ОРИГИНАЛЬНАЯ СТАТЬЯ

TRANSPERINEAL ULTRASOUND IN DETECTION OF UTERINE PROLAPSE

Salama Najem Jassim[1], Firas Abdullah AlBaghdadi[1], Wassan Raheem Mubark Al Khafajy[2]

1 - Department of Radiology, College of Medicine, University of Thi-Qar. Dhi-Qar, Iraq.
2 - Department of Gynecology, College of Medicine, University of Thi-Qar. Dhi-Qar, Iraq.

It has been shown that pelvic floor ultrasonography is helpful in diagnosing pelvic organ prolapse.

Purpose. To determine the optimal cut-off to define abnormal uterine descent on transperineal ultrasound.

Materials and methods. A prospective observational study that was conducted at Bint Al-Huda Teaching Hospital in Dhi-Qar Province during the period of 11 months from 1st of April 2024 till 1st of March 2025. It included 55 married females with sign and symptom of pelvic pain and incontinence who underwent clinical examination by well experienced gynecologist and two-dimensional transperineal ultrasound examination by a radiologist.

Results. Regarding transperineal ultrasound findings in diagnosing uterine prolapse, the sensitivity was 93.9%, the specificity was 86.4%, while the accuracy was 90.9%. The cut point of uterine position was 5.16 mm. Hence, uterine position> 5.16 mm below the symphysis is predictive for uterine prolapse.

Discussion. This study reported that uterine position relative to the posteroinferior margin of the symphysis pubis was significantly higher in patients with UP than in those without. This results agreed with results found by Wu M et al. study in 2021 and Shek KL et al. study in 2015. This study showed that the cut point of uterine position was 5.16 mm. Hence, uterine position > 5.16 mm below symphysis pubis is predictive for UP. Close results were found in Chinese studies conducted by Wu M et al. and Deitz HP et al.; while Shek KL et al. study reported a different result, represented by a higher cut-off value of more than 15 mm for predicting symptoms of prolapse.

Conclusion. Transperineal ultrasound is an effective diagnostic tool in identifying UP demonstrated by its high sensitivity (93.9%) and specificity (86.4%). Transperineal ultrasound found that uterine position higher than 5.16 mm below the symphysis pubis could accurately predict the chance of uterine prolapse`.

Keywords: uterine prolapse, transperineal, ultrasound, cut off, accuracy.

Corresponding author: Salama Najem Jassim, e-mail: salihkazim@yahoo.com

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ТРАНСПЕРИНЕАЛЬНОЕ УЛЬТРАЗВУКОВОЕ ИССЛЕДОВАНИЕ В ДИАГНОСТИКЕ ОПУЩЕНИЯ МАТКИ

Салама Наджем Джассим[1], Фирас Абдулла Аль-Багдади[1],
Вассан Рахим Мубарк Аль Хафаджи[2]

1 - Кафедра лучевой диагностики, Медицинский колледж, Университет Ти-Кар. Ди-Кар, Ирак.
2 - Кафедра гинекологии, Медицинский колледж, Университет Ти-Кар. Ди-Кар, Ирак.

Ультразвуковое исследование (УЗИ) тазового дна используется для диагностики пролапса тазовых органов.

Цель исследования. Определить пороговое значение для диагностики аномального опущения матки при трансперинеальном ультразвуковом исследовании (ТУЗ).

Материалы и методы. Проспективное обсервационное исследование проводилось в больнице Бинт Аль-Худа в провинции Ди-Кар в течение 11 месяцев с 1 апреля 2024 года по 1 марта 2025 года. В исследовании приняли участие 55 замужних женщин с симптомами тазовой боли и недержания мочи, прошедших клиническое обследование у опытного гинеколога и трансперинеальное ультразвуковое исследование (ТУЗ) у врача-рентгенолога.

Результаты. Чувствительность трансперинеального ультразвукового исследования при диагностике опущения матки составила 93,9%, специфичность – 86,4%, точность – 90,9%. Пороговое значение положения матки составило 5,16 мм. Таким образом, положение матки > 5,16 мм ниже симфиза является предиктором выпадения матки.

