MORPHOLOGICAL STUDY OF THE HUMAN OVARY IN DIFFERENT AGE GROUPS

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ABSTRACT

BACKGROUND

Ovarian pathology can manifest in various ways, e.g. menstrual abnormalities, cystic disease, infertility, benign and malignant tumours of the ovary, etc. Ovarian cancer is one of the leading cancers in Indian women.

The aim was undertaken to observe the age-related changes in the human ovary and to study if there is any difference between the right and left ovaries with respect to length, breadth, thickness and weight and compare it with the established findings of previous workers, which will help the clinicians to adopt appropriate diagnosis and treatment of the various clinical conditions associated with the ovaries.

MATERIALS AND METHODS

A study on human ovary was conducted in the Department of Anatomy, Gauhati Medical College, Guwahati. The morphological characteristics of 42 pairs of normal human ovaries of different age groups were studied (14 pairs in each age group). The ovaries were divided into three groups, viz. Group A or pre-reproductive, Group B or reproductive and Group C or postmenopausal. The results were statistically analysed and 't' test was done to find out the significant difference of mean value.

RESULTS

The morphology of the ovary including the length, breadth, thickness and weight of the three groups were measured and the findings were compared with each other and also with the findings of studies done by previous workers.

CONCLUSION

The study showed that there were certain differences in the morphology of ovary in the three groups. The study also revealed that the weight of the right ovary was more than the left ovary in all the three age groups. The results were statistically analysed and compared with the findings of previous workers.

KEYWORDS

Ovary, Pre-Reproductive, Reproductive, Postmenopausal.

BACKGROUND

The ovary (from Latin- ovarium, literally "egg" or "nut") is an ovum producing reproductive organs often found in pairs in the female as a part of the female reproductive system.[1] They are placed one on each side of the uterus close to the lateral pelvic wall suspended in the pelvic cavity by a double fold of peritoneum, the mesovarium, which is attached to the upper limit of the posterior aspect of the broad uterine ligament. They are dull white in colour and consist of dense fibrous tissue in which ova are embedded. Their average dimensions are 4×2×3 cm in reproductively mature women. They are more than double their size during pregnancy.[2] The paired ovaries, which are considered the home of the follicles are the primary female sex organs. They serve a dual purpose namely the production of ova and secretion of hormones namely oestrogen and progesterone, which control the secondary sex characters and furnish the endocrine background to the cyclic changes of mature sex life and of pregnancy. The ovaries are continuously undergoing complex changes in structure during mature sexual life. These changes are associated with profound alteration in the function and indeed in the structure of the secondary sex organs (the uterus, vagina and the mammary glands).[3]

Ovarian pathology can manifest in various ways, e.g. menstrual abnormalities, cystic disease, infertility, benign and malignant tumours of the ovary, etc.[4] Ovarian cancer is the third leading site of cancer among women in India.[5] This has encouraged the author to undertake a study on the morphology of the ovary in different age groups with the hope that the study will help the clinicians to adopt appropriate diagnosis and treatment of the various clinical conditions associated with the ovaries.

AIMS AND OBJECTIVES

1. To study the morphological changes of length, breadth and thickness and weight of human ovary in different age groups.

2. To study if there is difference between right and left ovary with respect to length, breadth, thickness and weight in the different age groups.

MATERIALS AND METHODS

The study on human ovary was conducted in the Department of Anatomy, Guwahati Medical College, Guwahati. The ovaries were divided into three groups according to the different ages namely, Group A or pre-reproductive (newborn to 13 years), Group B or reproductive (14 to 49 years) and Group C or postmenopausal (50 years and above). Specimen of ovary were collected from cadavers in the Department of Forensic Medicine, Gauhati Medical College, Guwahati, within 24 hours of death following all legal formalities where autopsies were done. The ovaries with no obvious pathological change and decomposition were taken for the study. Proper family history of the cadavers was taken from the relatives. The ovaries were taken along with the uterus and fallopian tube to have a better idea of the right and left ovaries. Specimens were also dissected from fresh full-time intrauterine dead babies and neonatal dead babies collected from the Department of Obstetrics and Gynaecology, Gauhati Medical College and Hospital, Guwahati. The ovaries were dissected out from the uterus and fallopian tube. They were first washed in normal saline, dried in blotting paper and weighed in an electronic weighing machine. The length, breadth, thickness of both the right and left ovaries were measured by means of a vernier callipers. Biometrical values of different groups were statistically analysed and significant difference of length, breadth, thickness and weight was noted. Paired t-test was done to find any significant difference between mean values.

