Uterine Length and Ovarian Volume in Healthy girls of 1-13 years of age

HAFIZA SAIMA NASEEM, AZHAR MAHMOOD JAVED, IRUM ASLAM, MARIA ZAHOOR, SADIA SADIQ

ABSTRACT

Aim: To study uterine length and ovarian volume in healthy girls of age group 1-13 years.

Study design: a cross sectional study

Place and duration of study: Department of Radiology Children Hospital & Institute of Child Health, Multan. Six months from April 2014-September 2014.

Methods: Five hundred girls of the age group from 1-13 years were selected randomly with no history suggestive of any uterine or ovarian problems and their uterine length and ovarian volume were taken and correlated with age and puberty. As regard to pubertal stage they were classified according to Tanner classification of breast into Prepubertal: Tanner stage 1 and Pubertal: from 2-5 Tanner stage.

Conclusion: uterine length and ovarian volume correlate positively with chronological age and puberty. Ovaries are mostly homogenous or microcystic in prepuberty girls and multifollicular pattern is more common in girls with puberty changes.

Keywords: ovarian volume, uterine length, puberty, BMI, chronological age.

INTRODUCTION

The knowledge of developmental changes that take place in the female reproductive organs is essential in the investigation of pelvic conditions in children and teenagers. Imaging methods can facilitate the achievement of a correct diagnosis. Ultrasonography (US) remains the most useful modality used in pediatric and adolescent gynecology and often the only necessary prior to therapeutic intervention. The principle of ultrasound involves the use of high-frequency (5-8MHz) sound waves to detect the interface of two tissues with different densities. Ultrasound beam reflected is based on the density of the tissue and converted into two- or three-dimensional images. The transabdominal probe is most widely used in pediatric gynecology and suffices for most indications. Abdominal sonographic imaging requires an adequately distended urinary bladder which allows transmissions of sound into deeper structures of the pelvis and displaces gas-filled bowel loops out of the pelvis allowing easier identification of the uterus and ovaries.

Ovarian and uterine growth patterns during childhood and puberty are not completely understood. Also, no consensus exists about the normal measures and morphologic appearance of the ovaries. This may be attributed to the methodological limitations of most studies, such as small sample size, inclusion of both pubertal and prepubertal girls in the same analysis, lack of statistical analyses, and use of formulae associated with logarithmic transformation the application of which is not practical. Main indications for pelvic ultrasonography in children and teenagers are the following: either early or late puberty, pelvic pain or tumor, ambiguous genitalia, vaginal bleeding in children, and primary amenorrhea.

The prepubertal uterus is thin, with the uterine body similar in size to the cervix. Because of the hormone stimulation that takes place in the puberty, the uterus grows and the uterine body becomes prominent. In addition, although cystic ovarian structures are also commonly observed on sonography, the classification of these structures is confusing and nonuniform.

The aim of our study was to correlate ovarian volume and uterine length as observed on sonography with chronological age and breast pubertal status according to Tanner stage.

METHODOLOGY

It was a prospective study in which apparently healthy girls of 1 to 13 years of age were selected randomly. There detailed history was taken and complete examination was carried out to rule out any chronic medical disease or genetic factors which can interfere with normal growth and puberty. Proper permission was taken from institutional ethical committee to conduct the study. Informed consent was taken from each patient describing them procedures of the study ensuring confidentiality and fact that there was no risk involved to the patient while taking part in this study. All girls were subjected
to history taking, general physical examination and pubertal assessment. There anthropometric assessment was done in the form of BMI calculation. Presence of thelarche was taken as the criterion to classify girls into pre-pubertal and pubertal group according to tanner staging.