Обсуждение. В данном исследовании показано, что положение матки относительно задне-нижнего края лонного сочленения было значительно больше у пациенток с опущением матки, чем у пациенток без данного состояния. Эти результаты согласуются с результатами исследования Wu M. и соавторов, проведенного в 2021 году, и исследования Shek K.L. и др., проведенного в 2015 году. Настоящее исследование показало, что пороговое значение положения матки составляло 5,16 мм. Следовательно, положение матки > 5,16 мм ниже лонного сочленения является предиктором выпадения. Похожие результаты были получены в китайских исследованиях, проведенных Wu M. и соавторами, и Deitz H.P. и др.; в то время как в исследовании Shek K.L. и соавторов был получен другой результат, представленный более высоким пороговым значением для прогнозирования симптомов пролапса, превышающий 15 мм.

Заключение. Трансперинеальное ультразвуковое исследование является эффективным диагностическим инструментом для выявления опущения матки, что подтверждается его высокой чувствительностью (93,9%) и специфичностью (86,4%). Трансперинеальное УЗИ показало, что расположение матки более 5,16 мм ниже лобкового симфиза может являться точным предиктором выпадения матки.

Ключевые слова: опущение и выпадение матки, трансперинеальное УЗИ, пороговое значение, точность.

Контактный автор: Салама Наджем Джассим, e-mail: salihkazim@yahoo.com

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The displacement of the uterus from its normal anatomical position into the vaginal canal through hymen or the introitus of the vagina is known as uterine prolapse (UP). This is due to the weakening of its surrounding support structures [1]. UP is one of the multiple conditions classified under the broader term of pelvic organ prolapse [2]. The majority of those affected are women, particularly those who have undergone hysterectomy surgery, vaginal deliveries, or several pregnancies. Although UP may not be life-threatening, it can significantly impair a woman's quality of life by causing symptoms like vaginal soreness, pelvic pressure, urinary incontinence, trouble having sex, and in more severe cases, tissue ulceration or infections [3, 4]. The traditional technique for assessing UP prior to surgery is the International Continence Society Pelvic Organ Prolapse Quantification (ICS POP-Q) system [5]. Imaging tests such as magnetic resonance imaging (MRI) have been shown to be comparable to clinical evaluations for the assessment of UP [6]. However, the limitations of both diagnostic approaches differ since MRI, a less expensive test, is not always available to physicians for the investigation of pelvic organ prolapse, and clinic evaluations only employ the anatomical surface with the hymen as a moveable point of reference [7,8]. Trans-perineal ultrasound (TPUS) has become more used in gynecology, urology, and obstetrics in recent years. It offers vital new information on conditions like obstructive urinary problems, pelvic organ prolapses, urine incontinence, and even how to manage childbirth [9]. To standardize the ultrasound diagnosis of prolapse, significant prolapse is defined as a drop of ≥10 mm for the anterior compartment and ≥15 mm for the middle and posterior compartments of the corresponding organ below the posteroinferior limit of the pubic symphysis [10]. However, TPUS is useful for both diagnosing significant prolapse in each compartment and for differentially diagnosing the illness of each compartment [11]. This non-invasive, radiation-free technique has grown in popularity since it is accessible, safe, and produces real-time pictures [12].

The aim of this study is to determine the optimal cut-off to define abnormal uterine descent on TPUS.

Materials and Methods.

Study design and setting.

This is a prospective observational study that was conducted at Radiology Department of Bint Al-Huda Teaching Hospital in Dhi Qar Province during the period of 11 months from 1st of April 2024 till 1st of March 2025.

Study patients and sample size.

The study included 55 married females with sign and symptom of pelvic pain and incontinence who underwent clinical examination by well experienced gynecologist and two-dimensional TPUS examination by a radiologist. Patients had a history of hysterectomy or pelvic floor surgery for prolapse / incontinence, women who gave birth six months or less ago, and patients refused to be a part of this study were excluded.