Study Group	Age Range (in years)	Number of Samples (n=42×2=84)
Group A (pre-reproductive)	Newborn to 13	14×2
Group B (reproductive)	14 to 49	14×2
Group C (postmenopausal)	50 and above	14×2
Study Group Distribution in Different Age Groups		

RESULTS AND OBSERVATION

The ovaries (both right and left) were found to be flattened almond-shaped bodies. However, the ovaries of the newborn were found to be small elongated structure with a smooth surface. The external surface of both ovaries in Group A and B were found to have a pearly grey appearance, but in Group C the ovaries were whitish. In the young age groups, the ovaries (both right and left) were found to be smooth, pitted and uneven in the reproductive age groups and small, shrunken and corrugated in the postmenopausal age group.

In this study, the mean length (in cm) of the right and left ovaries of Group A, Group B and Group C were found to be 2.427 and 2.301, 3.501 and 3.411 and 1.905 and 1.801, respectively.

The mean breadth (in cm) of the right and left ovaries of Group A, Group B and Group C were 1.516 and 1.417, 2.331 and 2.201 and 1.202 and 1.106, respectively. The mean thickness (in cm) of the right and left ovaries of Group A, Group B and Group C were 0.959 and 0.811, 1.211 and 1.042 and 0.775 and 0.643, respectively.

The average weight (in grams) of the right and left ovaries of Group A, Group B and Group C were found to be 3.398 and 3.131, 7.121 and 6.781 and 3.391 and 3.113, respectively.

Study Group	Mean Length of Ovaries in cm	Mean Breadth of Ovaries in cm	Mean Thickness of Ovaries in cm	Mean Weight of Ovaries in g
Group A	2.427	1.516	0.959	3.398
Group B	3.501	2.331	1.211	7.121
Group C	1.905	1.202	0.775	3.391
Table I. Mean Length, Breadth, Thickness and Weight of Right Ovaries				

Study Group	Mean Length of Ovaries in cm	Mean Breadth of Ovaries in cm	Mean Thickness of Ovaries in cm	Mean Weight of Ovaries in g
Group A	2.301	1.417	0.811	3.131
Group B	3.411	2.201	1.042	6.781
Group C	1.801	1.106	0.643	3.113
Table II. Mean Length, Breadth, Thickness and Weight of Left Ovaries				

Age Group	Length			Breadth			Thickness			Weight		
	Freq.	Relative Freq.	%	Freq.	Relative Freq.	%	Freq.	Relative Freq.	%	Freq.	Relative Freq.	%
Group A	2.427	0.307	30.7	1.516	0.300	30.0	0.959	0.325	32.5	3.398	0.244	24.4
Group B	3.501	0.450	45.0	2.331	0.462	46.2	1.211	0.412	41.2	7.121	0.512	51.2
Group C	1.905	0.243	24.3	1.202	0.238	23.8	0.775	0.263	26.3	3.391	0.244	24.4
SUM	**7.833**	**1.000**	**100**	**5.049**	**1.000**	**100**	**2.949**	**1.000**	**100**	**13.91**	**1.000**	**100**
Table III. Relative Frequencies of Length, Breadth, Thickness and Weight of Right Ovaries												

Age Group	Length			Breadth			Thickness			Weight		
	Freq.	Relative Freq.	%	Freq.	Relative Freq.	%	Freq.	Relative Freq.	%	Freq.	Relative Freq.	%
Group A	2.301	0.306	30.6	1.417	0.299	29.9	0.811	0.325	32.5	3.131	0.240	24.0
Group B	3.411	0.454	45.4	2.201	0.467	46.7	1.042	0.417	41.7	6.781	0.521	52.1
Group C	1.801	0.240	24.0	1.106	0.234	23.4	0.643	0.258	25.8	3.113	0.239	23.9
SUM	7.513	1.000	100	4.724	1.000	100	2.496	1.000	100	13.025	1.000	100

