Mouth, Tongue and Minor Salivary glands

Systems: Digestive

Causes: Genetic, blood supply, infection, cancer

Introduction

The diseases of systems are divided into congenital and acquired. The acquired are then divided into non-neoplastic and neoplastic.

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MOUTH

Congenital
Cleft lip and Cleft Palate

Definition: A cleft is a birth defect that occurs when the tissues of the lip and/or palate of the foetus do not fuse at about 8 weeks’ gestation.

Sites: A cleft lip is an opening in the upper lip that can extend into the base of the nostril. The condition can involve one or both sides of the lip, being below one or both nostrils. It is not always associated with a cleft palate.

A cleft palate is an opening in the palate which is the roof of the mouth. The cleft may only be in the bony hard palate and opens into the floor of the nose. Severe degrees affecting the bone of the hard palate have the cleft involving the alveolar ridge when there will also be cleft lip. Or it may only affect the soft palate.

Finally it can involve both the hard and soft palate and can occur on both sides of the centre of the palate. The cleft palate may not be associated with a cleft lip.

Incidence: averaged at one per 1000 newborns.

Peak age: at birth

Gender: cleft lip M : F = 2 : 1. Isolated cleft palate is more common in female babies.

Other demographic: lower incidence in African Americans – 0.3 per 1000 newborns.

Clinical presentation: with cleft lip, the mother can see facial deformity consisting of an elongated opening in the upper lip. This may be a small notch in the upper lip or an opening extending into the base of the nostril.

Babies with a cleft palate have a visible opening into the roof of the mouth. In some cases the cleft palate will be covered with the normal lining of the mouth and so can only be felt by the physician.

Babies with cleft lips and palates have feeding difficulties, especially those with cleft palates. The baby is unable to achieve complete suction. So liquids enter the nose from the mouth through the opening in the hard palate.

Babies also have abnormal speech, as the palate is necessary for speech formation. Even after repair, speech may still be affected.

May present with ear infections because the muscles of the palate do not open the Eustachian tubes that drain the middle ear. Fluid collects and becomes infected with some conduction deafness.

Teeth may also erupt misaligned.

Molecular pathogenesis: some cases are associated with a chromosomal abnormality – trisomies 13 and 18.

Risk factors: cigarette and alcohol use during pregnancy. Also medications such as phenytoin, sodium valproate and methotrexate increase the incidence of clefting.
**Macro appearance:** Image on the left is a cleft lip (arrow) and on the right (arrow) the cleft extends from the lip up into the centre of the nose.


![Image of a cleft lip and palate](image)


![X-ray image of a cleft lip and palate](image)

**Microscopic appearance** nil

**Biochemistry:** nil

**Diagnosis:** cleft lip and cleft palate can be diagnosed before birth by ultrasound – see image above.
After birth, diagnosed by physical examination.

**Treatment:** Feeding is difficult but may be possible for a baby breast-feeding, if it only has a cleft lip. Babies with cleft palate require a device attached to a feeding bottle that fits into the roof of the mouth to block the cleft opening and allow easier suckling.

Orthodontic treatment to narrow the gap in the upper lip must commence in the first 3 weeks of life. Surgical closure of the cleft lip is usually performed between one and 3 months of age. If the nose is an abnormal shape due to the cleft lip, it is corrected. More than one surgical procedure may be needed.

Goal of surgery for cleft palate is to achieve normal speech, normal facial growth and hearing and surgery is done between 3 and 18 months of age. May need additional operations to close the cleft and improve speech.

**Prognosis:** babies with cleft lip and palate have a good prognosis, with 80% developing normal speech.

**Lingual Thyroid**

**Definition:** is a congenital condition where ectopic thyroid tissue is located at the base of the tongue (posterior one third) and accounts for 90% of ectopic thyroid tissue. It is due to a failure of migration from the foramen caecum down to the normal position for the thyroid in front of the larynx and upper trachea. The diagram below is courtesy of A.Toso et al. Acta Otorhinolaryngol Ital 2009, 29(4) : 213-217

![Diagram of Lingual Thyroid]

**Sites:** the remaining 10% of ectopic thyroid tissue is located suprathyroid, infrathyroid, level with the hyoid, palatine tonsils, carotid bifurcation and distant sites in organs beyond the head and neck.
Incidence:  1 in 300,000

Peak age:  congenital so present at birth

Gender:  slightly more common in females.

Other demographics:  nil

Clinical Presentation:  may be asymptomatic and an incidental finding when imaging the tongue or when doing tests for thyroid pathology and no thyroid gland is found in the neck.

Symptomatic:  dysphagia, bleeding from mucosal ulceration, airway obstruction especially in infants.

Physical examination finds a red nodular mass which can vary from a few mm in size to 4 cm.

Thyroid function tests are normal in the majority but 33% suffer from hypothyroidism.

Molecular pathogenesis:  nil

Risk factors:  nil

Macro appearance:  physical examination using an endoscope

Xray appearance:  2 different patients – CT scan with IV contrast
(a) courtesy of Dr Paresh K Desai. Radiopaedia.org, rID 10914. The arrow indicates a small nubbin of contrast-enhancing tissue which is the lingual thyroid.

(b) courtesy of Dr Andrew Dixon. Radiopaedia.org, rID 20842. The arrow indicates a massive lingual thyroid.

Pre-contrast CT will show the thyroid tissue to be hyperdense which becomes greater after contrast.

Microscopic appearance: a lingual thyroid has exactly the same microscopic appearance as a thyroid gland located in normal position.

Biochemistry: The function of a lingual thyroid is the same as thyroid tissue in the neck.

Diagnosis: physical examination of the mouth. Also a nuclear medicine scan is useful to establish whether there is any functioning thyroid tissue elsewhere.

Treatment: usually nothing is required but if due to its size, it requires surgical removal, it is important to establish whether there is any thyroid tissue elsewhere because thyroxin replacement is essential with the surgery.

Prognosis: the outcome is usually very good.

Only rare cases untreated have become malignant as carcinoma.