**Tanner staging for breast development**

**Stage 1**: Pre-adolescent elevation of papilla only

**Stage 2**: Breast bud – elevation of breast and papilla as small mound; enlargement areolar diameter.

**Stage 3**: Further enlargement without separation of contours.

**Stage 4**: Projection of areola and papilla to form a secondary mound above the level of breast.

**Stage 5**: Mature areola recessed to general contour of breast.

Transabdominal ultrasound using convex and linear probe of high frequency, was carried out with full bladder to assess uterine and ovarian dimensions. X8 Doppler ultrasound machine was used. ProlateEllipse formula AXBXCX0.52 was used to calculate ovarian volume. Since volume of right and left ovary were not significantly different so mean of both volumes was considered as the final volume. Uterine length was calculated as it is considered a more reproducible marker than uterine volume. Girls were classified according to tanner stage of thelarche as shown in table 2. Both uterine length and mean ovarian volume were found to be higher in girls with thelarche. Mean ovarian volume and uterine length correlated positively with chronological age, and breast development.

### RESULTS

This study was conducted on 500 apparently healthy girls of 1-13 years of age. Uterus and ovaries were visualized in all patients. Uterine length in centimeter and ovarian volume in cm³ was calculated. As volume of right and left ovary were not significantly different so their mean volume was taken. Table 1 shows uterine length and ovarian volume in reference to chronological age. There was a significant progressive increase noted in mean ovarian volume at the age of 8yrs and same trend continued till 13years of age. Uterine length also showed a positive correlation with chronological age. Uterine length was taken as it is considered a more reproducible marker than uterine volume. Girls were classified according to tanner stage of thelarche as shown in table 2. Both uterine length and mean ovarian volume were found to be higher in girls with thelarche. Mean ovarian volume and uterine length correlated positively with chronological age, and breast development.

### Table 1:

<table>
<thead>
<tr>
<th>Age</th>
<th>n</th>
<th>Uterine length (cm)</th>
<th>Ovarian volume(cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean (SD)</td>
<td>Median</td>
</tr>
<tr>
<td>1year</td>
<td>25</td>
<td>2.60(0.61)</td>
<td>2.50</td>
</tr>
<tr>
<td>2year</td>
<td>30</td>
<td>2.56(0.44)</td>
<td>2.45</td>
</tr>
<tr>
<td>3year</td>
<td>38</td>
<td>2.70(0.63)</td>
<td>2.65</td>
</tr>
<tr>
<td>4year</td>
<td>37</td>
<td>2.75(0.32)</td>
<td>2.70</td>
</tr>
<tr>
<td>5year</td>
<td>48</td>
<td>2.85(0.30)</td>
<td>2.85</td>
</tr>
<tr>
<td>6years</td>
<td>29</td>
<td>2.95(0.45)</td>
<td>2.90</td>
</tr>
<tr>
<td>7year</td>
<td>51</td>
<td>3.05(0.28)</td>
<td>3.00</td>
</tr>
<tr>
<td>8year</td>
<td>52</td>
<td>3.30(0.37)</td>
<td>3.25</td>
</tr>
<tr>
<td>9year</td>
<td>47</td>
<td>3.70(0.65)</td>
<td>3.40</td>
</tr>
<tr>
<td>10year</td>
<td>34</td>
<td>4.05(0.65)</td>
<td>3.90</td>
</tr>
<tr>
<td>11year</td>
<td>40</td>
<td>4.70(1.13)</td>
<td>4.50</td>
</tr>
<tr>
<td>12year</td>
<td>36</td>
<td>5.2(1.50)</td>
<td>5.00</td>
</tr>
<tr>
<td>13year</td>
<td>33</td>
<td>6.0(1.25)</td>
<td>5.55</td>
</tr>
</tbody>
</table>

### Table 2

<table>
<thead>
<tr>
<th>Tanner breast stage</th>
<th>n</th>
<th>Average age of that group</th>
<th>Uterine length(cm)</th>
<th>Ovarian volume(cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean (SD)</td>
<td>Median</td>
</tr>
<tr>
<td>1</td>
<td>230</td>
<td>6yr</td>
<td>3.01(0.63)</td>
<td>2.95</td>
</tr>
<tr>
<td>2</td>
<td>200</td>
<td>9yr</td>
<td>3.58(0.70)</td>
<td>3.50</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>12yr</td>
<td>4.70(0.95)</td>
<td>4.50</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
<td>13yr</td>
<td>5.83(1.23)</td>
<td>5.45</td>
</tr>
</tbody>
</table>
DISCUSSION

Puberty is associated with marked physiological psychological changes. Ethnicity, genetic influences, environmental conditions and geographical locations appear to have role for timing and progression of puberty. Although timing and rate of occurrence of these changes is highly variable, puberty usually occurs between 10 and 14 years of age. Health professionals need a reference data for uterine and ovarian measurements because of importance of these values in relation to puberty and to differentiate normal from abnormal.