Table IV. Relative Frequencies of Length, Breadth, Thickness and Weight of Left Ovaries
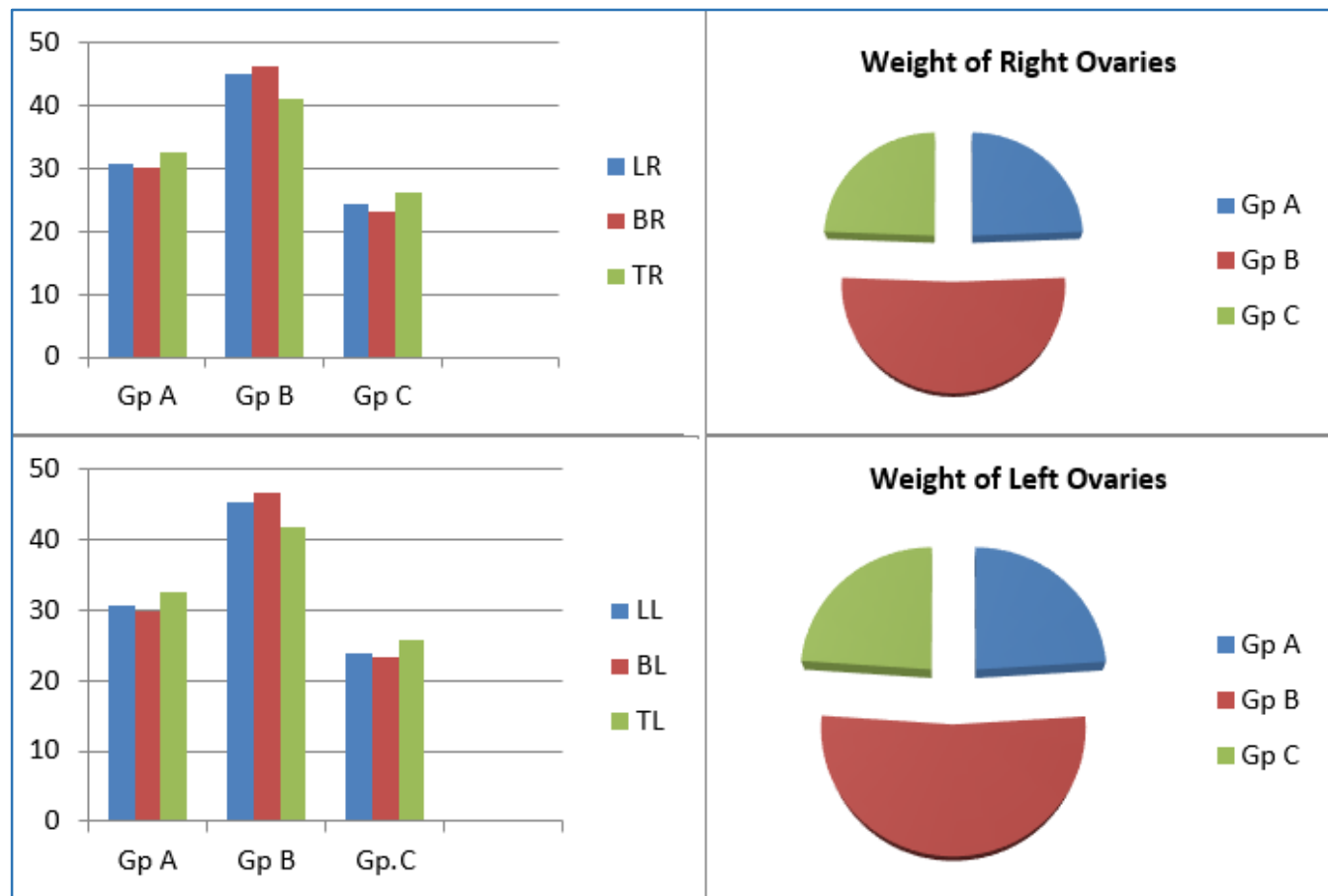