The lingual thyroid can be associated with thyrotoxicosis, the same as the thyroid gland in the neck.

MOUTH

ACQUIRED CONDITIONS

Inflammations

Skin diseases involving the oral mucosa

Lichen planus

Definition: Lichen planus is the most common skin disease to involve the oral mucosa and it is an acute or chronic inflammatory disease.

Site: buccal mucosa but can also affect the tongue and gingiva.

Incidence: occurs in 2% of the general population

Peak age: 30 – 60 years

Gender: F : M = 3.0 : 2.0

Other demographic: cell-mediated immunity plays a major role. 50% of people with lichen planus of the skin have oropharyngeal involvement.
Clinical presentation: patient presents with painful milky white reticulated papules in the mouth.

2 types: Reticular lichen planus – clinical examination discloses a netlike pattern of lacy white hyperkeratosis on the buccal mucosa, tongue, gingiva and this is the most common pattern.

Erosive or ulcerative lichen planus: there is superficial erosion with/without overlying fibrin clot and occurs on the tongue and buccal mucosa. When it involves the gingiva see shiny red painful erosions.

Molecular pathogenesis: nil

Risk factors: alcohol, tobacco

Macro appearance:

The image above is courtesy of Stevens, Lowe and Scott. Core Pathology 2009 p.22

Xray: nil

Microscopic appearance:

- thickening of the stratum corneum, stratum granulosum and stratum spinosum with formation of colloid
- liquefactive degeneration of the stratum basale, with separation from the underlying lamina propria, as a result of desmosome loss, creating small spaces
- Infiltration of T cells in a band-like pattern into the dermis sticking to the basal layer.
- Development of a "saw-tooth" appearance of the rete pegs, which is much more common in non-oral forms of lichen planus.
Lichen planus and normal specimen microscopic appearance courtesy of Wikimedia Commons.

**Biochemistry:** nil

**Diagnosis and Differential Diagnosis (DD):** clinical findings and may biopsy to check the differential diagnosis and exclude malignant change. DD – leukoplakia, pseudomembranous candidiasis (thrush), lupus erythematosis, secondary syphilis, pemphigus vulgaris and bullous pemphigoid.

**Treatment:** No cure, so treatment is often cortico-steroids for symptomatic relief.

**Prognosis:** Lichen planus in the mouth is very resistant to treatment and may last for 20 years or show repeated relapses. Carcinoma can rarely develop in the mouth lesions.

**Erythema multiforme**

**Definition:** consists of erosions with fibrin membranes and occasionally ulcerations. The reaction pattern of blood vessels in the dermis with secondary epidermal changes manifests clinically as characteristic erythematous iris-shaped papular and vesiculobullous lesions typically involving the extremities, especially the palms and soles, and the mucous membranes.

**Sites:** It can be found in the oropharynx. Also affects mucosa of nose, conjunctiva, vulva and anus.

**Incidence:** varies from 2 – 20 per 100,000 depending upon which drug is responsible.

**Peak age:** 50% occur in those under 20 years

**Gender:** more frequent in males than females

**Etiology:** the condition is a reaction to a variety of antigenic stimuli.

**Agents are Drugs:** sulphonamide, phenytoin, barbiturates, phenylbutazone, penicillin, allopurinol
Infection: especially following herpes simplex, also Mycoplasma  

In 50% there is no known etiological trigger agent.

Clinical presentation: painful lesions evolve over several days. In severe forms, there are systemic symptoms of fever, weakness and malaise.  

The mild form rarely involves the mucous membranes.  
The severe form most often occurs as a drug reaction, and always involves the mucous membranes.

Molecular pathogenesis: nil

Risk factors: drug reaction

Macro appearance: Severe form: lesions tend to become confluent and bullous. Cheilitis and stomatitis interfere with eating. 

The maximal variant is life-threatening. In addition there is necrotizing trachea-bronchitis, meningitis, renal tubular necrosis (Stevens-Johnson syndrome). 

![Image of lower lip](Image of lower lip - courtesy of Stevens, Lowe and Scott. Core Pathology 3rd ed. P.227)

Xray appearance: Nil

Microscopic appearance: inflammation characterized by perivascular mononuclear infiltrate, oedema of the upper dermis, apoptosis of keratinocytes with focal epidermal necrosis and sub-epidermal bullae formation. In severe cases there is complete necrosis of the epidermis. 

*Insert image of microscopy*

Image courtesy of Dr S V Murthy. Pathology of Skin. Common Disorders 2010
Biochemistry: nil

Diagnosis: history, physical examination and histopathology

Treatment: Prevention: control of herpes simplex using oral valacyclovir or penciclovir may prevent development of recurrent erythema multiforme.

Glucocorticoids are given systemically to the severely ill. Effectiveness is not established.

Prognosis: If progresses to the stage of Stevens-Johnson syndrome it can be fatal.

Systemic lupus erythematosus

Definition: it is a chronic inflammatory multisystem disease of auto-immune etiology

Mucosal involvement occurs in 25% of patients with chronic cutaneous lupus erythematosis.

Sites: buccal mucosa, palate, alveolar process and tongue.

Chronic plaques may also appear on the vermillion border of the lips.

Incidence: 15 : 100,000

Peak age: young women especially

Gender: F : M = 10 : 1. However, in pre-menstrual and post-menopausal females with less oestrogen, the ratio drops down to F : M = 3 : 1

Other demographics: more common in persons with black skin and also Asians.

Clinical presentation: In acute systemic lupus erythematosus, ulcers arise in purpuric necrotic lesions of the palate (80%), the buccal mucosa or gums.
Risk factors:

Many prescription drugs can cause lupus-like skin symptoms. These include high blood pressure (hypertension) medications, including hydrochlorothiazide, angiotensin-converting-enzyme inhibitors, and calcium-channel blockers. About 40 different drugs have been linked to lupus.

Smoking. Smoking may be a risk factor for triggering SLE and can increase the risk for skin and kidney problems in women who have the disease.

