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Assesing The Thickness Of Vaginal Wall And Vaginal Mucosa In Early Adolescent, Newly-Married Young Adult And Postmenopausal Women By Transabdominal Ultrasound

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ABSTRACT

Background
Similar to the uterine endometrium, the thickness of the vaginal wall varies in response to oestrogen levels. Numerous studies have reported a reduction in vaginal thickness during menopause. However, there is a dearth of published research on the ultrasonic evaluation of vault thickness. The study's objective is to use transabdominal sonography to assess and compare the thickness of the vaginal mucosa and wall in postmenarcheal teenagers, recently married women, and postmenopausal female individuals.

Materials and methods
The vaginal wall and mucosal thickness (VWT and VMT, respectively) of 188 female participants who underwent abdominal ultrasonography for routine/baseline studies or for trivial abdominal symptoms were analysed based on their ultrasound findings over a three-month period.

Results
A total of 188 female participants were examined. Of these, 48 belonged to the postmenarcheal adolescent age range (12–15 years), 66 were young adult subjects (20–25 years), and 74 were postmenopausal women (50–75 years). Between the three groups, statistically significant variations in VWT and VMT were observed. For adolescents who had just come of age, the VMT and VVT were 0.8-1.5 mm and 6.2-8.1 mm, respectively. For female patients who had recently tied the knot, the VMT and VVT were 0.9-2.5 mm and 7.8-21.4 mm, respectively. For postmenopausal subjects, the respective VMT and VVT were 0.4-0.8 mm and 4.4-6.8 mm.

Conclusion
According to the study, the thickness of the mucosa and wall reaches its peak in the early stages of adulthood, minimal in the postmenopausal phase, and intermediate in the early stages of adolescence. Sexual activity may have an aetiologic function in the rise in wall and mucosal thickness in young newly-married females. Vaginal blood flow, mucosal congestion, the function of oestrogens, other hormones and variables are likely to blame.

Keywords: Transabdominal sonography, vaginal wall thickness and vaginal mucosal thickness.

Introduction

The vaginal wall has been sonologically evaluated via transvaginal and transabdominal routes. The only drawback to the transabdominal approach may be the discomfort associated with keeping the bladder full. Compared to other modalities like MRI, which have also been used to assess the pelvis, it is more affordable, more accessible, and faster. Transvaginal scans may cause discomfort for postmenopausal women, as many of them exhibit symptoms of the genitourinary syndrome associated with menopause. They also necessitate the absence of an intact hymen.
The vaginal wall is made up of four layers: adventitia, submucosa, muscularis, and vaginal mucosa. The vaginal mucosa layer is composed of glycogen-containing stratified squamous epithelium that is not keratinized.
According to the method outlined by Balica et al., the measurements of vaginal wall thickness were obtained at the trigone level, because of the presence of ureteric jets on colour doppler which makes the UV junctions easily discernible, ensuring repeatability of the measurements.
By measuring the individuals when the bladder dome just touches the fundus, the current study has improved this technique even further. An overly distended bladder may stretch and thin out the vaginal vault, giving rise to an artificially low wall thickness measurement.
Limited studies have been done to date comparing vaginal wall thickness across different age groups, according to a search of the published literature. The purpose of this study is to fill this gap.

Aims and objectives

The purpose of the research is to use transabdominal sonography to compare the vaginal mucosal and vaginal wall thickness (VMT and VWT, respectively) in postmenarcheal teenagers, newlywed young adults, and postmenopausal female participants.

Materials and methods

Study design - Comparative – Analytical study.
Study Period: From February 2024 to April 2024 for period of three months., patients in the study group had trans-abdominal ultrasonography.

Study subjects

Group A: Postmenarcheal subjects, 12–15-year age group.
Group B: Young adult married women in 20–25-year age group.
Group C: Female postmenopausal females, 50 years of age and older.

Inclusion criteria

- Female outpatients with dyspepsia/abdominal pain, trivial discomfort, irregular menstrual cycles, dysmenorrhea and menorrhagia as initial criteria for inclusion.
- Young adult females who have recently married (married life 0–5 years).