Data collection tools.

A questionnaire was applied to all enrolled patients to collect the needed information. It includes questions to gather information about the demographic characteristics of examined women, obstetrical and gynecological history, surgical history, and ultrasound examination data.

Workup:

• TPUS was performed with the woman in the dorsal lithotomy position, after she had emptied her bladder and bowels.

• Examinations were performed by a sonographer, using a Voluson E6 Ge ultrasound device (GE Healthcare) equipped with 4–8-MHz curved-array volume transducer.

• The sonographer had no access to the patient's clinical data, or the pelvic organ prolapse clinical examination data. The acquisition angle was 85◦.

• Two-dimensional (2D) volumes were acquired, during rest, pelvic floor muscle contraction and maximum Valsalva maneuver, for later offline analysis.

• At least three volumes were obtained during Valsalva maneuver for each patient and each Valsalva maneuver was performed for a minimum duration of 6 s.

• The volume with the most severe signs of uterine prolapse was selected for measurements.

• Analysis was carried out using 2D View, version 10.0 (GE Healthcare).

• A horizontal line was placed through the posteroinferior margin of the symphysis pubis; this was the reference line.

• Another horizontal line, placed along the leading edge of the cervix, was used to define the position of the uterus.

• Uterine prolapse was assessed using uterine position (measured in mm) relative to the posteroinferior margin of the symphysis pubis on TPUS, during maximum Valsalva maneuver (fig. 1, 2).

Clinical examination.

Pelvic organs prolapse clinical examinations were performed by experienced gynecologists with ≥ 2 years' experience of performing pelvic organ prolapse clinical examinations. The

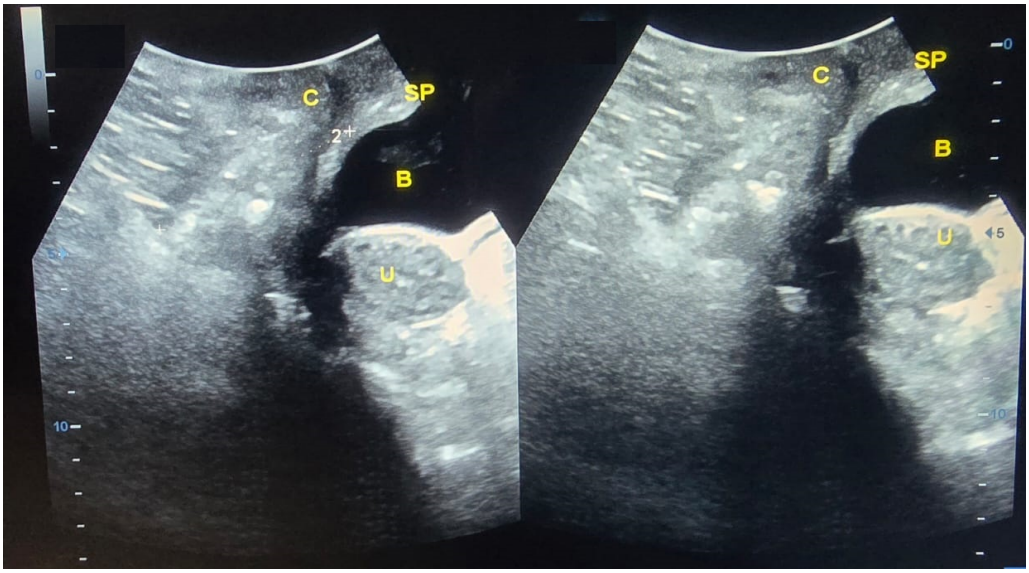

Fig. 1 (Рис. 1)

Fig. 1. Transperineal Ultrasound, mid sagittal view, performed at rest and after Valsalva maneuver.

Patient, 35-years-old female, no uterine prolapse (B – bladder, U – uterus, C – cervix, SP – symphsis pubis).

Рис. 1. Трансперинеальное УЗИ, средне-сагиттальная плоскость сканирования, в состоянии покоя и после пробы Вальсальвы.

