

ASSESSMENT OF VAGINAL VAULT PARAMETERS IN STRATIFIED AGE GROUPS AND ITS SOCIAL RELEVANCE IN A SOUTH INDIAN POPULATION

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ABSTRACT

BACKGROUND

The vagina and endometrium show varying thickness in response to sex steroids. The vaginal wall layers have oestrogen receptors. This study uses technique described by Balica A. et al.

The aim is to compute the two parameters, VMT and VWT in different age groups using transabdominal ultrasonography. Oestrogen regulates growth and function of the vaginal layers, demonstrated in laboratory animal studies. Only few articles describe these parameters.

The aim of the study is to compute the two parameters, VMT and VWT using transabdominal Ultrasonography in pubertal, reproductive age group and perimenopausal women.

MATERIALS AND METHODS

Transabdominal Ultrasonography was done in 200 patients over four months study period. Total Vaginal Wall Thickness (VWT) and Vaginal Mucosal Thickness (VMT) were measured.

RESULTS

Of 200 subjects, 14% were in pubertal age group. 58% patients were of the reproductive middle age group (19-45 years) and 28% were of the perimenopausal group (>45 years). Average total VMT measured 0.1024cm for the pubertal group, 0.2991cm for the reproductive group and 0.1205 cm in perimenopausal group, while VWT measures 0.6555 cm, 1.2814 cm and 0.7098 cm for the above groups respectively.

CONCLUSION

Study showed maximum vaginal wall parameters in adult reproductive age group and minimum values in perimenopausal age group.

The sexually active group showed highest parameters. Thus, it is imperative to establish standard values based on the sexual activity, and thus, help in medico-legal evaluation of sexually traumatised females.

KEYWORDS

Vaginal Wall Thickness (VWT), Vaginal Mucosal Thickness (VMT), Transabdominal Ultrasonography, Oestrogen.

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BACKGROUND

Attempts have been made to assess the vaginal wall parameters using transabdominal as well as transvaginal routes. We describe the use of transabdominal sonography to measure the total vaginal wall thickness and total vaginal mucosal thickness at the bladder trigone. The mean bladder

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wall thickness and SD from published data were within the 95% confidence interval of our data. Total vaginal and mucosal thicknesses are reliable measurements, which require specific evaluation in a postmenopausal population. They could be used to quantify vaginal atrophy and may correlate to symptoms of vulvovaginitis and their response to treatment.³ Ultrasound vaginal wall thickness demonstrated good intra- and inter-operator reliability, as well as consistency with histological measurement.⁶

Advantages of transabdominal route include that they have better patient compliance and have better learning curve than the transvaginal route. However, the reference standard values change depending on the route applied. We have studied the parameters only on the basis of transabdominal route as our sample size include children of

the pubertal age group as well, wherein transvaginal route is not warranted as this requires the absence of intact hymen in this group. Easy availability and quick assessment make ultrasonography a desirable modality compared to MRI which is also pivotal in pelvic imaging on routine basis.^{7,8}

Another group where transvaginal route may be less tolerated is the postmenopausal age group wherein atrophic vaginitis and vaginal pain/ drying/ itching are common symptoms.⁹

Another variation is that VWT is lower in women with vaginal prolapse until the prolapse extends beyond the hymen and then VWT is thicker and comparable with women without prolapse.¹⁰

Glycogen containing non-keratinised stratified squamous epithelium constitutes the vaginal mucosa. The vaginal wall is comprised of four layers (vaginal mucosa, submucosa, muscularis and adventitia).¹¹

The measurement of both the vaginal wall as well as the vaginal mucosa were obtained simultaneously at the level of the bladder trigone at the point of origin of the ureteric orifice thus, ensuring reproducibility in this method of measurement. This technique of measuring the vaginal wall parameters has been explained in the study by Balica et al.³ We ensured that our subjects did not present with an over-distended urinary bladder and was optimised by visualising that the uterine fundus was just covered by the distended bladder. This way we negated falsely thinned out parameters owing to stretched uterus as seen with over-distended bladder.

