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Research Protocol

Cervical Index: A Novel Sonographic Screening Test to Predict Preterm Birth

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Received: October 14, 2021; **Published:** November 22, 2021

Abstract

Introduction: Currently, prematurity is the main cause of perinatal morbidity and mortality. Premature neonates are at risk for neurological disorders, developmental delays, vision, and hearing problems. Cervical length remains the only widely used sonographic marker for preterm labor. We suggest using cervical index (CI) defined as a ratio of cervical length to its width as another screening tool for preterm labor.

Materials and Methods: This retrospective cohort study included 600 patients with singleton pregnancies. CI were measured between 12 - 17 weeks of gestation. CI were arbitrarily divided into 3 groups: less than 1, between 1 and 2 and more than 3. Gestational age at birth was obtained by reviewing patients' records.

Results: CI of less than 1 was most predictive of preterm birth (sensitivity 84%, specificity 56%). CI of 3 and above has a reverse predictive value for preterm birth: only 6% of women in this group delivered at less than 37 weeks of pregnancy.

Conclusion: Cervical index appears as a useful novel tool for predicting risk of preterm labor.

Keywords: *Cervical Index; Sonographic Screening Test; Preterm Birth*

Introduction

Currently, risk factors for of preterm birth include patients obstetrical history, presence of contractions and cervical length size, among others. Cervical length is the most useful indicator of preterm birth prediction [1]. This has evolved since 1996, when the relationship between the decreased cervical length and risk of spontaneous preterm birth was established by the multicenter Preterm Prediction Study involving 2,900 patients [2]. American College of Obstetricians and Gynecologists and the Society for Maternal-Fetal Medicine suggests that, for women with a history of spontaneous preterm birth of a singleton, serial transvaginal ultrasound cervical length monitoring is recommended [3,4]. We now have many options to decrease the risk of preterm labor, including progesterone supplementation, cerclage placement, and vaginal pessary insertion, among others [5,6].

Objective of the Study

Our objective was to evaluate whether cervical index (CI) can predict risk of preterm labor.

Materials and Methods

This retrospective cohort study was designed to evaluate prognostic the value of CI. Institutional Review Board approval was obtained. CI was measured in 600 women with singleton gestations who were scheduled for an ultrasound between 12 0/7-16 6/7 weeks' gestation. Transvaginal images were obtained with 4-to 9 MHz IC5-9D sonographic probes (Voluson; GE Healthcare Milwaukee, WI). CI was defined as a ratio of cervical length and width. Cervical indexes were arbitrarily divided into 3 groups: CI of ≤ 1 (group I), CI between 1 and 2 (group II), and CI of > 3 (group III). Our primary outcome was preterm birth between 34 and 37 weeks of gestation. Receiver operating characteristic (ROC) curves were developed to determine an optimal CI performance. Fisher exact test, X^2 test, student t test, Kappa coefficient, Spearman correlation, likelihood ratios, and stepwise linear regression were performed. P < .05 defined as significant using software (SPSS 21.0, Version 21; IBM Corp, Armonk, NY). Patients included in the analysis were between the ages of 18 - 36 years. Exclusion criteria included medically indicated preterm birth. Demographic and pregnancy outcome data were collected via chart review.

Results

A total of 600 patients were eligible for inclusion into the study. CI of < 1 was associated with preterm birth of less than 37 weeks with a sensitivity of 84% (p < 0.05; RR. 4.0), specificity 56%, positive predicative value 18%, negative predictive value of 98%. In this group, 42% of women delivered at less than 37 weeks. CI of 2 had a lesser association with preterm birth with a sensitivity of 52% (p < 0.05, RR. 3.8) specificity of 36%, positive predicate value of 20% and negative predictive value of 98%. In this group, 12% of women delivered at less than 37 weeks. Finally, CI of ≥ 3 had a reverse predictive value for preterm birth. In this group, only 6% of women delivered at less than 37 weeks.

Discussion

Current prenatal screening protocols using the cervical length measurement during the first and second trimesters identify approximately 55% of cases of spontaneous preterm birth (PTB) [7,8]. Therefore, researchers were looking for other sonographic markers to improve screening accuracy for preterm labor. Recently, Sochaki., *et al*. [8] introduced an anterior cervical angle (ACA) as a new sonographic marker for prediction of spontaneous preterm labor. The anterior cervical angle has been defined as an angle between the uterine wall and the cervical canal [7]. These authors concluded that screening of ACA measurement in the second trimester is predictive of PTB [7]. However, ACA is not easy to measure and is highly dependent on the location of the cervix and low uterine segment. Thus, Dziadosz., *et al*. [7] stated that "in the event that the lower uterine segment was found to be irregular the second caliper was placed centrally along the segment. In the event of a retroverted uterus, the angle should be measured in a similar fashion with the first ray along the measurable cervix and the second ray traced along the lower uterine segment. Unlike in an anteverted or axial positioned uterus, however, the posterior side of the angle closer to the intrauterine contents should then be measured". To avoid these technical difficulties we proposed cervical index, which had been proven effective in predicting success of induction of labor. One of the strengths of the study is the introduction of a novel and easy to use sonographic measurement. Cervical index appears to be a reliable predictor of PTB. One of the weaknesses of the study is its retrospective nature with possibility for selection bias.

Conclusion

In conclusion, CI may serve as novel sonographic screening tool for preterm labor. Future prospective trials are needed to confirm out findings and to define the role of CI as a screening tool for preterm labor. Until prospective trials are completed, the use of CI as a screening test for the prediction of PTV should be considered investigational.

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Volume 10 Issue 12 December 2021