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MORPHOLOGICAL PARTICULARITIES OF THE SUBMANDIBULAR GLAND IN RATS

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ABSTRACT. Starting from the contradictory information in the literature, we considered it appropriate to check through the histological examination submandibular gland in rats and its relationship with neighbouring structures. Our study highlights that the three portions described by some authors (Parhon et al., 1957) as part of the submandibular gland of rats, belonging to three different glands in neighbourly relations, but totally separated from them by a conjunctive capsule. The lay out of major salivary glands in intimate neighbourly relations, is a morphological feature in rats.

Keywords: submandibular gland, parotid gland, acini, cell, rats

INTRODUCTION

Salivary glands have a primordial role in the digestion of food. Saliva has also other functions: antibacterial, antimicotic and antiviral defence (using lysozyme, lactofferine, lactoperoxidase system), the elimination of toxic substances or microbial agents (Ognean et al., 2000). Information from literature concerning salivary glands, are quite rich, highlighting many morpho-functional features. There are data referring to structure and functions of the submandibular gland of the rats, but unfortunately in many authors the informations are uneven, even contradictory. Parhon (1957) describes submandibular gland in rats having three parts: serosa, mucosa and heterocrine. Tache (1994) says that submandibular and sublingual glands are strongly positioned, inside of a single capsule. The same author says that sublingual glands consist of mucous acini and the submandibular glands consist of mixed acini. Electronomicroscopical studies performed on rats submandibular gland indicated types of cells from the excretory channels (Sato and Miyoshi, 1997; Tandler et al., 1998) and the effects of some substances to them (Eveline et. al., 2003).

MATERIALS AND METHODS

The biological material used in this study was represented by 10 white Wistar rats with an average weight of 150g. After a preliminary narcosis with chloroform, the animals were killed by atlo-occipital dislocation. After lifting the skin and subcutaneous tissue removal have shown submandibular gland, we sampled the gland with adjacent structures for histological investigations. By cross-section with a very sharp blade, we got slices with thickness of about 5 mm, which were introduced for fixing in Stieve solution for 24 hours. After inclusion in paraffin, were charged slices with thickness of 5µ, and for we perform following staining techniques: Goldner's trichrom and PAS reaction.

RESULTS AND DISCUSSIONS

On the preparations made by us we have identified the three parts described by Parhon et al. (1957) (fig. 1). Serous portion described by Parhon is net defined by a capsular formation relatively thin but dense, which is separated from the second portion of which is in close proximity. There are no areas of interpenetration between the two formations, each is very net defined and having a particular structure. Structurally, the first portion is composed from acini and excretory channels. The acini appear all the same and after the Goldner's trichrom stain they are similar almost identical with those from parotid gland and exocrine pancreas, that is they have all of serous acini features. Cytoplasm of the cells of these acini is PAS, which confirms once again that they are serous acini.

The cytoplasm of these acini cells is PAS, which confirms once again that they are serous acini. Moreover, Parhon et al. (1957) states that a portion of the parotid gland, get from and crosses in succession from top to down muscular plane formed by the lower edge of the masseter muscle, anterior wall of the digastric muscle and surround the lower auricular orifice. It seems that this mass of glandular tissue covers an area greater than that described by Parhon, until submandibular gland that comes into contact, to an area whose size we are unable to clear because we have identified it only microscopically, which makes us think that it is not very high. Moreover, even Parhon said "this area has not been described by authors who have preceded us, who considered it as parotid gland", without specifying, unfortunately, the author referred to and it seems that had a correct interpretation. Given the total separation (by its own capsule) and the fact that by through all of the structural features this portion resembles with parotid gland, we believe that it is not a

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portion of submandibular gland but an extension of parotid which comes into contact with submandibular gland.

In the area of contact between the first and second part described by Parhon the capsule that was described anteriorlly interposes and which is common to both formations, so their relationship is intimate neighbourhood. Here existing acini are sized greater than those described in the first formation. They are all the same kind and in Goldner's trichrom stain, are similar, till identical to the existing mucous acini from sublingual gland (fig. 2) in most species. The secretory product from the cytoplasm of these acini cells is intensely PAS +, which shows that these acini are typical mucous. Regarding the type of the acini of this portion, Parhon et al. (1957) says that they are mucous type, which is correct. What does not look correctly interpreted is the fact that the authors consider this formation as a portion of submandibular gland. There are authors (Tache, 1994) that describe this formation as sublingual gland coming in intimate contact with submandibular gland. Given the net separation by a well contoured capsule, we consider that the respective formation belongs to sublingual gland and it is not a part of submandibular gland, which are the only neighbourly relations intimate.

