



Buccal gland within the buccinator muscle

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Abstract: There are major and minor salivary glands that aid in the digestive process. Major glands are discrete and exist in predictable locations; minor salivary glands are more widespread and usually found dispersed in the mucosa of the mouth. Glands have their own contractile abilities, which allow them to secrete products without the assistance of vasculature or skeletal, or smooth muscle. This study will describe a cadaveric histological specimen in which an ectopic buccal gland was embedded within buccinator muscle fibers. Potential causes and explanations for this finding will be discussed, as well.

Key words: Anatomy, Cadaver, Buccal mucosa, Minor salivary glands, Muscle

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Introduction

Salivary glands in the mouth produce saliva to aid food digestion, lubricate the bolus and oral cavity, initiate chemical digestion, and provide immune defenses [1]. Glands are clusters of secretory cells intermixed within the epithelial lining of tissues [1]. Since the salivary glands are exocrine, the secretory portions are invaginations of epithelium, called acini, that form ducts through which the secretions from the secretory cells may travel. Myoepithelial cells are the contractile units found at the base of and encase the secretory portions of glands [1, 2]. The actin and myosin-rich myoepithelial cells contract around acini to squeeze secretions into the ductal system [1].

There are two types of salivary glands: major and minor glands. The major glands are encased in a fibrous capsule, are paired, and include the submandibular, sublingual, and

parotid glands. The minor salivary glands are more diffuse and numerous than the major salivary glands. They are found sporadically within the submucosal lining of the oral cavity and features.

Clusters of minor salivary glands are located around the labia, buccal region, palatoglossal region, and palate of the oral cavity [3]. In the second edition of *Terminologia Anatomica*, five minor salivary glands are listed, *i.e.*, labial, buccal, palatine, molar, and lingual glands [4].

Molar glands are also called retromolar glands [5]. The buccal gland is a group of small glands near the area where the parotid duct pierces the buccinator. The labial and buccal glands are mixed, while those found deeper within the pharyngeal recesses are lined with relatively higher concentrations of mucous tubules [3, 6]. Ectopic minor glands are not frequently reported in the literature because their presence is highly variable and their functional contribution to saliva production is minimal compared to the major glands [3]. Though minor salivary glands generally are not responsible for much of the saliva production, the buccal glands are among the biggest contributors of the minor glands [7]. This case report will describe an accessory ectopic buccal gland found within the buccinator muscle.

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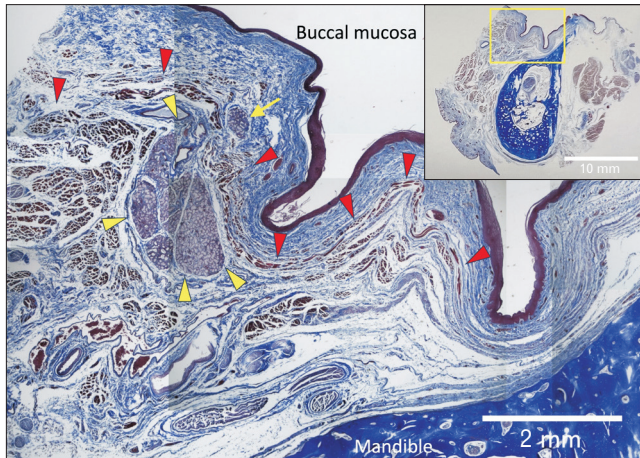


Fig. 1. Section of mandible stained with Masson's trichrome stain. The ectopic buccal gland (yellow arrowheads) is within the bucinator (red arrowheads). The smaller gland is also seen between the bucinator and buccal mucosa (yellow arrow).

Case Report

During the histological observations of sections made through a cadaveric mandible (premolar and molar areas), an ectopic buccal gland was identified in the mandibular premolar area (Fig. 1). The cadaver specimen was from a female whose age at the time of death was 92 years. Masson-trichrome staining was used for slide preparation. The plane of the slide was a coronal section. The gland was located within the bucinator muscle nearby the mandibular origin of the bucinator. The size of the gland was approximately 1.2 mm×2.0 mm. Adjacent to this gland, a smaller gland was also found between the bucinator and the buccal mucosa. The ectopic gland was not found in other coronal sections of the molar area from the same cadaver.

The present study was performed in accordance with the requirements of the Declaration of Helsinki (64th WMA General Assembly, Fortaleza, Brazil, October 2013). The authors state that every effort was made to follow all local and international ethical guidelines and laws that pertain to the use of human cadaveric donors in anatomical research [8].

Discussion

Minor salivary glands have been described as “spontaneous secretors” [9]. These glands produce and release their secretions asynchronously, and it has been hypothesized that they can function independently of nervous stimulation. Given this, perhaps the finding of a minor salivary gland

within muscle tissue would aid in its secretory function rather than disrupt the normal functioning of the gland. Thus, the mucous gland would be subject to the routine contraction of the bucinator.

