

Małgorzata Grzegorzczuk<sup>1</sup>, Klara Muszyńska<sup>1</sup>, Angelika Podlak<sup>1</sup>, Sylwia Klewin-Steinböck<sup>2</sup>

## Pathological changes on tongue

### *Zmiany patologiczne na języku*

<sup>1</sup> Student, Poznan University of Medical Sciences, Poland

<sup>1</sup> Student, Uniwersytet Medyczny im. Karola Marcinkowskiego w Poznaniu

<sup>2</sup> Chair and Department of Dental Surgery, Periodontal and Oral Mucosa Diseases,  
Poznan University of Medical Sciences, Poland

<sup>2</sup> Katedra i Klinika Chirurgii Stomatologicznej, Chorób Przyzębia i Błony Śluzowej Jamy Ustnej,  
Uniwersytet Medyczny im. Karola Marcinkowskiego w Poznaniu

DOI: <http://dx.doi.org/10.20883/df.2022.9>

#### ABSTRACT

The tongue is an essential organ that performs various functions such as communication, mastication, and swallowing. Despite its importance, the tongue is often overlooked in medical examination and pathological changes may go unnoticed for a long time. These changes can be classified into groups such as inflammatory changes, infectious and contagious diseases, trauma changes, precancerous and cancerous changes, and indications of systemic diseases. Trauma changes can result from accidental biting, burns from hot food or beverages, cuts from sharp objects, and injuries from sports or physical activities. Precancerous changes such as leukoplakia and erythroplakia, as well as cancerous changes such as squamous cell carcinoma and melanoma, can occur on the tongue. Factors that increase the risk of developing tongue cancer include tobacco use, excessive alcohol consumption, certain strains of HPV, age, and gender. Furthermore, systemic diseases such as iron deficiency, pernicious anemia, megaloblastic anemia, diabetes mellitus, Sjögren's syndrome, ulcerative colitis, amyloidosis, Kawasaki disease, and systemic sclerosis can also show characteristic oral manifestations. Early diagnosis of these conditions is important for effective management and prevention of irreversible complications.

**Keywords:** tongue, candidiasis, megaloblastic anemia, traumatic fibroma, linea alba, leukoplakia.

#### STRESZCZENIE

Język jest niezwykle ważnym narządem biorącym aktywny udział w czynnościach, takich jak komunikacja, żucie i połykanie. Pomimo swojego znaczenia język jest często pomijany w trakcie badania, a zmiany patologiczne mogą długo pozostać niezauważone. Zmiany widoczne na języku można podzielić na grupy: zmiany zapalne, choroby zakaźne i zaraźliwe, zmiany urazowe, zmiany przedrakowe i nowotworowe oraz objawy chorób ogólnoustrojowych. Zmiany urazowe mogą być wynikiem przypadkowego pogryzienia, oparzenia gorącymi potrawami lub napojami, skaleczenia ostrymi przedmiotami, a także urazów powstałych w wyniku uprawiania sportu lub aktywności fizycznej. Na języku mogą pojawić się zmiany przedrakowe, takie jak leukoplakia i erythroplakia, a także zmiany nowotworowe (rak płaskonabłonkowy, czerniak). Do czynników zwiększających ryzyko rozwoju raka języka należą: palenie tytoniu, nadmierne spożywanie alkoholu, niektóre szczepy wirusa HPV, wiek i płeć. Ponadto choroby ogólnoustrojowe, takie jak: niedobór żelaza, niedokrwistość złośliwa, niedokrwistość megaloblastyczna, cukrzyca, zespół Sjögrena, wrzodziejące zapalenie jelita grubego, amyloidoza, choroba Kawasaki i twardzina układowa, mogą również wykazywać charakterystyczne objawy w jamie ustnej. Wczesne rozpoznanie tych schorzeń jest ważne dla skutecznego postępowania i zapobiegania nieodwracalnym powikłaniom.

**Słowa kluczowe:** język, kandydoza, niedokrwistość megaloblastyczna, włóknik pourazowy, kresa biała, leukoplakia.

#### Introduction

The tongue is a multifunctional organ that consists of stratified muscles and is situated on the floor of the mouth. It plays a vital role in communication, mastication, and swallowing [1]. At the same time, the tongue is one of the most frequently overlooked anatomical structures in research. Due to

its location within the oral cavity, anatomical, histopathological structure, and function, the tongue is exposed to many external factors. At the same time, changes visible on the tongue may be a symptom of systemic diseases.