Пациентка, 35 лет, без опущения матки (B – мочевой пузырь, U – матка, C – шейка матки, SP – лобковый симфиз).

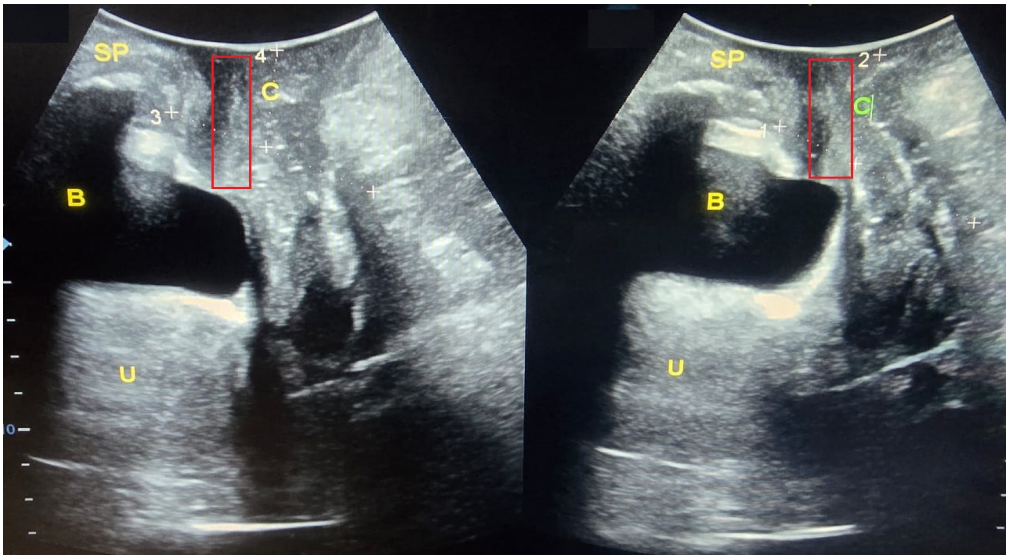

Fig. 2 (Рис. 2)

Fig. 2. Transperineal ultrasound, mid sagittal view, performed at rest and after Valsalva maneuver.

Patient, 45-years-old woman, uterine prolapse (B – bladder, U – uterus, C – cervix, SP – symphsis pubis). Distance more than 10 mm is prolapse (red rectangle).

Рис. 2. Трансперинеальное УЗИ, средне-сагиттальная плоскость сканирования, в состоянии покоя и после пробы Вальсальвы.

Пациентка, 45 лет, с опущением матки (B – мочевой пузырь, U – матка, C – шейка, SP – лонный симфиз). Расстояние более 10 мм соответствует опущению (красный прямоугольник).

Table №1. Distribution of study patients by general characteristics.

Variable	No. (n= 55)	Percentage (%)
Age (Year)		
< 35	23	41.8
35 – 44	5	9.1
> 45	27	49.1
BMI Level		
Normal	15	27.3
Overweight	31	56.4
Obese	9	16.3
Parity		
< 4	12	21.8
≥ 4	43	78.2
Mode of deliveries		
NVD	29	52.7
C/S	16	29.1
Both	10	18.2
Menopausal status		
Pre menopause	44	80.0
Post menopause	11	20.0

examiner had no access to the woman's clinical data or ultrasound findings.

Ethical considerations and official approvals.

The study was conducted in accordance with the ethical standards of the Scientific Committee of Radiology Department, College of Medicine / Thi-Qar University and with the Helsinki Declaration of 1975, as revised in 2013. Informed consent was obtained from each participant after discussion of the study and its objectives. The names were removed and replaced with identification codes. All information was kept confidential on a password-secured laptop, and the data were used exclusively for research purposes.

Statistical analysis.

