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Age related changes in submandibular salivary gland

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Abstract

Age changes of the submandibular glands (SMG) of male rats were studied morph metrically and ultra-structurally from youth to old age. The most conspicuous feature of the aged SMG was regressive changes of the granular ducts. The extent and height of the granular ducts decreased as well as the content of mature secretory granules. These changes may play an important role for an individual rat, because the granular duct synthesizes many biological factors.

Cytoplasmic crystalloids, salivary deposits and oncocytic transformation were also found in the SMG of rats more than 22-months-old. It was noticeable that the intercalated duct cells were especially affected by both crystalloid formation and oncocytic transformation.

Keywords: Salivary Grand, Cells, Age

1. Introduction

Various salivary glands in senescent humans and other animals have been examined extensively to characterize the structural and functional changes that occur during aging.

Although a wide range of different structural changes, involving both the parenchymal and stromal tissues, have been described, it is unclear how any of these changes affects the function of the salivary glands.

One major change in structure is the reduction in the volume with concomitant increase in the ductal volume. Despite this loss of functional acini, the salivary output and the contents seem to be unaltered, or minimally altered, due to aging.

One consistent change observed in many salivary glands of aged animals is the decline in the rate of synthesis of proteins and their messenger RNA (mRNA). However, the salivary acinar cells from aged animals can synthesize secretory proteins at an elevated rate just as effectively as those from their younger counterparts in response to external stimuli, which are known to enhance the rate of protein synthesis.

Thus, it appears that the salivary acinar cells, which remain structurally intact during aging, seem to retain their functional efficiency. Furthermore, these acinar cells, although reduced in number, are sufficient in quantity to carry out most of the salivary gland functions.

The submandibular gland participates as a major salivary secreting gland and have important anatomical position in relation to vital structures such as facial artery, submandibular lymph nodes, its duct related to the hypoglossal and lingual nerves.

The salivary glands have high incidence to be affected by certain types of pathological conditions in which a ratio of 10:1 or 8:1 of cases with salivary calculi are affected in the submandibular gland. Many studies and mostly that introduced; histochemical analysis of the submandibular gland were advanced to be applied on experimental animals, and they found that the glands like many other organs may shows changes with age.

The present study aims to study and to investigate the age related changes of the submandibular salivary glands anatomically as a cadaveric study, ultrasonographic, and the structural age changes of the glands in rats.

2. Material & Methods

Twenty-four rats introduced in this study for examining their right and left submandibular glands ultrasonographically (Siemens/Sonoline versa pro/with small part probe 7.5 Mhz.).

Subjects with history of renal failure and thyroid disturbances were not included in this study. The submandibular glands have been well-defined for their three dimensions.

2.1 Design of the study

The cadavers were dissected, bilaterally, at the submandibular region, an incision was made from (1 cm) behind symphysis menti of the mandible to (1 cm) behind the angle of the mandible, then (1 cm) upward beneath the auricle, the length of the incision was (3.5 cm). The skin was reflected and subcutaneous tissues were removed, the submandibular glands and their main duct was explored in site, and examined to recognize; length and width, then the glands were removed, weighed using electronic balance, there after each specimen was cut with a blade into small pieces (5mm in dimentions), fixed in 10% neutral buffered formaldehyde for 24 hours.

Tissue washed, dehydrated, and then embedded in paraffin blocks. Serial sectioned were made longitudinally at 4-6μm thickness using Cambridge rotary microtome. The processing continued then stained by haematoxylin and eosin stains, the morphological and histometric measurement were done including; twenty microscopic fields; in order to estimate the number and types of acini, striated ducts, intercalated ducts, and adipose cells.

The standard counting or measuring unit for counting were expressed per microscopic field; twenty observations were made, and were examined by (40X) objective. A calibrated stage micrometer type (Leitz), which consists of (100) minute lines, each line is equal to (10 μ), a calibrated ocular micrometer type (Reichert) and a light microscope type (Meiji) were used.

A superimposition between the calibrated ocular micrometer and calibrated stage micrometer were performed. Statistical analysis: For age related trends, results were analyzed statistically using regression analysis procedure. Differences between the means of different age groups were also examined using analysis of variance.