Figure 1. Graphical Presentation- Length, Breadth, Thickness and Weight of Right and Left Ovaries

Interpretation- From table III, it is found that the percentage of relative frequencies of right ovaries in all categories are more in the reproductive age group (length 45.0, breadth 46.2, thickness 41.2 and weight 51.2). Therefore, it is seen that size of the ovaries in the reproductive age group is more than that of pre-reproductive and postmenopausal age groups and it is found to be least in the postmenopausal age group. Again, from table IV, it is found that the percentage of relative frequencies of left ovaries in all categories are more in the reproductive age group than that of the other age groups.

From both the analysis, it can be concluded that the size of the ovaries (both right and left) in the reproductive age group are significantly more than that of the other age groups- i.e. Group A and Group C.

Ovaries	Group A			Group B			Group C		
	Freq. (f)	Relative Freq. (rf)	%	Freq. (f)	Relative Freq. (rf)	%	Freq. (f)	Relative Freq. (rf)	%
Right	2.427	0.513	51.3	3.501	0.507	50.7	1.905	0.514	51.4
Left	2.301	0.487	48.7	3.411	0.493	49.3	1.801	0.486	48.6
SUM	4.728	1.000	100	6.912	1.000	100	3.706	1.000	100

Table V. Relative Frequency of Length of Right and Left Ovaries

Ovaries	Group A			Group B			Group C		
	Freq. (f)	Relative Freq. (rf)	%	Freq. (f)	Relative Freq. (rf)	%	Freq. (f)	Relative Freq. (rf)	%
Right	1.516	0.517	51.7	2.331	0.514	51.4	1.202	0.521	52.1
Left	1.417	0.483	48.3	2.201	0.486	48.6	1.106	0.479	47.9
SUM	2.933	1.000	100	4.532	1.000	100	2.308	1.000	100
	Table VI. Relative Frequency of Breadth of Right and Left Ovaries								

Ovaries	Group A			Group B			Group C		
	Freq. (f)	Relative Freq. (rf)	%	Freq. (f)	Relative Freq. (rf)	%	Freq. (f)	Relative Freq. (rf)	%
Right	0.959	0.542	54.2	1.211	0.538	53.8	0.775	0.547	54.7
Left	0.811	0.458	45.8	1.042	0.462	46.2	0.643	0.453	45.3
SUM	1.77	1.000	100	2.253	1.000	100	1.418	1.000	100
	Table VII. Relative Frequency of Thickness of Right and Left Ovaries								

