

# Halitosis as an interdisciplinary problem

## Halitoza jako problem interdyscyplinarny

### Authors' Contribution:

A – Study Design

B – Data Collection

C – Statistical Analysis

D – Manuscript Preparation

E – Literature Search

F – Funds Collection

Dmitry Tretiakov<sup>ABEF</sup>, Andrzej Skorek<sup>AD</sup>

Otolaryngology Department, Medical University of Gdansk, Poland; Head: prof. Jerzy Kuczowski MD PhD

Article history: Received: 04.09.2019 Accepted: 12.11.2019 Published: 13.11.2019

### ABSTRACT:

**Introduction:** Chronic bad breath, malodor or halitosis is a common symptom that often brings the patient to the physicians. It is necessary to differentiate genuine halitosis (physiological and pathological types), pseudo-halitosis and halitophobia.

**The aim:** The aim of our study was to clarify whether a problem of halitosis is most often the result of the creation of tonsil stones and it's an issue for the otolaryngologists.

**Results:** After analyzing the available literature (Scopus database, PubMed) it was found, that tonsil stones are only 3% of all causes of halitosis. This fact must be kept in mind during the diagnosis and treatment of halitosis. Over 90% of the halitosis deriving in the oral cavity. Tonsil stones are a pathological condition as a result of dysfunction of the self-cleaning mechanism of the tonsil crypts, which predisposes the accumulation of food residues in the tonsil crypts and formation of mass with an unpleasant smell. Including this symptom as a feature of chronic tonsillitis is still controversial. The presence of tonsil stones does not always cause discomfort or other signs and does not must be treated.

**Conclusion:** The analysis showed that the halitosis problem has a very diverse background. It follows that before you start treating halitosis at an otolaryngologist, especially using surgery, you should perform a very thorough analysis of the ailments, often using to consult other specialists (dentist, gastroenterologist, nephrologist).

### KEYWORDS:

chronic bad breath, CO<sub>2</sub> laser, coblation, crytolysis, malodor, radiofrequency diathermy, tonsillitis

### STRESZCZENIE:

**Wprowadzenie:** Nieprzyjemny zapach z ust, nieświeży oddech, halitoza (łac. *fetor ex ore*, ang. *halitosis, oral malodor*) to objawy, które często zmuszają pacjenta do szukania pomocy u lekarza. Taki pacjent zazwyczaj od razu trafia lub jest kierowany przez innych lekarzy do otolaryngologa z podejrzeniem czopów migdałkowych (CzM). Jednak problem nieprzyjemnego zapachu z ust jest bardziej skomplikowany. W trakcie poszukiwania przyczyny tej dolegliwości należy rozróżnić: halitozę rzeczywistą (fizjologiczną oraz patologiczną), pseudo-halitozę i halitofobię.

**Cel:** Celem niniejszej pracy było wyjaśnienie czy problem halitozy rzeczywiście jest najczęściej wynikiem powstania CzM i zagadnieniem dla otolaryngologa.

**Wyniki:** Po dokonaniu analizy dostępnego piśmiennictwa (baza Scopus, PubMed) stwierdzono, że CzM stanowią tylko 3% wśród wszystkich przyczyn halitozy, co musi być brane pod uwagę w trakcie diagnostyki i leczenia nieprzyjemnego zapachu z ust. Ponad 90% przyczyn tego schorzenia pochodzi z jamy ustnej. Czopki („kamienie”) migdałkowe są stanem patologicznym, powstającym w wyniku zaburzenia mechanizmu samooczyszczania krypt migdałkowych, predysponującego do gromadzenia się w nich resztek pokarmu i powstania detrytu z nieprzyjemnym zapachem. Uznanie tego zjawiska jako objawu przewlekłego zapalenia migdałków podniebiennych nadal pozostaje sprawą kontrowersyjną. Obecność CzM nie zawsze powoduje dolegliwości i nie musi być leczona.

**Wnioski:** Jak wynika z przeprowadzonej analizy, problem nieprzyjemnego zapachu z ust ma podłoże bardzo różnorodne. Z tego powodu przed podjęciem leczenia halitozy przez otolaryngologa, szczególnie z użyciem metod chirurgicznych, należy wykonać bardzo wnikliwą analizę dolegliwości, nierzadko korzystając z konsultacji lekarzy innych specjalności (stomatolog, gastroenterolog, nefrolog).