In order to be able to recognize pathological changes on the tongue, it is necessary to know its

correct appearance. The tongue should be pinkish to reddish in colour on the dorsal and ventral surfaces. The ventral surface may have visible vascularity. The dorsal surface of the tongue should be rough due to the presence of papillae and free of hair, furrows, and sores. The ventral surface of the tongue should be smooth. In addition, the tongue should fit comfortably within the mouth. Any deviations from this condition express the characteristics of pathology.

Pathological changes on the tongue can be divided into a few groups: inflammatory changes, infectious and contagious diseases, trauma changes, precancerous and cancerous changes, and indications of systemic diseases [2].

### Inflammatory changes

The most common pathology within the tongue is glossitis. It is the overarching term for inflammation of the tongue. Clinically, it may present as a sore tongue, a change in the texture and/or colour, or both. Glossitis may appear suddenly or it may recur over time.

Geographic tongue is a chronic, recurrent, non-malignant inflammatory change which aetiology remains unknown. There are several scientific theories like psychosomatic, hereditary, hormonal and stress factors or vitamin deficiency theories. Multiple studies have shown a relation between higher levels of immunoglobulin E, asthma, eczema, allergic rhinitis, hay fever. Usual prevalence is evaluated between 20 to 29 years of age. It is believed that geographic tongue is an oral manifestation of psoriasis, because of its immunohistochemical, histopathological and clinical similarities. Clinical symptoms are changeable, but generally feature as erythematous, atrophic patches that migrate. It is connected with loss of filiform papillae with white annulate borders on lateral or dorsal side of tongue. There is no treatment needed until it is asymptomatic. For those symptomatic types topical steroids, cyclosporine, vitamin A, zinc or topical tacrolimus are advised [3].

Black hairy tongue (BHT), *lingua villosa nigra*, is non-malignant change that affects the dorsum of the tongue. This process is based on hypertrophy of filiform papillae. Typically it has a carpet-like form and black colour, but it can also appear in yellow, brown, green, blue colours or even be unpigmented. Aesthetic issues are the most common reason for medical consultation. Symptoms can be connected with dysgeusia, nausea, xerostomia, burning mouth syndrome or halitosis. Oncological or HIV positive patients, smokers, black tea and

coffee drinkers with inefficient oral hygiene are at higher risk of developing this disorder. Its pathophysiology has not been fully understood. Defective exfoliation can affect the condition of the tongue. Filiform papillae can reach 12 and even 18 mm in length, which facilitates bacterial and fungal colonization and the deposition of food debris. Treatment is based on proper oral hygiene, mechanical debridement and removal of potentially inducing factors [4].

Oral lichen planus (OLP) is a chronic, autoimmune disease that attacks mucosa. Its aetiology is not known clearly, but is thought to involve IV-type hypersensitivity, where mediators and T-cells attack keratocyte [5]. Usually, OLP is related to middle-aged or elderly women as patients. A well-based diagnosis may be hard to get because OLP can be easily mistaken with other oral lesions like pemphigoid changes. Lichen planus on the tongue takes the form of purple, shiny papules visible on its lateral surfaces. The papules are covered with characteristic white stripes. They can be itchy, painful and cause the tongue to swell. But what is important, lichenoid changes are always symmetrical and bilateral (**Figure 1**). These lesions can develop as a result of some medication or locating filling material in the mouth [6].



Figure 1. Lichen planus

Rycina 1. Liszaj płaski

## Infectious and contagious diseases

The tongue has direct contact with external factors, such as fungi, viruses, and bacteria. Each human oral cavity has a different microbial niche, called biofilm, non-infectious to the host. Nevertheless, sometimes host immunity can be impaired by external biological factors. As a result, structures like the tongue and mucosa can develop some lesions. It is crucial to focus on features of common pathogenic diseases [7, 8].

Tongue ulcer (aphthous stomatitis) is the most common ulcerative change that can appear on the surface of the tongue. Its etiology is complex, with plenty factors considered as crucial in its occurrence [9]. Mostly ulcers developed due to damage. The first symptom is pain, especially when damaged tissue came in contact with hard object (toothbrush, teeth, food). Usually it is a mild lesion that disappears after one or two weeks. All patients with an ulcer lasting more than 3 weeks should be consulted to rule out malignancy [10] or other serious conditions such as chronic infections, autoimmune disorders, nutritional deficiencies, or human immunodeficiency virus infection (AIDS).