Possible SLE Triggers

In genetically susceptible people, there are various external factors that can provoke an immune response, includes colds, fatigue, stress, chemicals, sunlight, and certain drugs.

Viruses. Patients with SLE may be more likely to have been exposed to certain viruses than the general population and includes the Epstein-Barr virus (the cause of mononucleosis), cytomegalovirus, and parvovirus-B1

Sunlight. Ultraviolet (UV) rays found in sunlight are important SLE triggers

Chemicals. Clusters of SLE cases have occurred in populations with high exposure to chemicals: chlorinated pesticides and crystalline silica are two suspects. A number of other chemicals are under investigation.

Macro appearance: lesions range from painless erythematous patches to chronic plaques. The latter are sharply marginated, irregularly scalloped white borders, radiating white striae and telangiectasia. Older plaques have a central depression and painful ulceration.

Insert photo of open mouth – see below

Image courtesy of Dr Boban Fidanoski – Systemic Lupus – oral manifestations and adverse effects of lupus on the oral cavity. Published online 2007.

Xray: nil
**Micro appearance:** Lesions reveal lichenoid mucositis with perivascular exudate and thickening of basement membrane. Immunoglobulin and complement were found in both the basement membrane and blood vessel walls.


Acanthotic, dysplastic stratified squamous epithelium with liquefaction degeneration of basal layer (just one layer of cells) and juxta epithelial cell-free zone.

![Image of skin pathology](image)

Images courtesy of Wikimedia Commons.

**Diagnosis:** clinical examination and histopathology

**Treatment:** patient should avoid direct exposure to sunlight as oral lupus may be part of the acute cutaneous systemic type. Remove any offending drugs acting as triggers. Corticosteroids may be used short-term.

**Prognosis:** 5 year survival is 93% but the figure varies depending upon whether the oral lupus is part of acute cutaneous LE or chronic cutaneous LE.

**Pemphigus vulgaris**

**Definition:** it is a serious acute or chronic, bullous, autoimmune disease of skin and mucous membranes that is often fatal unless treated with immunosuppressive agents. It is the prototype of the pemphigus family, which is a group of autoimmune acantholytic blistering diseases. Acantholysis is the loss of intercellular connections, such as desmosomes, resulting in loss of cohesion between keratinocytes.

**Classification of Pemphigus:** Courtesy of K Wolff, RA Johnson, Dick Suurmond. Fitzpatrick’s Color Atlas & Synopsis of Clinical Dermatology. 5th ed.

- Pemphigus vulgaris
  - Pemphigus vegetans: localized
  - Drug-induced

- Pemphigus foliaceus
  - Pemphigus erythematous: localized
  - Fogo selvage: endemic
  - Drug-induced

- Paraneoplastic pemphigus
Sites: It often presents in the oral mucosa. It may be confined to this site for months before cutaneous bullae occur.

Clinical presentation: blisters are very fragile, rupture easily.

Site: Sharply marginated erosions of the mouth involving buccal mucosa, hard and soft palate and gingiva, are presenting symptoms. The erosions are extremely painful, interfering with nutrition. Biopsy confirms the diagnosis. Image courtesy of the Mayo Foundation for Clinical Education and Research IMG 20006010.

Pemphigoid

Bullous pemphigoid

Definition: it is an autoimmune disorder presenting as a chronic bullous eruption, mostly in patients over the age of 60 years.

Site: In 10 – 35% it can affect the mucous membranes of the mouth. It is less severe and painful and less easily ruptured than the lesions of pemphigus. Light pressure on the bulla and a sliding movement causes the lesion to slough off.

Image below is courtesy of Dr TD Rees. Register Dental Hygienist 2015. The gingiva is raw, red and oedematous in several areas.
Treatment: Mainstay is corticosteroids. The patients often go into a permanent remission and do not require therapy.

Cicatricial pemphigoid
Is a rare disease, mainly of the elderly. It can feature primary erosions resulting from epithelial fragility in the mouth, oropharynx and nasopharynx. Treatment is dapsone and low dose prednisone producing a good response.

Infections

Viral

Herpes simplex virus type 1: blisters develop on the palate and gingiva, leaving shallow ulcers after the blisters rupture. Severe herpetic stomatitis affects immune-compromised patients, especially those with AIDS.

Herpes zoster: this can affect the mouth. Trigeminal shingles causing clusters of vesicles in the mouth, usually on one side, the side of the shingles involvement.

Coxackie A virus produces tiny vesicles in the mouth, with small vesicles in the skin, the hands and feet. It is transient, mild and mainly affects children.

Fungal

Candida albicans – “thrush”. Most often found in infants. One can see white patches on the palatal, buccal and tongue surfaces. The white patches are tangled fungal hyphae mixed with acute inflammatory cells and some desquamated epithelium. When the white patch is scraped off, the underlying epithelium is acutely inflamed and red.
In adults persons affected are those with diabetes mellitus, HIV infection and those receiving immunosuppressive therapy as well as those in an immunosuppressed state of advanced malignancy. It can also occur in women taking oral contraceptives or who are pregnant.

Image courtesy of Dr AD Wyatt. WebMD April 14, 2014

Bacterial

Acute necrotizing ulcerative gingivitis This is especially seen in young males with poor dental hygiene. Examination shows sloughing ulceration of the interdental papillae which spreads along the gingival margins. The gingiva are very painful and the breath smells very bad.

Extension of the necrosis and inflammation destroys the periodontal tissues. The necrotic areas contain a mixture of fusiform and spirochetal organisms (Fusobacterium and Borrelia species).

Non-infective stomatitis - aphthous ulcers

Cause unknown. Triggers are hypersensitivities, infections and stress. Last 1 – 2 weeks.

Sites: tongue, cheek and gums.

Tumours

Squamous cell carcinoma of the oral cavity

Site: most common on the lower lip. The oral tongue is the second most common site involving its anterior two-thirds on the lateral border. It may present as a thick white patch on the tongue which ulcerates.

Floor of the mouth and cheek are less common sites but that location is common in the Indian subcontinent. The soft palate is the least common site.

