P R A C E O R Y G I N A L N E
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The role of elastography in the differential diagnosis of endometrial pathologies – preliminary report

Rola elastografii w diagnostyce różnicowej patologii *endometrium* – doniesienie wstępne

Preis Krzysztof[1], Zielinska Katarzyna[1], Swiatkowska-Freund Malgorzata[1], Wydra Dariusz[2], Kobierski Juliusz[2]

[1] Department of Obstetrics, Medical University of Gdansk, Poland
[2] Department of Gynecology and Gynecological Oncology, Medical University of Gdansk, Poland

Abstract

Objectives: *The aim of the study was to prove the possibility of elastography application in the assessment of the indications for dilatation and curettage (D&C) of the uterine cavity in patients with wide endometrium found in transvaginal ultrasound examination.*

Material and methods: *Analyzed group consisted of 25 perimenopausal women admitted for D&C due to the suspicion of endometrial hypertrophy. In all the patients transvaginal ultrasound examination in B-mode and elastography by the use of ElastoScan® software were performed. Endometrium was described by Elastography Index (EI) presented in previous publications. The results were compared to the pathological results from D&C.*

Results: *Statistical analysis revealed significant difference of elastography image of endometrium described by EI between patients with normal or atrophic endometrium confirmed by pathological examination and women with abnormal findings – endometrial cancer, hypertrophy or polyp ($\chi 2$ Pearson test; p=0.00005). EI in the group with normal endometrium was 0 or 1 point and in the group with endometrial pathology was from 2 to 4 points. No patient with EI for endometrium above 1 point had normal or atrophic endometrium and no woman with EI 0 or 1 had any pathologic finding.*

Conclusions: *Elastography as a new diagnostic technique in gynecology seems to be a valuable tool differentiating endometrial pathologies from normal or atrophic endometrium in perimenopausal women with endometrium thickness above 5mm in transvaginal ultrasound examination.*

Key words: **elastography** / **transvaginal ultrasonography** / **endometrium** / / **hypertrophy of endometrium** / **endometrial cancer** /

Corresponding author:
Krzysztof Preis
Department of Obsterics, Medical University of Gdańsk
Poland, 80-402 Gdańsk, ul. Kliniczna 1a
tel./fax: +48 58 349 34 75
e-mail: kpreis@gumed.edu.pl

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Streszczenie

Cel pracy: *Celem pracy była ocena możliwości zastosowania elastografii w weryfikacji wskazań do diagnostycznego wyłyżeczkowania jamy macicy u pacjentek z poszerzeniem endometrium widocznym w przezpochwowym badaniu ultrasonograficznym.*

Materiał i metody: *Materiał stanowiło 25 okołomenopauzalnych pacjentek przyjętych w celu diagnostycznego wyłyżeczkowania jamy macicy z powodu poszerzenia endometrium stwierdzonego w przezpochwowym badaniu ultrasonograficznym. U wszystkich kobiet wykonano przezpochwowe badanie ultrasonograficzne w projekcji B-mode oraz elastograficzne przy użyciu oprogramowania ElastoScan®. Endometrium opisano stosując wcześniej opublikowaną skalę Elastography Index (EI). Uzyskane wyniki porównano z wynikami badania histopatologicznego materiału uzyskanego z wyłyżeczkowania jamy macicy.*

Wyniki: *Stwierdzono istotną statystycznie różnicę między obrazem elastograficznym ocenionym w skali EI między pacjentkami z prawidłowym wynikiem badania histopatologicznego a kobietami ze stwierdzoną patologią – rak endometrium, rozrost endometrium lub polip endometrialny (test $\chi 2$ Pearsona; p=0,00005). EI w grupie kobiet z prawidłowym lub atroficznym endometrium było ocenione na 0 albo 1 punkt, a w grupie z wynikiem nieprawidłowym – od 2 do 4 punktów. U żadnej z pacjentek z EI powyżej 1 punktu nie zdiagnozowano prawidłowego lub atroficznego endometrium i u żadnej z kobiet, u których endometrium oceniono na 0 lub 1 punkt nie stwierdzono patologii.*

