Ultrasound Cervical Assessment at 18-20 Weeks of Gestation

- predictive factor for preterm delivery -

Anca Stănescu[1], Liana Pleş[1], J. Marin[2], Roxana Chiriac[1]

1. Clinical Hospital for Obstetrics and Gynecology "Bucur"
2. UMF "Carol Davila", Bucharest

Correspondence:
Roxana Chiriac
e-mail: roxana_chiriac2007@yahoo.com

Abstract

Objective: *The purpose of this study was to determine the mean cervical length in singleton pregnancies between 18 to 20 weeks and also to asses the cut-off length of the cervix as a preterm birth predictor.* ***Study design:*** *This is a prospective study in which the cervical length was measured weekly in asymptomatic women with singleton pregnancies with transvaginal ultrasonography. The mean cervical length was assessed for every week of gestation from 18 to 20. The relation between cervical length and spontaneous preterm birth was analyzed using contingency table and linear regression.* ***Results:*** *There were 471 women included in this study. The mean cervical length value was 34.9mm. The preterm delivery (before 36 weeks of gestation) was observed in 12.3% (58/471) of cases and late abortion (before 28 weeks) in 6.8% (32/471). The risk for preterm or miscarriage is inversely related to cervical length; it is the highest under 20 mm cervical length. Funnelling also proved to be a predictive factor preterm delivery or miscarriage.* ***Conclusions:*** *The use of ultrasound assessment of cervical length in the screening prenatal programme may help select more specific the pregnancies in risk for preterm delivery.*

Keywords: *premature spontaneous birth, transvaginal scan, cervical length assessment*

Introduction

Preterm delivery affects 7-13% of all pregnancies and continues to be the primary cause of prenatal morbidity and mortality throughout the world[1]. Mortality rate for neonates from preterm delivery represents 70% of neonatal mortality. Morbidity and the risk of mental or physical handicap are increased in these cases[2]. The expenses for special care for preterm babies represents another factor that stimulated the research for an efficient prevention programme. The understanding of pathogenetic mechanisms leading to preterm delivery has improved greatly in the past several years, but it has not produced a significant decrease of preterm births incidence[1].

Ultrasound cervical assessment should become a standard procedure for screening along the fetal morphological ultrasound determination.

Digital examination has been commonly used to diagnose premature labor. It is subjective, it may vary between examiners and underestimates the true anatomic cervical length. This has been confirmed by a number of studies and this underestimation may result from the inability to digitally assess the cervical length beyond the vaginal fornices unless there is 2 cm or more dilation for intracervical canal examination[3].

At the beginning abdominal sonographic assessment was used, but it has some disadvantages[4,5]: a full maternal urinary bladder is needed, which can falsely extend cervical length, canceling the shortness or the funneling; maternal obesity can affect the measurement, as well as shadows of fetal parts; low frequency transducer must be used; it does not allow the assessment of OCI opening in all the cases; it has low reproducibility rate and it is not a standard technique. Abdominal ultrasound cervical determination is not a precise method and it must not be used for preterm delivery prediction.

Transperineal sonography (TPUS) seems to be as precise as transvaginal one, but the image resolution is better in transvaginal way, the first method should be reserved for women that find transvaginal ultrasound unacceptable as being invasive or inconvenient[1,3,6,7].

Only transvaginal ultrasound cervical examination represents an objective assessment of cervical length, of cervical internal os shape and the inferior uterine part. By transvaginal cervical ultrasound one can detect the asymptomatic preterm phase that can progress towards a miscarriage or preterm delivery. It is the only test that recognizes the premature opening of the internal os, the first physical sign of cervical ripening that preceded labor and delivery[8]. The changes of internal os aspect can not be assessed by digital examination, that was shown by several studies. Transvaginal Ultrasound examination has a superior prediction value when used as screening test for preterm delivery[9,10]. This technique does not have associated complications[8].

Material and Method

In a random population of asymptomatic pregnant women we tried to check the hypothesis that by using transvaginal ultrasound cervical assessment in the second trimester one can better predict preterm birth and we observed which parameter is more efficient (cervical length, internal os shape, funneling etc.)

