Ultrasound elastography in assessment of uterine cervical consistence during pregnancy

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Abstract

Assessment of the cervix in predicting preterm delivery and results of labor induction is usually performed by vaginal examination described as Bishop score and ultrasound measurements of cervical length and internal os. Possibility of stiffness assessment by elastography may be a way to avoid cervical palpation and to achieve objectivity of the examination. Authors describe a case of cervical assessment by elastography to show ability of this method to perform cervical examination. Elastography of the cervix seems to be able to show not only overall stiffness of the cervix, but also the differences of the stiffness of particular parts of the cervix, and to follow the changes going on as the pregnancy approaches term.

Key words: elastography, uterine cervix, preterm delivery, post-term pregnancy, cervical assessment

Introduction

Cervical changes at the end of pregnancy lead to delivery and if they begin too early or do not begin at term we face a preterm delivery or a post term pregnancy. Understanding of underlying mechanisms of cervical shortening, ripening and internal os dilatation help to plan treatment, but the most important is diagnosis. Obstetrical history, palpation of cervix and ultrasonographic assessment of cervical length and internal os are the most reliable methods of preterm delivery diagnosis and prediction of labor induction result [1, 2].

Examination of the cervix is described by Bishop scale [3, 4]. Subjectivity of the cervical assessment is the reason of efforts to develop objective methods to substitute palpation. Cervilenz for example allows to measure objectively length of vaginal portion of cervix [5]. Ultrasound besides measurement of internal os and canal length in objective numbers is being studied particularly in assessment of stiffness (use of grey-level histogram to calculate numbers representing cervical consistence by simple difference between anterior and posterior cervical wall, computer based texture analyzing system, analysis of 3D image), but they are not simple and reliable enough and thou not accepted so far [5-8].

Authors tried to visualize in elastography uterine cervix in pregnant woman to assess possibility of use of this method to eliminate subjectivity of palpation.

Case report

Pregnant woman at 26 weeks of her first gestation treated for intrauterine fetal growth restriction was admitted to the Department of Obstetrics of Medical University of Gdańsk. She had not reported any complaints regarding uterine contractions earlier. Two weeks later woman observed slight uterine contractions every 30-40 minutes. She was prepared to vaginal examination and transvaginal ultrasound scan. Consent to use elastography to check if the cervix is visible and possible to assess with this method was obtained from the patient.

Cervix was assessed in Bishop scale first – dilatation was assessed for 0 points, effacement – 0 points, station – 0 points, position – 0 points, consistency – 1 point. Bishop score was calculated to be 1 point and no risk of preterm delivery was diagnosed. Then transvaginal probe was introduced and cervical canal was measured – it was 34 mm long with closed internal os what confirmed the earlier diagnosis. Elastography was turned on and a picture of the cervix was saved (Figure 1).

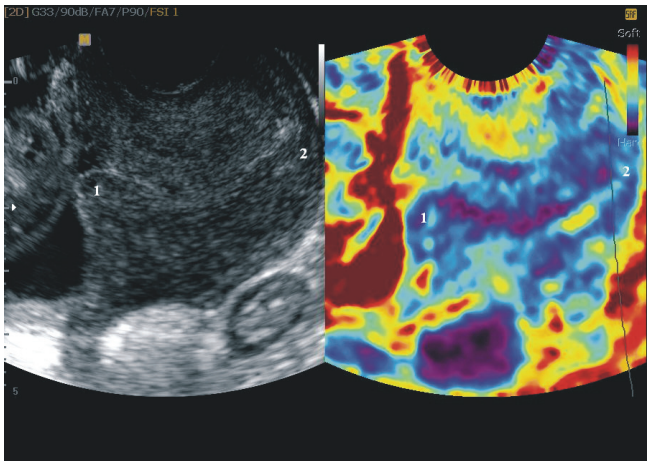

Fig. 1. Elastography of uterine cervix in pregnancy. 1 – internal os; 2 – external os

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The ultrasound Medison equipment: Accuvix V20 Prestige with 3D/4D and elastography software ElastoScan provided by Mar-Med Sp. z o.o. was used.

Patient was diagnosed to have no risk of preterm labor and no tocolytic treatment was introduced. Three days later she was still pregnant and reported no more uterine activity than previously.

Elastography was able to visualize the cervix and the picture was assessed regarding cervical consistence in different parts of it. The hardest part was in the region of internal os, what is consistent with mechanical properties of cervix during pregnancy [9]. Its consistence was similar to that of hard stool seen behind the cervix. A little less stiffness was presented by the region of cervical canal, the lower part the softer tissue. The softest part was the external part of the cervix – the more external region, the softer it was.

Discussion

Ultrasound assessment of the uterine cervix during pregnancy has to be complemented with vaginal examination and Bishop score to predict preterm delivery or labor induction success [1, 2, 3]. Efforts to avoid vaginal examination led to nothing so far, as consistence is one of the most important features of the cervix, together with length and internal os dilatation. Assessment of cervical length and internal os in ultrasound only is not recommended as it does not improve perinatal outcome [10]. All studies trying to assess consistence of the cervix by ultrasound require complicated mathematical formulas and thus are not useful in everyday practice [6, 7].

Elastography is a method allowing to assess consistence of tissue in objective way. It is possible to describe stiffness of the tissue by colors and compare different places – soft cysts or hard tumors in otherwise unchanged organ like prostate, breast, thyroid, salivary glands [11-15] and finding the hardest place helps to perform needle biopsy. Intraoperative localization of non-palpable tumors, for example deep in the liver, is the other use of sonoelastography [16]. Assessment of stiffness of whole the organs, like cirrhotic liver, is more difficult and harder to interpret, but also possible and helpful [17]. There are new studies trying to perform elastography in the preoperative evaluation of the mechanical and elastic properties of arteries and veins before arterio-venous fistula for dialysis [18].

So far no reports regarding possibility of uterine cervix visualization were published. Authors tried to prove, that the elastography shows stiffness differences between parts of cervix. It is known, that during pregnancy the region of internal os and cervical canal is hard and allows to hold the pregnancy till the delivery [9]. Difference between hard cervical canal and softer external parts of the cervix were seen at the picture, furthermore decrease of stiffness in the direction of the external os was also visualized. Authors hypothesized, that changes in cervical consistency could be objectively assessed by elastography instead of subjective palpation and Bishop score. Combination of cervical length and internal os measurements and assessment of consistence by elastography may be alternative to vaginal examination in cases of preterm delivery suspicion or in assessment of patients before labor induction. Low stiffness of region of internal os and cervical canal (similar to external part of cervical wall) may have the same significance as soft consistence assessed by vaginal palpation, but would be more objective.

Conclusions

Ultrasonographic elastography may be a method of objective assessment of cervical ripening. Further studies have to be conducted to create standards of cervical properties seen in elastography and changes of stiffness happening before delivery.

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