Though minor salivary glands have not been extensively studied in humans, they have been well documented in other mammals, namely rodents. Rats have a major salivary gland called the anterior buccal gland anterior to the third molar [10]. The buccal gland found in murine models is purely mucous, which is thought to be due to differences in mesenchyme induction during development. The positioning of this gland is similar to the location of the accessory parotid gland, which is commonly found in humans [2].

There are few anatomical studies on the human buccal glands. According to Kamiyo [11], the human buccal glands are always located on the lateral surface of the bucinator. However, others have stated they are between the buccal mucosa and the bucinator (*i.e.*, medial to the bucinator).

The flow rate of the buccal glands is significantly lower in children than in adults [12]. In elderly individuals, the buccal glands as well as the labial glands might show a decreased, unstimulated salivary flow [12]. The flow of the buccal gland is higher than the labial gland [13].

Salivary glands derive from embryonic ectoderm and endoderm tissues [2]. Anatomical variations in exocrine glands, like the salivary glands, can result from congenital defects.

Developmental abnormalities are a result of aberrant invaginations of mesenchyme that are either too close or far from the still developing lymphatic tissue [14]. Such variations may result in ectopic glands—glands found in locations other than typical and with an associated duct system separate from the typical gland's main duct system [14]. In the present case, the continuous contraction of the bucinator might cause chronic injury to the ectopic gland.

To our knowledge, the present case is the first histological evidence of an ectopic buccal gland within the bucinator muscle. Further studies are now necessary to discern the prevalence of such glands.

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Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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References

- Mescher AL. Junqueira's basic histology: text and atlas. 15th ed. McGraw Hill Education; 2018.
- Standring S. Gray's anatomy: the anatomical basis of clinical practice. 41st ed. Elsevier; 2016.
- Anniko M, Bernal-Sprekelsen M, Bonkowsky V, Bradley P, Iurato S. Otorhinolaryngology, head and neck surgery. Springer; 2010.
- Federative International Programme for Anatomical Terminology (FIPAT). Terminologia anatomica. 2nd ed. FIPAT; 2019.
- Iwanaga J, Nakamura K, Alonso F, Kirkpatrick C, Oskouian RJ, Watanabe K, Tubbs RS. Anatomical study of the so-called "retromolar gland": distinguishing normal anatomy from oral cavity pathology. *Clin Anat* 2018;31:462-5.
- Riva A, Valentino L, Lantini MS, Floris A, Testa Riva F. 3D-structure of cells of human salivary glands as seen by SEM. *Microsc Res Tech* 1993;26:5-20.
- Riva A, Loffredo F, Puxeddu R, Testa Riva F. A scanning and transmission electron microscope study of the human minor salivary glands. *Arch Oral Biol* 1999;44 Suppl 1:S27-31.
- Iwanaga J, Singh V, Takeda S, Ogeng'o J, Kim HJ, Morys J, Ravi KS, Ribatti D, Trainor PA, Sañudo JR, Apaydin N, Sharma A, Smith HF, Walocha JA, Hegazy AMS, Duparc F, Paulsen F, Del Sol M, Addis P, Louryan S, Fazan VPS, Boddetti RK, Tubbs RS. Standardized statement for the ethical use of human cadaveric tissues in anatomy research papers: recommendations from Anatomical Journal Editors-in-Chief. *Clin Anat* 2022;35:526-8.
- Harrison JD. Minor salivary glands of man: enzyme and mucosubstance histochemical studies. *Histochem J* 1974;6:633-47.
- Redman RS. The anterior buccal gland of the rat: a mucous salivary gland which develops as a branch of Stensen's duct. *Anat Rec* 1972;172:167-77.
- Kamijo Y. [Oral anatomy]. *Anatom*; 1969-1970. Japanese.
- Sonesson M. On minor salivary gland secretion in children, adolescents and adults. *Swed Dent J Suppl* 2011;(215):9-64.
- Sivarajasingam V, Drummond JR. Measurements of human minor salivary gland secretions from different oral sites. *Arch Oral Biol* 1995;40:723-9.
- Borji S, Moharrami Yeganeh P. Ectopic parotid gland in the left cheek: a case report. *J Med Case Rep* 2023;17:159.
- Iwanaga J, Singh V, Ohtsuka A, Hwang Y, Kim HJ, Morys J, Ravi KS, Ribatti D, Trainor PA, Sañudo JR, Apaydin N, Şengül G, Albertine KH, Walocha JA, Loukas M, Duparc F, Paulsen F, Del Sol M, Addis P, Hegazy A, Tubbs RS. Acknowledging the use of human cadaveric tissues in research papers: recommendations from anatomical journal editors. *Clin Anat* 2021;34:2-4.