Wnioski: *Wydaje się, że elastografia jako nowa metoda diagnostyczna zmian w obrębie narządu rodnego dobrze różnicuje rozrostowe patologie endometrium od prawidłowej lub atroficznej błony śluzowej u kobiet w okresie okołomenopauzalnym z szerokością endometrium powyżej 5mm w przezpochwowym badaniu ultrasonograficznym.*

Słowa kluczowe: **elastografia** / **ultrasonografia przezpochwowa** / **błona śluzowa macicy** / ***endometrium*** / **przerost *endometrium*** / **rak *endometrium*** /

Introduction

The ultrasound examination in non-symptomatic perimenopausal women is a very helpful tool in the diagnosis of endometrial cancer and other endometrial pathologies [1, 2, 3, 4]. Patients with wide endometrium in transvaginal examination are referred for D&C (dilation and curettage) to establish final diagnosis on a base of pathological findings [2, 3]. This is the standard assuring early diagnosis of endometrial cancer and promising better results of the treatment. However, the D&C procedure is not free from complications and requires anesthesia.

Introduction of elastography in other disciplines brought some expectations regarding differential diagnosis of endometrial pathologies. Elastography is a new ultrasound technique imaging the difference in movement of the tissue after applying compression. The soft tissues move much easier than the hard ones, and the difference is presented at the image as the difference of the color by the use of chosen color scale. The use of elastography was proved to be very helpful in oncology. Differentiation of hard tumors in softer tissue, defining their localization, size and the most changed region before biopsy was described in diagnostic process of management of tumors of breast, thyroid glands, prostate and others [5, 6, 7, 8, 9].

There are some publications presenting results of studies assessing the elastography significance in the imaging of the uterine cervix changes taking place before delivery [10, 11, 12, 13]. It was found useful in detecting the patients with better chances for labor induction success. Similar study is being conducted to check the usefulness of elastography in predicting preterm delivery. Authors of these studies, performed in the Department of Obstetrics of Medical University of Gdansk, invented Elastography Index to be able to describe the elastography images by numbers and to make it easier to evaluate the images and to perform statistical analysis [11].

Only two publications were found in the literature concerning application of elastography in gynecology [14, 15]. Authors proved, that in relation to the hard uterus and cervix, softer pathologic tissues were easy to present in the elastoscan.

Aim of the study

The aim of the study was to prove the possibility of the use of elastography in the assessment of the indications for dilation and curettage (D&C) of the uterine cavity in patients with wide endometrium found in transvaginal ultrasound examination.

Material and methods

Between November 2010 and January 2011 twenty five perimenopausal women with no clinical symptoms were admitted for D&C to the Department of Gynecology and Gynecological Oncology of Medical University of Gdansk due to the suspicion of endometrial hypertrophy because of endometrium thickness above 5mm, found in transvaginal ultrasound examination. In all the patients transvaginal ultrasound examination in B-mode was performed to confirm the indication for D&C. At the same time elastography image was taken and saved by the use of ElastoScan® software in Accuvix V10 Medison ultrasound equipment. Color map number 2 was used coding the hardest tissue as purple and the softest as red and setup regulated in such a way, that uterine walls were presented as purple. Endometrium was described by Elastography Index (EI) presented by Swiatkowska-Freund & Preis in previous publication [11, 12] as follows: purple was assigned 0 points, blue was assigned 1 point, green – 2 points,

yellow – 3 points and red – 1 point. To avoid the interobserver variability images acquired by one operator only were taken into account. The whole procedure was performed according to the Ethics Committee agreement.

In all the patients the standard D&C procedure was performed and the obtained material was sent for pathological examination. Normal or atrophic endometrium was considered as normal result. Polyp, hypertrophy and endometrial cancer were qualified as abnormal findings.