This is an observational clinic study based on prospective examination of pregnant women around 18-20 weeks of gestation, the way pregnancy ended being noted down from Bucur Maternity datebase, between January and December 2009. Before the first clinical examination, each patient is informed of the aim of the study, of its observational, non invasive characteristic, in order to obtain the informed consent. A number of 471 asymptomatic outpatients has been selected from all the pregnant women that went through ultrasound examination in our clinic. This group is considered to be representative for the entire population of pregnant women with low risk pregnancies. gestation age was determined by using the date of the last period and the ultrasound examination from the first trimester.

The inclusion criteria were: singleton viable pregnancy in the 18-20 weeks of gestation; delivery planned in our department; informed consent from the patient regarding vaginal ultrasound examination and participation in the study.

The exclusion criteria were: multiple gestation; congenital malformation or chromosomal aberration of the fetus; symptomatic patients with progesterone treatment; delivery planned in other medical unit; patients that refused to participate in this study; those with a cerclage; those with history of cervical surgeries; those with history of preterm delivery or miscarriages.

The cervical lenght assessment was done with transvaginal Comtron transducer, with the patient placed in the dorsal lithotomy position. The technique used in this study for measuring the cervical lenght by transvaginal ultrasound examination is as follows[8,9,11]:

- urinary bladder must be empty prior ultrasound examination;
- the ultrasound probe, protected by a condom, is introduced in the anterior fornix of the vagina, without exerting undue pressure on the cervix;
- a sagittal imagine of the cervix is obtained, with visualization of both osis and of the endocervical mucosa;
- the imagine is zoomed in order that 2/3 of the screen to be occupied by it;
- the calipers were used to measure the distance between the triangular area of echodensity at the external os and the V-shaped notch at the internal os;
- a pressure is applied in the anterior fornix of the vagina for 15 second;
- 3 measures are made in 5 minute and the shortest value is taken into consideration;
- funneling is noted down as well as the lenght of it.

Results

In this study there were 471 patients with singleton pregnancies between 18-20 weeks of gestation that were ultrasound examined. Cervical length assessment was successful in all cases. The median cervical length was 34,9 mm for the gestation age in study. Analyzing the data, there were 12,3% (58/471) preterm deliveries (before 36 weeks of gestation) and 6,8% (32/471) late miscarriages (before 28 weeks of gestation).

Three cut-off values of cervical length were established, as follows (for which sensitivity, specificity, positive and negative predictive values were determinated): 20 mm, 25 mm and 30 mm. After analyzing the results and comparing them, for the cut-off of 20 mm the values for the specificity, positive and negative predictive values were the most increased.

The funneling of cervical canal was noticed in 15 % (71 cases), of which 40 patients had a cervical length shorter than 20 mm (81 %). From table 2, the funneling frequency is higher in preterm delivery and miscarriage categories (64%, respectively 63%), in conclusion funneling is a predictive factor for preterm delivery and miscarriage.

From figure 1, funneling is more often noticed in cases with shorter cervical length especially shorter than 20mm.

Discussions

For the statistic analyze SPSS 17.0 was used. A model of direct logistic regression was created for better evaluation of the impact of several factors on the probability that the patients from this study would deliver preterm or would have a miscarriage. The model with all predictive factors was statistic significant, $\chi 2$ (4, N=471) = 149.21, p <.001, showing that the model was able to distinguish between the cases with preterm and term delivery.

Cervical length and changes of internal os, especially funneling had a great contribution, statistic significant in this analyzing model. The most predictive factor for preterm delivery was cervical length, with an odds ratio de 0.88, followed by funneling with an OR de 15.93, CI 95% 8.50-29.84, respectively OR 12.68, CI 95% 5.85-27.46 for miscarriage.

