Oral Cancer: Tongue Anatomy, Lesions and Referral Guidelines

Aims: To give an overview on lesions and common conditions affecting the tongue so that the participant can identify which may warrant referral for further investigation.

Objectives: On completion of this verifiable CPD article the participant will be able to demonstrate, through the completion of a questionnaire, the ability to:

- Demonstrate knowledge of tongue anatomy
- Identify statistics relating to cancer of the tongue
- Identify common conditions affecting the tongue and their causes
- Be able to identify which lesions may show signs of malignancy
- Know the stages and grading system for tongue cancer
- Know the National Institute of Care and Excellence guidelines on urgent head and neck cancer referral
- Pass an online assessment, scoring more than 70%

Introduction

Tongue cancer is a type of mouth cancer that usually develops in the squamous cells on the surface of the tongue. Tongue lesions of unclear aetiology may require biopsy or referral.[1]

The latest Cancer Research UK figures from 2017-2019 show that there are around 12,800 of new head and neck cancer cases in the UK each year. Head and neck cancer is the 8th most common cancer in the UK, accounting for 3% of all new cancer cases between 2017 and 2019.[2]

This article will describe the anatomy of the tongue, the symptoms of tongue cancer and some of the common tongue lesions that may present at clinical examination.

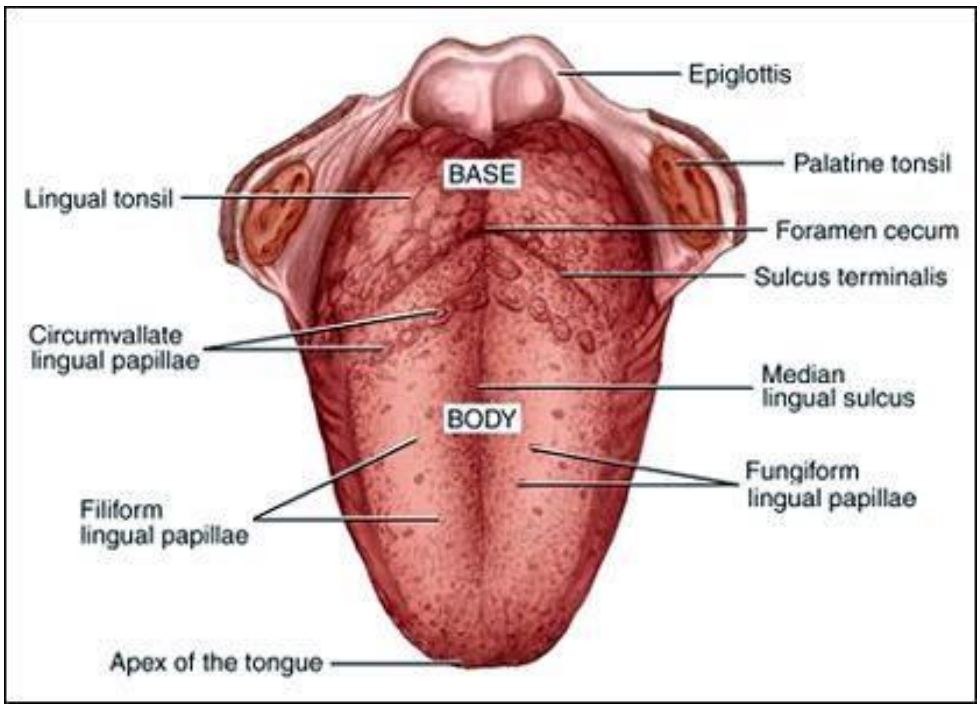
Anatomy of the Tongue

The top of the tongue - the dorsum, has a V-shaped line known as the terminal sulcus that divides the tongue into the anterior and posterior surfaces.

The **anterior 2/3rds of the tongue** is made up of the apex at the tip and body.

The **posterior/pharyngeal 1/3rd** is made up entirely of the root.

The anterior part of the tongue lies in the oral cavity with the tip and lateral margins in contact with the lingual surfaces of the teeth, and the dorsal surface in close association with the hard and soft palates. Running longitudinally down the centre of the tongue is a shallow median furrow under which lies the fibrous median septum which divides the tongue into left and right halves.



Papillae are thickly distributed over the anterior two thirds of the tongue and are responsible for giving the tongue its characteristic roughness. They have a mechanical function and a taste function where taste buds are present.

The Pharyngeal part of the tongue is devoid of papillae but exhibits a number of elevations due to the presence of underlying lymph nodes. This collection of lymphatic tissue is known as the pharyngeal tonsil or lingual tonsil.

The underside of the tongue - the ventral surface, is covered in a glossy membrane, which is less tightly bound down to the underlying muscle. The lingual fraenum runs from the midline of the ventral surface to the floor of the mouth.