The results of elastography presented as Elastography Index of endometrium were compared to the pathological results. The statistical analysis was performed in Statistica 9 software by the use of χ^2 Pearson test, and $p<0.05$ was considered significant.

Results

In 56% of the patients (14 women) no significant pathology was found – normal (6 patients – 24%) or atrophic (8 women – 32%) endometrium was described by pathologist. In eight cases (32%) endometrial polyp was diagnosed, in one case (4%) – endometrial cancer and in two cases (8%) endometrial hypertrophy.

The significant difference in EI was found between patients with normal finding results (normal or atrophic endometrium) and women with pathologic findings (endometrial cancer, hypertrophy or polyp) – χ^2 Pearson test, $p=0.00005$.

Table 1 presents EI in groups of patients with different pathological findings.

Table I. The range of Elastography Index points in patients with endometrial status found afterwards.

Pathology result	Number of patients		Elastography Index
	N	%	
Atrophy and normal	14	56	0 to 1
Polyp	8	32	2 to 4
Hypertrophy	2	8	3
Endometrial cancer	1	4	4
Total	**26**	**100**	**0 to 4**

Data presented in table 1 suggested, that normal and atrophic endometrium is evaluated as 0 or 1 point of EI, and abnormal tissue is softer, coded as green, yellow or red and assessed as 2, 3 or 4 points. It was hypothesized that EI 0 or 1 point is "normal" for endometrium, and any EI above 1 – "abnormal". Number of "normal" and "abnormal" EI in groups of patients with every pathology (cancer, hypertrophy, polyp) was separately compared to the group of patients with normal or atrophic endometrium. The significant difference for polyp (χ^2 Pearson test; $p<0.001$), hypertrophy (χ^2 Pearson test; $p<0.001$) and cancer (χ^2 Pearson test; $p<0.001$) was found.

Discussion

Many women undergo D&C for clinical symptoms or sonographic findings [1,3]. The procedure performed under general anesthesia brings significant complications risk for the patient. In many cases the pathological examination reveals no pathology and the patients do not require any treatment [1]. Any tool confirming the suspicion of endometrial hypertrophy suggested by B-mode ultrasonography would be very useful and might help to avoid unnecessary procedures.

Elastography proved to be very helpful in management of the prostate, breast or other organs cancer, where neoplasmatic transformation causes changes of the tissue elasticity – tumors are usually harder that the healthy organ [5,6,7,8,9]. In a case of uterus, as a relatively hard organ, elastography showed the endometrial pathologies as softer than normal or atrophic endometrium. Similarly to the study presented by Hobson et al. [14] and Thomas et al. [15], this technique enables to differentiate pathology from normal tissue, but does not help in establishing diagnosis. For endometrial pathology D&C and subsequent pathological examination remains the only reliable diagnostic method. The handicap of elastography however is very clear: in the group of perimenopausal women with no clinical symptoms, and endometrium over 5mm in transvaginal ultrasound, it might enable to select patients with no need for D&C. No patient with any endometrial pathology had EI below 2, but due to the small study group it is too early to say, that the sensitivity of this method is 100%. Probably in a bigger group of patients it will be possible to establish cut-off for EI for endometrium and to prove, that patients with EI below this value may be managed conservatively without performing endometrial biopsy.

Use of EI [11] enables to describe elastographic image of the endometrium in numbers in a very easy way. Color map number 2 allows assigning number of EI points to the chosen structure very clearly, as the colors are separated visibly at the image. That feature was the reason to choose the color map number 2 – color map presenting image in the shades of grey or brown is not so easy to describe as there are no clear delineations between the shades.

Conclusions

Elastography as a new diagnostic technique in gynecology seems to be a valuable tool differentiating endometrial pathologies from normal or atrophic endometrium in women with endometrium thickness above 5mm in transvaginal ultrasound examination.

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