Study of Morphology of the Ovary as a Determinant of Reproductive Age

Shamima Yesmin[1], Selina Anwar[2], Anjum Ara Begum[3],
Narayan Chandra Saha[4], Md. Khalilur Rahman[5]

Abstract

Context and rationale: *The age related infertility due to early ovarian ageing is one of the problems for women who want to become pregnant in late age in our country. Ovarian ageing reflects in its morphology. So this study was aimed at determining the gross morphology of the ovary in different age groups of Bangladeshi female (cadaver) to assess the possible relationships among different morphological variable of ovaries in different age groups. The present study would serve as a baseline data for the gynecologist, obstetricians and endocrinologist about the onset of infertility in the context of Bangladesh.*

Materials and methods: *Cross sectional analytical type of study was conducted at the department of Anatomy, Rangpur Medical College, Rangpur. Fifty pairs postmortem human ovaries from Bangladeshi female aged between 15 and 45 years were examined for morphological study. The morphological parameters such as length, breadth, circumference, weight and volume of the right and left ovaries determined by physical method and the data were compared between different age groups.*

Result: *Mean length, circumference and volume were significantly higher in group A than the other groups in both right and left sides. The difference reached a significant level (P< 0.05) in both ovaries in between and within groups for all mentioned parameter. The mean breadth of right ovary in group B and mean breadth of left ovary in group A were larger than the other groups but was not significant.*

Conclusion: *The values of the morphological measurements fall from younger to older women. This may be due to depletion of the ovarian non-growing follicles thus reflecting fall in the ovarian reserve.*

Keywords: *Ovary, morphology.*

Introduction

Ovaries are primary reproductive organs or gonad of female. They are not vital to individual's survival but vital to perpetuation of the species. The function of the ovary is to produce the female gamete or ova and hormones that assist in regulating the reproductive cycle. Each ovary is classically described as almond-shaped, about 3 cm long, 1.5 cm wide and 1 cm thick. The volume of the ovary is approximately about 11 cm^3 in the reproductively mature state, 6 cm^3 postmenopausally and 3 cm^3

1. Assistant Professor, Department of Anatomy, Northern Medical College, Rangpur.
2. Professor& Head, Department of Anatomy, Rangpur Medical College, Rangpur.
3. Professor & Head, Department of Anatomy, Prime Medical College, Rangpur.
4. Assistant Professor, Department of Anatomy, Rangpur Medical College, Rangpur.
5. Associate Professor, Department of Anatomy, Shaheed Ziaur Rahman Medical College, Bogra.

Correspondence: Dr. Shamima Yesmin

before menarche. Prior to the first menstrual period (menarche) the ovaries are about a third of the normal reproductive adult size. During early menopause, the average size of the ovary is 2.0 X 1.5 X0.5 cm and reduces in late menopause[1].

The appearance of the ovaries varies with the age of the woman. Before puberty they are smooth and rather solid in consistency. Between puberty and the menopause their surface becomes more corrugated in appearance due to follicular development and degeneration during each monthly ovarian cycle. After the menopause the ovaries shrink and are covered with scar tissue where month after month a follicle has ruptured and released its mature oocyte.

The oogenesis starts at the end of fifth week of intrauterine life. The cortical region of the ovaries consists of follicles of different stages: premordial or quiescent, primary or preantral follicle, secondary or antral (also called vesicular or Graafian) and preovulatory follicle [2]. The greatest number of oocyte

(several million) is present at about 20th weeks of gestation. At birth this number is about $1-2\times10^6$ and then the rate of atresia/apoptosis is relatively constant until age 37.5 years. So that whereas at puberty approximately 400,000 oocyte present in ovary, their number falls to about 25,000 oocytes at 37.5 years [3]. From this point, atresia accelerates until the average age of menopause (51 years) when only 1000 oocytes (follicles) remain [4].

There would be considerable clinical value in being able to predict whether a given infertile patient still has significant ovarian reserve to justify fertility treatment in the later stage of reproductive life. However, there is no data about the morphological variation of ovaries in infertile women. The morphology (length, breadth, circumference, weight and volume) of ovary is reflected on the number of growing follicles of ovary. The proportion of growing follicles increases as the pool of primordial follicles falls approaching the menopause [5]. Lass et al.[6] suggested that decrease in ovarian volume is an earlier sign of ovarian depletion and is associated with poor response to ovulation induction. As the bulk of the ovary is made of antral follicles in the absence of a corpus luteum, total volume relates closely with total antral follicles[7]. Probably the simplest and most accurate test of ovarian reserve is the measurement of total ovarian volume [8]. Hadsma et al.[9] found the number small follicles (2-6mm) declined with age. So decrease in the number of antral follicles may indicate early ovarian ageing. Early ovarian aging in the early thirties could provide information to women rational decision about their fertility without risking involuntary childlessness.

Materials

The specimens

The present study was carried out on 50 pairs of human ovaries collected from 50 Bangladeshi females of different age groups during post mortem. Specimens of ovaries was collected from the unclaimed dead bodies of road-traffic accident autopsied in the morgue of the Gazipur Sadar Hospital and the Department of Forensic Medicine of Rangpur Medical College, Rangpur after completion of all legal formalities.