### SŁOWA KLUCZOWE:

cuchnący oddech, diatermia radiofalaowa, koblacja, kriochirurgia, kryptoliza, laser CO<sub>2</sub>, nieprzyjemny zapach z ust, zapalenie migdałków podniebiennych

## ABBREVIATIONS

- CBCT** – cone beam computed tomography  
**CT** – Computed Tomography  
**HALT** – Halitosis Associated Life-Quality Test  
**MRI** – Magnetic Resonance Imaging  
**TC** – tonsillar calculi  
**TS** – tonsillar stone  
**QOLQ** – Orthognathic Quality of Life Questionnaire

## INTRODUCTION

Patients report to the otolaryngologist very frequently due to white, grey and grey-green or yellow masses accumulating in the tonsillar crypts [tonsillar calculi (TC), tonsil stones (TS)] which are characterized by a quite unpleasant odor. It is not an acute condition which appears suddenly. Usually those persons report the persistence of such a problem for several months, and frequently even years and suggest pharyngeal infection and demand treatment, often even with the use of antibiotic therapy. Some patients cope with TS alone, cleansing the crypts by imposing pressure on the tonsil with a finger or a toothbrush.

Often times, halitosis poses a serious social issue, aggravates patient-environment communication, reduces self-esteem, forces to avoid contact with other people. However it should be noted that an unpleasant odor from the mouth can be caused by reasons other than TS: a healing wound after surgery or surgery performed by a dentist, maxillofacial surgeon or otolaryngologist, bacterial or fungal infection of the oral cavity, nasal and paranasal sinuses, periodontal disease, decaying cancer in the upper respiratory tract, inadequate dental and oral hygiene, frequent consumption of alcohol, smoking and liver or kidney problems. The use of some antidepressants, diuretics, non-steroidal anti-inflammatory and anticholinergic drugs may also cause halitosis. The problem of unpleasant odor from the mouth has been known since ancient times and remains relevant in medicine to this day [1–5].

Palatine tonsils have numerous crypts (from 10 to 30 each) lined, like the entire tonsil, with a nonkeratinized stratified squamous epithelium. Crypts significantly increase the surface of the tonsil and hence escalate the contact between the environment and the lymphatic tissue (Fig. 1a.). In an average-sized adult palatine tonsil, the estimated surface area of the epithelium lining the tonsillar crypt is 295 cm<sup>2</sup> and is about 6x larger than the surface of the epithelium lining the mouth and oropharynx (45 cm<sup>2</sup>) [6, 7].

A history of inflammatory conditions of the oropharynx causes the formation of scarring on the outer surface of the palatine tonsil, which in turn distorts the self-cleansing function of the crypts during speaking or swallowing saliva. The close contact of the tonsil and tonsillar crypts with the digestive pathway may enable the entrance of food residue. They provide an excellent basis for the development of anaerobic bacteria, including: *Porphyromonas gingivalis*, *Treponema denticola*, *Neisseria pneumococci*, *Actinomyces*, *Bacteroides*, *Prevotella intermedia* and *Fusobacterium nucleatum*. This results in decay and the formation of aromatic sub-

stances which contain sulfur (hydrogen sulfide, methyl mercaptan and dimethyl sulfide), and the forming detritus has an unpleasant odor (Fig. 1b., 2.) [5, 8, 9]. The described mechanism explains the predisposition to formation of TS in patients with recurring acute or chronic tonsillitis.

## EPIDEMIOLOGY

Halitosis is a common disorder; according to Kizhner et al. it regularly affects 10–30% of people, and according to Sulser et al. up to 50% of the population [3, 10]. In the general population of the USA, halitosis occurs in 50%, while in China in 6–23% [11, 12]. In the group of Turkish residents over 60 years of age, halitosis was found in about 28% [12].

The vast majority of causes of unpleasant mouth odor are associated with oral pathology (90%). Other reasons are linked to otolaryngological conditions and respiratory diseases, accounting for about 8% of all causes of halitosis, of which 3% are caused by TS. Diseases of the digestive system, kidneys and other metabolic syndromes are responsible for the remaining causes (2%). An unpleasant odor from the mouth in patients with chronic tonsillitis affects 73% [4, 5, 13].

