TRANSABDOMINAL SONOLOGICAL ASSESSMENT OF VAGINAL WALL AND MUCOSAL THICKNESS IN EARLY ADOLESCENT, NEWLY-MARRIED YOUNG ADULT AND POSTMENOPAUSAL SUBJECTS IN SOUTH INDIA- A PRELIMINARY COMPARATIVE STUDY

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ABSTRACT

BACKGROUND
The vaginal wall like the endometrium of the uterus shows variations in wall thickness in response to oestrogen levels. Postmenopausal decline in vaginal thickness has been documented in myriad studies. Limited published work exists, however, that documents ultrasound assessment of vault thickness.

The aim of the study is to evaluate and compare the vaginal mucosal and wall thickness in postmenarcheal adolescents, newly wed and postmenopausal female subjects by transabdominal sonography.

MATERIALS AND METHODS
Ultrasound findings of 188 female subjects with regard to vaginal wall and mucosal thickness (VWT and VMT, respectively), who underwent abdominal ultrasonography for trivial abdominal symptoms or as a routine/baseline study over a three month period were analysed.

RESULTS
A total of 188 female subjects were examined. 48 of these were postmenarcheal adolescents in the 12-15 years age group, 66 were recently wedded young adult subjects in the 20-25 years age group and 74 were postmenopausal females in the 50-75 years age group. Statistically significant differences in VWT and VMT were noted between the three groups. VMT and VVT for postmenarcheal adolescents were 0.8-1.5 mm and 6.2-8.1 mm, respectively. VMT and VVT for recently wedded female subjects were 0.9-2.5 mm and 7.8-21.4 mm, respectively. VMT and VVT for postmenopausal subjects were 0.4-0.8 mm and 4.4-6.8 mm, respectively.

CONCLUSION
The study suggests that mucosal and wall thickness are maximal in early adult life, minimal in the postmenopausal period and intermediate in early adolescence. A variety of factors are probably responsible, viz. the role of oestrogens and other hormones, vaginal blood flow and mucosal congestion. The variations between wall thickness in young newly-married females and the other two groups suggests that sexual activity has a aetiologic role in the increase in wall and mucosal thickness in this age group.

KEYWORDS
Vaginal Wall Thickness, Vaginal Mucosal Thickness, Transabdominal Sonography.

thin out the vaginal vault leading to a falsely low value for wall thickness.

A search of published literature shows limited studies to date comparing vaginal wall thickness across multiple age groups. It is the aim of this study to make a start in addressing this lacuna.

**Aims and Objectives**

The study aims to compare vaginal mucosal and vaginal wall thickness (VMT and VWT, respectively) in postmenarcheal adolescents, newly-wed young adult and postmenopausal female subjects by transabdominal sonography.

**MATERIALS AND METHODS**

**Study Design**

Comparative- Analytical study.

**Study Period**

Patients in the study group undergoing abdominal ultrasound in a 3-month period from May to August, 2017.

**Study Subjects**

Group A- Postmenarcheal subjects aged 12-15 years.
Group B- Married young adult females aged 20-25 years.
Group C- Postmenopausal females aged 50 years and above.

**Inclusion Criteria**

- Female outpatients presenting with abdominal pain/dyspepsia, trivial abdominal discomfort, irregular menstrual cycles, dysmenorrhea and menorrhagia.
- Newly-married (married life 0-5 years) young adult females.

**Exclusion Criteria**

- Hospitalised patients.
- Current or recent pregnancy.
- Patients with history of pelvic surgery.
- Uterovaginal prolapse.
- Patients with abdominopelvic masses.
- Patients with clinical features of vulvovaginitis.

**Study Procedure**

From each patient, data regarding age, symptomatology and marital status was collected prior to transabdominal scanning. Abdominal ultrasonography was done for all subjects in a fasting state after oral hydration with special reference to optimal bladder filling. This was defined as bladder filling adequate enough for the bladder dome to cover the uterine fundus or which provided satisfactory visualisation of the fundal region, if for example, the uterus was seen to be retroverted.

Vaginal wall thickness was assessed by the technique described by Balica A et al. Coronal ultrasound scan images were acquired at the level of the ureteric orifices as determined by the position of ureteric jets on colour Doppler imaging (Figure 1). Vaginal mucosal and wall thickness was obtained after rotating the probe into a sagittal plane (Figure 2). All measurements were performed by the author using a GE Logic F8 system and a 2-5 MHz convex abdominal probe.

**Statistical Analysis**

The data obtained were coded, checked and entered into Microsoft excel. The statistical analysis was done by SPSS software version 16. The mean and standard deviation of vaginal wall and mucosal thickness were calculated among three groups and compared using Student’s t-test making the newly-married women as reference. The level of significance was estimated with 95% confidence interval with p value <0.05.