Exclusion criteria

- Those who are hospitalized.
- Recent or ongoing pregnancy.
- Individuals who have undergone prior pelvic surgery.
- Utero-vaginal prolapse.
- People with masses in the abdomen and pelvis.
- Individuals with vulvovaginitis's clinical characteristics.

Study procedure

Prior to transabdominal scanning, information on each patient's age, symptomatology, and marital status was gathered. Following oral hydration, abdominal ultrasonography was performed on all individuals while they were fasting, paying particular attention to adequate bladder filling. This was described as inflating the bladder to the point where, in the event that the uterus was observed to be retroverted, the bladder dome would cover the uterine fundus or would allow for good visualization of the fundal region.
The method outlined by Balica A et al. was used to measure the thickness of the vaginal wall. The location of the ureteric jets on colour Doppler imaging was used to estimate the level of the ureteric orifices, where coronal ultrasound scan images were obtained (Figure 1). After moving the probe into a sagittal plane, the thickness of the vaginal mucosa and wall was measured (Figure 2). The author used a GE Logic F8 system and a 2-5 MHz convex abdomen probe to perform all measurements.

Figure 1. Ureteric Jets Outlined by Power Doppler Imaging.

Figure 2. Vaginal Wall Thickness at the Level of the Ureteric Orifices -Marked by Cursors.

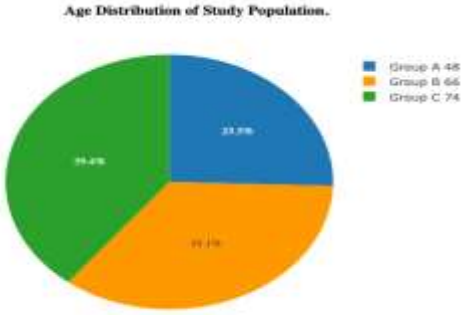
Statistical analysis

After being coded and verified, the collected data were imported into Microsoft Excel. Three groups' vaginal wall and mucosal thickness mean and standard deviation were determined. Student's t-test was used to compare the results, with the newlywed women serving as the reference. With a p-value of less than 0.05, the 95% confidence interval was used to evaluate the level of significance.

Results

Age Distribution of Study Population

Utilizing ultrasonography, 188 female population individuals were evaluated. Of these, 74 (39.4%) patients belonged to group C (postmenopausal females aged 50 and beyond), 48 (25.5%) were in group A (postmenarcheal subjects aged 12–15 years), and 66 (35.1%) were in group B (married young adult females aged 20–25 years).



No.	Group	Wall Thickness (Range)	Wall Thickness (Mean)	P value
1.	A	6.2-8.1 mm	6.8 ± 1.4 mm	<0.001
2.	B	7.8-21.4 mm	14.2 ± 2.6 mm	Reference
3.	C	4.4-6.8 mm	5.8 ± 1.3 mm	<0.001

Table 1. **Vaginal wall thickness in different groups**

During the current investigation, the vaginal wall thickness of 48 (25.5%) Group A subjects ranged from 6.2-8.1 mm with a mean thickness of 6.8 ± 1.4 mm; 66 (35.1%) Group B subjects ranged from 7.8-21.4 mm with a mean thickness of 14.2 ± 2.6 mm; and 74 (39.4%) Group C subjects ranged from 4.4-6.8 mm with a mean thickness of 5.8 ± 1.3 mm. There was a statistically significant difference (p value <0.001) in the vaginal wall thickness of newly married women compared to the other two groups: postmenarcheal and postmenopausal. (Table I).

No.	Group	Mucosal Thickness (Range)	Mucosal Thickness (Mean)	P value
1.	A	0.8-1.5 mm	0.9 ± 0.2 mm	<0.001
2.	B	0.9-2.5 mm	1.4 ± 0.4 mm	Reference
3.	C	0.4-0.8 mm	0.5 ± 0.1 mm	<0.001

Table 2. **Vaginal mucosal thickness in various groups**

Within the current study, the vaginal mucosal thickness ranged from 0.8-1.5 mm with a mean thickness of 0.9 ± 0.2 mm for 48 (25.5%) of group A subjects, 0.9-2.5 mm with a mean thickness of 1.4 ± 0.4 mm for 66 (35.1%) of group B subjects, and 0.4-0.8 mm with a mean thickness of 0.5 ± 0.1 mm for 74 (39.4%) of group C subjects. Between the vaginal mucosal thickness of newly married women and the other two groups of postmenarcheal and postmenopausal women, there was a statistically significant difference (p value <0.001).