## DIAGNOSTIC PROCEDURE

During diagnosis of unpleasant odor from the mouth, we should consider the existing classification:

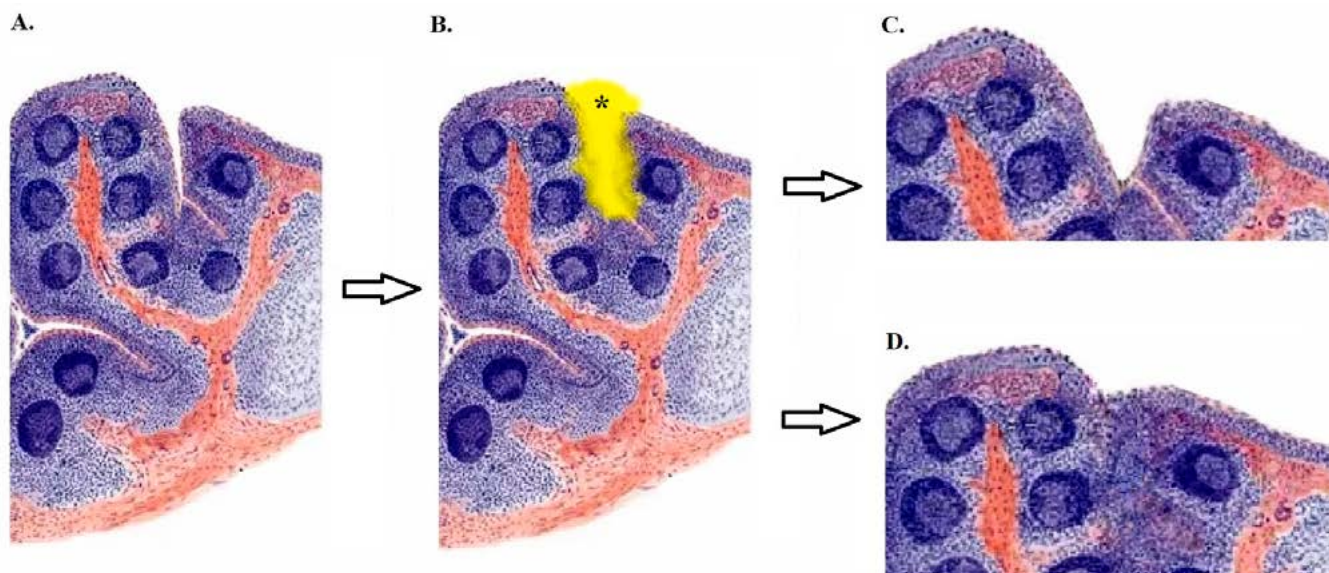
- real halitosis (physiological, pathological),
- pseudo-halitosis,
- halitophobia.

Halitosis can be recognized when an unpleasant odor is felt not only by the affected person but also by those around him or by detection of sulfur compounds in the exhaled air using technical methods (organoleptic method, gas chromatography). Physiological halitosis is where there is an odor from the mouth after eating food (onion, garlic) combined with inadequate oral hygiene.

Pseudo-halitosis is when the patient does not have a real problem with odor from the mouth (other people do not feel the odor or there are no sulfur compounds in the exhaled air using technical methods), but he is still sure that he has bad breath.

Halitophobia refers to a situation where, despite successful treatment, the patient's perception of the breath problem still exists. At this point, treatment of his condition should be directed to other specialists who could provide appropriate psychological or psychiatric advice [9, 14].

The organoleptic method of measuring halitosis is suggested as the "gold standard" in the diagnosis of unpleasant odor from the mouth. The test involves assessing the smell of the tip of a plastic tube or spoon previously inserted into the patient's mouth. The most commonly used is the Rosenberg scale (0 to 5, where 0 is no



**Fig. 1.** A. Palatine tonsil crypt; B. Palatine tonsil crypt filled with tonsil stone (\*); C. Tonsillar crypt after cryptolysis (shallowing of the crypt and widening of its opening); D. Tonsillar crypt after cryptolysis (closing the crypt's opening and lumen).



**Fig. 2.** Tonsillar calculi/stone.

appreciable odor; 1 – barely noticeable odor; 2 – slight, but clearly noticeable odor; 3 – moderate odor; 4 – strong odor; 5 – extremely foul odor). This test is based on a subjective evaluation of the smell performed by the person examining the patient. The estimated level of reliability is around 83% [3, 15, 16].