The risk for preterm delivery or miscarriage is inversely depending of cervical length, so as shorter the cervix is, as higher the risk is. Also, as sooner the shortening of the

Table 1 Distribution of all cases depending on cervical length, preterm delivery, miscarriage. Specificity, sensitivity, positive and negative predictive values for cervical length both in preterm delivery and in miscarriage

CL		Preterm delivery					Misscariage				
		Nr.	Sens %	Spec %	PV+%	PV-%	Nr.	Sens %	Spec %	PV+%	PV-%
<20mm	49	27	47	99	93	92	20	63	99	91	97
<25mm	16	7	59	98	85	94	4	75	98	80	98
<30mm	32	6	69	92	56	95	1	78	92	45	98
<35mm	57	5					1				
>35mm	317	13					6				

cervix apear during the pregnancy, the higher is the risk of prematurety.

The results obtained during this study are accourding to the date from the literature. Bittar et al. measured cervical length at 22-24 weeks and had the following results: preterm delivery between 34-37 weeks - 23,8% (25/105). Preterm delivery rate was significant higher in cases of cervical length shorter than 20mm, exactly like in the study from Bucur Maternity. Cervical length shorter than 20mm had a predictive positive value for delivery before 34 weeks of 43,5% and before 37 weeks of 69,6 %. A cervical length longer than 20 mm is associated with preterm delivery only in 3,5% before 34 weeks. Sensitivity for preterm delivery prediction of a cervical length shorter than 20mm was 83,2% at 34 weeks and of 64% for 37 weeks[2]. Nicolaides et al. consider cervical length assessment at 23 weeks a predictive factor for preterm delivery , with a risk of 0,8 % for CL of 30mm; 4% for CL of 15mm and 78% for CL of 5mm[8]. Cook et al. obtained for measuring cervical length at 20 weeks of gestation, for a CL shorter than 21mm, the following: sensitivity 50%, specificity de 89%, PPV of 56% and NPV of 86%[12].

When talking about the best period of time for these measurements, a number of studies concluded that there is no clinical benefit from cervical ultrasound examination before 16 weeks of gestation[13]. Berghella et al. consider that less than 5 % of pregnant women have a short cervix at that gestation age and even those who deliver preterm have a cervical length longer than 25mm during the first trimester. Searching through the literature, there were different periods found for cervical assessment: Berghella et al. recommend that measurements be done at 16-24 weeks[9], Bittar et al. at 22-24 weeks[2], the most frequent gestation age for cervical assessment was less than 24 weeks, more precisely between 20-24 weeks[14]. Choosing the period in this study between 18-20 weeks is justified by the following: as sooner the shortening of the cervix is diagnosed the possibility of therapeutically intervention

Table 2 Funneling

		Term delivery	Preterm delivery	Miscarriage	Total
Funneling	no	377	21	12	400
	funneling	14	37	20	71
Total		381	58	32	471