The most common fungal lesion on the tongue is candidiasis. It is an opportunistic infection that develops in the presence of immunodeficiency, in elderly or infant patients. Most often, the infection is caused by an overgrowth of *Candida albicans* [11]. Unpleasant taste, soreness and pain can occur. Usually, no treatment is necessary, however there are non-prescription medications a patient can purchase to ease the pain and discomfort in the mouth. In more severe cases antifungal treatment is needed. Oral candidiasis (OC) can take a white or erythematous form. The white form can present as pseudomembranous and chronic hyperplastic candidiasis. Symptoms of pseudomembranous candidiasis include white creamy lesions that can be easily wiped off, leaving red, swollen areas. Acute pseudomembranous stadium of oral candidiasis can affect neonates and patients with lower immunocompetence, xerostomia, or steroid inhalers. Erythematous OC includes acute atrophic candidiasis, median rhomboid glossitis, angular cheilitis and linear gingival erythema. Acute atrophic candidiasis can possibly appear after antibiotic treatment. This form of the disease is painful for the patient and may require medical intervention. The main symptoms include a burning tongue or even mouth, tenderness of mucosa and sensitivity to specific foods or drinks. Median rhomboid glossitis is only a visual issue for the patient, no treatment is needed unless there is some tongue hypersensi-

tivity. In angular cheilitis, long dental procedures or cheek retraction can be initiating factors. The patient should be informed that this problem may be long-term and require a combination of antifungal and antibacterial treatment to resolve [12, 13].

Herpes Simplex Virus Type 1 infection usually affects children and most often manifests as a primary herpetic gingivostomatitis (PHGS). In oral cavity, it generally occurs on mucosa of the soft and hard palate or gingiva, tongue, lips, and the inner side of the cheeks. Herpetiform lesions are visible as numerous, hurtful yellowish grey ulcerous changes with a red rim. This disease can be transmitted by direct contact with pathogenic changes or body fluids like saliva [14]. Lesions on the tongue are painful, but the disease itself is not severe and is self-limited when it affects healthy organisms [15]. Central nervous system dysfunction is a serious, but rather uncommon complication. Systemic antiviral treatment has been accepted as the most efficient for herpetic gingivostomatitis [16, 17].

Varicella viruses may also have some impact on the condition of the tongue. Those pathogens cause purulent ulceration on the surface of epithelium. Varicella-zoster virus causes Ramsay Hunt syndrome, also known as herpes zoster oticus. In this case infection inflames the geniculate ganglion of cranial nerve VII. The classic triad of this syndrome is ipsilateral facial paralysis, otalgia and vesicular rash. Sometimes there might be no rash at all or the paralysis demonstrates before the rash. In early stadium fever can also occur. If the rash is existing, it might be more vesicular or maculopapular and can affect tongue surface as much as palate, face or scalp. Additionally some patients may complain about changes in taste sensation, dysphagia, painful earache, eye dryness. An examination in Ramsay Hunt syndrome must include inspection of cranial nerve, check up in oral cavity, scalp, external ears and auditory canals in case of rash [18]. Plenty of studies and researches showed that most effective treatment involves acyclovir, valacyclovir, famciclovir and steroids. Usually treatment should last for about 7 to 10 days. Steroids, typically prednisone, should be used in high doses from 4 to 37 days [19].

COVID-19 has also expanded with its symptoms into the oral cavity [20]. Dysgeusia has become one of the most common signs of ongoing SARS-CoV-2 infection. These diseases manifest with several indications, including ulcers, halitosis, erosion, fissured, depapillated tongue, vesicles, swelling, or erythema. Additionally, COVID-19 patients develop aphthous-like lesions, mucositis, and Kawasaki-like disease. Those pathogens should be treated with

proper medication for organism to heal. However, dental clinicians sometimes are patients' first health contact professionals and have an important role in diagnosing potentially dangerous illnesses [21].

Tuberculosis is a contagious disease caused by *Mycobacterium Tuberculosis*. Despite widespread vaccination, the number of cases of tuberculosis are increasing [22]. Primary lesions in the oral cavity are uncommon. They take the form of single painless ulcers with enlargement of regional lymph nodes. Most common are changes associated with pulmonary disease secondary lesions. Those lesions take the form of usually single, indurated, irregular, painful ulcers covered by inflammatory exudates. Ulcers increase slowly in size and do not tend to spontaneously heal. Both primary and secondary changes are most often observed on the tongue. Tuberculous ulcer should be differentiate with syphilis, actinomycosis, squamous cell carcinoma, traumatic lesions or leukaemia to name a few.