Etiology:

Some oral squamous cell carcinomas (OSCCs) arise in apparently normal mucosa, but many are preceded by clinically obvious potentially malignant disorders (PMDs), especially erythroplakia (red patch), leukoplakia (white patch), a speckled leukoplakia (red and white patch), or verrucous
leukoplakia. The challenge is predicting which oral mucosal potentially malignant disorders will progress to neoplasia.

*Image courtesy of Dr C Sculley. Medscape 2014 shows a painless, hard lump inside the cheek in a heavy smoker which had arisen from chronic candida leukoplakia.*

Erythroplastic lesions are velvety red plaques, which in at least 85% of cases, show frank malignancy or severe dysplasia. Most white lesions are not malignant or premalignant.

Specckled or verrucous leukoplakias are more likely to be premalignant. Carcinomas are seen 17 times more frequently in erythroplakias than in leukoplakias, but leukoplakias are far more common. The prevalence of malignant transformation in leukoplakias ranges from 3-33% over 10 years; homogeneous leukoplakias are only very occasionally premalignant, but speckled or verrucous leukoplakias are more likely to be premalignant.

In most cases, a biopsy and a histologic examination are required because dysplasia may precede malignant changes. The rate of malignant changes can be as high as 36% when moderate or severe dysplasia is present.

**Peak age:** middle aged and older persons.

**Incidence:** 6th most common neoplasm in the world. Accounts for 90% of cancers in the oral cavity. It is 50% more frequent in blacks than in whites.

**Gender:** Males slightly more than females.

**Clinical presentation:** chronic, indurated ulcer on ventral aspect of tongue very common site.

Carcinomas of the alveolus or gingiva are mostly seen in the mandibular premolar and molar regions, usually as a lump (epulis) or ulcer. The underlying alveolar bone is invaded in 50% of cases, even in the absence of radiographic changes, and adjacent teeth may be loose.

Second primary tumors (SPT) are additional primary carcinomas (synchronous tumors) present in as many as 10-15% of persons with oral carcinoma and are most commonly seen in the mouth in patients with gingival, floor of mouth, lingual, or buccal carcinoma. SPTs may also be present elsewhere in the upper digestive tract.

Lymph node examination is very important, and general examination and, possibly, endoscopy, may be indicated to detect metastases or second primary tumours. From 30-80% of patients with oral cancer
have metastases in the cervical lymph nodes at presentation. Oral cancer predominantly metastasizes locally and to regional lymph nodes, primarily in the anterior neck. Later, dissemination to the lungs, liver, or bones may occur.

**Molecular pathogenesis:** 50% of oropharyngeal cancers especially those involving the tonsils, the base of the tongue and the oropharynx have oncogenic variants of HPV (human papilloma virus) which are capable of inducing the formation of tumours.

Also chromosomal changes suggestive of the involvement of tumor suppressor genes (TSGs), particularly in chromosomes 3, 9, 11, and 17 have been identified. Functional TSGs seem to assist growth control, while their mutation can unbridle these control mechanisms.

The regions most commonly identified have included some on the short arm of chromosome 3, a TSG termed *P16* on chromosome 9, and the TSG termed *TP53* on chromosome 17,

**Risk factors:** sunlight is a risk factor for carcinoma of the lip.

20 fold greater risk with chronic abuse of smoked tobacco and 5 fold greater risk with alcohol abuse. In those patients who abuse both alcohol and tobacco, there is a 50 fold increased risk.

**Macro appearance:** Image courtesy of Dr C Sculley. Medscape 2014 shows – arrows – an indurated ulceration on the under surface of the tongue which was a squamous cell carcinoma.

![Image of tongue with arrows indicating ulceration.](https://via.placeholder.com/150)

**Xray:** Imaging studies are used to determine of there has been local invasion and distant spread. Panorthotomography of the jaw may show local bone destruction but this is not always demonstrated when it is actually present.

**Microscopic appearance:**

1. **well differentiated and keratinizing.**

The epithelium forms islands resembling normal stratified squamous epithelium, except that the islands are invading the underlying tissues and undergoing aberrant keratinization. Instead of the keratin being formed and shed from the surface, it is formed within the substance of an epithelial island, producing a keratin whorl or *epithelial pearl*. This is a feature of well-differentiated carcinoma.
Epithelial islands may be discrete and circumscribed, although they are invading the underlying tissues quite extensively or appear more moth eaten with loss of basement membrane. SCC consists of small islands of squamous cells with a high mitotic index and nuclear hyperchromatism but no obvious keratinization. Image courtesy of Wikipedia media.

2. **Poorly differentiated SCC** consists of sheets of cells showing extreme pleomorphism, giant nuclei, and multiple and bizarre mitoses and often is difficult to distinguish from poorly differentiated lymphoma or melanoma. In this instance, immunocytochemical markers such as keratins, common leukocyte antigen, and melanoma-specific antibodies are indicated.

**Biochemistry:** Calcium level: As many as 4% of patients with cancer in the head and neck may have elevated serum calcium levels. This is a poor prognostic indicator primarily found in persons with advanced disease.

**Diagnosis:** An incisional biopsy must be performed on any oral mucosal lesion suggestive of cancer, including any ulcer that does not heal within 2-3 weeks. An incisional biopsy is required, under local anesthesia. A biopsy specimen of the red lesions is best if both red and white lesions are present because red areas, rather than white, are more likely to show dysplasia. A lymph node biopsy is best performed on regional lymph nodes to assess spread.

**Differential Diagnosis:** actinic keratosis (solar keratosis), manifestations of oral leukoplakia, erythroplasia, lichen planus and mucosal candidiasis.

**Treatment:** may attempt radiotherapy because this maintains the tissue layout but if it fails to control the cancer, surgical excision can be attempted. Chemotherapy may also be offered but unfortunately both radiotherapy and chemotherapy have many unpleasant side effects.

The goal of surgery for oral squamous cell carcinoma is to remove the primary tumor together with a margin of clinically normal tissue to ensure complete excision of malignant tissue.