In our study a positive correlation was observed of ovarian volume and uterine length with chronological age, and breast development. Mean ovarian volume was found to be significantly associated with chronological age and breast development while chronological age, BMI, and breast development were important predictors of uterine length. In our study significant increase in ovarian volume was noted at the age of 8 yrs. However, with breast development, mean ovarian volume and uterine length also increases. There was also increased follicular activity observed in girls having puberty changes. Our results are in accordance with other studies.

Khadilkar et al (2006) concluded that growth of female reproductive organs in Indian girls from birth to 18years of age correlates with age in term of uterine and ovarian volume. Razzaghy et al (2011) in Iran suggested that there is a progressive increase in uterine and ovarian measurements in relation to age, height, weight, and puberty. They found that uterine volume carries best correlation with age and stage of puberty. These findings are in agreement with our study results.

Similarly, a study carried out by Badouraki et al, 2008 in brazil in 99 girls of age range 1-12 years showed that there was a gradual increase in uterine and ovarian volume in relation to age, length, weight, and puberty. Atilia el al (2012) carried out a study in Turkish population and concluded that in prepubertal girls only age correlated with ovarian volume while in pubertal girls age considerable correlation was observed in both uterine and ovarian volumes. Liat et al. 2006. observed that increase in uterine and ovarian measurement may be an early sign of precocious puberty. Interestingly, cohen et al observed that the mean ovarian volume in girls less than 6 years of age is less than or equal to 1 cm3. The increase inovarian volume begins after 6 years. In prepubertal girls (6–10 years old),ovarian volumes range from 1.2 to 2.3 cm3. In premenarchal girls (11–12 years old), ovarian volumes range from 2 to 4 cm3. The stated difference might be due to the fact that above study was conducted on Caucasian population which is a different population in many aspects from Asian population. Puberty is influenced by many factors including genetic, geographical, nutritional and environmental factors.

De vries et al studied role of ultrasound in assessment of uterine and ovarian volumes and their relation to puberty and suggested that increased uterine and ovarian measurements may be an early sign of precocious puberty. Confusing discrepancies are found in the literature regarding the terminology for ovarian echostructure (solid, microcystic, multicystic, macrocystic, major isolated cyst) the following simplified classification was used:

- Type 1 or homogeneous: absence of visible cysts or follicles;
- Type 2 or paucicystic: <6 follicles with a diameter of<10mm;
- Type 3 or multicystic: ≥6 follicles with a diameter of<10 mm;
- Type 4 or macrocystic: ≥1 follicle with a diameter ≥10 mm.

Ovaries are considered as dynamic organ with stromal and follicular component. In infants microcysts were frequently observed owing to raised FSH level through mothers who are lactating. So presence of microcysts appears a physiological phenomenon in children due to either anovulation or through FSH stimulation.

In our study we also found that either paucicystic or homogenous ovaries were more common in girls without puberty while increased follicular activity was observed in girls having puberty changes. Uterine anatomy also changes during childhood. The uterus develops a tubular configuration (anteroposterior cervix equal to anteroposterior fundus) or sometimes a spade shape (anteroposterior cervix larger than anteroposterior fundus).

Similarly, Herter et al also suggested that in prepubertal girls ovaries were generally homogenous or microcystic as follicular activity continues even in prepubertal period. However multicystic ovaries were seen in girls with puberty. The presence of ovarian follicles (<1cm) is routinely detected in 84% of neonates up to the second year of life, and in 68% of children between two and six years of age.
CONCLUSION

Uterine length and ovarian volume correlate positively with chronological age and puberty process. With ultrasound assessment being an easily available and cost effective test, it definitely has role in preliminary assessment of female children puberty disorders and expected changes with age.

REFERENCES