

Original Article

Histological study of proportion of cortex and medulla of the ovary in Bangladeshi women

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Abstract

This cross sectional, descriptive study was done in the Department of Anatomy, Dhaka Medical College, Dhaka from January to December 2009, to determine the proportion of cortex and medulla of the ovary in different age group of Bangladeshi women. This study was based on collection of 140 ovaries of 70 unclaimed female dead bodies from the morgue of Dhaka Medical College, Dhaka. The samples were divided into three age-groups including A (10-13 years), B (14-45 years) & C (46-52 years). Histological slides were prepared by using routine haematoxylin and eosin stain. Ten best prepared histological slides from each age group were examined to determine the thickness of the cortex and medulla & proportion of the thickness of the cortex and the medulla of the ovary were expressed in percentages. The mean proportion of the cortex and the medulla of the right ovary were found $80.83 \pm 0.58\%$ and $19.17 \pm 0.58\%$ in group A, $86.95 \pm 1.14\%$ and $13.05 \pm 1.14\%$ in group B, $70.53 \pm 1.53\%$ and $29.47 \pm 1.53\%$ in group C respectively. The mean proportion of the cortex and the medulla of the left ovary were found $80.63 \pm 0.58\%$ and $19.37 \pm 0.58\%$ in group A, $86.78 \pm 1.14\%$ and $13.22 \pm 1.14\%$ in group B, $70.41 \pm 1.50\%$ and $29.59 \pm 1.50\%$ in group C respectively. The difference in mean proportion of the cortex and the medulla was not significant in between the ovaries. However, the difference in mean proportion of the cortex and the medulla of the ovary between group A & group B, group A & group C and group B & group C were statistically significant.

Key words : Human ovary, cortex, medulla

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Introduction

The ovaries are the primary female reproductive organs with functions of production and ovulation of oocytes and production and secretion of ovarian hormones like oestrogens and progesterone.¹ Immediately beneath the surface epithelium of the human ovary, there is a tough collagenous coat named tunica albuginea, which surrounds the ovarian tissue and divides into an outer cortex, and an inner medulla.² Ovarian follicles are embedded in the stroma of the cortex. Scattered smooth muscles are also present there around the follicles. Medulla contains loose connective tissue, blood vessels, lymphatic vessels and nerves.^{3,4} At the hilum, the cortex is interrupted, and the mesovarium is continuous with the medulla.³ The ovarian cortex and medulla are very different, reflecting their difference in amount, structural and functional properties.^{3,5} For many years, the striking changes attending follicle maturation and ovulation have led most researchers of ovarian morphology to focus attention primarily on the ovarian follicles. Several works have been done on ovarian reserve and follicles; however, minimal attention has been given on ovarian cortex and medulla.⁵ Moreover, to the best of our knowledge, no previous record has been found of research on ovarian cortex and medulla in our country. Hence, for the first time, we proposed our study to determine the proportion of cortex and medulla of the cadaveric ovary that would help in clinical decision making in gynaecologic endocrinology, pathology and ultrasonography.

Methods

This cross sectional, descriptive study was done in the Department of Anatomy, Dhaka Medical College, Dhaka, from January to December 2009, based on collection of 140 intact human ovaries from 70 unclaimed female dead bodies with age range of 12-52 years. The age was noted down from the morgue's record book in the Department of Forensic Medicine, Dhaka Medical College, Dhaka. All the samples were collected within 24-36 hours of death without any sign of putrefaction and taken from medicolegal cases excluding poisoning, any cutting or crushing injury to the ovary, ovary found in one side and diseased ovaries. This study was approved by the Ethical Review Committee of Dhaka Medical College, Dhaka. The ovary was taken out from cadaver by dissection and its outer surface was dried with blotting paper and fixed in 40% formalin solution. After isolation, the samples of

ovaries were divided into three age-groups comprising A (10-13 years), B (14-45 years) & C (46-52 years), according to Kumar & Malhotra (2008).⁶

For preparation of the slide, tissue blocks were fixed in 10% formol saline in a plastic container. The tissues were washed in running tap water, dehydration was done with ascending grades of alcohol, cleared with xylene, infiltrated and embedded in paraffin. Paraffin blocks were cut at 5 mm thickness and were stained with routine Harris' Haematoxylin and Eosin (H & E).

At first, the thickness of the cortex and the medulla of the ovary were measured. For measurement of the thickness of the cortex and the medulla of the ovary, 10 best prepared slides were selected from each group. Hence, a total of 30 slides were examined. Three different fields were chosen from each slide for measuring the thickness (Figure-1). The thickness was measured by using a stage micrometer and an ocular micrometer. Three measurements were taken for each slide and the average value was noted. Measurement was done by how many ocular micrometer divisions correspond to the thickness of the cortex and the medulla, according to Nurunnabi et al. (2009).⁷

Data were expressed as mean±SD. The comparison between right and left ovary was done by unpaired Student's 't' test and the comparison between different age groups was done by One-way ANOVA.