Sexually-transmitted diseases also have manifestations in the oral cavity and can affect the tongue [23]. Syphilis, caused by the bacterial spirochete *Treponema pallidum*, can be noticed at its primary stage as a hard and painless ulceration on the tongue, palate, gingiva, or lips. Secretion from this papule is highly contagious and any direct contact with the saliva of the infected human can be dangerous. Tertiary syphilis may also demonstrate as a granulomatous inflammation of the mucosa [24]. To confirm suspicions about syphilis infection, serological laboratory tests and histopathological analyses should be taken, which is necessary to choose the proper treatment for the patient [25].

Human *Papillomaviruses* (HPV) beyond its sexually related transmission can also spread by mouth-to-mouth or during delivery. This group of viruses correlates with specific benign lesions present on the tongue, including squamous papilloma, condyloma acuminata, multifocal epithelial hyperplasia, verruca vulgaris [26]. However, there are some malignant transformations that dental specialists should be aware of [27]. There are clinical trials that link some oral, head, or neck cancers to HPV infection. Vaccination can be used as a preventive method, but its impact on more severe changes is currently being analysed by scientists.

Gonorrhoea disease is related to the bacteria *Neisseria gonorrhoeae* and affects both sexes [28]. The main symptoms comprise urethritis and cervicitis, however it could be spread into the oral cavity, including the tongue. Any abscesses with evacuating pus may indicate the presence of gonococci bacteria. Other appearing symptoms include enlarged

cervical lymph nodes, throat purulent inflammation, or even higher body temperature. Diagnosis is based on biochemical tests and microscopy. During the treatment phase, systemic antibiotic therapy, such as azithromycin or ceftriaxone, is most often used. As there is no existing vaccine, it is important to educate people and promote responsible sexual behaviour [29]. Gonorrhoea should be differentiated between syphilis, tuberculosis, herpes simplex glossitis, aphthous stomatitis and squamous cell carcinoma, because of its similar morphological appearance.

### Trauma changes

Tongue injuries can occur due to accidental biting, sharp or broken teeth or fillings, blunt trauma, and penetrating trauma. Accidental biting [30] can occur while chewing, epilepsy seizures or when a tongue is between the teeth in falls, quarrels and car accidents. Serious damage may result from sharp, broken teeth or fillings. Local structures can also be affected if the tongue is involved in a major face trauma.

Penetrative trauma to the face, such as a gunshot wound or hard stabbing, can cause big bleeding and can block the airway due to swelling of the tongue and floor of the mouth. Most tongue wounds are petty and heal very fast without infection because of the abundant blood supply of the tongue, but large wound can be difficult to control bleeding. Diagnosing an hidden tongue injury is usually easy to detect visually, but for severe trauma, it is important to establish and regulation the airway, treat bleeding, and damaged the teeth,



Figure 2. Linea alba

Rycina 2. Linia biała



mandible, midface, and other areas of the face. It is important to assess the damage. Minor cuts on the tongue caused by a broken tooth or filling can be treated by smoothing the tooth or fixing the filling. Using a mouth guard or protector can help the healing process of small cuts on the tongue.

Linea alba (**Figures 2 and 3**) occurs as a fine white line due to thickening of the epithelium from recurrent mild chewing trauma. It is usually localized in the buccal mucosa, but can occur on both sides of the tongue. Linea alba is benign and does not require treatment [31].



**Figure 3.** The same person – visible grinding area – cause of linea alba

*Rycina 3. Ten sam pacjent – widoczna linia nagryzania – przyczyna powstania linii białej*

### Precancerous and cancerous changes

Leukoplakia is a white sticky patch or plaque that appears on the tongue. Erythroplakia is a similar lesion that appears red. Lesions with mixed white and red patches are called erythroleukoplakia. All of these lesions may be precancerous. Therefore, biopsy and microscopic analysis are recommended. Erythroplakia and leukoplakia increase the risk of precancerous conditions. The precancerous potential of leukoplakia increases with age and with the size and number of lesions. Women and patients with lesions on the tongue or the floor of the mouth and those with mottled skin are also at increased risk. Tobacco use is the most common factor associated with leukoplakia, which resolves spontaneously when you stop smoking [31].

