

Quantitative Analysis of the Cervical Texture by Ultrasound in the mid-pregnancy is associated with spontaneous preterm birth.

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Objective

To determine if there is an association between quantitative analysis of the Cervical texture by ultrasound in the mid-trimester of pregnancy and sPTB <37 weeks.

Methods

- Nested case-control study based on a prospective cohort of 677 singleton gestations between 19.0 and 24.6 weeks.
- Cases: women who presented a sPTB <37 weeks. Controls: women who delivered at term.
- Women receiving any treatment to prevent sPTB were not eligible for the study.
- Cervical texture (CTx) analysis was performed from a region of interest delineated in the anterior cervical lip (Figure 1). Cervical length (CL) was also measured off-line.
- To obtain the best combination of cervical textures features associated with sPTB, a learning algorithm was developed based on feature transformation and discriminant analysis-regression.
- The ability of CTx algorithm to predict sPTB was evaluated using a leave-one-out cross-validation technique, obtaining a CTx-based score for each women.
- ROC curves for CTx-based score were drawn and compared to CL.

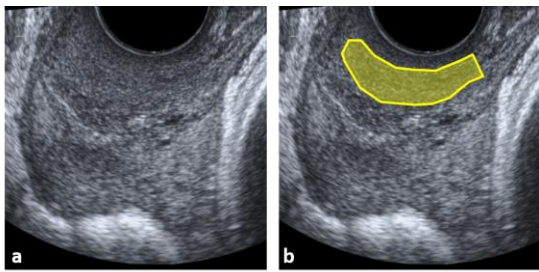


Figure 1. Sagittal view of the cervix (a) and delineation of the anterior cervical lip (b).

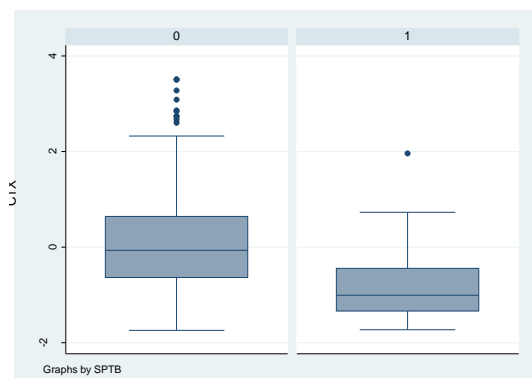
Table 1. Demographic and pregnancy characteristics of sPTB <37+0 weeks and term group.

	Total n=310	Cases n=27	Controls n= 283	p-value
Maternal Age	33 (28 - 37)	34 (29 - 38)	33 (28 - 37)	0.44
Caucasian	223 (71.9)	20 (74.1)	203 (71.3)	0.80
Tobacco use	46 (14.8)	3 (11.11)	43 (15.2)	0.57
BMI (kg/m2)	23.0 (21.0 - 26.1)	25.2 (20.3 - 26.6)	23.0 (21.0 - 26.1)	0.69
Nulliparous	159 (51.3)	10 (37)	149 (52.7)	0.08
Previous PTB	35 (11.3)	6 (22.2)	29 (10.3)	0.03
Cervical intervention/uterine maformation	15 (4.8)	4 (14.8)	11 (3.9)	0.01
GA at scan (weeks+days)	21 (20.3 - 22.3)	21.2 (20.3 - 23.1)	20.6 (20.3 - 22.2)	0.53
CL at scan (mm)	38.6 (34.3 - 42.6)	37.7 (32.2 - 41.5)	38.6 (34.5 - 42.8)	0.26
CL <25 mm	6 (1.9)	5 (18.5)	1 (0.3)	<0.001
CTx-based score	-0.13 (-0.73 - 0.59)	-1.01 (-1.34 - 0.45)	-0.07 (-0.64 - 0.64)	<0.001
GA at delivery (weeks+days)	39.4 (38.4 - 40.3)	34.6 (32.5 - 36)	39.6 (38.6 - 40.3)	NA
Birth weight (gr)	3275 (2945 - 3530)	2300 (1600 - 2550)	3340 (2990 - 3560)	NA
Spontaneous onset of labor	212 (68.4)	27 (100)	187 (66.1)	NA

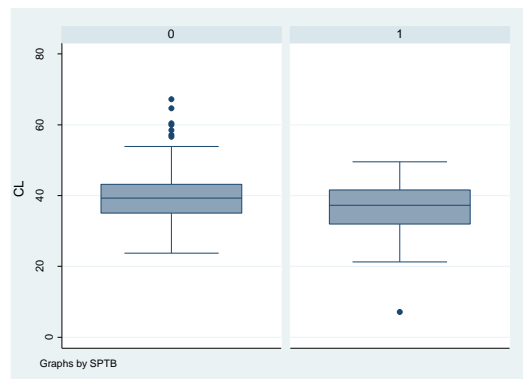
Data given as: median (interquartile range) or n (%). BMI: body mass index; PTB: preterm birth; GA: gestational age. CL: cervical length; NA: not applicable.

Results

CTx-based score: **OR 0.31 (95% CI 0.17-0.56; p<0.0001)** vs **ORadj 0.33 (95% CI 0.18-0.63; p=0.001)** maintained its significant association to sPTB after adjusting for possible confounders (history of sPTB, cervical intervention or Müllerian malformation and CL <25 mm).



CTx-based score: -0.07 vs -1.01 (p<0.001)



CL: 38.6 vs 37.7 (p=0.26)

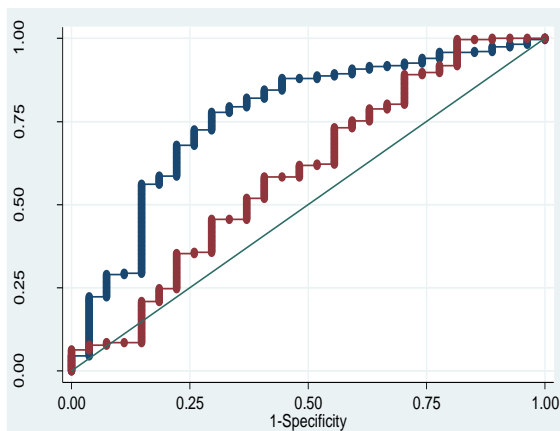


Figure 3. Receiver operating characteristic (ROC) curves for CTx-based score (CTx) and cervical length (CL) with regard to predicting spontaneous preterm delivery <37.

CTx AUC: 0.77 (95% CI 0.66-0.87)
CL AUC: 0.60 (95% CI 0.47-0.72)

Conclusions

- Quantitative analysis of the cervical texture is able to extract information from the ultrasound images associated to sPTB <37 weeks.
- CTx-based score is independently associated to sPTB.
- More women representing sPTB cases are needed to create a predictive model and to validate it in a new set of images.