Risk Factors for Tongue Cancer

Risk factors for tongue cancer include the following:

- Smoking- Research suggests that over 60% of mouth and oropharyngeal cancers in the UK are caused by smoking

- Alcohol- Research shows that around 30% of mouth and oropharyngeal cancers are caused by alcohol consumption. Smoking and drinking alcohol together further increases the risk
- Chewing tobacco or betel quid (tobacco and areca nut/spices)

- Poor nutrition
- Human Papilloma Virus (HPV)
- Weak immune system
- Age (people over the age of 45 are more likely to develop mouth cancer)
- Gender (Men are more likely to develop oral and oropharyngeal cancer than women)
- Previous cancer
- Family history[3]

Location and Symptoms of Tongue Cancer

Tongue cancer can occur in the **anterior 2/3^{rds}**, where it is more likely to be seen and felt and therefore is more likely to be diagnosed when the cancer is small. Cancer that occurs in the anterior 2/3^{rds} of the tongue is considered to be a type of oral cavity cancer.[4]

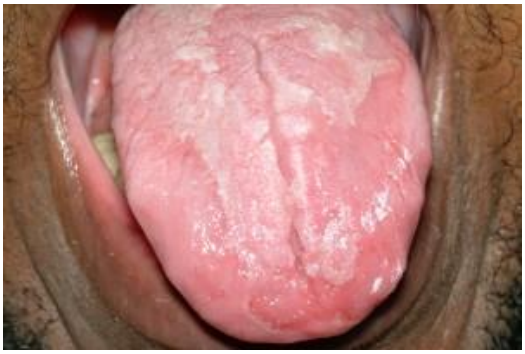
Cancer that begins in the **posterior/pharyngeal third** of the tongue is considered to be a type of oropharyngeal cancer (hypopharyngeal cancer). In this type of cancer, it may develop with few signs and symptoms. Cancer at the base of the tongue is more often diagnosed at an advanced stage, when the tumor is larger, and the cancer has spread into the lymph nodes of the neck.[4]

Symptoms of tongue cancer can include:

- A persistent red or white patch on the tongue
- A persistent sore throat
- A persistent sore spot (ulcer) or lump on the tongue
- Pain when swallowing
- Persistent numbness in the mouth
- Unexplained bleeding from the tongue, pain in the ear (rare)[3]

It is important to remember that there are many tongue conditions that the clinician may note on examination, and many of these conditions are benign (harmless). However, tongue lesions that are potentially malignant (cancerous), or of unclear aetiology, may require biopsy or referral. The following section describes some conditions of the tongue and highlights which ones may need referral for further investigation.

Geographic Tongue



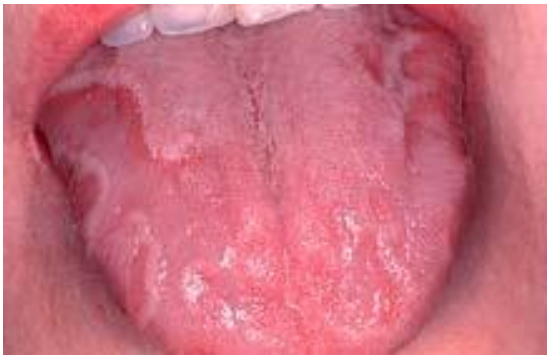


Fig 1 and 2. Geographic tongue [5,6]

Geographic tongue (fig.1 and 2) is also known as benign migratory glossitis or erythema migrans and is the most common tongue condition, affecting at least 1-2% of patients, although some sources report it to be much more common.[7] It is a benign condition that typically affects the dorsum of the tongue, although it can occasionally affect the ventral surface. The dorsum of the tongue develops areas of papillary atrophy, leaving erythematous (red) and smooth areas. The lesions typically occur in multiple locations on the tongue and coalesce over time to form the typical map like appearance. The lesions usually change in shape, size and migrate to other areas.

The cause of Geographic tongue is unknown. Some research has linked it to psoriasis.[8] In addition, other factors including emotional stress, vitamin deficiency, allergy, genetic factors, immune disorders, bacterial or fungal infection and systemic diseases are known to play a causative role.[9]

Geographic tongue is usually symptomless, but the smooth areas may be sensitive to spicy foods.[1,7] There is usually no treatment for Geographic tongue but advice can be given to take note of which foods cause soreness so that the patient can avoid them. Some patients may be sensitive to certain toothpaste. Switching to a toothpaste that does not contain Sodium Lauryl Sulfate may help. Topical steroids, retinoic acid, cyclosporine, antihistamine, tacrolimus, and immune system regulators have been used in proposed treatment plans, yet they are neither specific nor curative.