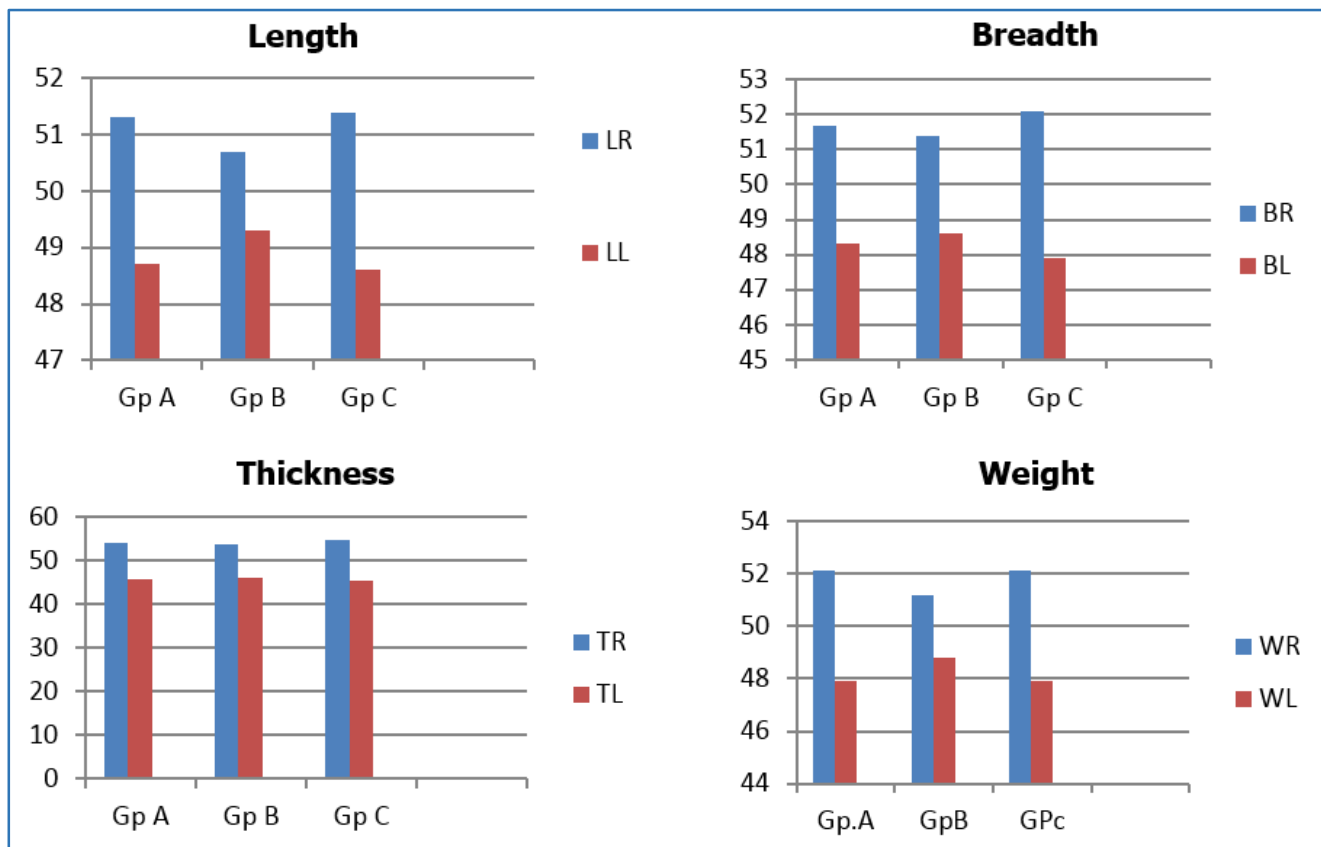| Ovaries	Group A			Group B			Group C		
	Freq. (f)	Relative Freq. (rf)	%	Freq. (f)	Relative Freq. (rf)	%	Freq. (f)	Relative Freq. (rf)	%
Right	3.398	0.521	52.1	7.121	0.512	51.2	3.391	0.521	52.1
Left	3.131	0.479	47.9	6.786	0.488	48.8	3.113	0.479	47.9
SUM	6.529	1.000	100	13.907	1.000	100	6.509	1.000	100
	Table VIII. Relative Frequency of Weight of Right and Left Ovaries								

Figure 2. Diagrammatical Representation for the Difference between Left and Right Ovaries

Interpretation

From table V, it is seen that the length of right ovaries are more than that of the left ovaries in all the three groups, i.e. group A, group B and group C. Again, analysing the table VI, VII and VIII, it is found that breadth, thickness and weight of the right ovaries in each group are more than that of the left ovaries. Finally, we can conclude that for each age group the length, breadth, thickness and weight of right ovaries are more than that of the left ovaries.

Group A			
Particulars	**Length**	**Breadth**	**Thickness**	**Weight**
Calculated t	3.17315	4.59213	5.18817	5.82311
Tabulated t	2.055	2.055	2.055	2.055
P values	<0.05	<0.05	<0.05	<0.05
Group B				
Particulars	**Length**	**Breadth**	**Thickness**	**Weight**
Calculated t	4.15612	3.14567	5.34123	5.69212
Tabulated t	2.055	2.055	2.055	2.055
P values	<0.05	<0.05	<0.05	<0.05
Group C				
Particulars	**Length**	**Breadth**	**Thickness**	**Weight**
Calculated t	3.12561	4.50172	6.98223	5.14562
Tabulated t	2.055	2.055	2.055	2.055
P values	<0.05	<0.05	<0.05	<0.05

Table IX. "T-Test" for the Significance Difference

Interpretation

Calculating 't' value and P value at 95% confidence interval we found that the P value is <0.05. Therefore, we can conclude that the length, breadth, thickness and weight of right ovaries are significantly different than that of left ovaries in each age group.