Surgery thus provides a one-stage definitive procedure, from which the patient normally recovers within a few weeks. Although modern reconstructive techniques can produce good oro-facial aesthetics and function, neither can be totally guaranteed. Cancer centres receive many patients with advanced disease, and many operations fail to remove the tumor completely, resulting in a poor outcome and recurrence of the tumor.
**Prognosis:** The oral squamous cell carcinoma can infiltrate locally and metastasize to regional lymph nodes in the neck.

5-year survival for early-stage oral cancer is 80% but only 20% for late stage disease.

The prognosis of oral SCC is site dependent. For intraoral carcinoma, the 5-year survival rate may be as low as 30% for posterior lesions presenting late.

For lip carcinoma, the 5-year survival rate often is more than 70%. Abnormal nuclear protein expression in keratosis or tumor cells may have prognostic significance.

**TONGUE**

**Congenital**

**Abnormality in Number**

**Aglossia congenital**

**Definition:** Complete absence of the tongue.

Aglossia is a rare anomaly caused by failed embryogenesis of the lateral lingual swellings and tuberculum impar from the fourth to eighth gestational weeks.

Most cases of aglossia and hypoglossia reported in the literature were associated with limb deformities, cleft palate, deafness, situs inversus, and several syndromes, such as Moebius, Pierre Robin, and Hanhart. As the tongue plays an important role in facial growth, patients have dentofacial deformities that affected the mandible in particular, such as severe malocclusion and agenesis of permanent mandibular incisors. Thyroid dysfunction has recently been associated with aglossia.

The use of rapid prototyping models of the jaws as an aid to osteogenic distraction of the mandibular symphysis can be attempted


**Duplication of the tongue**

The lower midline facial cleft defect is due to failure of midline union of the first branchial arch. Complete duplication of the tongue can occur as part of the Tessier 30 cleft.

The case shown below had midline cleft of the lower lip with cleft of the mandible, along with complete duplication of the tongue.

Ref: Nirmal C Bhattacharyya, Kabita Kalita, Manoj Gogoi, Pradip K Deuri Journal of Indian Association of Pediatric Surgeons, 2012,. 17, (2): 75-77
Baby 5 months old

Arrow indicates the break in the midline of the mandible

**Treatment:** consists of a series of operations, the last being deferred until the age of 10 years, in order not to interfere with the growth of the permanent tooth buds.

**Acquired conditions of the Tongue**

**Infections:**

**Definition**

- **candida** – see previous section on Mouth
- **Syphilis** – the chancre of early syphilis can occur on the tongue, lip, palate and tonsil.

**Sites:** solitary, painless, indurated, reddish ulcer, localized at the site of Treponema pallidum inoculation and usually resolves after one month. It is associated with regional lymphadenopathy.

Commonly found in the genital area but 5% are extragenital involving the oral mucosa especially if there has been a history of unprotected orogenital sex.

Appears between 10 and 90 days after infection.

Xray : Nil

Micro: Nil

Biochemistry and lab tests: a blood test called the VDRL (Veneral Disease Research Laboratory) is performed. It detects antibodies to syphilis.

Negative result is normal.
The ability of the VDRL test to detect syphilis depends on the stage of the infection. Best result is in the middle phase.
False negative results occur during the early and late stages.
False positive results occur with HIV, Lyme disease, Malaria and Systemic Lupus Erythematosus.

FTA-ABS test (Fluorescent treponemal antibody-absorption test) is more specific for syphilis.
However, the VDRL test is able to be repeated after treatment and if treatment has been successful, a positive result will become negative.

Diagnosis: The diagnosis is confirmed by the specific serology and the demonstration of Treponema pallidum in the lesion

Treatment: The Centre for Disease Control recommends intramuscular Benzathine penicillin G 2.4 million units in a single dose.

Prognosis: Primary lesions resolve spontaneously after 4 weeks.
The treatment is to deal with the systemic disease but the VDRL may not revert to negative for 3 months.

Enlargement of the Tongue

Congenital

Beckwith-Wiedermann syndrome: It is classified as an overgrowth syndrome, which means that affected infants are considerably larger than normal (macrosomia) and tend to be taller than their peers during childhood. Growth begins to slow by about age 8, and adults with this condition are not unusually tall. The overgrowth of the tongue occurs in 90% and causes difficulties in feeding and breathing. The infant is unable to completely close its mouth. Associated abnormalities include midline abdominal
abnormalities like omphalocoele, umbilical hernia and diastasis of the recti abdominus. There may be neonatal hypoglycaemia. It can be familial where it is autosomal dominant.

**Down’s syndrome: Trisomy 21** - occurs 1 / 1000 births. There is a relative macroglossia in 75% cases as the mouth is too small for the tongue. There is mental impairment in 99%, with an average IQ of 50 and functioning at the level of a 9 year old child.

The tongue has a papillary fissured surface.

All people with Down syndrome have an extra, critical portion of chromosome 21 present in all or some of their cells. The additional partial or full copy of chromosome 21 which causes Down syndrome can originate from either the father or the mother. Approximately 5% of the cases have been traced to the father.


**Robinow’s syndrome:** rare genetic disorder characterized by limb shortening and abnormalities of the head, face and external genitalia. Sometimes called foetal face syndrome because the features are like those of an 8 week foetus. "Foetal facies" describes the appearance of a small face and widely spaced eyes. Clinical features also may include a short, upturned nose, a prominent forehead, and a flat nasal bridge. The upper lip may be "tented," exposing dental crowding. Image courtesy of Human Growth Foundation 2014.
Endocrine and Metabolic disorders

Glycosaminoglycans (formerly called mucopolysaccharides): The mucopolysaccharidoses are a group of inherited metabolic diseases caused by the absence or malfunctioning of certain enzymes needed to break down glycosaminoglycans molecules; long chains of sugar carbohydrates in each cell that build bone, cartilage, tendons, corneas, skin, and connective tissue.

Glycosaminoglycans are also found in the fluid that lubricates joints.