Fissured Tongue

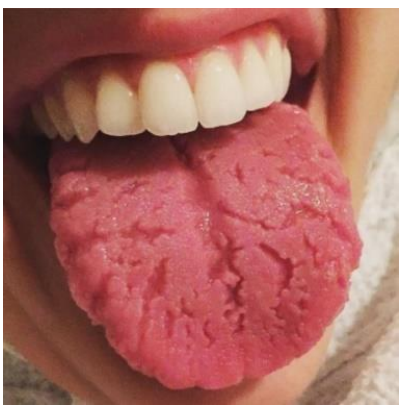


Fig.3 Fissured tongue

Fissured tongue (fig.3) is the second most common tongue condition and is a benign condition characterised by a deepening of normal tongue fissures. There may be one of more fissures of varying sizes and depths. Malodour and discoloration may occur with inflammation or trapping of food.[1] Fissured tongue may be evident at birth or develop in childhood, however it also increases with age. The following medical conditions are also linked to fissured tongue:

- Sjogren's syndrome - A long-term autoimmune disease in which the moisture-producing glands of the body are affected
- Down's Syndrome - Also called Trisomy 21, is a genetic condition that can cause a variety of physical and mental impairments
- Geographic tongue
- Melkersson-Rosenthal syndrome - A neurological condition characterised by a fissured tongue, swelling of the face and upper lip, and Bell's palsy
- Malnutrition

Since fissured tongue is often seen in families, the condition may also be genetic. Usually no treatment is required but the tongue should be gently brushed.

Median Rhomboid Glossitis

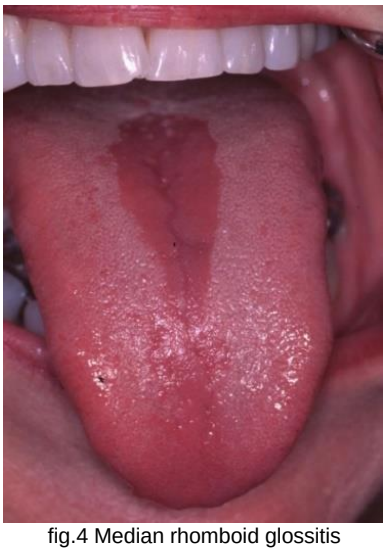


fig.4 Median rhomboid glossitis

Median rhomboid glossitis is a benign condition and is characterised by a smooth, shiny, erythematous, sharply circumscribed, asymptomatic, plaque like lesion on the dorsal midline of the tongue, immediately in front of the circumvallate papillae.[1] It affects approximately 1% of the population and men between the ages of 30-50 years of age are most commonly affected.[10] Most of the time, the condition is asymptomatic, but burning and itching is possible. The condition is commonly associated with a candidial infection and can be treated with anti fungals. Predisposing factors include smoking, denture wearing, diabetes, use of corticosteroid sprays or inhalers and Human Immunodeficiency Virus (HIV).[1]

Atrophic Glossitis

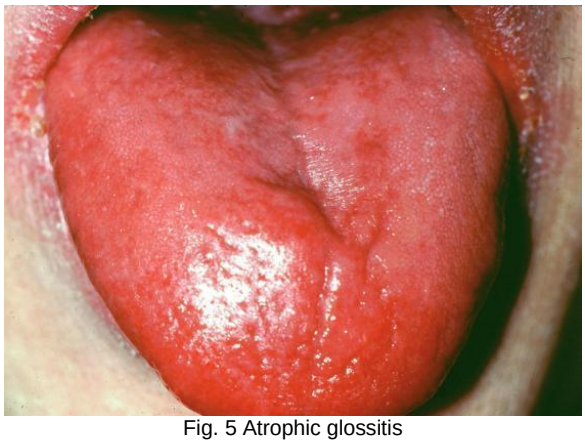


Fig. 5 Atrophic glossitis

Atrophic glossitis (fig.5) is also known as smooth tongue because of the smooth, glossy appearance with a red or pink background. It occurs by atrophy of the filiform and fungiform papillae, and it does warrant thorough diagnostic evaluation since it is primarily a manifestation of underlying conditions.[1] Nutritional deficiencies of thiamine (vitamin B_1), vitamin B_6, Vitamin B_{12}, riboflavin, iron, folic acid and niacin are common causes.[11] It can also be caused by oral candidiasis. Treatment involves treating the nutritional deficiency or underlying condition.

