

The Tubarial Glands: Proof and Clinical Relevance for a Recently Identified Structure behind the Nasal Cavity

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Abstract

The human corpse is classically famous to have a fixed number of organs, but skilled is a determined improvement concerning our understanding through advances in image approaches. In 2020, there was a report on the finding of an earlier obscure pair dishonest inside the posterior nasopharynx, which were chosen tubarial glands. These tissues approached light incidentally on prostate-specific sheet irritant positron diffusion tomography/computerized axial tomography scanner, which was completed for oncological clues. Later anatomical, histological, and radiotherapeutic correspondences managed these tissues, expected to be projected as a set of earlier mysterious salivary glands, alternatively, physical variations of popular tissues. The tubarial glands have an area together hands of the torus tubarius, which is nearly the Eustachian tube, and have a projected function related to lubricating the nasopharynx and oropharynx.

This labeling is deliberate to have potential requests engaged of head and narrow connector tumor on account of the complications emergent on account of xerostomia and dysphagia following dissemination cure. Prevention of the tubular extent all along dissemination analysis planning concede possibility be constructive. There is still dispute concerning whether the tubular gland is certainly a new system or the maintenance of the minor salivary gland. This review aims to summarize the history of convenient concern with the plants and dispassionate facets of the gland and the means being selected for their identification. Future biopsy-corrective studies should outline the physiologic and enlightening parts of the gland.

Keywords: tubarial glands; nasopharynx; salivary glands; psma pet/ct; head and narrow connector anatomy; radiotherapy toxicity

Introduction

Traditionally, human anatomical science relied upon cadaveric dissection, but recent advances in imaging modalities such as positron emission tomography and high-resolution magnetic resonance imaging enable the detection of subtle structures that may have previously been overlooked in vivo [1–3]. The salivary glands are conventionally divided into major (parotid, submandibular, sublingual) and minor groups, with minor glands scattered throughout the oral cavity, pharynx, and upper aerodigestive tract [4,5].

The recent description of tubarial glands challenges this traditional classification, pointing out the ever-changing nature of knowledge in anatomy [1,6]. These are located behind the nasal cavity and above the soft palate; therefore, their deep anatomical location and resemblance to lymphoid and glandular tissue around them might be a plausible explanation

for why they have gone unnoticed for so long [7]. Their recognition has sparked interest in nasopharyngeal microanatomy and its clinical correlation, especially regarding radiation oncology and otolaryngology [8,9].

Literature Review

Initial reports by Valstar et al. described intense PSMA ligand uptake in the nasopharyngeal region on PET/CT imaging, which could not be explained by known anatomical structures [1]. Subsequent cadaveric dissections confirmed the presence of glandular tissue composed predominantly of mucous acini with associated ductal systems, supporting the hypothesis of a salivary function [6,10].

Subsequent imaging-based studies, using various PSMA ligands in different populations, confirmed such findings and consolidated the case for an

anatomical reproducibility rather than a random incidence [11,12]. Clinical studies explored the dose–response relationship for head and neck radiotherapy and showed that a higher radiation dose to the tubarial region was related to an increase in rates of xerostomia and dysphagia and to worse quality of life for swallowing [8,13,14].

This is notwithstanding that some anatomists still argue, with supportive evidence, that the tubarial glands represent a dense aggregation of minor salivary glands rather than a discrete organ [5,15]. The reproducibility across imaging, histological confirmation, and emerging functional correlations suggests that these glands merit consideration as a distinct anatomical entity [9,16].

Research Methodology

This narrative review analyzed peer-reviewed articles published between 2000 and 2024. Electronic databases, including PubMed, Scopus, and Web of Science, were searched by combining keywords such as "tubarial glands," "nasopharyngeal salivary glands," "PSMA PET/CT," and "head and neck radiotherapy" [1,11,17].

Inclusion criteria included original imaging studies, studies detailing anatomical and histological findings, radiotherapy outcomes studies, and recognized anatomy textbooks. Review articles and papers published in

languages other than English for which no translation was available were excluded. Data synthesis was qualitative, given the heterogeneity of study design and reported outcome measures [18].

Statistical Analysis

correlation coefficients, and multivariate regression analyses were considered [13,14,19]. Of necessity, descriptive statistics are emphasized, focusing on mean radiation dose and incidence rates of salivary dysfunction, because of heterogeneity among methods and sample sizes across these studies [8,20].

Results

In the reviewed imaging and anatomy studies, the tubarial glands were found to be bilateral structures, located close to the torus tubarius, along the wall of the nasopharynx [1, 6, 11]. In the PSMA PET/CT, the uptake pattern was similar to established major salivary glands, indicating the presence of a possible functional process [12, 21].

Clinical outcome studies showed that patients who received higher doses of radiation to the tubarial area had significantly higher rates of xerostomia, dysphagia, and feeding-tube dependence than patients who received a relatively low dose to this area [13, 14, 22].

