less subjective in most cases.[7]

In the study of Afzali et al.,[6] delivery time was used as the dependent variable in a logistic regression analysis with maternal age, number of pregnancies, history of previous preterm deliveries, chorionic villus atresia (CGA), and cesarean section as the independent variables; CGA was found to be the only significant factor in preterm delivery ($P = 0.002$) after four steps of stepwise (Wald) backward analysis.

5. Conclusion

Due to the necessity of specialized perinatal care, preterm and very preterm birth prediction presents a significant difficulty. It would appear that CGA detection is a useful signal for this. The lack of the CGA on sonography indicates a lack of cervical maturation, which might be taken as an indicator of impending PTL and a bad pregnancy result. Cervical length and CGA were discovered to be significant predictors of preterm birth, and our data show a strong connection between the absence of CGA at 14–28 weeks gestation and SPTL before 35 and 37 weeks gestation. To determine whether or if the lack of CGA is a significant predictor of PTL, more studies are required.

Conflicts of interest

There are no conflicts of interest.

References

1. Quinn JA, Munoz FM, Gonik B, et al. Preterm birth: case definition & guidelines for data collection, analysis, and presentation of immunisation safety data. *Vaccine*. 2016;34: 6047–6056.
2. Rita D, Haripriya V. Comparative study of efficacy of nifedipine, nitroglycerin dermal patches and isoxsuprine as tocolytic agents in suppression of preterm labour 1-year study at navodaya medical college hospital and research centre Raichur. *Int J Reprod Contracept Obstetr Gynecol*. 2021;10: 2806–2811.
3. Goyal N, Agrawal M. Comparative study of effectiveness of transdermal nitroglycerine patch and oral nifedipine in management of preterm labor. *Eur J Mol Clin Med*. 2020;7: 2091–2098.
4. Marsoosi V, Pirjani R, Jafarabadi MA, Mashhadian M, Ziaee S, Moini A. Cervical gland area as an ultrasound marker for prediction of preterm delivery: a cohort study. *Int J Reprod Biomed*. 2017;15:729.
5. Reicher L, Fouks Y, Yogev Y. Cervical assessment for predicting preterm birth—cervical length and beyond. *J Clin Med*. 2021;10:627.
6. Afzali N, Mohajeri M, Malek A, Alamatian A. Cervical gland area: a new sonographic marker in predicting preterm delivery. *Arch Gynecol Obstet*. 2012;285:255–258.
7. Yoshimatsu K, Sekiya T, Ishihara K, Fukami T, Otabe T, Araki T. Detection of the cervical gland area in threatened preterm labor using transvaginal sonography in the assessment of cervical maturation and the outcome of pregnancy. *Gynecol Obstet Invest*. 2002;53:149–156.
8. Pires CR, Moron AF, Mattar R, Diniz AL, Andrade SG, Bussamra LC. Cervical gland area as an ultrasonographic marker for preterm delivery. *Int J Gynecol Obstet*. 2006;93: 214–219.
9. Kahyaoglu S, Kahyaoglu I, Kaymak O, Sagnic S, Mollamahmutoglu L, Danisman N. Can transvaginal ultrasonographic evaluation of the endocervical glandular area predict preterm labor among patients who received tocolytic therapy for threatened labor: a cross-sectional study. *J Matern Fetal Neonatal Med*. 2013;26:920–925.
10. Maia MC, Nomura R, Mendonça F, Rios L, Moron A. Is cervical length evaluated by transvaginal ultrasonography helpful in detecting true preterm labor? *J Matern Fetal Neonatal Med*. 2020;33:2902–2908.
11. Cahill AG, Odibo AO, Caughey AB, et al. Universal cervical length screening and treatment with vaginal progesterone to prevent preterm birth: a decision and economic analysis. *Am J Obstet Gynecol*. 2010;202:548.
12. Werner EF, Han CS, Pettker CM, et al. Universal cervical-length screening to prevent preterm birth: a cost-effectiveness analysis. *Ultrasound Obstet Gynecol*. 2011;38:32–37.
13. Parry S, Simhan H, Elovitz M, Iams J. Universal maternal cervical length screening during the second trimester: pros

and cons of a strategy to identify women at risk of spontaneous preterm delivery. *Am J Obstet Gynecol*. 2012;207: 101−106.

14. Berghella V, Pereira L, Gariepy A, Simonazzi G. Prior cone biopsy: prediction of preterm birth by cervical ultrasound. *Am J Obstet Gynecol*. 2004;191:1393−1397.