Gas chromatography is the method of choice if accurate measurements of specific gases are required. It is a very objective and reliable technique in which the concentration of volatile sulfur-containing compounds is determined in saliva or exhaled breath samples. Measurements are made with the generation of mass spectra and analyzed with a gas chromatograph. The method was introduced by J. Tonzetich in the late 1960s. [3, 15]. Unfortunately, it is rarely used in everyday medical practice and has found application almost exclusively in scientific research.

A halimeter, which is a device with an electrochemical sensor that generates a signal when exposed to sulfur-containing compounds,

can be used to test for an unpleasant odor from the mouth. The halimeter was introduced in the early 1990s as an auxiliary method for determining the severity of breath odor based on the identification of hydrogen sulfide and, to a lesser extent, methyl mercaptan. These gases have previously been recognized as bad breath by a gas chromatograph [5].

Recently, the use of questionnaires has been described, allowing on the one hand to assess the deterioration of quality of life caused by halitosis, and on the other – the effectiveness of used treatment (HALT, SF-36 test, QOLQ) [3, 17, 18]. Usually it does not take more than 5–7 minutes to complete such a questionnaire and it may be of great help in the diagnosis of halitosis.

Other tests used to diagnose bad breath, such as: BANA test [N-benzoyl-DL-arginine-2-naphthylamide], chemical sensors, saliva incubation test, quantification of  $\beta$ -galactosidase activity, monitoring of ammonia concentration and polymerase chain reaction

(PCR-RT) are still in the course of scientific investigations conducted to determine their practical value [3]. The discussed methods of identification and monitoring of unpleasant odor from the mouth do not permit the identification of the cause of halitosis.

The task of an otolaryngologist is to determine the cause of halitosis and to start suitable treatment. Although the problem of the onset of TC has long been a known fact, it remains controversial to judge whether TC is a symptom of chronic tonsillitis. The main ailments that can be reported by a patient with chronic tonsillitis are:

- unpleasant mouth odor,
- feeling of fullness, feeling of tightness in the throat,
- sensation of a foreign body in the throat,
- feeling of pressure/pain in the ear,
- white, gray, yellow masses in the tonsil crypts from 1–2 mm to >10 mm in size,
- recurrent frequent upper respiratory tract infections, particularly tonsillitis.

Otolaryngological examination allows to reveal tonsillar hypertrophy (although this is not a necessary condition), distortion of palatine tonsil volume, wide openings of the tonsil crypts filled with white, gray or yellow detritus (Fig. 2.). It is not uncommon to identify a detritus only after pressing around the palatine tonsil with a spatula or exposing the palatoglossal arch. This may be associated with the presence of an unpleasant odor from the patient's mouth. TS is found equally in both genders and in all ages.

During otolaryngological examination, the condition of the entire upper respiratory tract should be assessed, without limiting to examination of the oropharynx and tonsils, as changes in the nose and paranasal sinuses (sinusitis, nasal stones, nasal and sinus cancer), nasopharynx (polyp, cancer), pharynx and larynx (cancer, esophageal reflux) may also cause bad mouth odor. In the course of diagnostics, the criterion differentiating halitosis derived from the oral cavity from halitosis derived from the nose and sinuses may be a separate assessment depending on the pattern of breathing: through the nose or through the mouth. In the case of halitosis, there will be no unpleasant odor from the mouth in the air breathed through the nose. Nasal congestion and runny nose require diagnostic imaging to detect conditions of the nasal and/or paranasal sinuses. High concentrations of methyl mercaptan and low hydrogen sulfide can also be a criterion to differentiate nasal halitosis from oral halitosis [13].

If necessary, diagnostics can be extended to include endoscopic examinations of the respiratory tract, stomach and esophagus, imaging tests (CT, CBCT, MRI) and consultations with doctors of various specialties (dentist, gastroenterologist). Only after excluding other causes of halitosis, the otolaryngologist may proceed with the treatment of tonsillar calculi/stones.

## TREATMENT

The approach to treatment of halitosis should be varied and depend on the type and cause of the unpleasant odor from the mouth. Real

and physiological halitosis does not require treatment. Changing the method of oral hygiene, brushing the teeth and the tongue can be more than sufficient to get rid of the above-mentioned ailments.

