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Original Article

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Microscopic Study on the Diameter of the Parietal Cells of Post Mortem Human Stomach

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Abstract

Introduction: *Disease pattern as well as diagnostic and treatment options may be helped by examining the diameter of parietal cells of human stomach, as the change with age. It seems that there is a few research in this area and needs more studies, including gross anatomical studies, with data available in Bangladesh.* ***Materials and Methods:*** *This Cross-sectional descriptive study was carried out at Department of anatomy, Sylhet M.A.G. Osmani Medical College, Sylhet during the periods from January 2013 to December 2013. Fifty human postmortem stomach were selected from unclaimed dead bodies that were under examination in the morgue of department of Forensic Medicine, Sylhet M.A.G. Osmani Medical College, Sylhet. The collected samples were divided into 3 groups upon age. Group A (7-14 years), Group B (15-22 years) and Group C (23-64 years). Histological study was carried out on relatively 18 fresh samples.* ***Results:*** *The mean diameter of parietal cells was 14.09(SD± 0.91) µm in the age group of 7 to 14 years ; 16.60 (SD± 0.91) µm in the age group of 15 to 22 years and 17.81(SD± 1.52) µm in the age group of 23 to 64 years ($p<0.001$) with 16.69(SD± 2.03) µm in male and16.49(SD± 1.99) µm in female ($p=0.825$) A significant positive correlation was observed between age and diameter of parietal cells ($p<0.001$).* ***Conclusion:*** *Age related changes were found in the diameter of parietal cells.*

Keywords: *Stomach, parietal cells, cadaver.*

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Introduction:

The stomach has three histologically distinct regions[4].Gastric glands, fundic gland (Glands of body and fundus) and pyloric glands[1]. The cells of this glands secret gastric juice which contain mucous, pepsinogen, hydrochloric acid, intrinsic factor, gastrin, and gastric lipase[3]. Fundic glands contain three major types of cells: parietal, chief and mucous neck cell[4]. The normal human stomach contains approximately 1 billion parietal cells[6,9]. Parietal (oxyntic) cells are the source of gastric acid and intrinsic factor of castle, a glycoprotein necessary for the absorption of vitamin B12[3]. They are large, oval and strongly eosinophilic, and have centrally placed nuclei. Parietal cells occur intermittently along the wall of the more apical half of the gland, but can reach as far as the isthmus; they bulge laterally into the surrounding connective tissue[5]. They have a unique ultra-structure related to their ability to secrete hydrochloric acid. The luminal side of the cell is deeply invaginated to form a series of blind-ended channels(canaliculi) that bear numerous irregular microvilli covered by a plasma membrane rich H+/K+ ATPase antiporter channels. The latter actively secrete hydrogen ions into the lumen; chloride ions follow along the electrochemical gradient. The mitochondria-rich cytoplasm facing these channels contains a tubulo-vesicular system of abundant fine membranous tubules directed towards the canalicular surface[8]. The precise structure of the cells varies with its secretory phase: when stimulated, the number and surface area of the microvilli increases up to five-fold, probably as a result of rapid fusion of the tubule-vesicular system with the plasma membrane. A single parietal cell can concentrate hydrogen up to 4 million times, from pH 7.4 – 0.8[7]. It undergoes a series of well-organized events to generate HCl through the H+, K+ ATPase and the associated Cl– and K+ channels[10].When stimulated, tubulovesicles fuse with the membrane to form an extensive network of canaliculi, increasing the surface area of the parietal cell's apical membrane[11,12]. This process is reversed at the end of stimulated secretion, when the excess membrane retreats beck into the tubulo-alveolar system and microvilli are lost.

Materials and Methods:

Human stomachs were collected from the unclaimed dead bodies autopsied in the Department of Forensic medicine in Sylhet M.A.G. Osmani Medical College, Sylhet during study period from January 2013 to December 2013 meeting the inclusion and exclusion criteria included in the study. The collected samples were divided into 3 groups depending upon age. Each group was again subdivided into two sub-group depending upon their sex.

Table-I Grouping distribution according to age:

		Number of sample		
Group	Age limit in years	Male	Female	Total
A	7-14 years	5	3	8
B	15-22 years	6	4	10
C	23-64 years	18	14	32

Procedure for histological study:

For the measurement of diameter of parietal cells six slides were selected from group A, B & C. (from each group)

Preparation of the slide:

Tissue blocks were fixed in 10% formalin 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) stain. **Measurement of transvertical diameter of parietal cell:**

To get the trans-vertical diameter of each parietal cell, two special measuring instruments were used, stage micrometer and ocular micro-meter. At first the stage micrometer was set on the microscope stage. Then the ocular micrometer was placed at the eye piece. On the stage micrometer there was a straight lines which was one millimeter in length was divided into 100 small divisions. Thus each small division measured 0.01mm. The ocular micrometer also had a line , calibrated into small divisions.

100 divisions of stage micro-meter = 1000μm

1 division of stage micrometer =10 **μm**

In low magnification(10X)

35 ocular micrometer division =100 stage division

1 ocular micrometer division =100/35 stage division= 2.86 stage division

1 Stage division =10 μm

1 Ocular division + 10 x 2.86 μm = 28.6 μm.

It was to be noted that during this procedure , the objective to see the parietal cell and the eye piece lens used were those as would be used to see the parietal cell. After that standardization, the stage micrometer was removed. Then the slide was placed one by one and the greatest longitudinal and transverse diameter of the parietal cell were measured and expressed in the term of μm. For example, if the longitudinal diameter of parietal cell was equal to 5 small division on the ocular micrometer, then the longitudinal diameter in term of μm would be 5X28.6 μm or 143.0 μm. Then the mean greatest longitudinal diameter and the mean greatest transverse diameter were calculated.

The transverse diameter was then calculated by the following formula: Diameter of parietal cell=

$$\frac{\text{Longitudinal diameter + transverse diameter}}{2}$$

Results:

In the present study, the mean diameter of parietal cells was 14.09(SD± 0.91) μm in the age group of 7 to 14 years ; 16.60 (SD± 0.91) μm in the age group of 15 to 22 years and 17.81(SD± 1.52) μm in the age group of 23 to 64 years. The difference among the groups was statistically significant (F

= 17.290; p< 0.001). Distribution of diameter of parietal cells by different age group was shown in Table II.

Table II: Distribution of diameter of parietal cells by different age group

Diameter of parietal cells(µm)	Age group			*P value
	Group A	Group B	Group C	
Mean ± SD	14.09± 0.91	16.60± 0.91	17.81± 1.52	p< 0.001
Range	12.98-15.22	15.33-17.89	15.25-19.77	

Group A : 7 to 14 years; Group B: 15 to 22 tears ; Group C: 23-64 years

*One way ANOVA test was applied to analyse the data.

Discussion:

In the present study the mean diameter of parietal cells was 14.09 (SD± 0.91) µm in the age group of 7 to 14 years; 16.60 (SD± 0.91) µm in the age group of 15 to 22 years and 17.81 (SD± 1.52) µm in the age group of 23 to 64 years .The difference among the groups was statistically significant(p<0.001)This result was correlated with the study of Begum GN 2,13 that mean diameter of parietal cells was 14.44(SD± 1.58) µm in the age group of 2 to 16 years ; 16.87(SD±0.48) µm in the age group of 17 to 22 years and 17.67(SD± 1.28) µm in the age group of 23 to 65 years.

Conclusion:

In the present study, it was observed that a significant change of diameter of parietal cells with advancing age.

Conflict of Interest: We stated that there is no conflict of interest in this study.

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