DISCUSSION

In the present study, the ovaries of all the three groups were found to be flattened almond-shaped bodies, which is similar to the findings of Ross and Reith,[6] Bannister and Dyson[7] and Hawkins and Bourne.[8] The ovaries of the newborn were found to be small, elongated with a smooth surface, which is similar to the observation of V.R. Tindall.[9] In the young age groups, the ovaries both right and left were found to be smooth, pitted and uneven in the reproductive age group and small shrunken and corrugated in the postmenopausal age group. These views were similar to that of Ullah,[3] V.R. Tindall[9] and Hawkins and Bourne.[8] V.R Tindall[9] stated that after menopause the ovary becomes smaller in size as a result of atrophy of the medulla and not due to scarring following repeated ovulation as is sometimes stated.

Forabosco et al[10] in a study on neonatal ovary mentioned that ovarian length varies from 9 to 17 mm, width 3.5 to 7 mm and thickness from 2.5 to 5 mm. In the present study, also the length, breadth and thickness of the two ovaries were found to be between 13 to 15 mm, 6 to 7 mm and 4 to 5 mm, respectively. The weight of both the ovaries of the newborn was found to be 0.3 to 0.4 g.

The length, breadth, thickness of the ovaries were found to be 2.5 to 5 cm, 1.5 to 3 cm and 0.6 to 1.5 cm as reported by various workers like Hamilton and Mossman,[11] Bloom and Fawcett,[12] V.R Tindall[9] and C.S. Dawn.[13]

C.S Dawn[13] mentioned that each ovary weighs 5 to 10 g (average 7 g during the reproductive period). In this study, also the average weight of the ovaries in the reproductive age group is found to be similar to the findings of C.S. Dawn. This increase in size is probably due to the proliferation of the stromal cells and the larger cortex-containing follicles. However, the mean weight of the right ovary (7.121 g) was found to be more than that of the left ovary (6.781 g), which was similar to the findings of Bhatla[14] and Perven HA[4] et al.

The average length, breadth, thickness and weight of the right and left ovaries were found to be least in the postmenopausal age group, which correlates with the statements of Ross and Reith,[6] V.R. Tindall,[9] Hawkins and Bourne[8] and Bannister and Dyson[7] who stated that after menopause, the ovaries become small and shrunken. This is probably due to atrophy of the medulla due to decrease in endogenous hormone production in the menopausal age group.

The average dimensions of both the ovaries in the pre-reproductive age group were found to be greater than that of the postmenopausal age group, but lesser than that of reproductive age group.

The mean length, breadth and thickness of the ovaries were found to be more on the right side than the left, which confirmed to the findings of McVay[15] and Ahmed SM[16] et al. Ahmed et al observed that the size of the ovary is not equal in both side of the same individual and the right is considered somewhat larger than the left.

Damjanov and Linder[17] stated that the weight of the ovaries is 5-8 g. CS Dawn[13] and Romanes[18] stated that the ovarian weight is in between 5-10 g. According to Thibodeau and Patton,[19] the weight of the ovary is 3 g. Bhatla[14] stated that the ovaries are 4-8 g and the right tends to be larger than the left. In my study, the weight of the right ovary was found to be greater than that of left ovary in all age groups. The highest mean weight was found in Group B (14 to 49 years) and the lowest in Group C (50 years and above) in both the ovaries. This finding was similar to that of Bhatla[14] and Perven HA[4] et al who observed that in all age group the right ovary was greater in weight than that of left ovary. Perven HA et al further observed that the highest mean weight was found in Group B (14-45 years).

CONCLUSION

The present study has highlighted the morphological changes of the ovary at different ages. Studies on the histological changes of the ovary is necessary to have a better idea of the age-related changes. The study may be used as a base for further advanced study on the histomorphological structure of the human ovary, which may help in the diagnosis and treatment of various ovarian diseases.

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