The two most important substantive risk factors for developing tongue SCC (squamous cell carcinoma) are heavy smoking and alcohol consumption.

Tobacco smoke contains known carcinogens, primarily nitrosamines and polycyclic hydrocarbons. Alcohol is metabolized to acetaldehyde, which affects DNA repair. Other lesser-known but important risk factors for developing tongue cancer include betel consumption, exposure to radiation, immunocompromised status, poor oral hygiene, and genetic factors. Human papillomavirus (HPV) infection is also known to be involved in tongue cancer. Recently, HPV-associated cancers of the base of the tongue have been associated with improved response to treatment and improved survival compared with their HPV-negative counterparts [32].

It may be difficult to differentiate tongue lesion, so an local excision and histopathological examination is indicated to distinguish benign lesions (e.g., granular cell tumors, fibromas, lymphoepithelial cysts) from premalignant leukoplakia or squamous cell carcinoma [31].

Granular cell tumors are little, single, solid and painless lesion that can protrude anywhere on the body. In more than half of the cases are visible in the mouth and up to one-third on the dorsum of the tongue. Tumor surface is smooth unlike squamous cell carcinoma, which has a rough or crusted surface. These tumors are most common in women over the age of 30 and malignant transformation is rare [33]. Traumatic fibroma is common lesion of the oral cavity. It usually presents as a smooth focal thickened area, typically dome-shaped and pink in colour, along the occlusal line. It is caused by the mass of dense collagenous connective tissue at sites of chronic vexation.. Chronic trauma may also accelerate the development of pyogenic granulomas at sites of traumatic fibromas [34]. Other benign lesions are lymphoepithelial cysts. They are yellowish lumps on the ventral surface of the tongue, tonsil areas, or the bottom of the mouth and probably arise due to entrapment of the salivary epithelium in lymphoid aggregates during embryogenesis. One of the most common oral lesions is squamous papilloma occurring in up to 1% of adults. It is commonly associated with human papillomavirus type 6 or 11 infection. Usually presents as a single solitary pedunculated lesion with finger-like projections. Treatment includes surgical excision or laser excision [31].

The tongue is one of the most commonly affected subsites in the oral cavity, along with the lips and floor of the mouth. Importantly, the anterior two-thirds of the tongue is considered part of the oral cavity, while the posterior one-third (the base of the tongue) is considered the subsite of the oro-

pharynx. Although histologically similar to conventional oral tongue cancer, tongue base malignancies have certain important implications that make them a distinct disease entity in terms of treatment, prognosis, and follow-up. Malignant tumors of the tongue represent one of the greatest management challenges for head and neck oncologists because treatment adversely affects mouth and throat function and, ultimately, quality of life and poor prognosis of advanced disease in patients. Squamous cell carcinoma is the most common malignant tumor of the tongue and usually presents with three gross morphologic growth patterns: exotropic, ulcerative, and infiltrative. Because of their location, malignant tumors of the tongue can be routinely detected early in their onset. Smoking, alcohol consumption, and more recently human papillomavirus infection are considered the main risk factors for developing tongue cancer. Initially, malignant lesions may mimic the appearance of benign oral pathologies and the final diagnosis is often delayed. The unique behaviour of these tumors requires vigilance and aggressive treatment to minimize the risk of locoregional spread. It is generally believed that superficial lesions are treated with single modality therapy, while larger lesions are treated with multiple modalities [35]. Despite advances in oral cancer diagnosis and treatment in recent decades, the long-term prognosis for patients with advanced tongue SCCA is generally poor, with a 5-year survival rate of approximately 50% [36].

### Indication of systemic diseases

An oral examination can reveal symptoms of an underlying systemic disease and be an indicator of general health. Systemic diseases associated with oral findings include autoimmune, hematologic, endocrine, and neoplastic processes. Many systemic diseases at first appear as changes in the oral cavity or are recognizable based on them.

Both iron deficiency and pernicious anemia can occur with oral findings. Iron deficiency anemia often manifests as mucosal atrophy and pallor and glottal atrophy. Patients with pernicious anemia may present with erythema (focal or diffuse) of the tongue along with atrophy. This condition is often called magenta tongue. A burning sensation of the lips, tongue, and buccal mucosa is common with both types of anemia, as is angular cheilitis [37].