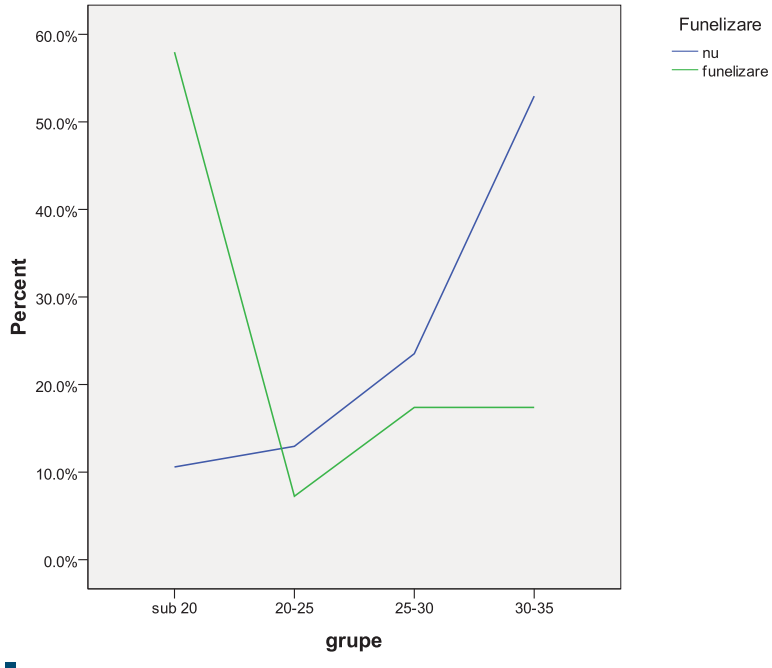

Figure 1. Funneling distribution

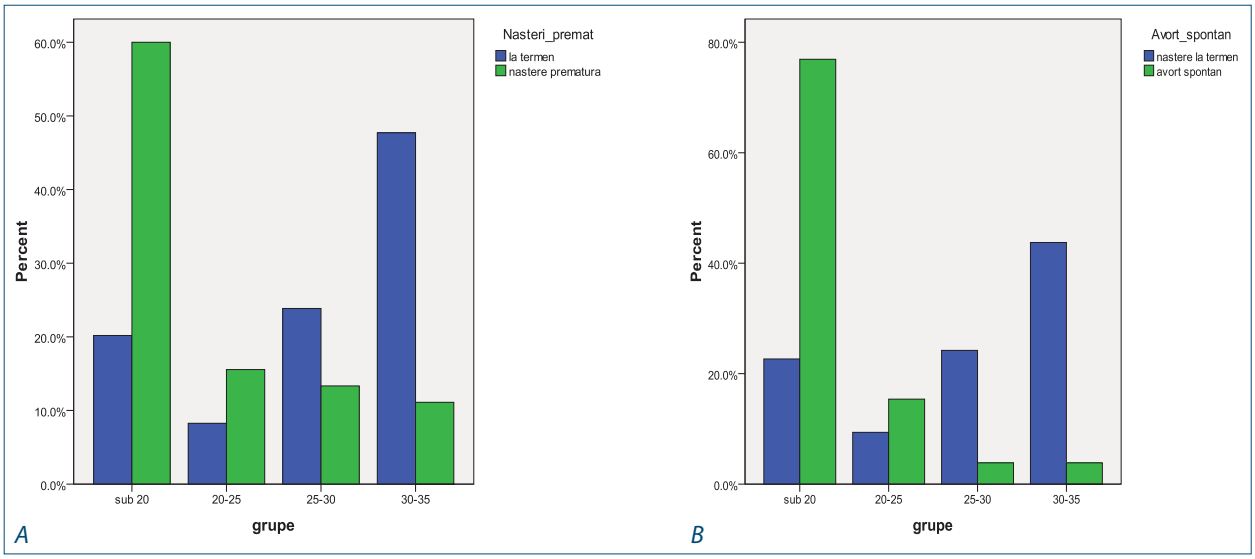

Figure 2. A. Preterm delivery distribution in comparison with term delivery for different cervical length values; B. Miscarriage distribution in comparison with term delivery for different cervical length values

in due time is increased. Also the cervical length measurement can be done in the same time as the 3D ultrasound examination for fetal morphological development.

Concluzions

Translational cervical ultrasound assessment at 18-20 weeks can be an efficient screening test for preventing preterm delivery, a screening test that would select the real patients with increased risk for miscarriage or preterm delivery, this way it is possible to avoid over treatment cases.

The criteria for considering cervical length assessment a efficient screening test[15]:

- it is a secure and easily accepted method;
- it can detect asymptomatic phase, the beginning of cervical shortening;
- it is a well established reproducible technique;
- it allows treatment initiation for preventing miscarriage or preterm delivery;
- it is a valid test.

All these pieces of information can help patients avoid unnecessary interventions or those with questionable value, like tocolizis, hospitalizations, activity restrictions, cerclage. Randomized trials are still necessary to determine the optimal management of one case of short cervix diagnosed by transvaginal ultrasound examination[16].

Novelty of this study consist in the following: the study of the most important factors that can determine late miscarriage, which has not been found in literature; cervical assessment at 18-20 weeks of gestation; the proposal as screening test for the transvaginal cervical ultrasound measurement. ■

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