Version 26 of the Statistical Package for Social Sciences (SPSS) was used to analyze the data. The data was displayed as ranges, means, and standard deviations. percentages and frequencies used to display categorical data. The uterine position in relation to UP was compared using an independent two-tailed t-test. To diagnose UP, uterine position was predicted using receiver operating characteristic (ROC) curve analysis. A P-value of less than 0.05 was regarded as significant.

Results.

In this study, patients' age ranged from 26 to 59 years with a mean age of 39.63±10.3

years; 56.4% of were overweighed, 78.4% had four children or more, 52.7% were delivered by NVD, 80% were pre menopause (Table №1).

Table №2 shows the sensitivity, specificity, and accuracy of TPUS findings in diagnosing UP. The sensitivity was 93.9%, while the specificity was 86.4%. The accuracy of the TPUS was 90.9%.

Receiver operating characteristic (ROC) curve analysis was constructed to predict uter-

Table №2. Diagnostic characteristics of MSCT and non-EPI DWI MRI in relation to the detection of recurrence of cholesteatoma.

TPUS findings	Clinical diagnosis		
	Prolapse	No prolapse	Total
Prolapse	31	3	34
No prolapse	2	19	21
Total	33	22	55

ine prolapse by using uterine position relative to the posteroinferior margin of the symphysis pubis. The cut point of uterine position was 5.16 mm. Hence, uterine position > 5.16 mm below the symphysis pubis is predictive for UP, as a large significant area under the curve (AUC= 81.5%) indicating significant association between higher level of uterine position below the symphysis pubis and prediction of uterine prolapse with sensitivity of 90.9%, specificity of 86.4% and accuracy of 89.1% (fig. 3, Table №3).

vic organ descent in reference to fixed bone landmarks [14]. This technique increases the accuracy of the diagnosis and helps differentiate UP from other pelvic floor issues. By offering comprehensive anatomical information, the imaging results can impact surgical decision-making, resulting in customized surgical techniques and possibly better results [15, 16, 17]. This study reported that uterine position relative to the posteroinferior margin of the symphysis pubis was significantly higher in patients

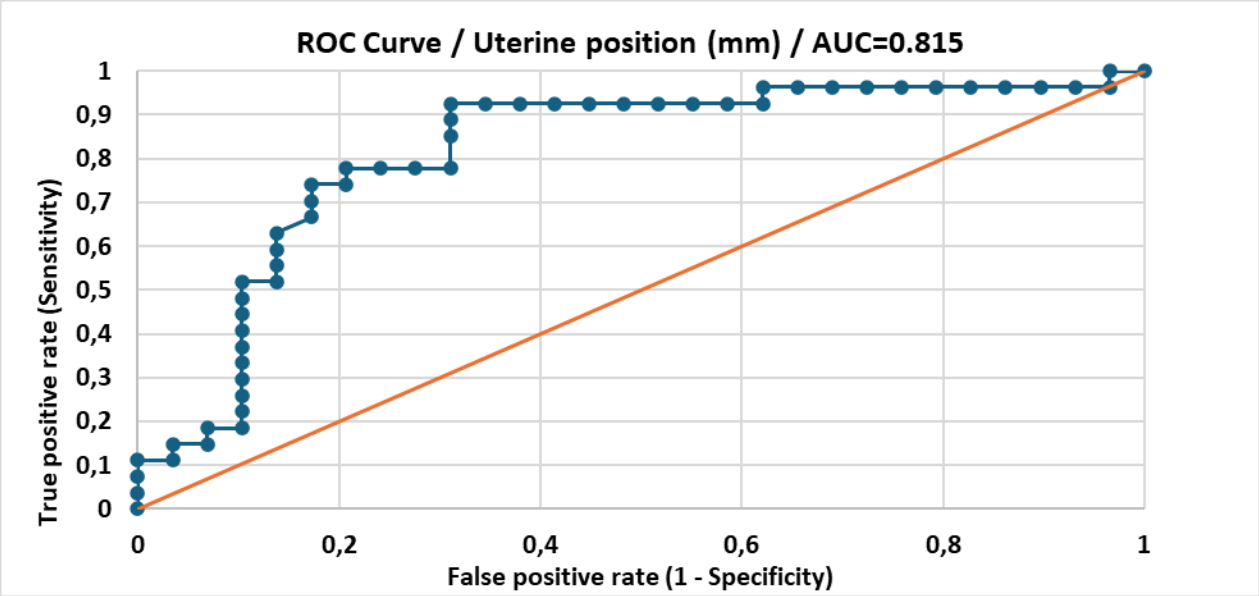

Fig. 3 (Рис. 3)

Fig. 3. Graph.