In order to find the relationship between age and the different variables, correlation analysis were used for this purpose. These statistical tests were prepared using Statistical program under Microsoft Excel XP.

3. Results

The ultrasonographic three dimensional measurements; & standard deviation, the means of; weight of the (SMSGs) were estimated and collectively had an alternative changes, so the result appeared to have no statically significant changes in the size of the gland.

The adipose cells are few and scattered in the parenchyma; not as groups and the connective tissue septa was thin and devoid of adipose cells.

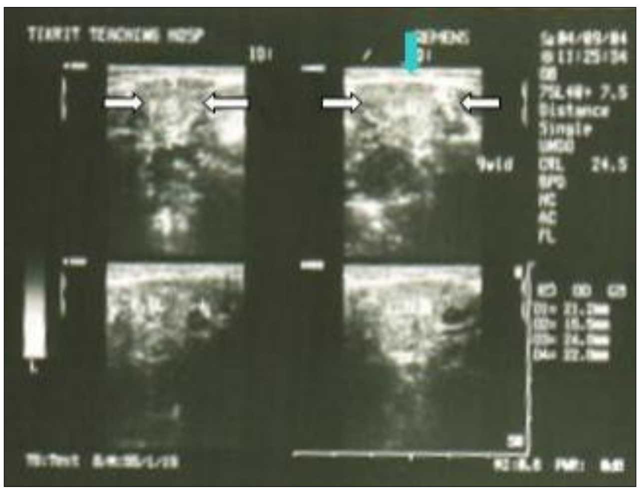

Fig 1

Fig 2

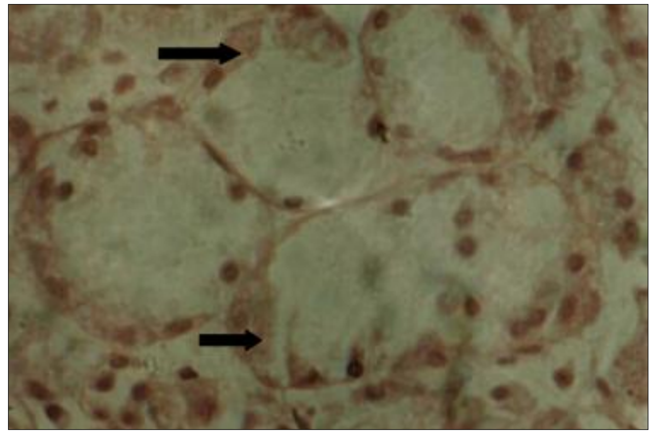

Fig 3

4. Conclusion

It can be decides from the above mentioned results that there was an increases in the proportion of serous acini at the expanses of the mucous type in the (SMSGs) with increasing of the age and accompanied by marked increases in the distribution of adipose cells in the lobules and accompanying the increases of the connective tissue in the interlobular space's.

Such findings are in agreements with previous study, that obtained by Baum [8] who stated that both the parotid and the submandibular salivary glands lose between 20-30% of their essential tissue, from above an explanation for the decrease in the number of serous and mucous acini (atrophy in the parenchyma) due to aging. Such results is also in agreement with Scott [2], Dong [9].

Despite the atrophy in the parenchyma, and from the previous observations of the loss of physiological reserve of most of organs which are well accepted phenomenon of aging, an obvious increase in the diameter of both the serous and mucous acini has been shown in this study, however this difference was statistically not significant, but the human submandibular gland retains what may be termed a reverse secretory capacity. Metabolic states may also affect the salivary glands, they can have their size increased through a variety of metabolic states: such as starvation, protein deficiency and hepatic disease. The same is true concerning the increase in the means of the diameter of the striated ducts and the observed intercalated ducts, both are explained according to the reserve secretory capacity since both ducts are incorporated in the process of salivary secretion and absorption, participation of ions, and the cells of the intercalated ducts are capable of proliferation and division into other components to compensate the reduction in the activity of the other components in the elderly subjects.

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