Methods

The study was carried out in the Department of Anatomy of Rangpur Medical College, Rangpur from July 2008 to June 2009. For convenience of the study age grouping was done for differentiating various features in relation to age according to the [10] as group A (age range 15-30 years), group B (age range 31-38 years) and group C (age range 39-45 years). As 50 pairs of ovaries were collected for this present study, after age grouping, 24 ovaries belongs to group A (48%), 16 ovaries belongs to group B (32%) and 10 ovaries belongs to group C (20%).

Measurement of the length and breadth of ovaries
The length of the ovaries were measured with the help of slide caliper graduated in mm and fractions of mm were measured with vernier scale, graduated in mm for more accurate measurements. The length of each ovary was measured from uterine end to tubal end and tubal end to uterine end. Then the average length was recorded.

The breadth of the ovaries were measured form three points –first in the uterine end, second in the middle and third in the tubal end of ovary. The average of these three measurements was taken as the thickness of each ovary.

Measurement of the circumference of ovaries
The circumference were measured at the region of ovaries maximum transverse diameter, generally it was in the middle portion of the ovaries. The circumference was measured by a thread and marked by marker. Then the mark of the thread was measured by tape. At least two measurements were done parallel to the first measurement. Then the average measurement was taken as the circumference of the ovary.

Measurement of the weight and volume of the ovaries
The weight of the ovaries was recorded in gram (gm) with a digital weighing machine. After taking the weight, volume of the ovaries was determined in milliliter (ml) by water-displacement method by immersing it in water in a graduated jar.

Ethical Clearance
This study was approved by the Ethical Committee of Rangpur Medical College, Rangpur.

Results
The observed values of different parameters were presented in table I along with level of significance of difference between three age groups.

Table-I

Morphological parameters of the ovary in relation to age

Characteristics	Group A		Group B		Group C		P values
	Right	Left	Right	Left	Right	Left	
Length (cm)	1.08-4.97	2.94-5.25	2.4-5.36	2.00-4.87	2.05-3.97	2.00-3.86	A vs C*
	3.71±0.77	3.64±0.56	3.65±0.93	3.51±0.68	3.00±0.63	3.00±0.65	A vs C*
Breadth (cm)	0.84-1.74	0.97-1.94	0.89-1.64	0.84-1.54	0.84-1.50	0.69-1.93	
	1.23±0.20	1.24±0.24	1.27±0.28	1.15±0.20	1.15±0.21	1.17±0.37	
Circumferenc e (cm)	2.90-7.65	3.50-7.65	3.10-8.10	2.00-6.60	2.40-5.45	3.00-6.15	A vs C*
	5.74±1.37	5.66±1.05	4.84±1.86	5.16±1.17	4.28±0.85	4.45±1.00	A vs C*
Volume (ml)	2.00-8.00	1.5-8.00	2.00-8.00	2.00-6.00	0.7-5.00	0.9-5.00	A vs C*
	5.15±2.24	4.73±1.79	4.00±1.92	4.13±1.15	3.37±1.33	3.44±1.23	A vs C*
Weight(gm)	2.15-8.75	2.25-8.10	1.70-7.65	2.10-7.10	0.85-5.55	0.95-5.85	A vs C*
	5.45±2.17	4.96±1.81	4.26±1.76	4.48±1.32	3.53±1.50	3.64±1.48	(Right)

Results are shown in mean ±SD, difference between mean were analyzed by unpaired t-test
P value P<0.05 was taken as significant

It was found that the length, circumference, volume and the weight of both the right and left ovaries showed a trend of higher to lower values from group A to group B to group C. Also these values were significantly higher in group A than group C except for the weight of the left ovaries. However no differences were found regarding these parameters right and left ovaries for any measurements.

Regarding the breadth of the ovaries, breadth of the right ovaries of group B showed highest value. Otherwise the trend of higher to lower values from group A to group B (left) to group C was similar as other parameters.

Discussion

Gross analysis of ovaries was done and findings were compared among the three groups and between both right and left ovaries. Morphological features of ovaries may vary with different factors like age, weight, environmental and genetic factor, family history, other pelvic surgery and infection.

The mean lengths, circumference, volume and weight (except breadth of right ovaries) of both right and left ovaries were decreased progressively from group A to group B to group C. This decrease in length was statistically significant between and within groups group A and C. These data were similar with Russel[11] and Gavern [12]. The breadth of the right ovaries was highest among groups and weight of right ovaries was only significantly higher in group A than group C.

From the present study it may be observed that the above mentioned variables (length, breadth, circumference, volume and weight) of ovaries were decreased with increase of age in Bangladeshi females. It may be due to depletion of the follicular storage in the ovarian cortex with the increase of age.

Wallace and Kelsey[8], Bannister and Dyson[1] reported that adult ovarian volume decreases with increasing age as the remaining pool of primordial follicles becomes exhausted.

Lass et al.[6] stated that, in women of >35 years ovarian volume significantly smaller than in women of <35 years and have been shown to have only a third of the total follicles of younger women. This result corresponds with the present study.

Lass et al [6] also suggested that decrease in ovarian volume is an earlier sign of ovarian depletion and is associated with poor response to ovulation induction.

Conclusion

From the present study it may be observed that the morphological measurements of the human female ovaries in relation to the age also supported by other studies. The length, circumference, volume and weight of both the right and left ovaries are decreased with increased age due to ageing process, hormonal influence, environmental and genetic cause. For further studies with large sample size and modern techniques are recommended.

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