

Effect of Aging on the Quantitative Number of Brunner's Glands

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ABSTRACT

Background: Age related changes in the number of Brunner's Glands (BG) in four anatomical parts of human duodenum were studied. The few studies done on this topic were conducted mainly in men. Studies involving a much larger age group, from foetuses to elderly individuals up to 85years of age including both sexes were not done earlier and were evaluated.

Aim: To find out whether the number of (BG) differs with increasing age in the four anatomical parts of duodenum.

Materials and Methods: This study was carried out on the basis of 74 specimens taken from still-born foetuses. The patients were divided into four groups as <1-25 years, 26-50 years, 51-75 years and 76-85 years. Duodenal biopsies without gastrointestinal disorders were included in the study group. Sections were

prepared and stained with haematoxylin-eosin. Ten microscopic fields of vision (FOV) were examined under high power on every representative slide from each duodenal portion and average was calculated. The (BGs) were analyzed quantitatively. The final result was expressed as the number of glands per high power field. The average number of (BG) in field of vision per high power field for each of the age groups was tabulated for subsequent statistical study. The documented data was calculated by the SPSS, version 16.0 software.

Result: The decrease in (BG) is significant (p -value < 0.001) in the superior (first) and ascending (fourth) part of duodenum in all the age groups.

Conclusion: It suggests that the number of glands can differ according to variations in age in duodenum.

Keywords: Duodenum, Histopathology

INTRODUCTION

BGs are branched tubuloalveolar glands confined predominantly to the duodenum in humans. Most BGs are sub mucosal, but about one-third of their volume can be found above the muscularis mucosa where the glands empty into the crypts of Lieberkuhn [1,2]. From the histophysiology point of view, BGs should produce an alkaline secretion ($pH = 8.0-9.5$) [3]. This neutralizes the acid that originates in the stomach and provides favorable pH conditions for adequate action by pancreatic juice enzymes [4].

Changes that contribute to cellular aging include decreased cellular replication and accumulation of metabolic and genetic damage [5]. Normal human fibroblasts, when placed in tissue had limited division potential [6]. After a fixed number of divisions all somatic cells become arrested in a terminally non-dividing state known as senescence. Cells from children undergo more rounds of replication than do cells from older people [5].

Studies done by Lipski et al., [7] using biopsies of duodenum from men aged between 22 and 70 years showed no significant change in (BG) morphometry with aging.

MATERIALS AND METHODS

This study was carried out in Government Medical College, Kottayam, Kerala, India over a period of 34 months from 2002 to 2005. Prior to the commencement of this study, the necessary permissions were taken from the institutional ethics committee as well as from the principal of the institution.

A total of 74 duodenal specimens from both sexes were examined. Forty two specimens were obtained from the bodies brought for postmortem examination. Ten specimens were from biopsies received in pathology department. Sixteen specimens were from dissection hall cadavers and six fetal specimens were obtained from labor room. The study materials were grouped into four according to age as <1-25 years, 26-50 years, 51-75 years and 76-85 years. The number of cases in the study group < 1-25 years

was 16. The second group from 26-50 years had 27 cases. The third group from 51-75 years had 22 cases. The fourth group was from 76-85 years which had 9 cases. Samples with any illness that might compromise the morphological integrity of the digestive system were excluded from the study based on clinical history and histopathology confirmation. After removal, each duodenum was immediately immersed in 10% formalin, cut open and washed with running water. After complete inspection of the duodenal mucosa, which needed to be whole, small duodenal wall samples of size 2x1 cm were removed with a scalpel. The samples were obtained from each of the four anatomical portions of the duodenum (superior, descending, inferior and ascending). Each sample removed was then put back into 10% formalin, where it remained for 24 hours. The samples were processed and embedded in paraffin blocks. Sections of five micrometers in thickness were cut and stained with hematoxylin and eosin stain. The (BGs) were analyzed quantitatively. Ten microscopic fields of vision (FOV) were examined under high power on every representative slide from each duodenal portion and average calculated. The final result was expressed as the number of glands per high power field. The average number of (BG) in FOV per high power field for each of the age groups was tabulated for subsequent statistical study.

STATISTICAL ANALYSIS

Analysis was done by using the SPSS, version 16.0 software. Mean and standard deviation were used to describe variables. ANOVA was used for testing any significant difference. For statistical significance, p -value <0.05 was used as significant.

RESULTS

[Table/Fig-1] shows the number of (BG) in field of vision (FOV) under high power field in the four anatomical parts of duodenum in the four age groups.

(BGs) were found in all the 10 microscopic fields examined from

the four anatomical portions of duodenum studied in the age group below 75 years. In the age group 76-85 years except for the fourth part, (BGs) were present.

In the superior (first) part of duodenum the average number of glands in the age group <1-25 years was 510.00 ± 32.91 . In the age group 26-50 years it was 489.56 ± 23.90 . [Table/Fig-2] shows the microscopic appearance of first part of duodenum in a 42-year-old male. At 51-75 years it becomes 350.05 ± 25.71 and at 76-85 years it decreases further to 219.89 ± 7.40 . Here the p-value is < 0.001 and hence significant.