Red Tongue

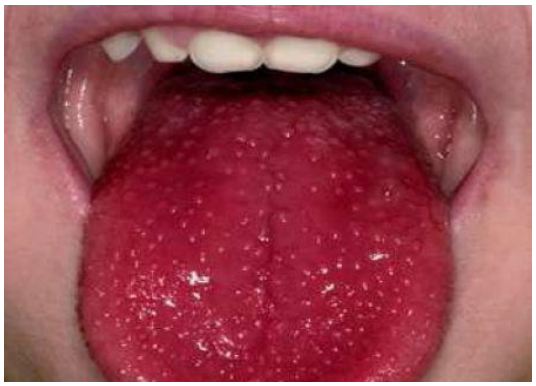


Fig. 6 Red tongue

There are some obvious causes of red tongue, such as eating certain foods. Some acidic foods can also cause temporary redness and discomfort. However, red tongue such as that pictured above, can be a sign of an underlying medical condition.[12] Red tongue (fig.6) could be related to:

- Vitamin deficiency
- Kawasaki disease- A rare condition that mainly affects children under the age of five. Kawasaki disease causes the blood vessels to become inflamed and swollen, which can lead to complications in the blood vessels that supply blood to the heart[13]
- Food or drug allergies
- Streptococcus infection (Scarlet Fever)

This condition is seen more commonly in children than in adults.

Black Hairy Tongue

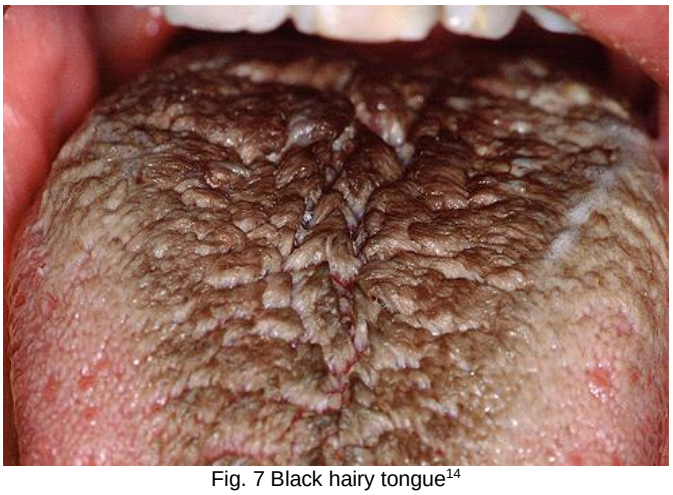


Fig. 7 Black hairy tongue[14]

Black tongue (fig.7) is a benign condition caused by too much bacteria or yeast growth in the mouth. The bacteria build up on the papillae. Instead of shedding as they normally do, the papillae start to grow and lengthen, creating hair like projections and as such it is often known as “black hairy tongue” (lingua villosa nigra). The papillae can grow to 15 times their normal length. The darker colouration results from trapping of debris and bacteria in the elongated strands. Although usually black, hairy tongue can also be white or tan in colour.

Black tongue can be caused by medications, smoking, poor diet, soft diet, radiation of the head and neck, dry mouth or use of products that contain Bismuth such as Pepto-Bismol which is an antacid medication. It is also more prevalent in those patients infected with HIV, and those that are HIV negative and use intravenous drugs.[1,12]

Treatment may involve improving diet, smoking cessation and improving oral hygiene. A tongue scraper can be advised. Eating fresh pineapple may help as it contains an enzyme that breaks down the papillae.

Hairy Leukoplakia

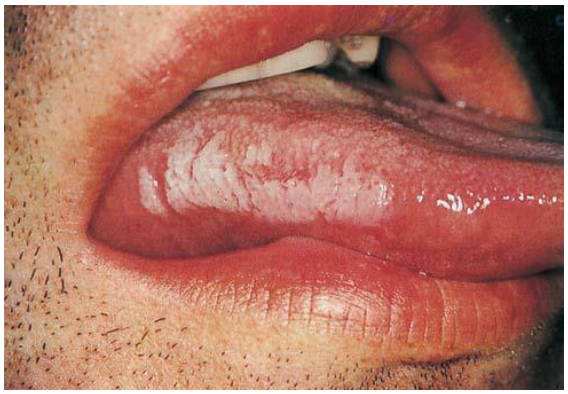


Fig.17 Hairy leukoplakia

Hairy leukoplakia (fig.17) is found on the lateral border of the tongue and differs from black hairy tongue in its location and association with immunosuppression. It is caused

by Epstein Barr virus infection but if it occurs in the absence of a known immunocompromising condition, HIV testing should be considered.[1]

Treatment is not necessary since the lesion is benign. The condition often resolves rapidly with high dose of antiviral medication Acyclovir but recurs once this therapy is stopped, or as the underlying immunocompromise worsens.