Patients with real and pathological halitosis constitute the largest group among all cases of halitosis. Therapeutic management in this group of patients is complicated and always depends on the cause of the discomfort. For that reason, those patients can be treated by doctors of various specialties (dentist, family doctor, otolaryngologist, gastroenterologist, oncologist, nephrologist, diabetologist).

In this article we aim to focus on the problem of treatment of real, pathological halitosis caused by TS.

The presence of TSs, which do not cause any discomfort, is not a medical condition and does not require any treatment. Patients with TS and/or halitosis in the course of often recurrent acute pharyngitis and tonsillitis, a history of perineural abscess, the presence of complications of chronic tonsillitis (rheumatoid arthritis, glomerulonephritis, rheumatic fever), PANDAS disorder, Sydenham's chorea) should be qualified for complete removal of the palatine tonsils (tonsillectomy) [4, 19, 20].

Patients with real, pathological halitosis, with accumulation of tonsil stones, without systemic complaints, can be treated conservatively or surgically.

Conservative treatment involves rinsing the mouth and throat with water after each meal. Studies have not shown a greater effectiveness of disinfectants (e.g. chlorhexidine, hydrogen peroxide) in preventing tonsil stones [14]. As food residues accumulate in the tonsil crypts, most people are able to clean them themselves. Recordings of this process are common on the internet. There are also various "devices" made of syringes with a fitted cannula for introducing to tonsillar crypts and rinsing the accumulated deposits with water, saline or disinfectants. This approach has opponents among otolaryngologists who believe that the introduction of a rigid cannula into the crypt causes additional injury and leads to further scarring and deterioration of the self-cleaning mechanism of the tonsillar crypts. There is a group of patients who do not accept this procedure for various reasons (retching, throat very sensitive to touch, pain, bleeding after rinsing) and are looking for another solution to the problem. For that reason, a minimally invasive procedure performed on palatine tonsils, commonly called as cryptolysis, has enjoyed greater popularity in the recent years.

Cryptolysis is most often performed under local anesthesia (superficial anesthesia of the pharyngeal mucosa combined with the injection of anesthetic into the tonsillar crypt niche and palatoglossal and palatopharyngeal arch). This procedure involves a wide opening of large tonsillar crypts (Fig. 1c.) or closure of small crypts after previous flushing of the tonsil stones (Fig. 1d.). The literature describes various techniques for performing cryptolysis using radiofrequency diathermy, various types of lasers and cryosurgical methods. The procedure is well tolerated by patients and is characterized by a low level of complications (0.5–3%) and a high level of effectiveness after the first procedure (80–85%) and after a second treatment (95%). Only in 3–5% of cases complete removal

of palatine tonsils is required due to failure of the procedure and persistence of discomfort [4, 7, 21–24]. It should be emphasized that this is not a method of treating chronic tonsillitis, but only a procedure aimed at preventing the onset of TS.

Radiofrequency diathermy is one of the methods used to perform cryptolysis. It is an atraumatic technique for cutting and coagulating soft tissues using radio waves (4.0 MHz), which allows for precise management of the tonsillar crypt. Unlike electrocoagulation, the advantage of radiofrequency diathermy is minimal lateral thermal spread. The resulting incision line only covers the radio wave field, while leaving the surrounding cells intact [23, 25]. There is a number of radiofrequency diathermy devices from various manufacturers (Ellman, RaVoR, Celon) available on the Polish market.

CO<sub>2</sub> laser and diode laser can also be used for cryptolysis. To access the crypts of the upper pole of the palatine tonsil, it is not uncommon to incise the glossopalatine arch. This is followed by coagulation of the lymphoid tissue in the tonsils with a laser to evaporate the surface layer of the tonsils layer by layer, similarly, to peeling onion layers. Shrinkage of the mucosa at the laser site limits entry into the crypts, resulting in their cystization. The incision of the edges of a large crypt with subsequent evaporation creates a wide combination of the crypt while shallowing it [5, 22].

Cryosurgery is another method used to treat halitosis. In this case, nitrous oxide or liquid nitrogen is used as the source of cold. With the help of special tips, the doctor “freezes” the surface layer of the palatine tonsil. The healing period is associated with the occurrence of contraction of tonsillar tissue and closing (cystization) of the tonsil crypts.