P ROC curve to predict uterine prolapse by using uterine position (measured in mm) relative to the posteroinferior margin of the symphysis pubis.

Рис. 3. График.

ROC-кривая позволяет предсказать выпадение матки, используя положение матки (измеренное в мм) относительно задне-нижнего края лобкового сочленения.

Table №3. Diagnostic accuracy of uterine position (measured in mm) relative to the posteroinferior margin of the symphysis pubis to predict UP.

	Cut-off value	Sensitivity	Specificity	PPV	NPV	Accuracy
Uterine position (mm)	5.16	92.6%	72%	73.5%	90.9%	80.4%

Discussion.

TPUS has been utilized to quantify prolapse since 2001. This method is straightforward, safe and simple to duplicate. TPUS offers details on the functional anatomy and underlying organs. It has been demonstrated that the POP-Q stage and pelvic ultrasonography findings of prolapse are significantly correlated [13]. A helpful imaging technique for assessing UP is TPUS, which offers dynamic visualization of pel-

with UP than in those without. This results agreed with results found by Wu M et al. study in 2021 [18] and Shek KL et al. study in 2015 [19].

This study showed that the cut point of uterine position was 5.16 mm. Hence, uterine position > 5.16 mm below symphysis pubis is predictive for UP. Close results were found in Chinese studies conducted by Wu M et al. and Deitz HP et al.; while Shek KL et al. study re-

ported a different result, represented by a higher cut-off value of more than 15 mm for predicting symptoms of prolapse [18-20]. According to recent research, retroversion is more prevalent among Asians and could play a significant role in Asian women's aberrant uterine descent. The lower uterine position and higher prolapse rate in Chinese women compared to Caucasian women may be explained by this [21]. In addition to the patients' ages, postmenopausal women frequently report greater incidence of prolapse symptoms as they age. Additionally, since different studies have different definitions of what constitutes "prolapse" and how severe it is, some include Stage I (mild) prolapse, while others only consider Stage II or higher to be clinically significant and ultimately related to the U/S device experience.

In this study, TPUS examination showed that 61.8% of patients had signs of pelvic organ prolapse, the sensitivity of the TPUS was 93.9%, while the specificity was 86.4%. The accuracy was 90.9%. On the other hand, clinical diagnosis showed that 60% were diagnosed with pelvic organ prolapse.

Rodríguez-Mias NL et al. study found that prolapse symptoms were reported by 59.2%, Braverman M et al. study, showed that 58.9% presented with symptoms of prolapse in the form of a lump in the vagina or a dragging sensation [22]. Clinically, 82.8% had significant prolapse [23]. The difference reported among studies can attributed to the age and menopausal status, geography and socioeconomics, since women in rural populations may present later with more advanced symptoms due to limited access to healthcare, parity, diagnostic criteria used, as some studies use clinical examination to diagnose prolapse, even in asymptomatic women while others rely only on self-reported symptoms and finally related to cultural factors, because in some cultures, women may not report symptoms like urinary incontinence, pelvic pressure, or sexual discomfort due to stigma.

Conclusion.

TPUS is an effective diagnostic tool in identifying UP demonstrated by its high sensitivity (93.9%) and specificity (86.4%). TPUS found that uterine position higher than 5.16 mm below the symphysis pubis could accurately predict the chance of UP. It is advised that TPUS to be incorporated into standard evaluation procedures for patients exhibiting pelvic organ prolapse symptoms.

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Conflicts of interest.

The authors declare no conflict of interest regarding this article.

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