Histomorphology of Salivary Glands after Ligature and Reconstruction of Common Carotid Artery in Rabbits

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INTRODUCTION
Salivary secretion is crucial in maintenance of oral health and play important role in prevention of dental caries also in healing of extraction wounds (6,10).
Age related alterations of normal structure of salivary glands includes decrease of parenchimatous structures and increase of stromal, ductal part and fat tissue content (16). On data from human necropsies it was supposed that increasing level of degenerative vascular disease through ischaemia has some causal relation to the aging atrophy of salivary gland parenchyma.Significant sex differences in aging changes of human salivary glands were not present (20). Different results were obtained on secretory function in young adult and aged male and female rats. No significant alterations in submandibular gland salivary flow rate or the concentrations of total protein, Na+, K+ and neutral sugar in the secreted saliva were observed between different aged animals. Significant sex differences in salivary flow rate and total protein content were found in rats(22). Necrotic lesions of salivary glands as necrotizing sialometaplasia is regarded as result of compromised blood supply to the salivary gland usually by local trauma, some role has smoking (1, 3).
In experiment lobular necrosis of salivary glands was observed after ligating of vesels close to gland (22). The lobular configuration of necrosis is explained by the separate blood flow to each lobule. In experimental studies there are more data on histomorphological response of salivary glands to ligation of salivary ducts as vessels feeding salivary glands. We can't find any publication to compare histomorphology of salivary glands after ligation and reconstruction of feeding artery.

AIM OF THE STUDY
The aim of the study is to determain the influence of ischemia to salivary gland tissue and ability to recover after reestablishment of regional blood supply.

MATERIALS AND METHODS
The experiments were authorized by the Animal Ethics Committee of the Latvian Food and Veterinary Administration. Twenty male Californian rabbits weighing approximately 3 kg were used. Under intravenous general anesthesia with Diazepam 2mg/kg and 5% Ketamin hydrochloride 15 mg/kg and local infiltration with 0.5% Lidocain solution 5 ml, the ligation of a. carotis communis dextra was performed with 4-0 silk and the wound was closed with Vicryl 5-0. After 28 days under general anesthesia 10 rabbits were sacrificed and samples were taken from all major salivary glands and histological measured acinar dimensions and acinar epithelial cell. For rest 10 rabbits under the general anesthesia were performed revascularization of a. carotis communis dextra. After 28 days the rabbits were sacrificed with intrapulmonal injection of T61. The acini dimensions and acinar epithelial cell diameter in microns in all glands were measured except buccal glands were measured.

RESULTS
In ischemic conditions all glands react with decrease of acinar epithelial cell diameter and also diametr of functional unit of salivary gland. After revascularisation reestablishment of acini and secretory epithelial cells was observed.

CONCLUSIONS
Rabbit’s salivary glands have potential to recovery in diminished after ligation of ipsilateral common carotid artery size of acini and secretory epithelium after 4 week ischemia if the blood supply is reestabilished.

Key words: salivary glands; histology; carotid artery ligature; reconstruction.
infiltration between serous, mucous and myoepithelial or biopsies. The main histological findings include fat infiltration between serous, mucous and myoepithelial cells in the intercalated and striated ducts (18, 24), replacement of functional parenchymatous cells by fat and connective tissue also oncocytes (25, 19). Reduction of functionally active parenchyma is explained due chronic obstruction of salivary ducts (21), acinar and ductal atrophy, ductal hyperplasia and dilatation (7). There are only some publications with data on intraglandular vascular changes as tortuosity of arteries and dilatation of veins (18), vascular congestion as result of atheromatous plaques and vascular obstructions (2) in human salivary glands with atrophic and degenerative changes. The vascularity network is regarded as critical to the functioning of the secretory acinar cells and the production of saliva, but it is difficult to detect in routine histological sections (26).

In experiment age-related changes of salivary glands were studied on rats and mouses (13, 14). Distribution pattern of blood vessels in mouse submandibular gland is in similar manner to that in humans and in such way histomorphological data obtained in experiment may be used in interpretation of human pathology. We can’t find data about comparison of salivary gland morphology in human and rabbits. Rat and mouse salivary glands undergo severe degeneration if their blood supply via the main feeding artery is interrupted (5, 12, 15). There is difference in ischemic damage severity in peripheral and central portions of salivary glands (23, 9). Three-dimensional evaluation of blood vessels using stereoscopic and scanning electron microscopy in mouse submandibular gland showed no communicating vessels between the gland proper and the capsula. It is suggested that the parenchymal cells surviving in the ischemic peripheral portion of the gland are nourished by permeation of tissue fluid contained in the capsula (17). Our histomorphological data confirms ischemic damages of major salivary glands due ligation of regional feeding artery. No necrotic tissue changes were observed as are obtained in previous reports where ligation of feeding arteries was done more close to salivary gland and possibility of collateral compensation is less. All rabbit’s major salivary glands showed decrease of secret granules in glandulocytes, diminished diameter of acinar epithelial cells and size of acini. Revascularisation due reconstruction of occluded common carotid artery resulted in restored functional morphology of ischemic salivary glands by increase in size of acinar epithelium and parenchymatous acini which showed to be bigger as on contralateral control side.

Histomorphological changes of salivary glands after occlusion of common carotid artery in experiment may have some consequences to explain salivary gland function in quiet common human pathology as are occlusive diseases of carotid arteries.
CONCLUSIONS

1. After ligation of common carotid artery in rabbits ischemic changes as decrease in functional activity and size of major salivary gland acinar epithelial cells and size of acini occurs.
2. Revascularisation by reconstruction of occluded common carotid artery provides increase in size of acinar epithelial cells and acini up to that on control collateral side.

Conflict of interest: None

REFERENCES

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Fig. 1. Diameter of parotid gland acini and acinar epithelial cells 4 weeks after ipsilateral common carotid artery ligation

Fig. 2. Diameter of submandibular gland acini and acinar epithelial cells 4 weeks after ipsilateral common carotid artery ligation

Fig. 3. Diameter of buccal gland acinar epithelial cells 4 weeks after ipsilateral common carotid artery ligation

Fig. 4. Diameter of submandibular gland acini and acinar epithelial cells 4 weeks after ipsilateral common carotid artery revascularization

Fig. 5. Diameter of parotid gland acini and acinar epithelial cells 4 weeks after ipsilateral common carotid artery revascularization

Fig. 6. Diameter of buccal gland acinar epithelial cells 4 weeks after ipsilateral common carotid artery revascularization
Fig. 7. Submandibular gland control side after ischemia, x 200

Fig. 8. Parotid gland test side after ischemia, x 400

Fig. 9. Buccal gland test side after ischemia, x 200

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