Traumatic Fibroma

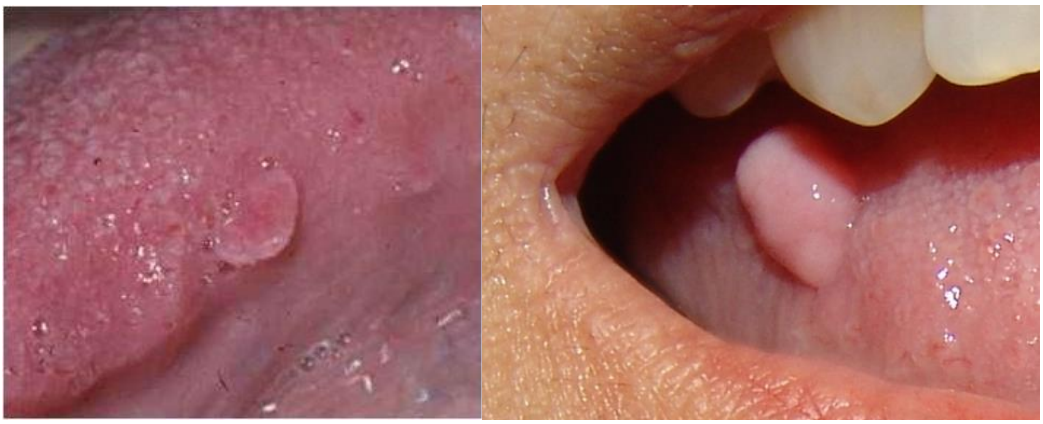


Fig. 8 and 9 Traumatic Fibroma [15,16]

Traumatic fibromas (fig 8,9) are a common lesion that appear as a raised, thickened nodule that is dome shaped. It is lighter in colour than the surrounding tissues, with the surface often appearing white due to hyperkeratosis. It is the result of chronic irritation of one area of the tongue, particularly along the bite line. It is considered benign; however, an excisional biopsy is usually performed to definitively diagnose the lesion since it can be difficult to differentiate the lesion from other neoplasms. [1]

Lymphoepithelial Cysts

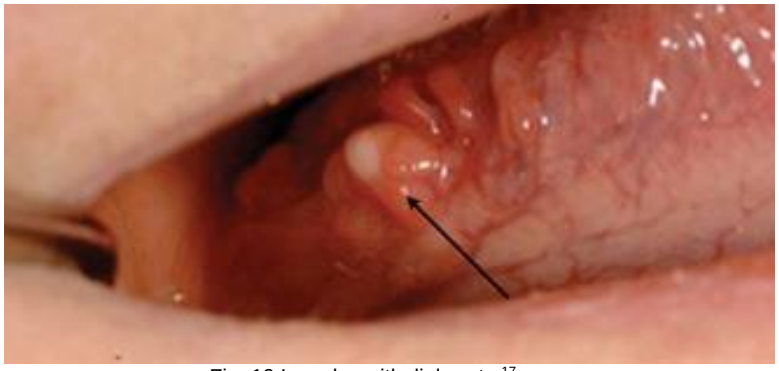


Fig. 10 Lymphoepithelial cysts [17]

Lymphoepithelial cysts (fig. 10) are rare white or slightly yellow nodules located on the ventral surface of the tongue, tonsillar region or floor of the mouth and they are soft on palpation. The exact cause of oral lymphoepithelial cyst development is unknown. They are benign; however, biopsy is required to confirm diagnosis.

Papilloma

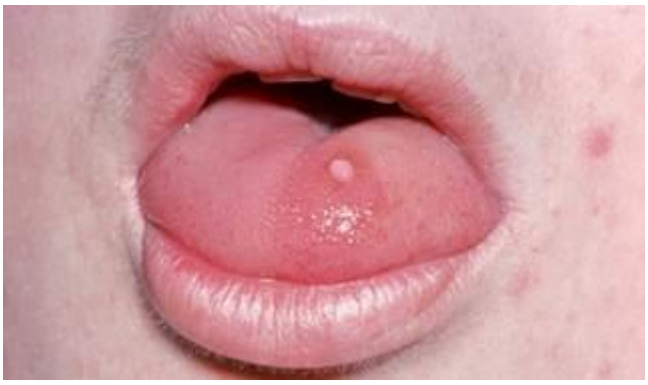


Fig.11 Papilloma

Squamous papilloma (fig.11) is one of the more common oral lesions, occurring in up to 1 percent of adults.[1] Many are thought to be induced by viral infection of the epithelium, especially from human papillomavirus (HPV) type 6 or 11. Human papillomavirus (HPV) is a DNA virus that belongs to the papilomaviridae family and is frequently sexually transmitted.[18]

The most commonly infected areas are the vulva, perineum, urethral meatus, and cervix. However, with a rise in oral sexual practice, HPV is frequently found in the oral mucosa. Currently, there are more than 100 types of HPV. Out of these, 24 are associated to oral lesions with different oncogenic potential.[18]

Papillomas typically appear as a single, isolated, pedunculated lesion with finger-like projections. Treatment involves surgical excision or laser ablation.[1]