**RESULTS**

**Age Distribution of Study Population**

188 female subjects were assessed by ultrasound. Of these, 48 (25.5%) were in group A (postmenarcheal subjects aged 12-15 years), 66 (35.1%) were in group B (married young adult females aged 20-25 years) and 74 (39.4%) of patients belonged to group C (postmenopausal females aged 50 years and above).
In the present study, 48 (25.5%) of Group A subjects had a vaginal wall thickness ranging from 6.2-8.1 mm with a mean thickness of 6.8 ± 1.4 mm, 66 (35.1%) of Group B subjects had a vaginal wall thickness ranging from 7.8-21.4 mm with a mean thickness of 14.2 ± 2.6 mm and 74 (39.4%) of group C subjects had a vaginal wall thickness ranging from 4.4-6.8 mm with a mean thickness of 5.8 ± 1.3 mm. The statistically significant difference was obtained between the vaginal wall thickness of newly-married women with other two groups of postmenarcheal and postmenopausal groups (p value <0.001) Table 1.

<table>
<thead>
<tr>
<th>No.</th>
<th>Group</th>
<th>Wall Thickness (Range)</th>
<th>Wall Thickness (Mean)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A</td>
<td>6.2-8.1 mm</td>
<td>6.8 ± 1.4 mm</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2.</td>
<td>B</td>
<td>7.8-21.4 mm</td>
<td>14.2 ± 2.6 mm</td>
<td>Reference</td>
</tr>
<tr>
<td>3.</td>
<td>C</td>
<td>4.4-6.8 mm</td>
<td>5.8 ± 1.3 mm</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Table 1. Vaginal Wall Thickness in Various Groups**

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

<table>
<thead>
<tr>
<th>No.</th>
<th>Group</th>
<th>Mucosal Thickness (Range)</th>
<th>Mucosal Thickness (Mean)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A</td>
<td>0.8-1.5 mm</td>
<td>0.9 ± 0.2 mm</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2.</td>
<td>B</td>
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<td>1.4 ± 0.4 mm</td>
<td>Reference</td>
</tr>
<tr>
<td>3.</td>
<td>C</td>
<td>0.4-0.8 mm</td>
<td>0.5 ± 0.1 mm</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Table 2. Vaginal Mucosal Thickness in Various Groups**

The exclusion criteria were designed to preclude subjects in whom pre-existing pelvic conditions could alter VMT/VWT. Postmenopausal patients with clinical evidence of uterovaginal prolapse were not included. Previous studies in surgical pathology specimens of vault tissue have shown an increase in VWT in these patients due to hypertrophy of the muscularis layer.9 Patients with pre-existing clinical features of vulvovaginitis were excluded from the study.

MRI findings in vulvovaginitis have been described by Elsaiys KM et al10 and include the presence of fluid in the vaginal lumen, vaginal wall enhancement and vaginal wall thickening. Initially, study subjects were assessed sonologically by estimation of VMT at the midpoint of the vaginal vault when taken from the posterior fornix to the uterine level and also by assessment at the level of the visually narrowest point on sagittal imaging. Subsequently, the technique described by Balica A et al11 for measurements at the level of the trigone was adopted. This led to results, which were more consistent and reproducible on intraobserver measurements at different sittings.

The technique described above has been slightly modified by taking measurements at optimal bladder filling, which was defined as a bladder dome just covering the uterine fundal level. This would obviate errors on account of artifactual wall thinning from stretch due to an over distended bladder.

The study results demonstrate that vaginal mucosal and wall thickness vary across age groups, being maximal in early adult life, minimal in the postmenopausal period and of intermediate thickness in early adolescence.

Multiple factors are probably responsible here, namely the role of oestrogens and other hormones, vaginal blood flow and mucosal congestion. The role of oestrogen levels in vaginal wall thickness is well documented.2,8,9,11 Postmenopausal women experience loss of vaginal tone, support and function. All four layers of the vaginal wall are involved in these changes. Histologically, the vaginal epithelium is thinned out with possible accompanying superficial keratinisation. This results in narrowing of the vaginal vault, reduced vaginal blood flow, loss of mucosal glycogen content with increase of vaginal pH from acidic to alkaline (3.8-5.5 to 7.0-7.4). The reduction or absence of lactobacilli causes a change in vaginal flora with its replacement by pathogenic bacteria. The symptoms include vaginal laxity, dryness, irritation or itching and bleeding. The condition is now termed the genitourinary syndrome of menopause.7

Statistically significant differences in wall thickness between young newly-married females and the other two groups suggests that sexual activity has an aetiological role in the increase in wall and mucosal thickness in this age group. Possibly, microtrauma induced by penetrative sexual activity and vaginal wall congestion maybe responsible here.

No detailed questioning with regard to the level of sexual activity was conducted. Questionnaires such as the GRRISS format maybe helpful in this context.12 Further studies...
targeted to this age group should help confirm preliminary findings reported here.

**CONCLUSION**

The results indicate that vaginal mucosal and wall thickness are maximal in early adult life, minimal in the postmenopausal period and of intermediate thickness in early adolescence.

The mean vaginal wall thickness and vaginal mucosal thickness as assessed in this study is not strictly comparable to the study of Balica et al as the latter study did not stratify patients by age. However, the mean and SD values in the present study group B patients, young adult females showed agreement with those obtained previously. The mean of VWT, the current study group B was 14.2 ± 2.6 mm against measurements of 14.5 ± 4.2 mm reported by Balica et al is within the 95% CI.

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**REFERENCES**