People with a mucopolysaccharidosis either do not produce enough of one of the 11 enzymes required to break down the sugar chains into proteins and simpler molecules or they produce enzymes that do not work properly. Over time, these glycosaminoglycans collect in the cells, blood, and connective tissues. The result is permanent, progressive cellular damage that affects the individual's appearance, physical abilities, organ and system functioning, and, in most cases, cognitive development.

These conditions are often referred to as MPS I, MPS II, MPS III, MPS IV, MPS VI, MPS VII, and MPS IX and may also referred to by their original names, which are Hurler (MPS I H), Hurler-Scheie (MPS I H/S), Scheie (MPS I S), Hunter (MPS II), Sanfilippo (MPS III), Morquio (MPS IV), Maroteaux-Lamy (MPS VI), Sly (MPS VII), and Hyaluronidase deficiency (MPS IX).

Physical symptoms generally include coarse or rough facial features (including a flat nasal bridge, thick lips, and enlarged mouth and tongue), short stature with disproportionately short trunk (dwarfism), dysplasia (abnormal bone size and/or shape) and other skeletal irregularities, thickened skin, enlarged organs such as liver or spleen, hernias, and excessive body hair growth. Short and often claw-like hands, progressive joint stiffness, and carpal tunnel syndrome can restrict hand mobility and function. Recurring respiratory infections are common, as are obstructive airway disease and obstructive sleep apnea. Many affected individuals also have heart disease, often involving enlarged or diseased heart valves. Currently there is no cure for these disorders.

Medical care is directed at treating systemic conditions and improving the person's quality of life. Physical therapy and daily exercise may delay joint problems and improve the ability to move.

Image of a 16 year old male with MPS VI (Maroteaux-Lamy) courtesy of: Vassili Valayannopoulos, Helen Nicely, Paul Harmatz, Sean Turbeville. Orphanet Journal of Rare Diseases 2010, 5:5 - showing coarse face, frontal bossing, enlarged tongue, thick lips, abnormal dentition and gingival hyperplasia.
Acromegaly:

**Definition:**
excessive enlargement of the limbs due to thickening of bones and soft tissues, caused by hypersecretion of growth hormone, usually from a tumor of the pituitary gland. In adults whose bone growth has stopped, the bones most affected are those of the face, jaw, hands, and feet.

**Clinical:**
Gradual enlargement of paranasal sinuses, prominence of nose and supraorbital ridges, prognathism, widely separated teeth, and an underbite are part of the coarsening of facial features.

The tongue grows larger, and because the jaw is larger, the teeth become more widely spaced. Image courtesy of Wikipedia Commons.

Early signs include increased metabolism and strength and profuse sweating. Later joint pain, weakness, and sometimes diabetes mellitus and visual disturbances are seen. In children overproduction of growth hormone stimulates growth of long bones and results in gigantism.

**Incidence:** 50 per 1,000,000
Xray appearance:

![MRI Image](image)

**Surgical treatment** includes removal of the tumor or the pituitary gland (transsphenoidal hypophysectomy, pituitary irradiation, or a combination of the two.

Drug therapy with the dopamine receptor agonist bromocriptine may be used as adjuvant therapy in conjunction with either surgery or radiation.

**Cretinism and myxoedema:**

**Definition:** is a condition of severely stunted physical and mental growth due to untreated congenital deficiency of thyroid hormones (congenital hypothyroidism).

**Clinical:** the tongue is thickened and hangs loose out of the mouth.

**Amyloidosis:**

The condition is related to abnormal and excess production of proteins and clumps of abnormal proteins build up in certain organs. The tongue is one site and appears swollen. The cause of primary amyloidosis is not well understood. Genes may play a role.

![Image](image)

Image courtesy Mayo Foundation for Medical Education and Research – amyloid enlarging the tongue.
Lipoid proteinosis: is a rare, chronic, inherited, monogenetic, autosomal recessive metabolic disorder characterized by widespread nodules/papules, indurated plaques and ulcerated lesions primarily involving skin and mucous membranes, including the tongue. Dense calcification occurs bilaterally in the amygdala portion of the hippocampus.

The calcification is due to specific peri-capillary (territory of anterior choroidal artery) degenerative changes with calcification within deposits of hyaline material localized to the amygdala and hippocampus in the temporal lobes – see arrows on skull xray below.


Tumours of the tongue

Benign

Haemangioma

In children this is the most common tumour in the cervical region.

Macro: it is usually a submucosal mass at the base of the tongue, especially the cavernous type.


The swelling was bluish purple in color with normal surrounding area – see arrows around the perimeter on the left image. On palpation the swelling was soft to firm in consistency, painless, with no palpable thrills and blanched on compression.

The right image shows the post-operative appearance.
**Xray:** Pre-op feeder vessels are identified using Colour Doppler ultrasound

A panorthotomograph of the jaw and mouth may disclose small circular areas of calcification which are called phleboliths - see 2 arrows -and represent calcification in small thrombi. This is diagnostic of haemangioma.


**Micro:** cavernous haemangioma excised is composed of tangles of thin walled cavernous vessels or sinusoids – see arrow, that are separated by a scanty connective tissue stroma.

Lymphangioma

Definition: are benign lymphatic analogues of blood vessel haemangiomas.

Types:

Simple capillary lymphangioma: composed of small lymphatic channels and are slightly elevated and sometimes pedunculated lesions and grow to 1 – 2 cm diameter.
Micro: networks of endothelium-lined spaces that can be distinguished from capillary channels only by the absence of erythrocytes (red blood cells).

Cavernous lymphangioma (Cystic Hygroma): these can grow very large.
Micro: massively dilated lymphatic spaces lined by endothelial cells and separated by intervening connective tissue stroma containing lymphoid aggregates. The tumour margins are not discrete and the tumour is not encapsulated, making complete resection difficult.