Candidiasis

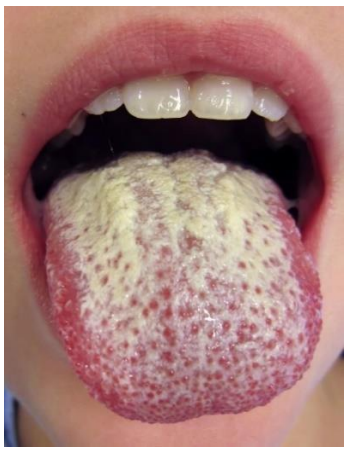


Fig. 12 Candidiasis

Candida (fig.12) is a fungus found in normal oral flora; however, it can proliferate in immunocompromised, malnourished, or debilitated persons. Pseudomembranous candidiasis (thrush) presents as white plaques, but these can be wiped away to leave red patches on the mucosa so in this way it can be distinguished from leukoplakia.[1]

Leukoplakia

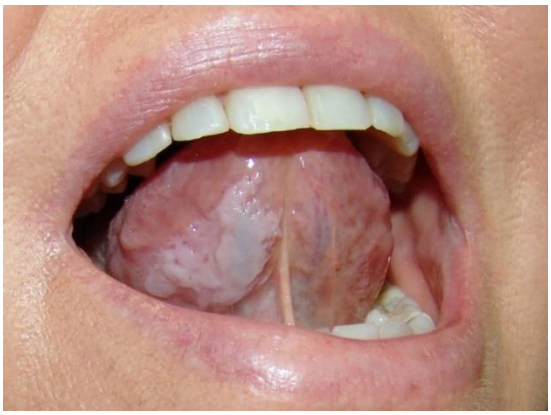


Fig. 13 Leukoplakia on the ventral surface of the tongue [20]

Leukoplakia (fig.13) was first defined by the World Health Organisation as “a white patch or plaque that cannot be characterised clinically or pathologically as any other disease.”[21] During an examination, a lesion may be considered to be leukoplakia if it cannot be attributed to another condition.

Leukoplakia reflects a build-up of excess epithelial keratin (proteins). Hyperkeratosis of the oral mucosa may occur due to friction or tongue biting.[22]

Leukoplakia is also produced in response to noxious stimuli such as constant exposure to irritating chemicals and tobacco smoke. When the leukoplakia is in response to constant exposure to noxious stimuli such as tobacco smoke, the presence of white patches is considered pre-cancerous since squamous cell carcinoma often arises within them. Two such tobacco related lesions are nicotine stomatitis and tobacco pouch keratosis.

Due to the premalignant potential biopsy and microscopic analysis is recommended.[1]

Erythroplakia

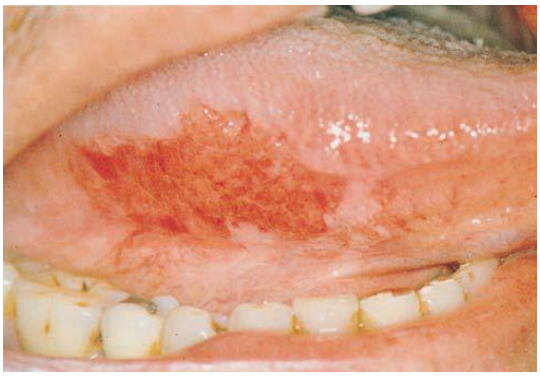


Fig.14 Erythroplakia

Erythroplakia (fig. 14) is defined by the World Health Organisation as “A red patch that cannot be defined clinically or pathologically as any other condition.”[21] Erythroplakia may also have white areas within it (erythroleukoplakia). Although it is not as common as leukoplakia, erythroplakia is much more likely to show dysplastic changes or

malignancy. The 2015 last updated October 2023 NICE guidelines advise an urgent referral for cases of Erythroplakia and erythroleukoplakia.[23]

Squamous Cell Carcinoma

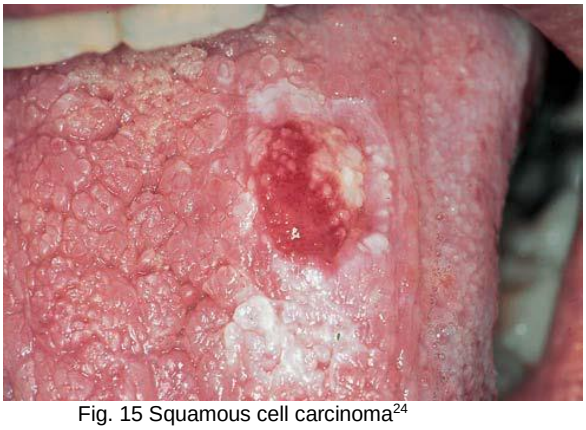


Fig. 15 Squamous cell carcinoma[24]