Third portion has a very particular structure, not found in most species in any of the major or minor salivary glands.. At this level the acini appear all identical, are relatively small size, nucleus of acinous cells being round and sitting at one third basal of the cells as in any serous acini. Regarding the cytoplasm, it appears much more transparent compared with that from serous acini of parotid gland.

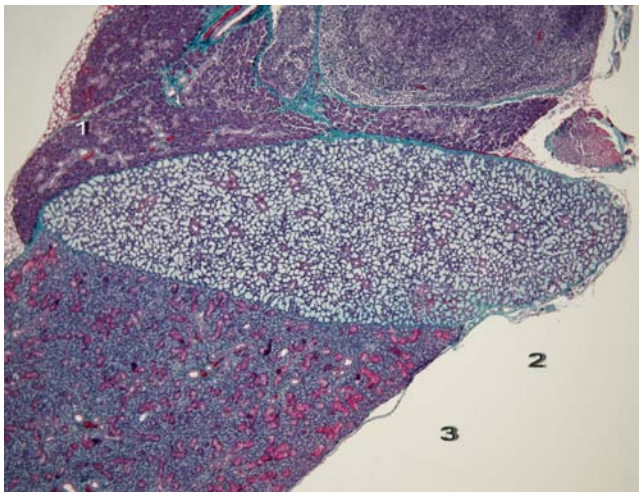

Fig. 1 Intimately contact disposal of the three major salivary glands (1-parotid gland, 2-sublingual gland, 3-submandibular gland) in rats *(Goldner's trichrom stain, x4)*

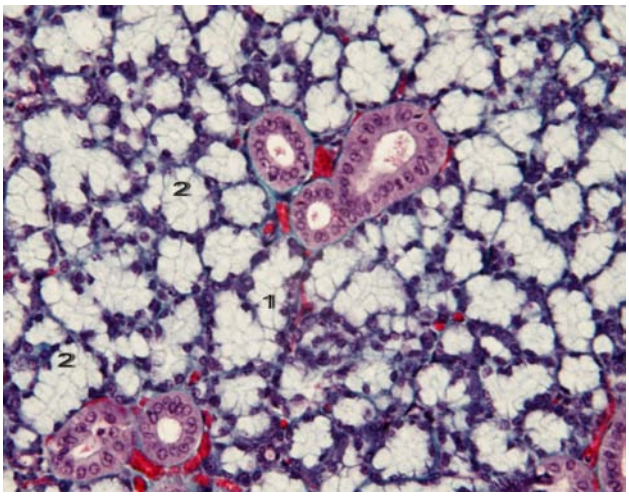

Fig. 2 Mucous acini (1) and striated channels (2) in sublingual gland *(Goldner's trichrom stain, x40)*

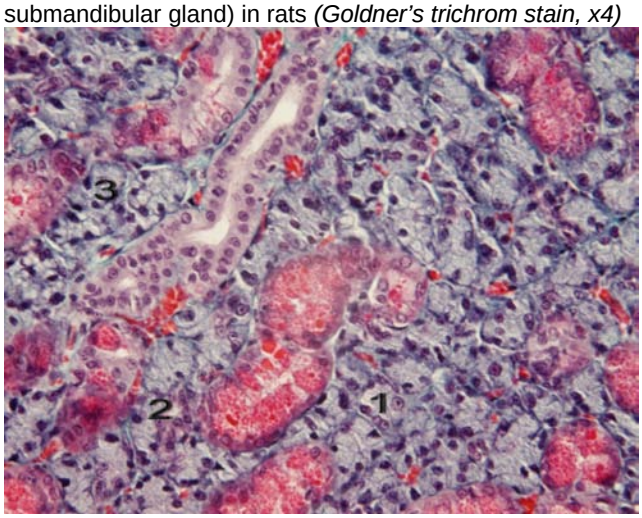

Fig. 3 Serous acini (1), granular channels (2) and striated channels (3) in submandibular gland in rats (*Goldner's trichrom stain, x40*)