Megaloblastic anemia is a subgroup of macrocytic anemia and has a characteristic morphological abnormality of red cell precursors in the bone marrow, namely megaloblastic erythropoiesis.

Of the many causes of megaloblastic anemia, the most typical are disorders due to cobalamin (vitamin B12) or folate (vitamin B9) deficiency. A wide range of oral signs and symptoms can develop in anemic patients as a result of underlying alterations in oral epithelial cell metabolism. Clinical signs are weakness, fatigue, shortness of breath, and neurologic abnormalities. The presence of oral signs and symptoms such as glossitis, angular cheilitis, recurrent stomatitis, oral candidiasis, diffuse erythematous mucositis, and oral mucosal pallor gives the dentist an opportunity to participate in the diagnosis of this condition. Early diagnosis is important to prevent irreversible neurological manifestations [38].

Diabetes mellitus is one of the most common chronic diseases characterized by hyperglycemia. This disorder can cause many complications in different areas of the body, including the oral cavity. Important oral symptoms and complications associated with diabetes include: geographic tongue, coated and fissured tongue, dry mouth (xerostomia), tooth decay (including root caries), periapical lesions, gingivitis, periodontal disease, oral candidiasis, burning mouth (especially glossodynia), altered taste, oral lichen planus (OLP), recurrent aphthous stomatitis, increased tendency to infections, and defective wound healing. Prevention and management of oral complications are important as there is evidence that chronic oral complications adversely affect glycemic control in these patients [39].

Sjögren's syndrome (SS) is characterized by xerostomia and xerophthalmia and more commonly affects women. Oral manifestations of SS include findings related to parotid hypertrophy and decreased salivary secretion such as the increased risk of tooth decay, infections, and swallowing problems. Saliva is often thick or absent and the oral mucosa can become dry, red, and wrinkled. The tongue is atrophied and fissured, with deep grooves that can trap food and give off an odor [40].

Many diseases present findings not only on the tongue but also on mucosal surfaces, such as in ulcerative colitis. Not only aphthous ulcers but also lesions resembling pyoderma gangrenosum of the tongue have been reported as oral lesions. These lesions may show progressive necrosis and deep ulceration. Redness of tongue lesions and aphthous ulceration may be correlated with worsening gastrointestinal symptoms [41].

Amyloidosis can be divided into two types: organ-confined and systemic. Oral soft tissues are rarely affected in organ-confined amyloidosis. Systemic amyloidosis can lead to macroglossia due

to the deposition of amyloid on the tongue. Tongue lesions present as nodular or diffuse enlargement with subsequent ulceration or hemorrhage. A biopsy can confirm the diagnosis [37].

Kawasaki disease primarily affects children under the age of five. As systemic vasculitis, it is the leading cause of heart disease in children in the United States. Diagnosis is based on fever of 38.5 degrees Celsius and 4 of the 5 basic clinical features: oral changes, multiforme rash, bilateral conjunctivitis, extremity changes, and cervical lymphadenopathy. Intraoral findings can be characterized by "strawberry tongue", cracked lips, and erythema [42].

Systemic sclerosis is characterized by dense collagen deposition within tissues and can range from localized to systemic disease. Oral findings vary including changes in the lips and mouth. The lips may be pursed restricting the opening of the mouth also dry mouth is common. The tongue appears smooth, the same as the palatal rugae [37].

## Conclusion

Tongue is one of the most often used muscles in a human body. As it performs many functions that are crucial for everyday activities, it can be affected by various infections, damages, malformations or cancerous lesions. It is possible to bracket those pathological changes into some specific groups. Inflammatory changes are commonly visible as a glossitis and are connected with human immune system response. Infectious and contagious diseases can be presented as some ulcerations during aphthous stomatitis. In candidiasis symptoms can have a wide spectrum, from genial, not involving any treatment, to severe, which require medical intervention. Some virus infections can be hard to relate with symptoms among oral cavity by dental specialists. In those cases higher awareness can choke off further transmission and reduce the percentage of an infected population. It can also prevent occurring complications linked with unrecognised illnesses.