Discussion

Numerous ultrasonography studies have examined the assessment of vaginal wall thickness (VWT) and vaginal mucosal thickness (VMT), but this work is the first to explicitly assess this measurement in the early stages of young adulthood. There have been attempts to measure both single and double walls at several locations within the vaginal vault using different approaches (transvaginal and transabdominal).

When utilized in accordance with the previously described guidelines, the transabdominal route was universally accepted by all groups in the current investigation. Body habitus did not provide a challenge to accurately determining VWT and VMT.

Vault form and thickness have already been reported by MRI investigations. Because ultrasound is readily available, inexpensive, and requires little time, it performs better than MRI for imaging the vault.

The purpose of the exclusion criteria was to exclude participants whose pre-existing pelvic problems potentially affect VMT/VWT. Patients who had undergone menopause with indications of vaginal prolapse were excluded. Previous research using vault tissue surgical pathology specimens has demonstrated an increase in VWT in these patients as a result of muscularis layer hypertrophy.

The study excluded patients who had pre-existing vulvovaginitis clinical characteristics.

According to Elsayes KM et al., MRI findings in vulvovaginitis include vaginal wall thickening, vaginal lumen fluid, and vaginal wall enhancement.

Sonological evaluation of the study subjects was first performed at the level of the visually thinnest point on sagittal imaging, as well as at the midway of the vaginal sheath when measured from the posterior fornix to the urethral level. Following that, the method for measurements at the trigone level as outlined by Balica A. et al. was used. As a result, the findings obtained from intraobserver measures at various sittings were more consistent and repeatable.

Measurements were taken at optimal bladder filling, which was defined as a bladder dome that just covered the uterine fundal level. This somewhat changed the technique previously described. This would eliminate mistakes caused by fictitious wall weakening from strain from an over enlarged bladder.

The study's findings show that the thickness of the vaginal mucosa and wall varies with age, reaching its maximum in the early stages of adulthood, its minimum in the postmenopausal stage, and its intermediate level in the early stages of adolescence.

Vaginal blood flow, mucosal congestion, and the role of oestrogens and other hormones are likely the main contributing elements in this case.

It is commonly known that oestrogen levels affect the thickness of the vaginal wall. Vaginal tone, support, and function are lost in postmenopausal women. These alterations affect the vaginal wall's four layers. The vaginal epithelium thins out histologically, and superficial keratinization may coexist. This causes the vaginal pH to rise from an acidic range of 3.8–5.5 to 7.0–7.4, constriction of the vaginal vault, decreased vaginal blood flow, and loss of mucosal glycogen content. Pathogenic bacteria replace lactobacilli, changing the vaginal flora when

they are reduced or absent. Vaginal laxity, dryness, discomfort or itching, and bleeding are some of the symptoms. The genitourinary syndrome of menopause is the new name for the condition.
The increase in wall and mucosal thickness in this age group appears to have an aetiologic role in sexual activity, as evidenced by statistically significant variations in wall thickness between young recently married females and the other two groups. Microtrauma brought on by penetration-related sexual activity and vaginal wall congestion could be the cause of this.
Regarding the amount of sexual activity, no in-depth questioning was done. In this situation, questionnaires like the GRISS format can be useful. Additional research aimed at this age range should aid in verifying initial results presented here.

Conclusion

According to the findings, vaginal mucosal and wall thickness peaks in early adulthood, falls off during the postmenopausal stage, and then reaches an intermediate level in the early stages of adolescence.
Since Balica et al.'s study did not stratify patients based on age, the mean vaginal wall thickness and vaginal mucosal thickness as determined in this investigation are not strictly comparable to those findings. Nonetheless, the young adult female patients in study group B's mean and SD values agreed with earlier findings. The VWT mean for study group B was 14.2 ± 2.6 mm, which is within the 95% confidence interval (CI) compared to readings of 14.5 ± 4.2 mm reported by Balica et al.

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