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Cyclic Sonographic Cervical Changes with the Normal Ovarian Cycle in Childbearing Age Female

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Abstract:-

➢ ***Objectives***

The objective of this research is to study the hypothesis that the cervical canal is an active gynecologic organ responding to the cyclic ovulation hormones comparable to its known hormonal response in obstetrics. We hypothesized that cervical canal diameter changes have a significant correlation with dominant follicle growth during ovulation. This is tested against the null hypothesis that cervical canal diameter doesn't correlate with ovulation changes.

➢ ***Patients and method***

We studied 60 patients in childbearing age who were examined by transvaginal 2D ultrasound on menstrual days 7, 11 and 13. Monitoring included cervical canal diameter and dominant follicle size.

➢ ***Results:***

60 patients in childbearing age (ranging between 18 and 39 years). The mean cervical diameter on day 13 was 2.2083 mm (SD=.80471). the mean diameter of the dominant follicle on day 13 was 20.7483 mm (SD=2.73945). a strong positive correlation was found between the diameter of the cervical canal and the diameter of the dominant follicle. There is a negative correlation between patient age and dominant follicle size on day 13 (P<0.001) and cervical canal diameter on day 13 (insignificant statistically).

➢ ***Conclusion***

The uterine cervix has cyclic anatomical changes in non-pregnant women in addition to the known cyclic changes in endocervical secretions.

I. INTRODUCTION

The cervix is an organ of great importance in the process of fertility. All gynecologists focus their attention on the ovarian factor for fertility represented mainly by the follicular size. Follicular size is used as the main predictor for the best time of fertilization capability. The cervical dimensions and structure show cyclical changes throughout the menstrual cycle (Gibor et al,1970).

It has been known for a long time that the cervix plays a crucial role in gynecologic and obstetric physiology. Clinical evaluation of cervical mucus to evaluate ovulation is cumbersome. Thanks to the vaginal ultrasound that allowed the day to day evaluation of ovulation. However, cervical evaluation with ultrasound was not fully done in spite of its importance.

The cervix is 3 to 4 centimeters long and is 2.5 centimeters wide. The ectocervix is the portion of the cervix projecting into the vagina. It is covered by non keratinized stratified squamous epithelium. The cervical canal is lined by columnar epithelium that also lines the endocervical glands. The squamocolumnar junction is the area where the epithelial cells of the endocervix and the ectocervix meet (Herfs et al, 2013). The size and shape of both the cervix and the external os differ in women (Pardo et al, 2003; Mazouni et al, 2005). The anterior-posterior (AP) and lateral diameters of nonpathological cervices decrease with age (Gemer et al, 2009).

The cervical mucus, a glycoprotein gel produced by the cervical gland, has two contradictory functions. First, it prevents the passage of pathogenic organisms from the loaded vaginal lactobacilli. The second opposite function is the facilitation of passage of motile spermatozoa, with their protection, activation, and nutrition. The understanding of the cervical canal biochemical properties is still evolving.

II. MATERIAL AND METHOD

All the women were evaluated by transvaginal ultrasound TVS on menstrual days 7th, 11th, and 13th. The patient empties her bladder just before the test. The patient is examined by TVS while in the dorsal lithotomy position. To examine the cervical canal, the cervix should occupy more than 50% of the screen. The cervical canal width is measured in the middle third of the cervix that is full of sono-luscent cervical discharge. In the same examination sitting, the ovaries on both sides are examined. The largest follicle is measured on either side.

➢ *Inclusion criteria:*

- Regular menstrual cycles (21 and 35 days)
- No hormonal treatment (including oral pills) during the cycle preceding the study cycle.
- Patients age between 18 and 40 years.

➢ *Exclusion criteria:*

- Patients of extremes of age (less than 18 or more than 40)
- History of cervical operations as cerclage.
- Lower genital tract infections.
- Patients with intrauterine contraceptive devices.

- Patients on hormonal treatment either for contraception, ovulation induction or for management of menstrual irregularity.