Lymphangioendotheliomatosis known as “Congenital cutaneovisceral angiomatosis with/without thrombocytopenia. Show lymphatic differentiation, strengthening the association between abnormal lymphatic endothelium and coagulopathy. Found on the skin or in the mouth. The skin lesions are often mistaken for hemangiomas. Equal frequency in males and females. Complication is sometimes life-threatening haemorrhage from the gastro-intestinal tract. Micro image below courtesy of Humpath.com 2005

Granular cell tumour of the tongue: these are benign tumours found throughout the body but 70% are located in the tongue, oral mucosa and hard palate and 30% in the skin. Believed to be of primitive neuroectodermal origin. This type of tumor has been found to be both benign (98%) and malignant (2%).
The tumour is a pale cream to brown with well defined borders. It is 1 x 1 cm size, oval shape and soft consistency.

**Micro:** consisting of parakeratinized stratified squamous epithelium showing pseudoepitheliomatous hyperplasia. The underlying connective tissue shows tumor cells arranged in the form of nests and ribbons. These neoplastic cells are large polygonal in shape with indistinct cell borders – see arrow, abundant coarse eosinophilic granular cytoplasm and pale eccentric nuclei, some of which are vesicular. These neoplastic cells exhibit mild hyperchromatism and pleomorphism. The adjacent fibro-cellular stroma consists of collagen fibers, fibroblasts and few endothelium lined blood capillaries.

**X-ray:** CT and MRI shows lesions are solid and homogeneously enhance. It can mimic a primary squamous cell carcinoma.
Malignant

Squamous cell carcinoma of the base of the tongue (posterior one third of the tongue):

**Etiology:** human papillomavirus (HPV) is a strong aetiological factor for squamous cell carcinoma in the oral cavity (compared to other regions in the head and neck), with HPV DNA isolated from up to 50% of cases, and thought responsible for the tumour in over half of these.

**Spread:**
- Often limited to one side
- Cross the midline only when the tumour becomes large
- To the tonsillar pillar or pharyngeal wall
- Submucosally under the valleculae into the supraglottic larynx
- Anteriorly into the sublingual space
- Inferiorly and laterally to the deep soft tissue of the neck where the styloid musculature is involved and also the internal carotid artery.
- 30% have bilateral cervical metastases at initial presentation especially the internal jugular nodes.
- Tumour spread to the floor of the mouth can involve submandibular nodes.

It is important to know which nodes have metastases, as this alters the treatment offered.

Squamous cell carcinoma of the oral tongue (anterior two-thirds of the tongue):

**Site:** 75% of all tongue SCC arise from the oral tongue.

**Spread:** Nodal metastases present in 60% at time of diagnosis.
- Typically invades tongue muscle, spreading along the bundles of intrinsic muscles deeper into the tongue.
- Spreads along extrinsic tongue muscles to their sites of attachment at the hyoid bone, mandible and styloid process.
- Submucosally to the floor of the mouth, tonsils, mandible and pharyngeal walls.
- Lymph drainage is to the submandibular and internal jugular nodes, often bilaterally.

Assessment of the extent of the tumour in relation to the midline is important, because if it crosses, it removes hemiglossectomy as a treatment option.

**Diagnosis:**

CT is the most commonly used modality for assessment of tongue squamous cell carcinoma, able to both locally stage the tumour and assess for nodal metastases.

Lesions typically appear of soft tissue attenuation, usually a little more attenuating because of the keratin, than normal tongue musculature and enhance following contrast administration.

Thin section CT is the most sensitive modality for assessing early bony erosion.
Non-contrast scans of the neck may demonstrate increased attenuation of involved nodes due to keratin production by tumour deposits. Axial and sagittal CT images below courtesy of Dr F Gaillard. Radiopaedia.org, rID 9188 show the arrow identifying the tumour in the left anterior portion of the tongue.

MRI
MRI is excellent at identifying the extent of tumour infiltration and is especially useful in patients with significant dental amalgam which causes artefact on CT.

Treatment: For small tumours excision is possible with a hemiglossectomy or partial hemiglossectomy. Reconstruction of the tongue depends on the size of the defect. When less than a third of the tongue has been resected primary closure is possible. Larger defects require pedicle or free-flap reconstruction. Larger lesions which cross the midline, although sometimes technically resectable with a total glossectomy, are usually not resected due to the operation being poorly tolerated.

In tumours that extend laterally across the floor of mouth and into the mandible, resection is extensive often requiring segmental removal of the mandible and reconstruction.

Radiotherapy is often used either in conjunction with surgery or alone in advanced cases.

Minor Salivary Glands

As the mouth is lined by stratified squamous epithelium, with salivary gland tissue in the submucosa, abnormalities of the salivary glands occur in the mouth.

Salivary calculi: from the submandibular or parotid glands cause a swelling in the region of the sites of emergence of their ducts into the mouth; that is the sublingual and buccal locations. The swelling may be due to retained secretion or to the calculus, the sialolith itself.

Images of a calculus in the submandibular duct below courtesy of F Gaillard. Radiopaedia.org, rID 9232. The arrow in (a) points to the calculus on a conventional xray of the jaw area. (b) CT scan arrow again on the calculus. (c) is a sialogram where contrast material is gently injected into the blocked duct. The arrow is pointing to a calculus beyond which contrast has spilled into the internal duct system of the submandibular gland.
Treatment: salivation is promoted by having the patient suck a lemon for 10 minutes. The increased flow of saliva from the main glands (parotid and submandibular) may push the calculus into the oral cavity. If this is unsuccessful, the calculus may need to be surgically removed because infection will set in proximal to the level of the obstruction.

Chronic sialadenitis: calculi or inspissated secretions can form in the major salivary ducts obstructing flow of secretions. Back pressure leads to dilation of the ducts and atrophy of the salivary acini associated with interstitial fibrosis and lymphocytic infiltrate.

Other causes of sialadenitis are viral infections such as paramyxovirus (mumps) and auto-immune conditions like Sjögren's syndrome.

Mucocoele (mucous retention cyst): these occur as small cystic nodules on the mucosal aspect of the lower lip. They are due to obstruction of the minor labial salivary gland ducts, with cystic dilatation and retention of secretions. The mucocoeles are frequently traumatized, with escape of mucoid secretion into adjacent tissues.