Coblation is a technology used for: tonsillectomy, reduction of nasal turbinates, surgery of the larynx, sinus and palate. The technology

uses a controlled (not heat-driven) process that consumes radio-frequency energy to excite electrolytes in a conductive medium, such as a saline solution or gel, to create precisely focused plasma. The resulting plasma causes the disintegration and/or dissolution of tissues at the point of contact at relatively low temperatures (40–70°C), causing minimal damage to surrounding tissues [26].

Before using each of these methods, it should be remembered to flush the tonsillar crypts from the accumulated detriment.

If the patient is diagnosed with pseudo-halitosis, the treatment consists of advising him about his misconception due to the fact he has no real problem with breathing.

Treatment of halitophobia and persistent pseudo-halitosis, despite explanatory conversations, should be conducted by a psychiatrist or psychologist.

## CONCLUSIONS

After analyzing the literature data, it can be seen that an unpleasant odor from the mouth can have many different causes and is an interdisciplinary problem. A distinction should be made between real and specific (physiological and pathological) halitosis, pseudo-halitosis and halitophobia.

TSs constitute only 3% among all causes of halitosis. The recognition of their presence as the characteristics of chronic tonsillitis still remains controversial among otolaryngologists. Their existence does not always cause discomfort and does not have to be treated in every case. When diagnosing and treating an unpleasant mouth odor, the above data must be taken into account, especially before planning the use of surgical methods (cryptolysis, tonsillectomy).

## References

1. Prinz H.: Offensive breath, its causes and its prevention. *Dent Cosm.*, 1930; 72: 700–707.
2. Onal Z., Cullu-Cokugras F., Isildak H., Kaytaz A., Kutlu T., et al.: Evaluation of the likelihood of reflux developing in patients with recurrent upper respiratory infections, recurrent sinusitis or recurrent otitis seen in ear-nose-throat outpatient clinics. *Turk J Pediatr.*, 2015; 57(3): 258–265.
3. Kizhner V., Xu D., Krespi Y.P.: A new tool measuring oral malodor quality of life. *Eur Arch Oto-Rhino-Laryngology*, 2011; 268(8): 1227–1232.
4. Ferguson M., Aydin M., Mickel J.: Halitosis and the Tonsils. *Otolaryngol Neck Surg.*, 2014; 151(4): 567–574.
5. Rio A.C.D., Passos C.A.C., Nicola J.H., Nicola E.M.D.: CO<sub>2</sub> Laser Cryptolysis by Coagulation for the Treatment of Halitosis. *Photomed Laser Surg.*, 2006; 24(5): 630–636.
6. Nave H., Gebert A., Pabst R.: Morphology and immunology of the human palatine tonsil. *Anat Embryol (Berl.)*, 2001; 204(5): 367–373.
7. Perry M.E.: The specialised structure of crypt epithelium in the human palatine tonsil and its functional significance. *J Anat.*, 1994; 185(Pt 1): 111–127.
8. da Conceição Passos C.A., Altemani A., Nicola J.H., Nicola E.M.D.: Histopathological Evaluation in Biopsies of Palatine Tonsils Submitted to Cryptolysis by Coagulation with CO<sub>2</sub> Laser for Treatment of Chronic Caseous Tonsillitis. *Photomed Laser Surg.*, 2004; 22(3): 211–219.
9. Iwamoto T., Suzuki N., Tanabe K., Takeshita T., Hirofuji T.: Effects of probiotic *Lactobacillus salivarius* WB21 on halitosis and oral health: an open-label pilot trial. *Oral Surgery, Oral Med Oral Pathol Oral Radiol Endodontology.*, 2010; 110(2): 201–208.
10. Sulser G.F., Brening R.H., Fosdick L.S.: Some Conditions that Effect the Odor Concentration of Breath. *J Dent Res.*, 1939; 18(4): 355–359.
11. Liu X.N., Shinada K., Chen X.C., Zhang B.X., Yaegaki K. et al.: Oral malodor-related parameters in the Chinese general population. *J Clin Periodontol.*, 2006; 33(1): 31–36.
12. Avcu N., Ozbek M., Kurtoglu D., Kurtoglu E., Kansu O. et al.: Oral findings and health status among hospitalized patients with physical disabilities, aged 60 or above. *Arch Gerontol Geriatr.*, 2005; 41(1): 69–79.
13. Tangerman A., Winkel E.G.: Extra-oral halitosis: an overview. *J Breath Res.*, 2010; 4(1): 017003.
14. Yaegaki K., Coil J.M.: Examination, classification, and treatment of halitosis; clinical perspectives. *J Can Dent Assoc.*, 2000; 66(5): 257–261.
15. Porter S.R., Scully C.: Oral malodour (halitosis). *BMJ.*, 2006; 333(7569): 632–635.
16. Oho T., Yoshida Y., Shimazaki Y., Yamashita Y., Koga T.: Characteristics of patients complaining of halitosis and the usefulness of gas chromatography for diagnosing halitosis. *Oral Surgery, Oral Med Oral Pathol Oral Radiol Endodontology.*, 2001; 91(5): 531–534.

