Can vaginal pH predict menopause?

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ABSTRACT

الأهداف : مراجعة دور حموضة المهبل pH في تشخيص انقطاع الطمث .

الطريقة : أجريت دراسة مقطعية وصفية في قسم النساء و التوليد – مستشفى جامعة أمير – سمنان – إيران خلال الفترة من مارس 2008م حتى مارس 2009م على 200 امرأة (100 امرأة لم ينقطع لديهن الطمث، و 100 امرأة بعد انقطاع الطمث) تراوحت أعمارهن من 45–56 عام. وضعت ورقة قياس حموضة المهبل pH بشكل مباشر و متصل لجدار الثلث الأسفل من المهبل و تم قياس حموضة المهبل pH . كما تم الحصول على العينات، و مزرعة الإفرازات المهبلية، و أخذ عينات الدم لقياس الهرمون المنبه للجريب (FSH) في اليوم نفسه. تمت معالجة حالات التهاب المهبل البكتيري، و المشعرة، والتهابات المهبل الأخرى . و بعد 2 أسبوع تم قياس حموضة المهبل pH . كانت المعايير المميزة لتشخيص انقطاع الطمث هي FSH ≥35IU، وظهور أعراض نقص الاستروجين، و انقطاع الدورة لمدة عام . استخدم المنحنى الوصفي لمستقبل العمليات لتحديد نقطة الانقطاع . تم قياس الحساسية، و النوعية، وقيم التخمين الإيجابية، و السلبية .

النتائج : كان عمر معدل الانحراف المعياري للنساء بعد انقطاع الدورة 58±3.8، و في النساء اللواتي لم ينقطع لديهن الطمث 47.6±2 . تقدر حساسية حموضة المهبل في تشخيص انقطاع الطمث 92.7%، والنوعية 83.5%–، و الإيجابية 84.9%–، و السلبية 92%–، و قيم التخمين (6 ≥ نقطة الانقطاع) .

خاتمة : تشير دراستنا أن حموضة المهبل pH وسيلة جيدة لاختبار تشخيص انقطاع الطمث .

Objectives: To review the role of vaginal pH in the diagnosis of menopause.

Methods: This descriptive cross-sectional study was performed in the Department of Obstetrics and Gynecology, Amir University Hospital, Semnan, Iran from March 2008 to March 2009 on 200 women (100 non-menopausal and 100 post-menopausal) from 45-65 years old. The pH paper was placed directly in contact in the lower third side wall of the vagina, and the pH was measured. Simultaneous sampling and culture of the vaginal discharge and blood samples for follicle stimulating hormone (FSH) was performed in the same day. Cases of bacterial vaginosis, trichomonas or other vaginitis were treated, and again 2 weeks later, the vaginal pH was measured. The gold standard for the diagnosis of menopause was FSH ≥35IU, hypoestrogenemia symptoms, and amenorrhea for one year. Receiver operating characteristic curve was used to determine the best cut-off point. The sensitivity, specificity, positive and negative predictive values were evaluated.

Results: The mean ± standard deviation age in the post-menopausal women was 58 ± 3.8, and in non-menopausal women was 47.6 ± 2. The vaginal pH in the diagnosis of menopause has a sensitivity of 92.7%, specificity - 83.5%, positivity - 84.9%, and negative - 92% predictive values (cut-off point ≥6).

Conclusion: Our study suggests that the pH of the vagina can be a good alternative to test for the diagnosis of menopause.

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Menopause occurs due to failure of menstruation in relation to ovarian dysfunction that is a natural event, and part of the natural process of aging. Conventionally, menopause is considered as absence of menstrual cycles. However, using modern laboratory tests, menopause can be as one year amenorrhea with hypo-estrogenemia symptoms, and follicle stimulating hormones (FSH) above 40 IU.[1] In recent studies,[2] it was believed that the use of genetic profiles may add to the accuracy of known markers in the prediction of menopause. The average age of menopause in the United States is 50-52 years old, and in a study by