The tongue is a sensitive organ and can be easily injured by biting, burning, or other types of trauma. The most common cause of impressions on the tongue is accidental biting or rubbing against the teeth or dental appliances, such as braces or dentures. In some cases, certain medical conditions or medications can also cause changes or abnormalities in the tongue. To treat tongue trauma, it's important to first determine the cause and address it if possible. For example, if a sharp tooth or filling is the culprit, a dentist may need to smooth

it down or make other adjustments to prevent further injury. If the cause is a tongue piercing, proper care and cleaning can help prevent infection and promote healing. Also precancerous and cancerous changes can occur on the tongue, and early detection is essential for successful treatment. Treatment for precancerous and cancerous changes on the tongue typically involves surgery, radiation therapy, and chemotherapy. The choice of treatment depends on the stage of the cancer and the patient's overall health. If you notice any abnormal changes in your tongue, such as persistent sores or lumps, consult your healthcare provider as soon as possible.

An oral examination can provide important clues about a patient's overall health, including the presence of systemic diseases such as autoimmune, hematologic, endocrine, and neoplastic processes. The oral cavity can be affected by a variety of conditions, including anemia, diabetes mellitus, Sjögren's syndrome, ulcerative colitis, amyloidosis, Kawasaki disease, and systemic sclerosis. Early recognition and diagnosis of these conditions is important for proper management and prevention of irreversible complications. Dentists and healthcare professionals should be aware of the oral signs and symptoms of these diseases and incorporate them into their clinical evaluations.

## Acknowledgements

### Conflict of interest statement

The authors declare no conflict of interest.

### Funding sources

There are no sources of funding to declare.

## References

- [1] du Toit DF. The tongue: structure and function relevant to disease and oral health. *SADJ*. 2003;58(9):375–383.
- [2] Sara B, Giuseppe M, Adelaide CM. Dorsal Lingual Surface and Halitosis: a Morphological Point of View. *Acta Stomatol Croat*. 2016;50(2):151-157.
- [3] Campana F, Vigarios E, Fricain JC, Sibaud V. Geographic stomatitis with palate involvement. *An Bras Dermatol*. 2019;94(4):449-451.
- [4] Gurvits GE, Tan A. Black hairy tongue syndrome. *World J Gastroenterol*. 2014 Aug 21;20(31):10845-50.
- [5] Alrashdan MS, Cirillo N, McCullough M. Oral lichen planus: A literature review and update. *Arch Dermatol Res*. 2016;308(8):539-551.
- [6] Müller S. Oral lichenoid lesions: distinguishing the benign from the deadly. *Mod Pathol*. 2017;30(1):54-67.
- [7] Randall DA, Wilson Westmark NL, Neville BW. Common Oral Lesions. *Am Fam Physician*. 2022;105(4):369-376.