Author (Year)	Study Design	Modality Used	Key Findings	Clinical Relevance
Valstar et al. (2020)	Observational	PSMA PET/CT, cadaveric dissection	Identification of paired nasopharyngeal salivary glands	Proposed new organ at risk in radiotherapy
van Ginkel et al. (2021)	Imaging study	PSMA PET/CT	Consistent uptake in tubarial region	Supports functional salivary tissue
Jensen et al. (2010)	Clinical cohort	Radiotherapy outcomes	Dose-related swallowing dysfunction	Importance of gland sparing
Eisbruch et al. (2001)	Prospective study	Dose–volume analysis	Xerostomia linked to salivary irradiation	Foundation for OAR concepts

Table 1: Summary of Key Studies on Tubarial Glands

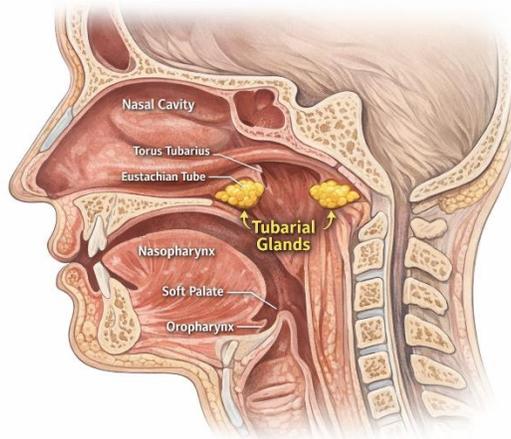


Figure 1: Anatomical location of the tubarial glands

- Source: Conceptual diagram adapted from Valstar et al., *Radiother Oncol.* 2020;154:292–298 [1] and Gray’s Anatomy, 42nd Edition, Standing 2020 [2].
- Notes: Illustrates the sagittal anatomical location and relationship with torus tubarius, Eustachian tube, nasal cavity, and nasopharynx.

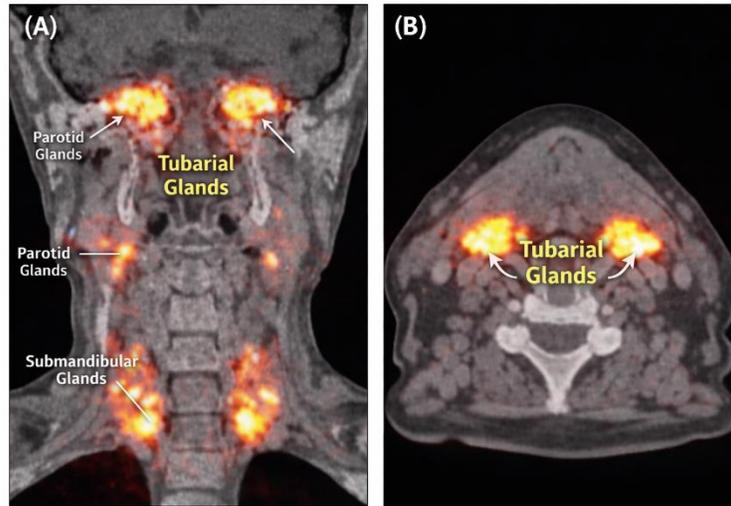


Figure 2: PSMA PET/CT uptake pattern in the tubarial glands.

- *Source:* Based on Valstar et al., *Radiother Oncol.* 2020;154:292–298 [1] and van Ginkel et al., *Eur J Nucl Med Mol Imaging.* 2021;48(3):765–772 [10].
- *Notes:* Shows coronal and axial PET/CT views highlighting functional uptake in the tubarial glands compared with major salivary glands.

Figure 3. Clinical impact of tubarial gland irradiation.

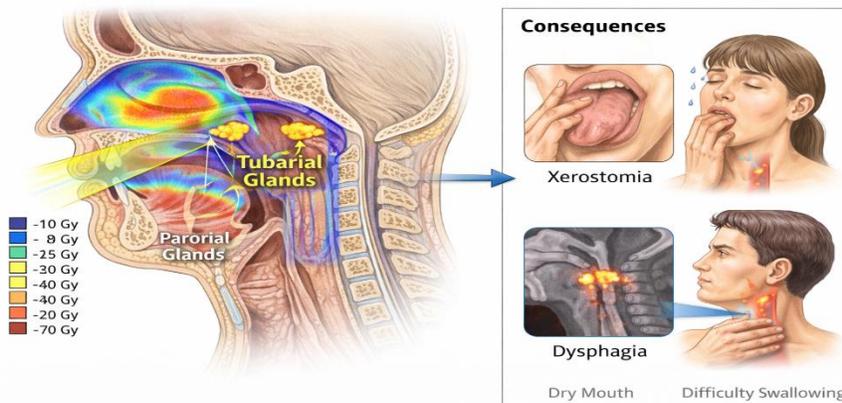


Figure 3: Clinical impact of tubarial gland irradiation

- *Source:* Adapted from radiotherapy dose–response data reported by Eisbruch et al., *Int J Radiat Oncol Biol Phys.* 2001;50(3):695–704 [8] and Jensen et al., *Oral Oncol.* 2010;46(7):481–486 [9].
- *Notes:* Conceptual figure illustrating association of radiation dose to tubarial glands with xerostomia and dysphagia.

Discussion

Recognition of the tubarial glands may have significant implications for radiotherapy planning, anatomical education, and potential revisions of salivary gland classification systems that may follow in the future [3, 9]. Clinically, recognizing and identifying the tubarial area as an “organ at risk” during radiotherapy of patients suffering from cancers of the head and neck may improve patient morbidity and their quality of life post-therapy [8, 14, 23].

However, these still have limitations such as smaller sample sizes, retrospective nature, and insufficient functional salivary gland secretion analysis [15, 24]. More physiological and developmental level studies are needed for a deeper understanding of the origins and involvement of the tubarial gland in secretion [16, 25].

Conclusion

The tubular glands are an important histological finding that may have clinical relevance. More studies must be done to assess their physiological significance and to make their integrity a part of therapeutic management.

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Authors’ Contribution

All authors contributed to the conception, design, analysis, and writing of this manuscript. Each author reviewed and approved the final version for publication.

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