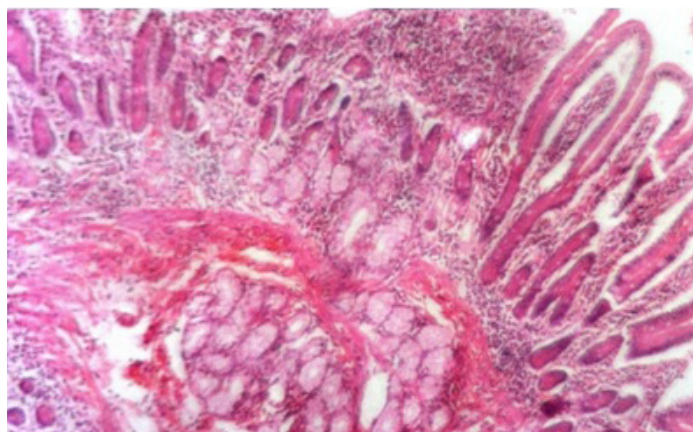
In the ascending (fourth) part of duodenum the average number of glands in the age group <1-25 years was 60.19 ± 9.98 . In the age group 26-50 years it was 39.07 ± 12.28 , 51-75 years it was 15.09

| Age Group | First Part of Duodenum | Second Part of Duodenum | Third Part of Duodenum | Fourth Part of Duodenum |
|-------------|------------------------|-------------------------|------------------------|-------------------------|
| 1-25 Years | 510.00 ± 32.91 | 459.88 ± 20.94 | 200.00 ± 19.16 | 60.19 ± 9.98 |
| 26-50 Years | 489.56 ± 23.90 | 322.93 ± 11.84 NS | 77.81 ± 8.47 NS | 39.07 ± 12.28 |
| 51-75 Years | 350.05 ± 25.71 | 310.14 ± 17.82 NS | 99.64 ± 17.50 NS | 15.09 ± 7.12 |
| 76-85 Years | 219.89 ± 7.40 | 200.22 ± 24.29 | 35.89 ± 7.40 | 00 |

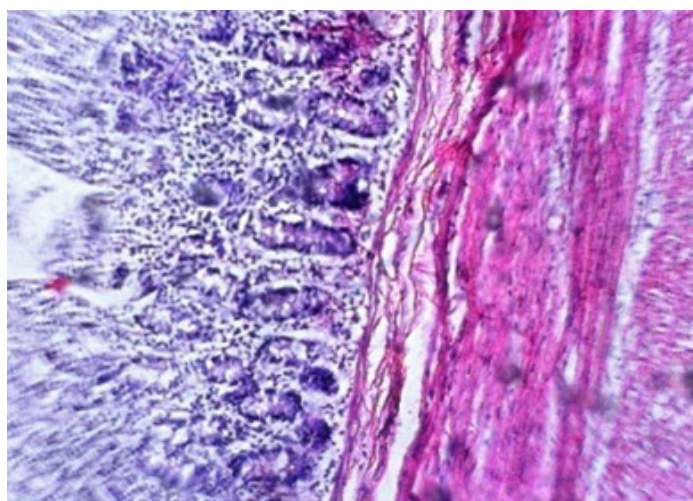
[Table/Fig-1]: Number of BG in field of vision under high power field in the four parts of duodenum in the four age groups

* Values are mean \pm SD, n = 16 (1-25 years), 27 (26-50 years), 22 (51-75 years) and 9 (76-85 years)

† NS p > 0.05 (ANOVA) non-significantly different between the groups and others are significantly different (p < 0.001) from each other between groups and within the groups



[Table/Fig-2]: Microscopic appearance of the first part of duodenum in a 42-year-old male. BG are seen packed in the submucosa and a few in the mucosa (H&E X 10x)



[Table/Fig-3]: Microscopic appearance of the fourth part of duodenum in an 81-year-old male with absence of BG (H&E X 10x)

± 7.12 and at 76-85 years was 00. Here also the p-value was <0.001 and hence significant. [Table/Fig-3] shows the fourth part of duodenum in an 81-year-old male with absence of (BG).

The descending (second) part and inferior (third) showed a non significant difference (p > 0.05) in the age groups 26-50 years and 51-75 years.

DISCUSSION

Brunner's glands are highly branched, mucous-secreting, compound tubular glands lined by a simple columnar epithelium and usually present in all the four parts of duodenum. According to Robert B Tallitsch et al., [8] although most sections of the duodenum contain duodenal glands the most inferior portions of the duodenum may contain a reduced number of these glands and therefore they may be absent from the sections.

Studies done by Macéa et al., [9] on (BG) showed the following findings (1) (BGs) are present in the sub mucosa of all portions of the duodenum (2). The presence and quantity of (BGs) was greater in the first portion of the duodenum. Even though BGs are present in all the sections studied, the quantities found diminish significantly in comparison with the quantities in the first portion (3). There was a gradual and significant decrease in the quantity of (BGs) in the third portion, and even more so in the fourth portion, where their quantity reaches a minimum.

The features of this study are [1]. The number of (BG) in a wide age range, from <1 year to 85 years was studied [2]. Both the sexes were evaluated in this study [3]. In order to find out the variation in the number of glands with increase in age, four study groups are categorised.

Only a few studies are done on the age related changes in the number of (BG) in human being. A study done by Lipski et al., [7] using biopsies of duodenums from men aged between 22 and 70 years has shown no significant change in (BG) morphometry with aging. In the present study the number of (BG) in first and fourth part of duodenum decreases significantly in all the age groups as age increases. The difference in the result in the present study may be due to the wide age range of the study population including both sexes which might give a broader understanding of the issue. One drawback in this study was that the sample size in the age group 76- 85 years was 9 which may be small when compared to the sample size in the other age groups.

CONCLUSION

The result of this study conclude that the number of (BG) may decrease significantly as age increases especially in the first and fourth part. Further studies may be required to find out the effect of decreased mucosal defence mechanisms, metaplastic changes and microbial infections in the number of duodenal glands as age increases.

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