the National Health Institute in Iran it was reported to be 49.6 years old.[3,4] It is considered that the age of menopause is determined by genetic factors.[1] Lifelong sun exposure, lifelong physical activity, current use of calcium supplementation, and lifelong fish consumption correlates with the age of natural menopause, and it has a seasonal modulation,[5,6] and increased body mass index may be a cause of early menopause.[7,8] There is no association between the age of menopause and educational level.[9] Soon after menopause there are no ovarian follicles,[3] 1-3 years after menopause, the FSH and luteinizing hormone (LH) increase occurs, and during 1-3 years it reaches to a maximum level. The FSH levels is more than LH, as LH can be quickly cleared from the blood,[3] changes in circulating testosterone, and to a lesser extent, estradiol are correlated to changes in dehydroepiandrosterones (DHEA's) in the perimenopausal transition period,[10] also there is a significant decline in the estradiol level,[11] and the anti-Mullerian hormone and inhibin-B decreases.[12] The hypoestrogenic state of menopause is the cause of vaginal atrophy, vaginitis, and urinary tract infection (UTI), and dysparonia.[13] An increased FSH level is the cause of vessel active phenomena such as, hot flushes,[14] estrogen therapy has neuroprotective action, and natural estrogen have less complications than traditional Hormone replacement therapy.[15,16] The vaginal alkaline environment occurs in menopause that induces reduction of *Lactobacillus,* and increases the asymptomatic bacteriurea and symptomatic UTI.[17] The FSH test is a routine test for the diagnosis of menopause. According to some studies, vaginal pH is a useful and inexpensive test for the screening of menopause, and if the vaginal pH is ≤4.5, it is considered that the level of serum estradiol is before menopause, but an increase of pH to 5.6-6.5 is due to limited or reduced levels of estradiol, or bacterial infections. In the absence of the vaginal bacterial infection, a pH between 6-7.5 strongly suggests menopause.[3,18] Normally, a vaginal pH <4.5, and infections such as *Trichomona vaginalis*, bacterial vaginosis, and *Streptococcus (Strep)* group B can increase vaginal PH.[1] Vaginal pH can be elevated by bacterial vaginosis, blood, cervical mucus, semen, and vaginal medication, and vaginal douches.[18] However, as the role of the vaginal pH in the diagnosis of menopause has not been proven, this study was performed to assess the role of the vaginal pH in the diagnosis of menopause.

Methods. This study was performed in the Department of Obstetrics and Gynecology, Semnan University of Medical Sciences, Amir University Hospital, Semnan, Iran from March 2008 to March 2009. The study was approved by the ethical committee of the Semnan University of Medical Science. Two hundred women 45-65 years old, who were referred to the health centers, private medical offices, and Amir Hospital clinic were evaluated. One hundred women were menopausal (FSH ≥35 IU) with one year amenorrhea, and hypoestrogenic symptoms, such as flushing, and 100 were non-menopausal women (FSH <35 IU). The vaginal pH and serum FSH were measured in both groups. In the non-menopausal group, the serum FSH was measured 7-10 days before the next menstrual period (the minimum variation in FSH at this time). The exclusion criteria were: using oral or vaginal estrogen in the recent 2 weeks, vaginal infections, antibiotics user in the recent 2 weeks, intercourse 72 hours before the test, and vaginal douche. In all patients, the tape (universal indicator pH meter [Hangzhou Special Paper Industry Co., Ltd, Hangzhou, China]) was placed directly in contact with the lower third side wall of the vagina, and the pH was measured. After wetting the tape, the tape color changes was compared with the colorimetric color scale, and the pH was recorded. Then, the samples of the vaginal discharge were collected by the relevant laboratory for cultivation of bacterial vaginosis, *Strep* group B and *Trichomonas,* and blood samples were sent to measure FSH in approximately 1 hour after the vaginal pH testing. Cases of bacterial vaginosis, *Trichomonas,* or other vaginitis were treated, and again 2 weeks later the vaginal pH was measured and recorded. In the laboratory, the FSH levels of follicular phase (3-12 IU) and mid cycle phase (8-22 IU), and a FSH of 35-151 IU were considered as postmenopausal.

The receiver operating characteristic (ROC) curve was used to determine the best cut-off point for vaginal pH for predicting menopause. The statistical analysis was performed by Statistical Package for Social Sciences Program (SPSS version 16.0 for windows). The Chisquare test was used to compare percentages. A p value ≤0.05 were considered as statistically significant.