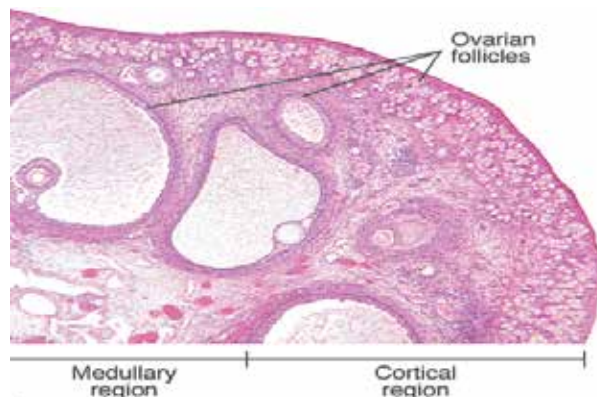


Figure-1 : Photomicrograph of the ovary from group B showing the developing follicles in the outer cortex and the blood vessels and nerves in the inner medulla (H & E stain)

Results

The mean proportion of the cortex and the medulla of the right ovary was found 80.83±0.58% and 19.17±0.58% in group A, 86.95±1.14% and 13.05±1.14% in group B, 70.53±1.53% and 29.47±1.53% in group C respectively. The mean proportion of the cortex and the medulla of the left ovary was found 80.63±0.58% and 19.37±0.58% in group A, 86.78±1.14% and 13.22±1.14% in group B, 70.41±1.50% and 29.59±1.50% in group C respectively. The highest and the lowest results for cortex were found in group B and group C respectively and vice versa for medulla in both the ovaries (Table-I).

Table-I : Percentage proportion of cortex and medulla of right and left ovary in different group

Age group	Percentage proportion of cortex and medulla (%)					
	Cortex			Medulla		
	Right Ovary Mean±SD	Left Ovary Mean±SD	P value	Right Ovary Mean±SD	Left Ovary Mean±SD	P value
A (n=10)	80.83 ± 0.58 (80.20 - 81.54)	80.63 ± 0.58 (80.05 - 81.25)	>0.50 ns	19.17 ± 0.58 (18.46 - 19.80)	19.37 ± 0.58 (18.75 - 19.95)	>0.50 ns
B (n=10)	86.95 ± 1.14 (85.25 - 88.10)	86.78 ± 1.14 (85.10 - 88.03)	>0.50 ns	13.05 ± 1.14 (11.90 - 14.75)	13.22 ± 1.14 (11.97 - 14.90)	>0.50 ns
C (n=10)	70.53 ± 1.53 (68.37 - 72.45)	70.41 ± 1.50 (68.27 - 72.25)	>0.50 ns	29.47 ± 1.53 (27.55 - 31.63)	27.59 ± 1.50 (27.75 - 31.73)	>0.50 ns
	P value	P value		P value	P value	
A vs B	<0.001 ***	<0.001 ***		<0.001 ***	<0.001 ***	
A vs C	<0.001 ***	<0.001 ***		<0.001 ***	<0.001 ***	
B vs C	<0.001 ***	<0.001 ***		<0.001 ***	<0.001 ***	

Figures in the parentheses indicate range. Comparison between right and left side done by unpaired Student's 't' test and comparison between different age groups done by One-way ANOVA (PostHoc), ns = not significant, *** = significant.

The difference in mean proportion of the cortex and the medulla was not statistically significant in between the right and the left ovary ($P>0.50$) (Table-I).

The difference in mean proportion of the cortex and the medulla of the ovary between group A & group B, group A & group C and group B & group C were statistically significant ($P<0.001$) (Table-I).

Discussion

Forabosco et al (1991)⁸ studied 5 left neonatal ovaries and found the proportion of the cortex 70-90% and the medulla 30-10%. Sforza et al (1993)⁹ studied 8 left ovaries taken from 3 fetuses, 4 neonates and 1 child of 8 months. They found that primitive cortical tissue was 88.2% and medulla 11.8% in fetuses; at birth cortex was 79.7% and medulla 20.3% and at 8 months of age cortex was 85% and medulla 15% on average.

Sforza et al. (2003)¹⁰ studied the ovaries from 4 fetuses, 5 newborns and 1 infant of 8 months and found that ovarian cortex was on average 41% at 20 weeks of fetal development, 53% at birth and 68% at 8th postnatal month.

Healy (2008)² stated that before puberty, the cortex forms 80% and the medulla forms 20% of the volume of the ovary. After puberty, the cortex forms the major part of the ovary and encloses the medulla except at its hilum. The present findings are similar to that of Forabosco et al. (1991),⁸ Sforza et al. (1993),⁹ Sforza et al. (2003)¹⁰ and Healy (2008).² However, there is no previous study in our country on proportion of the cortex and the medulla of the ovary, as to compare with the present study.

To the best of our knowledge, this is the first ever study in our country on determining the proportion of cortex and medulla of the ovary. Further studies with larger sample and advanced stereological techniques are recommended.

The results of the present study can be used as a standard reference for the ovaries of Bangladeshi women and to determine the abnormal evidences in Forensic and Pathologic corpses.

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