

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

Mario Jose Rodriguez¹

¹Associate Professor, Department of Radiology, PK Das Institute of Medical Sciences, Kerala.

ABSTRACT

BACKGROUND

The vaginal wall like the endometrium of the uterus shows variations in wall thickness in response to oestrogen levels.^{1,2} Postmenopausal decline in vaginal thickness has been documented in myriad studies.² Limited published work exists, however, that documents ultrasound assessment of vault thickness.^{3,4}

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 VWT for postmenarcheal adolescents were 0.8-1.5 mm and 6.2-8.1 mm, respectively. VMT and VWT for recently wedded female subjects were 0.9-2.5 mm and 7.8-21.4 mm, respectively. VMT and VWT 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.

HOW TO CITE THIS ARTICLE: Rodriguez MJ. 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. J. Evid. Based Med. Healthc. 2017; 4(70), 4181-4184. DOI: 10.18410/jebmh/2017/832

BACKGROUND

Transvaginal and transabdominal routes have been used to sonologically evaluate the vaginal wall.^{3,4} The transabdominal route has wide patient acceptance with the discomfort of maintaining a full bladder perhaps being the only negative. It is readily available, cheaper and faster than modalities such as MRI, which have also been used to assess the pelvis.^{5,6} Transvaginal scans require absence of an intact

Financial or Other, Competing Interest: None.

Submission 19-08-2017, Peer Review 21-08-2017,

Acceptance 28-08-2017, Published 30-08-2017.

Corresponding Author:

Dr. Mario Jose Rodriguez,

Associate Professor, Department of Radiology,

PK Das Institute of Medical Sciences,

Vaniyankulam, Ottapalam, Kerala, India.

E-mail: mariojoserod@gmail.com

DOI: 10.18410/jebmh/2017/832

hymen and maybe uncomfortable for postmenopausal patients, many of whom experience features of the genitourinary syndrome of menopause.⁷

The vaginal mucosa layer comprises glycogen containing non-keratinised stratified squamous epithelium, while the vaginal wall is comprised of four layers (vaginal mucosa, submucosa, muscularis and adventitia).⁸

The measurements of vaginal wall thickness have been taken at the level of the trigone in accordance with the technique described by Balica et al,³ because at this location, the UV junctions are readily identifiable via the ureteric jets on colour Doppler and hence the measurements are reproducible.

The present study has further refined this technique by assessing the subjects when the bladder dome just covers the fundus as the over distended bladder may stretch and



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, dysmenorrhoea 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.

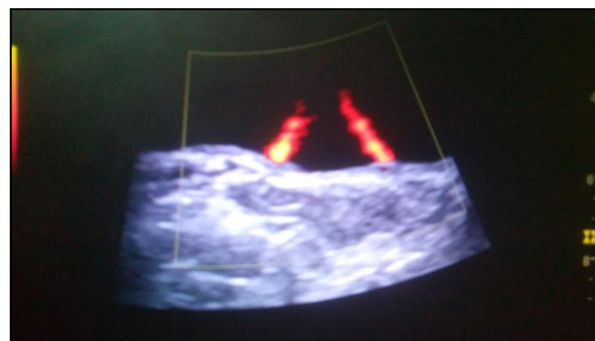


Figure 1. Ureteric Jets Outlined by Power Doppler Imaging



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

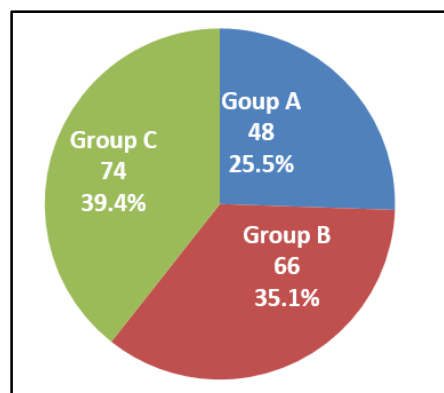
Statistical Analysis

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).



Age Distribution of Study Population

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 Various Groups

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.

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

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).

DISCUSSION

The measurement of Vaginal Wall Thickness (VWT) and Vaginal Mucosal Thickness (VMT) has been addressed by various ultrasound studies,^{3,4} but the present work is the first specifically evaluating this measurement in early young adult life. Measurements have been attempted at multiple sites in the vaginal vault by various routes (transabdominal and transvaginal) and both single and double wall measurements have been performed.

In the current study, the transabdominal route had universal acceptability across all groups when used as per the protocols detailed earlier. Body habitus was not a constraining factor in the accurate determination of VMT and VWT.

MRI studies have previously documented vault morphology and thickness. Ultrasound scores over MRI in imaging of the vault due to its easy availability, low cost and minimal time required.^{5,6}

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 Elsayes 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 sheath when taken from the posterior fornix to the urethral level and also by assessment at the level of the visually narrowest point on sagittal imaging. Subsequently, the technique described by Balica A et al³ 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 GRISS 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.

ACKNOWLEDGEMENT

The author wishes to acknowledge the assistance and help of his colleague, Dr. Sruthi MV, Assistant Professor, Department of Community Medicine, PK Das IMS in the data evaluation and analysis for this manuscript.

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