Carcinomas account for about 96% of oral cancers. The most common type of oral malignancy, which accounts for approximately 9 out of 10 oral cancers, is the squamous cell carcinoma (fig.15).[25] Initially, lesions appear as a slight thickening over a red or white base. This may lead to nodularity or ulceration, causing pain and discomfort.[23] Biopsy is critical to confirm the diagnosis Treatment typically requires surgery and radiation therapy.[1]

Lichen Planus

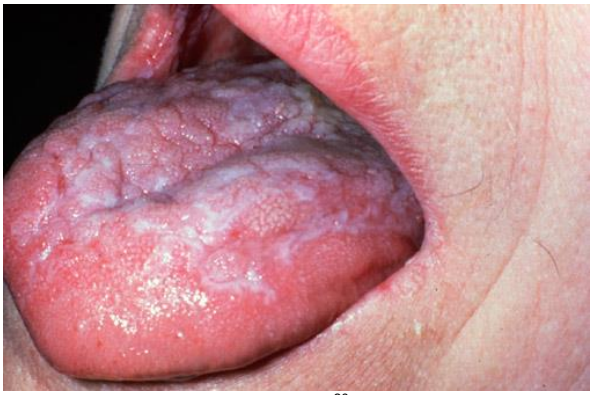
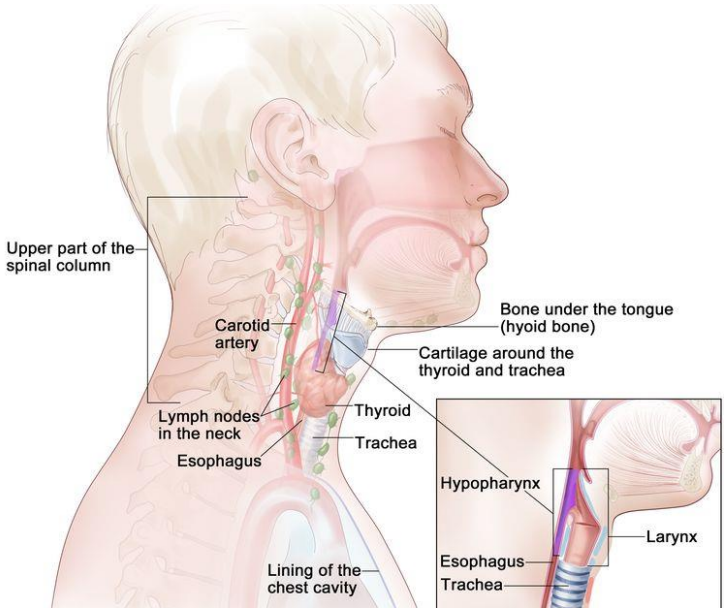


Fig.16 Lichen Planus[26]

Lichen Planus (fig.16) is an immunologic condition that affects the skin or mucosal surfaces, such as the mouth and tongue.[1] A variety of medicines may cause lichenoid lesions which are almost identical in appearance to Lichen Planus. Lichen planus may be reticular, where the lines lesions present as white, interlacing lines. Erosive lichen planus still has the white, interlacing lines, but with erythematous areas and central ulceration and is usually symptomatic.[19] Candida can coexist with lichen planus and requires treatment with an antifungal agent. There has been a lot of debate as to the possible malignant potential of oral lichen planus.[27] However, it has been reported to fulfil the WHO criterion of a premalignant condition.[28,29]

Hypopharyngeal Cancer



Areas where hypopharyngeal cancer may form or spread[30]

The hypopharynx is the part of the throat (pharynx) that lies behind the Larynx. Cancers that start in the larynx are called laryngeal cancers, and those that start in the hypopharynx are called hypopharyngeal cancers. Hypopharyngeal cancer is uncommon in the developed world and is mainly diagnosed in men who smoke tobacco and consume excessive alcohol. However, recent trends in the developed world have shown an increase in the number of women being diagnosed.[31]Hypopharyngeal cancer can develop when malignant cells develop in the hypopharynx. The following can be signs of hypopharyngeal or laryngeal cancer:

- A lump in the neck
- Difficulty/pain associated with swallowing
- Voice changes
- Ear pain[30]

Recommended Referral Pathway as Detailed in the NICE Guidelines and Cancer Research Referral Guidelines

Referral Details

It is important that certain details are recorded on a patient referral so that a waiting list can be prioritised.

- Patient's details. This includes the patient's name, address and telephone number.
- Medical history: Including doctor's name and contact details.
- Relevant social history: Including smoking and drinking status.
- Detailed description of the lesion including duration, site, size, colour, texture and findings upon palpitation.

- Clinical diagnosis in order to categorise the urgency of the referral.

Urgency of Referral (England, Northern Ireland and Wales)

The NICE Guidelines for suspected general cancer referrals were published in 2015 and were last updated in October 2023 and the details below are taken directly from the referral guidelines.[32] The full guidelines are available from the further reading section at the end of this article.