The assessment of standard values in this area is mandatory in order to address socially relevant issues such as the changes seen in sexually assaulted females by comparing with standard values in stratified age groups based on their sexual activity as well as gravida score.

Aims and Objectives

This is a review study to measure the vaginal parameters, namely, vaginal wall thickness (VWT) and Vaginal mucosal thickness (VMT) and to compare these in the different age groups of female patients.

MATERIALS AND METHODS

This is a comparative type of analytical review study of retrospective nature. The study included 200 female patients and was completed over a four month period from June through September, 2018.

Three groups of subjects were included, the first group comprised of pubertal females of 11-17 years, second group were comprised of sexually active reproductive age-group who were either nulliparous or multiparous and belonged to the ages of 19-45 years and finally the peri-menopausal group who had scanty or no menses and were of >45 years respectively.

Inclusion Criteria

Female patients who came for routine check-up.

Patients who presented with trivial or unrelated complaints such as abdominal pain, renal colic or menstrual irregularities.

Young married adult females who were routinely worked up to rule out causes of infertility in the nulliparous state as well as multiparous females who came for routine scans.

Exclusion Criteria

- Hospitalised with acute symptoms
- Patients with history of pelvic surgery
- Females with features of cystitis or pelvic inflammatory disease.
- Patients with uterine prolapse
- Currently pregnant subjects

Study Procedure

Following data collection such as clinical history, age, marital status and gravida score, patient was subjected to routine transabdominal Ultrasonography. Pre requisites such as adequate oral hydration and full bladder status were adhered to. Urinary was filled to such a point where the uterine fundus was just covered by the dome of the bladder so as to ensure that the uterus would not be stretched out (Figure 1).

Vaginal wall thickness assessment was done in compliance to the technique described by Balica A. et al³ in which, coronal USG imaging at the level of ureteric orifices was done after visualization of the ureteric jets via Colour Doppler. (Figure 2 and Figure 3). Then, sagittal section at the desired midpoint between the levels of bilateral ureteric orifices was obtained following which, the radiologist measures vaginal wall parameters using GE Logic F8 system and a 2-5 MHz curvilinear abdominal probe.



Figure 1. Depicts the Measurements Technique of VMT and VWT



Figure 2. Shows the Level of Ureteric Jet of Urine as on Colour Doppler Imaging

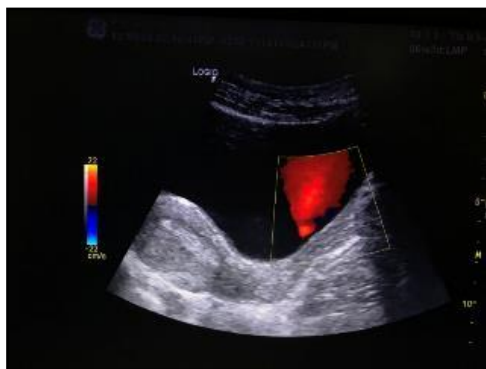


Figure 3. Shows the Sagittal View of Mid-Point between Ureteric Junctions and the Colour Jet on CDI

Statistical Analysis

The statistical analysis showed that the mean and standard deviation of total vaginal wall and mucosal thickness were calculated among the three groups and compared using Student’s t-test making the reproductive middle aged women as reference group. The level of significance was estimated with 95% confidence interval with p value <0.05. Descriptive statistics were computed on variables such as age, VMT and VWT. One-way ANOVA is used to analyse the association of age with VMT and VWT. All of the statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 16.0 and Microsoft Office Excel 2007.

RESULTS

	Minimum	Maximum	Mean	Standard Deviation
Age (years)	11	94	37.04	19.006
VMT (cm)	0.03	0.90	0.22	0.140
VWT (cm)	0.09	1.240	1.02	0.871

Table 1. Descriptive Statistics (Range, Mean and Standard Deviation)

Age	Mean	P Value
10-18	0.6555	0.001
19-45	1.2814	
>45	0.7098	

Table 2. Association between Age and VMT (Vaginal Mucosal Thickness in cm)

P value is less than 0.05 (i.e, 0.001) at 95% confidence interval. So the association between age and VMT are statistically significant.