Statistical analysis: the statistical analysis was done using the SPSS package (Statistical Package for the Social Sciences). Data were analyzed using descriptive statistics for basic statistics. Correlations were done using bivariate correlation (Pearson's correlation) tests.

III. RESULTS

The mean age of studied patients ranged between 18 and 39 years (mean= 27y ± SD=5.3 y).

The mean cervical canal diameter on day 7 of the cycle ranged between 0.9 mm and 2.8 mm (mean 1.2mm±SD 0.45) On day 13 of the cycle while the mean follicle size of the dominant follicle was 11.02 mm (SD=2.59). On day 13 of the cycle, the cervical canal diameter ranged between 1.0 mm and 3.6 mm (mean2.2 ±0.8) and the mean dominant follicle size was 20.7 mm (SD=2.73). Bivariate correlation (Pearson's correlation) testing showed a strong significant correlation between the diameter of the cervical canal on day 13 of the cycle and the dominant follicle size on the same day.

IV. DISCUSSION

Transvaginal ultrasound plays a pivotal role in the evaluation and monitoring of ovulation. It has a potential value for prediction of ovulation such a prediction would aid in the precise timing of artificial reproductive techniques.

Traditionally, follicle size would be the only valuable measure to predict ovulation, but in this research, we tried to improve this predictivity by adding another predictor; the cervical canal diameter changes. Cervical changes during the menstrual cycle are well known for a long time. This raises the assumption that these changes are related precisely to ovulation.

We studied 60 female patients in different age groups within the childbearing age period ranging between 18 and 39 years (mean= 27y ± SD 5.3 y).

The cervical criterion studied was cervical diameter changes during the preovulation/ovulation period. This was compared to the dominant follicle size during the same period.

During the period of preovulation/ovulation, the predominant hormone is the estrogen. Estrogen is produced from all the growing follicles including the dominant one. Upon selection of the dominant follicle, it becomes the main source of estrogen, while the other follicles are inhibited. Ref. accordingly, one may expect that estrogenic effects on the cervix to be correlated to the size of the dominant follicle in the ovary during the preovulatory period. Ref (Dovey, et al 2008). The cervix itself is a fibromuscular structure, with a proportion of fibrous tissue of more than 80%. However, it is lined by columnar epithelium that lines the endocervical glands. It secretes cervical mucous with the special rheologic structure depending on the hormonal milieu. It is excessive, thready with good water content in response to estrogen during the preovulatory period. On the other hand, upon exposure to progesterone during the post-ovulation period, it becomes little, thick and with poor hydration making a plug that closes the cervix.

Mean cervical diameter on the start of examination on day 7 of the cycle was ranging between 0.9 mm and 2.8 mm (mean=1.2mm±0.45). This is increased in the peri-ovulatory period on day 13 of the cycle to range between 1.0 mm and 3.6 mm (mean2.2 ±0.8). Changes in cervical canal diameter were correlated to the changes in the dominant follicle diameter. A positive correlation with a correlation coefficient of 0.705 and p value<0.001. Using partial correlation to exclude the effect of the patient's age on the correlation showed that this correlation is not affected by the patient's age (still positive correlation with nearly the same correlation coefficient =0.71 with P value< 0.001).

Changes in cervical canal diameter in response to estrogen at the time of ovulation can not be explained by increased cervical mucus production. The cervical canal is open and no increase in pressure into the cervical canal can happen. Further investigations are needed to know the mechanisms of changes of cervical canal diameter.

V. CONCLUSION

Many physiologic changes in the female genital tract are waiting to be discovered and need a further deeper investigation to be evaluated. The physiologic changes in the endocervix are well known. Anatomical changes are well known during pregnancy and labor. Anatomical changes in nonpregnant uterine cervix need more investigations. The cervical canal appears to be an active organ in nonpregnant females similar to its role during pregnancy and labor. Further researches are needed to elucidate the secrets of this organ.

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