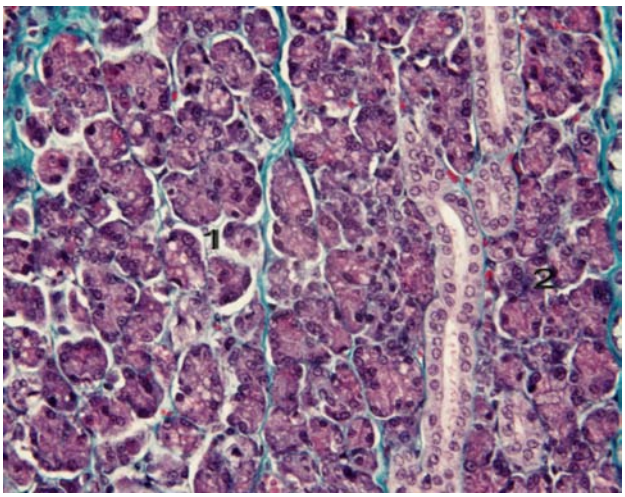

Fig. 4. Serous acini (1) and striated channels (2) in parotid gland *(Goldner's trichrom stain, x40)*

In literature there are very controversial views regarding to acini from submandibular gland from some rodents. Thus, most of the studies assigned to the acini term serous, but Gautier and Diomedea-Fresa (1958), Grad and Leblond (1949) says they are mucous or atypical mucous type. Schaffer cited by Jacoby and Leeson (1959) named them seromucous and Boerner-

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Patzelt (1955) cited by Jacoby and Leeson, (1959) think they are mostly mucous than serous.

To elucidate this controversial aspect, we made PAS reaction, which showed that the acini of submandibular gland are PAS-, like those of parotid gland that is the cells from their structure present a serous secretion. Based on microscopic observations and stains used by us, we can say without risk of wrong, that the acini of submandibular gland of rats are all by the same type namely serous acini (fig. 3), similar but not identical with those of parotid gland (fig. 4).

Regarding excretory channels there are very particular aspects not found in most species of mammals. From acini leaving also in this case, small channels, called intercalar channels. Moreover, inside of lobules, there are two types of channels with a diameter somehow comparable. Some of them have classical structure of striated channels, very similar or even identical with that seen in most species of mammals. The second category present narrow lumen comparable with striated channels, although their diameter is comparable in most of situations. The cells from their walls are taller than those of striated channel walls. In cytoplasm of these cells can be observed net outlined grains, polymorph such as size and as tinctorial affinity, which is why they were called granular channels.

These channels predominate numerically compared with the first category, although also the last one is fairly well represented. This shows the fact that these channels, which present secretory cells in their walls, are wall are quite long. Certainly the two categories of channels are disposed one following another continuously. The statement is supported by the fact that in some cases is surprised this continuity and transition from one cell type to another is done in some cases more sharply, while in others there is a transition zone where there are intercalar cells characteristic of the two types of channels, with a varying from case to case. Granular channels are disposed between the intercalar channels and striated channels, aspect proved by the fact that some sections surprised the union zone, both between an intercalar channel and granular one but also of the granular and striated one. We can say that more granular channels are followed by a striated one, because we revealed all the situations, that is granular channel in continuity relations with a striated one, but also two or more granular channels followed by a striated one. Based on the results, we believe that this structure is submandibular gland in rats.

Reviewing images of histological sections, we identified the three parts described by Parhon et al. (1957) but they appear separated from each other by thick and continuous conjunctive walls, without interpenetration areas, even having very small sizes. There have not been observed formations (acini or channels) which pass from one formation to another. In this situation, we believe that the three portions described Parhon et al. (1957) as part of the same gland (submandibular gland) are actually three different glands (parotid, sublingual and submandibular glands), situated in neighbourly relations on a certain portion of their surface .They are so closely attached, so that areas that come into contact, are served by a common capsule. It is a morphological feature of this species, but that does not appear to have functional implications.

CONCLUSIONS

The existence of three distinct portions of submandibular gland in rats, is not confirmed by our investigation.

The three "parts" are delimited by a net conjunctive capsule, without interpenetration areas, which demonstrates that they belong to three different glands, in neighborly relations.

The layout of the three major salivary glands (parotid, sublingual and submandibular gland) in intimacy relations, represent a morphological feature in rats, but that does not appear to have functional implications.

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