Age	Mean	P Value
10-18	0.1024	0.001
19-45	0.2991	
>45	0.1205	

Table 3. Association between Age and VWT (Total Vaginal Wall Thickness in cm)

P value is less than 0.05 (i.e., 0.001) at 95% confidence interval. So the association between age and VWT are statistically significant.

Pearson Correlation	P Value
0.314	0.001

Table 4. Correlation between VMT and VWT

DISCUSSION

There are few Ultrasonography studies that discuss the measurement of Total Vaginal Wall Thickness (VWT) and Vaginal Mucosal Thickness (VMT),^{7,8} however our study aims at reviewing the findings in the above-mentioned literature and integrate this into socially significant scenarios for eg., non-invasive and reliable evaluation of victims of sexual assault. The method of assessing the said parameters using transabdominal or transvaginal routes have been described. In this study, only the transabdominal route has been used owing to inclusion of peri-menarche age group in whom the transvaginal route is contraindicated. Body habitus did not interfere in the accurate determination of VMT and VWT.

MRI studies have previously documented vault morphology and thickness. Ultrasound was preferred more than MRI in imaging of the vault owing to availability, better patient compliance, low cost and minimal time required.^{9,11} The postmenopausal patients with clinical evidence of uterovaginal prolapse were excluded because studies have shown an increase in VWT in these patients as a result of hypertrophy of the muscularis layer.¹²

Patients with pre-existing clinical features of vulvovaginitis were also not included in our study.

Features of vulvovaginitis on MRI have been elaborated by Elsayes KM et al¹³ such as presence of fluid in the vaginal lumen, vaginal wall enhancement and vaginal wall thickening.

Estimation of VMT in the study subjects was done at the level of the midpoint of vaginal sheath between the posterior fornix and the urethral level or by measuring at the narrowest point in the vault. Then the technique described by Balica A et al³ wherein the measurement was done at the level of the trigone was adopted. This method was found to be more consistent and reproducible with least variation of measurements done in subsequent sittings.

Our study includes perimenarche, active reproductive and perimenopausal age-groups and the maximum values of VMT and VWT were seen in the second (reference) age group, while minimum values were seen in the perimenopausal group. In addition, maximum thinning of the parameters was noted in a couple of post radiation therapy individuals who had come for regular screening, likely due to fibrosis.

Few causative factors for this age-dependent variation that need mention include role of oestrogens and other hormones, vaginal vascularity and mucosal congestion.

The oestrogen levels show a direct relation with vaginal wall thickness in literature.^{2,14} There is significant loss of vaginal tone, support and function in postmenopausal women experience. This implies involvement of all four

layers of the vaginal wall are involved in these changes. Histological studies show possible superficial keratinisation in causing thinning of vaginal epithelium. 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. The symptoms like vaginal laxity, dryness, irritation or itching and bleeding are usually encountered. The condition is now termed the genitourinary syndrome of menopause.¹²

Statistically significant differences in wall thickness between young reproductive age-group of females and the other two groups suggests that sexual activity has an etiologic role in the increase in wall and mucosal thickness in this age group. This is pivotal in postulating that these parameters may be used for analytical purposes in assessing the victims of sexual violence, by setting reference standard values for the different age groups and comparing the values obtained in the assaulted victims.

This study did not include specific history regarding sexual activity. However, questionnaires such as the GRISS format may help in this context. This study calls for more detailed and centric studies to assess and set standard measurements for the same considering its social significance.

CONCLUSION

This study shows that Vaginal Mucosal Thickness (VMT) and total Vaginal Wall Thickness (VWT) are maximal in young reproductive age group of women, minimal in the perimenopausal age group and intermediately low in early adolescence.

This study provides information of the vaginal wall parameters in stratified age groups, which was not the case in study by Balica et al.³ However, the mean and SD values in the reproductive young age group aged 19-45 years was found to be comparable to the aforementioned study.

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