Results. The mean ± standard deviation (SD) age in the post-menopausal women was 58.0 ± 3.8, and in non-menopausal women was 47.6 ± 2.0. In the cultivation of the study group, 8 cases of *Enterobacter (E.) coli,* and 5 cases of *Gardnerella* infection were reported, and were treated with one week oral metronidazole, and the culture was performed again, and re-infection was reported in 2 cases, and these 2 cases were excluded. In one post-menopausal case, FSH was reported <35, and this case was also excluded. In the control group, in 60 cases *Gardnerella, Trichomonas,* mixed, and *Strep* infections were reported. Those 15 cases were *Trichomonas*, 25 cases were *Gardnerella*, 7 cases were *Strep*, and 13 cases were mixed infection. All infections were treated: *Trichomonas* and *Gardnerella* infection

Table 1 - Sensitivity and 1-specificity of vaginal pH based on different cut-off points extracted from the receiver operating characteristics curve.

Vaginal pH	Sensitivity	1-Specificity
3	1	1
4.25	1	0.938
4.75	1	0.619
5.25	0.990	0.381
5.75	0.928	0.165
6.25	0.722	0.072
6.75	0.412	0.0
8	0	0

with metronidazole, mixed infection with Ofloxacin and metronidazole, and *Strep* with Clindamycin cream in 7 days duration were treated, and after treatment cultivation showed re-infection in the 2 cases that were excluded from the study. In total, 3 non-menopausal patients were excluded from the study; one case did not performed FSH, and 2 cases had infection in culture. Therefore, 97 patients in each group were studied. The mean ± SD pH levels in non-menopausal women was 5.1 ± 0.7, and in postmenopausal women was 6.6 ± 0.5, and that difference was significant (*p*=0.000). The mean ± SD FSH in non-menopausal group was 11.3 ± 8.1, and in post-menopausal group was 62.1 ± 13.9 and the difference was significant (*p*=0.000). The different values of vaginal pH and related sensitivity and 1-specificity is shown in **Table 1**. The area ± standard error under the curve (AUC) was 0.942 ± 0.015 (95% confidence interval: 0.913 - 0.972). The ROC curve was developed to predict menopause, revealing the best cut-off point for vaginal pH to be ≥6 (**Figure 1**). The predictive value of this cut-off point of vaginal pH in the diagnosis of menopause were: sensitivity (92.7%), specificity (83.5%), positive (84.9%), and negative (92%).

Discussion. The pH measurement in the absence of vaginal infections is a useful way to determine the status of vaginal estrogen, and may be used to diagnose menopause. According to a study by Cailloutte et al,[18] measuring vaginal pH is a useful and inexpensive test for the screening of menopause. This study confirmed that increased pH range of 5.6-6.5 levels represent the low estradiol level or bacterial agents, and in the absence of bacterial agents vaginal pH between 6-7.5 strongly suggests menopause.[18] Our study showed that a vaginal pH of ≥6 represents menopause, and suggests that the result of our study is similar to the Cailloutte study.

Roy et al,[19] in a review article study approved that vaginal pH can be effective in the diagnosis of menopause. The results of this study showed that in post-menopausal women who do not have estrogen therapy, the mean pH level is 6, and with estrogen treatment decreases to to 4.5.[19] Our study also confirmed that a pH of 6.6 ± 0.5 represents menopause, and this is in agreement with Roy et al's[19] study. Roy et al's study[19] also showed that a pH of >5 had a sensitivity of 64-67% in the diagnosis of menopause. In our study, the sensitivity of vaginal pH in the diagnosis of menopause was 92.7%. That showed the sensitivity was higher in our study. Altoparlak et al[17] reported that the reduction of estrogen is an important cause of infection in women after menopause, as vaginal pH increases after menopause, and the *Lactobacillus* of vaginal flora is replaced by *Enterobacter* colonization especially by *Escherichia (E.) coli.*[17] In our study there were many cases of *E. coli* colonization, and these findings support our study. Maloney et al[20] confirmed that the vaginal pH after estrogen therapy decrease, and may reduce UTI's. In their study,[20] a pH of 7.4 ± 0.7 (mean ± SD) has been reported, that is almost near to the vaginal pH of 6.6 ± 0.5 (mean ± SD) in our study in post-menopausal women.

The limitations of this study were the significant number of the control group with vaginal infection that requires treatment, and some cases are not cooperative. In our center, we used invasive test as a routine test for prediction of menopause and in measuring the serum FSH level. So, the result of our study advocated that the measurement of vaginal PH that is a simple and noninvasive test could be replaced instead of serum FSH level. We recommend further study with more cases in regard to the role of the vaginal PH in the prediction of menopause. So, the measurement of vaginal PH is a simple and non-invasive test that could be used.

We recommend further study with more cases with regard to the role of vaginal PH in the prediction of menopause.

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Related topics

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