- [8] Mangold AR, Torgerson R.R, Rogers RS. 3rd. Diseases of the tongue. Clin Dermatol. 2016;34(4), 458-469.
- [9] Sánchez-Bernal J, Conejero C, Conejero R. Recurrent Aphthous Stomatitis. Actas Dermosifiliogr (Engl Ed). 2020;111(6):471-480.
- [10] Scully C, Shotts R. Mouth ulcers and other causes of orofacial soreness and pain. West J Med. 2001;174(6):421-424.
- [11] Richardson R, Antilla VJ. Suun hiivainfektioiden diagnostiikka ja hoitoperiaatteet [Diagnosis and treatment of oral candidosis]. Duodecim; laaketieteellinen aikakauskirja. 2010;126(2):174-180.
- [12] Millsop JW, Fazel, N. Oral candidiasis. Clin Dermatol. 2016;34(4):487-494.
- [13] Hellstein JW, Marek CL. Candidiasis: Red and White Manifestations in the Oral Cavity. Head and Neck Pathol. 2019;13: 25-32.
- [14] Arduino PG, Porter SR. Herpes Simplex Virus Type 1 infection: overview on relevant clinico-pathological features. Jou Oral Path & Medi: Off publ of Int Asso of Oral Path and the Am Aca of Oral Path. 2008;37(2):107-121.
- [15] Huber MA. Herpes simplex type-1 virus infection. Quintessence Int. 2003;34(6):453-467.
- [16] Huang CW, Hsieh CH, Lin MR, et al. Clinical features of gingivostomatitis due to primary infection of herpes simplex virus in children. BMC Infect Dis. 2020;20:782.
- [17] Arduino PG, Porter SR. Oral and perioral herpes simplex virus type 1 (HSV-1) infection: review of its management. Oral Dis. 2006;12(3);254-270.
- [18] Baran A, Chodyncka B. Zoster oticus and its complications. Ramsay Hunt syndrome. Report of three cases. Dermatology Review/Przegląd Dermatologiczny. 2011;98(5):416-421.
- [19] Moylan A, Karsten E, Yeung S, et al. Primary varicella zoster infection with tongue lesions. BMJ Case Rep. 2018.
- [20] Iranmanesh B, Khalili M, Amiri R, et al. Oral manifestations of COVID-19 disease: A review article. Dermatol Ther. 2021;34(1)2-5.
- [21] Kim SY, Byun JS, Choi JK, et al. A case report of a tongue ulcer presented as the first sign of occult tuberculosis. BMC Oral Health. 2019;19(1):1-4.
- [22] Jain P, Jain I. Oral Manifestations of Tuberculosis: Step towards Early Diagnosis. J Clin Diagn Res. 2014;8(12): 18-21.
- [23] Queirós C, Costa JBD. Oral transmission of sexually transmissible infections: A narrative review. Acta Med Port. 2019;32(12):776-781.
- [24] Smith MH, Vargo RJ, Bilodeau EA, et al. Oral Manifestations of Syphilis: a Review of the Clinical and Histopathologic Characteristics of a Reemerging Entity with Report of 19 New Cases. Head Neck Pathol. 2021;15(3):787-795.
- [25] de Andrade RS, de Freitas EM, Rocha BA, et al. Oral findings in secondary syphilis. Med Oral Patol Oral Cir Bucal. 2018;23(2):138-143.
- [26] Syrjänen S. Oral manifestations of human papillomavirus infections. Eur J Oral Sci. 2018;126 Suppl. 1:49-66.
- [27] Hübbers CU, Akgül B. HPV and cancer of the oral cavity. Virulence. 2015;6(3):244-248.
- [28] Chue PW. Gonorrhea-its natural history, oral manifestations, diagnosis, treatment, and prevention. J Am Dent Assoc. 1975;90(6):1297-1301.
- [29] Unemo M, Seifert HS, Hook EW 3rd, Hawkes S, Ndowa F, Dillon JR. Gonorrhoea. Nat Rev Dis Primers. 2019;5(1):79.
- [30] Hennessy BJ. Tongue Trauma, DDS, Texas A&M University, College of Dentistry. 2022.
- [31] Reamy B.V., Derby R., Bunt C. W. Common Tongue Conditions in Primary Care. Am Fam Physician. 2010;81(5):627-634
- [32] Gonzalez M, March AR. Tongue Cancer. StatPearls. Treasure Island (FL) Publishing; 2023 Jan.
- [33] Dive A, Dhobley A, Fande PZ, Dixit S. Granular cell tumor of the tongue: Report of a case. J Oral Maxillofac Pathol. 2013;17(1):148. English
- [34] Vujhini SK, Reddy SE, Sudheer MV, et al. Irritation fibroma of tongue: a case report. Int J Res Med Sci 2016;4:1272-1273.
- [35] Gosselin BJ. Malignant Tumors of the Mobile Tongue. Available at: <https://emedicine.medscape.com/article/847428>.
- [36] Gonzalez M, Riera March A. Tongue Cancer. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2023.
- [37] Heidi L. Gaddey, MD. Oral manifestations of systemic disease. Academy of General Dentistry. 2017; 23-29.
- [38] Hélder Antônio Rebelo Pontes, Nicolau Conte Neto. Oral Manifestations of Vitamin B12 Deficiency: A Case Report. Journal of the Canadian Dental Association. 2009, Vol. 75, No. 7, 533-537.
- [39] Rohani B. Oral manifestations in patients with diabetes mellitus. World Journal of Diabetes. 2019;10(9):485-489.
- [40] Nazmul-Hossain AN, Morarasu GM, Schmidt SK, et al. A current perspective on Sjögren's syndrome. J Calif Dent Assoc. 2011;39(9):631-637.
- [41] Geraldine N. Systemic Disease Manifestations in the Oral Cavity. Osteopathic Family Physician. 2014; 6(3): 16-21.
- [42] Saguil A, Fargo M, Grogan S. Diagnosis and management of kawasaki disease. Am Fam Physician. 2015;91(6):365-371.

Acceptance for editing: 2023-10-04  
Acceptance for publication: 2023-12-19

#### Correspondence address:

klchstom@ump.edu.pl