17. Kishi M., Abe A., Yonemitsu M.: Relationship between the SF-36 questionnaire and patient's satisfaction following halitosis therapy. *Oral Dis.*, 2005; 11(s1): 89–91.
18. Al-Ahmad H.T., Al-Sa'di W.S., Al-Omari I.K., Al-Bitar Z.B.: Condition-specific quality of life in Jordanian patients with dentofacial deformities: a comparison of generic and disease-specific measures. *Oral Surgery, Oral Med Oral Pathol Oral Radiol Endodontology.*, 2009; 107(1): 49–55.
19. Aylikci B., Çolak H.: Halitosis: From diagnosis to management. *J Nat Sci Biol Med.*, 2013; 4(1): 14.
20. Kabir M.H., Sarwar A.F.M., Hossain M., Ahmed I.: Etiological Factors, Diagnoses, and Treatments of Halitosis: A Review update. *J Shaheed Suhrawardy Med Coll.*, 2013; 5(2): 106–110.
21. Krespi Y.P., Kizhner V.: Laser tonsil cryptolysis: In-office 500 cases review. *Am J Otolaryngol.*, 2013; 34(5): 420–424.
22. Finkelstein Y., Talmi Y.P., Ophir D., Berger G.: Laser Cryptolysis for the Treatment of Halitosis. *Otolaryngol Neck Surg.*, 2004; 131(4): 372–377.
23. Vogt K., Konuhova S., Peksis K., Markow J.: Development and clinical evaluation of bipolar radiofrequency cryptolysis. *Otorhinolaryngol Neck Surg.*, 2016; 2(2): 1–5.
24. Kapoor U., Sharma G., Juneja M., Nagpal A.: Halitosis: Current concepts on etiology, diagnosis and management. *Eur J Dent.*, 2016; 10(2): 292.
25. Ata N., Övet G., Alataş N.: Effectiveness of radiofrequency cryptolysis for the treatment of halitosis due to caseums. *Am J Otolaryngol.*, 2014; 35(2): 93–98.
26. Chang C.Y., Thrasher R.: Coblation cryptolysis to treat tonsil stones: A retrospective case series. *Ear, Nose Throat J.*, 2012; 91(6): 238–254.

---

Word count: 3800

Tables: –

Figures: 2

References: 26

---

DOI: 10.5604/01.3001.0013.5601 [Table of content: https://otorhinology.pl.com/issue/12464](https://otorhinology.pl.com/issue/12464)

---

**Copyright:** Copyright © 2019 Polish Society of Otorhinolaryngologists Head and Neck Surgeons. Published by Index Copernicus Sp. z o.o. All rights reserved

---

**Competing interests:** The authors declare that they have no competing interests.

---



The content of the journal „Polish Society of Otorhinolaryngologists Head and Neck Surgeons“ is circulated on the basis of the Open Access which means free and limitless access to scientific data.

---



This material is available under the Creative Commons – Attribution 4.0 GB. The full terms of this license are available on: <http://creativecommons.org/licenses/by-nc-sa/4.0/legalcode>

---

**Corresponding author:** Dmitry Tretiakow; Otolaryngology Department, Medical University of Gdansk, Smoluchowskiego Str. 17, 80-214 Gdansk, Poland; Phone: +48 (58) 349 31 10; E-mail: [d.tret@gumed.edu.pl](mailto:d.tret@gumed.edu.pl)

---

**Cite this article as:** Tretiakow D., Skorek A.: Halitosis as an interdisciplinary problem; *Pol Otorhino Rev* 2019; 8(4): 9-14

---