1.8 Head and neck cancers

Laryngeal cancer

1.8.1 Consider a suspected cancer pathway referral (for an appointment within 2 weeks) for laryngeal cancer in people aged 45 and over with:

- Persistent unexplained hoarseness or
- An unexplained lump in the neck.

Oral cancer

1.8.2 Consider a suspected cancer pathway referral (for an appointment within 2 weeks) for oral cancer in people with either:

- Unexplained ulceration in the oral cavity lasting for more than 3 weeks or
- A persistent and unexplained lump in the neck.
-

1.8.3 Consider an urgent referral (for an appointment within 2 weeks) for assessment for possible oral cancer by a dentist in people who have either:

- A lump on the lip or in the oral cavity or
- A red or red and white patch in the oral cavity consistent with erythroplakia or erythroleukoplakia.

1.8.4 Consider a suspected cancer pathway referral by the dentist (for an appointment within 2 weeks) for oral cancer in people when assessed by a dentist as having either:

- A lump on the lip or in the oral cavity consistent with oral cancer or
- A red or red and white patch in the oral cavity consistent with erythroplakia or erythroleukoplakia.[32]

The **Scottish** Referral Guidelines for Suspected Cancer recommend urgent referral for patients meeting the following criteria:

- Persistent unexplained head and neck lumps for >3 weeks.
- An ulceration or unexplained swelling of the oral mucosa persisting for >3 weeks.
- All red or mixed red and white patch es of the oral mucosa persisting for >3 weeks.
- Unexplained tooth mobility not associated with periodontal disease.

- Persistent, particularly unilateral, discomfort in the throat for >4 weeks.
- Ear pain without evidence of local ear abnormalities.[33]

Stages and Grades

Mouth cancers starting on the lips, gums, soft tissue and anterior section of the tongue are staged using the TNM staging system.[34]

TNM system:

- **T** describes the size of the tumour, with numbers 1 to 4 (1 for small, 4 for large).
- **N** stands for lymph nodes, with numbers 0 to 3 (0 means no lymph nodes have cancer, 3 means many do).
- **M** stands for metastases or whether the cancer has spread to another part of the body, with numbers 0 or 1 (0 means it has not spread, 1 means it has).

The number system is used for oral pharyngeal cancer:

Stage 1

Earliest stage and the cancer is 2cm or smaller and 5mm deep or less. It has not spread. (Same as TNM stage T1,N0,M0)

Stage 2

The cancer is 2cm or smaller, and it is deeper than 5mm but no deeper than 10mm, or the cancer is larger than 2cm but no larger than 4cm, and it is 10mm deep or less. It has not spread. (Same as TNM stage T2,N0,M0)

Stage 3

The cancer is larger than 4cm, or deeper than 10mm, but has not spread to any lymph nodes or to other parts of the body or the cancer is any size but one lymph node contains cancer cells on the same side of the neck as the cancer, and the lymph node is no more than 3cm across. (Same as T3,N0,M0 or T1,2 or 3, N1, M0)

Stage 4

Means that the cancer is advanced and is further divided into 3 stages a, b and c. Further information can be accessed by using the link at the end of this article.

The grade of cancer refers to how aggressive it is and how likely to spread.
Tongue cancer can be:

- **Grade 1** (Low grade)- slow growing and unlikely to spread. Cancer cells look like normal mouth cells)
- **Grade 2** (Intermediate grade)- Cancer cells look slightly different to normal mouth cells
- **Grade 3** (High grade)- Very aggressive and likely to spread. Cells look very abnormal and not like normal mouth cells.[34]

Conclusion

A clinician may come across many different conditions that can affect the tongue and it is important to be able to differentiate between lesions that are benign and lesions or conditions that may be suspicious. Having good knowledge of anatomy and different oral lesions can improve the early detection of mouth cancer which can lead to better outcomes for the patient. Dental professionals should use the relevant guidelines when deciding when to refer patients for further investigation.

Personal Development Plan and Reflective Learning

This CPD is linked to the following GDC Enhanced CPD Development Outcome:

C. Maintenance and development of knowledge and skill within your field of practice.

Reflective learning is now a requirement of the GDC Enhanced Professional Development Scheme. As such, you will now be given the option to answer some reflective learning questions, before your certificate is generated. These will be:

1) What did you learn (or confirm) from the activity that was helpful or relevant to your daily work and patients?
2) Comment on any changes/updates needed in your daily work
3) How has completion of this CPD article benefitted your work as a DCP?

Examples will be provided. Please remember you can update this at any time from your CPD log. If you take a few moments to write your reflection on completion, you will have fulfilled the Enhanced CPD requirements.

Further reading

NICE (2015) Updated October 2023 Suspected cancer: recognition and referral
Scottish Referral Guidelines for Suspected Cancer (2019)
Cancer Research UK. Number stages and grades of mouth cancer.

References

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