A variant, a ranula, occurs beneath the tongue, in association with the ducts of the sublingual and submandibular salivary glands. It is a thin-walled, bluish cyst.

A ranula is a rare benign acquired cystic lesion that occurs in the floor of mouth. It results from obstruction of a sublingual gland or adjacent minor salivary gland with resultant formation of a mucous retention cyst. A ranula can be classified based on its extent:

1. simple ranula: confined to the sublingual space
2. plunging ranula (also known as diving ranula or cervical ranula): extends into submandibular space. As a simple ranula enlarges it dissect along facial planes beyond the confines of the sublingual space, either:
   1. around the posterior edge of the mylohyoid muscle, or
   2. directly through a deficiency of the mylohyoid muscle (mylohyoid boutonniere)
Most ranulas have no epithelial lining and are simply pseudocysts lined by a condensation of connective tissue at the periphery of the collection, formed in response to the inflammatory effect of the salivary secretions. The fluid within a ranula closely resembles that of the normal secretions of the sublingual glands.

**Xray** identifies a connection to the sublingual space. This may be a thin tail of fluid or a significant local fluid collection. Simple ranula is within the sublingual space above the mylohyoid muscle but plunging ranula dives into the submandibular space with a collapsed sublingual portion called the "tail". The image is courtesy of Dr Maxime St-Amant, Radiopaedia.org, Rid 26842. Arrow points to the ranula.

**Treatment:** intraoral excision of the sublingual gland and drainage of the cyst: 0% recurrence

Sialography of the submandibular duct will not show a communication with the cyst.

**Tumours of the Minor Salivary Glands in the mouth**

Minor salivary glands are located in the oral mucosa, palate, uvula, floor of mouth, posterior tongue, retromolar area and peritonsillar area, pharynx, larynx, and paranasal sinuses). Minor salivary gland lesions are most frequently seen in the oral cavity and the palate is the most common site.

This group may be involved by mucoepidermoid carcinoma, adenoid cystic carcinoma, adenocarcinoma, pleomorphic adenoma, acinic cell carcinoma.

**Benign**

**Pleomorphic Salivary adenoma.** This is the most common benign tumour of minor salivary glands and it is also found in the parotid, submandibular and sublingual glands (major salivary glands).

**Adenolymphoma** (Warthin’s tumour), the second most common salivary tumour is almost always in the parotid gland but occasionally is found in the oral cavity.

**Monomorphic adenoma** is the 3rd most common. It behaves like pleomorphic adenoma and histologically can be mistaken for the malignant adenoid cystic carcinoma.
Malignant

1. **mucoepidermoid carcinoma** most common – 50% of minor salivary gland tumours.

   **Site:** Palate most common site – 46% and the buccal mucosa 20%. Can occur in the tongue base.

   **Treatment:** local excision plus radiotherapy

   **Prognosis:** Prognosis is very dependent on grade, with low grade tumours having a 90-98% survival and a low local recurrence rate, compared to 30-54% surviving, and a very high local recurrence rate for high grade tumours

2. **adenoid cystic carcinoma** is the next most common.

   **Peak age:** 40s – 60s

   It is slow-growing but locally invasive spreading especially to perineural spaces.

   Due to its slow growth, it has a relatively indolent but relentless course. Unlike most carcinomas, 90% patients with it survive for 5 years, only to have tumors recur and progress.

   **Prognosis:** Another unusual feature of this tumour is it seldom metastasizes to regional lymph nodes.

   Poor prognostic signs at the time of initial surgery are a solid growth pattern, perineural invasion of major nerves and/or positive margins after histopathologic examination.

   *Distant metastasis* is the most common presentation of treatment failure. The lung is by far the most common site of metastasis, with the liver being the second most common site. Bone metastases usually indicate a fulminating clinical course.

3. **acinic cell carcinoma.**

   **Site:** 12% are found in the minor salivary glands

   **Gender:** women : men = 3: 2

   **Peak Age:** 50’s

   **Risk factors:** previous irradiation and familial predisposition

   **Diagnosis:** A CT scan usually demonstrates slight contrast enhancement and may be necessary for evaluation of tumor size, extension, relationship to facial nerve and other structures, and distant metastasis

   **Differential diagnosis:** is considered, with clear cell carcinomas, mucoepidermoid carcinomas, Warthin’s tumor, and oncocytomas.

   Majority behave as benign tumours but rarely can show malignancy as extensive local infiltration and lymph node metastases.
Micro: Courtesy of Dr H El Teraifi

Acinic cell carcinoma, which is encapsulated (arrow), and consists of clusters of malignant cells forming acini (left). The malignant cells themselves are pleomorphic and have atypical nuclei.

Treatment: surgical excision and radiotherapy

Prognosis:

Acinic cell carcinoma of the salivary glands are distinctive neoplasms of individually unpredictable behavior. Contrary to the widely accepted notion that ACCs can be equated with favorable prognostic groups, such as low-grade mucoepidermoid carcinoma or low grade adenocarcinomas, recent studies are increasingly suggesting that there is a subset of ACCs with poor prognosis. Prolonged follow-up data are believed necessary to gauge the impact of treatment on survival. Aggressive tumors were treated three times as frequently with surgery and radiation compared with treatment patterns for less aggressive disease.

Multiple recurrences and metastasis to cervical lymph nodes indicate a poor prognosis. Distant metastasis is associated with very poor survival. ACCs in minor salivary glands are less aggressive than those in the major salivary glands.

The overall 5-year disease-specific survival is estimated to be around 91%, and 88% at 10 years. Significant association was noted between poor survival and high-grade disease, regional or distant metastasis at presentation, submandibular tumors, pain, male gender, and age older than 30 years. Short duration of symptoms, incomplete excision, frequent mitoses, focal necrosis, pleomorphism, neural invasion, infiltration, stromal hyalinization, large size have also been reported as poor prognostic factors. In other studies, the presence of a predominately solid architecture was strongly associated with a poor outcome.

Follow-up

Although indolent in nature (slow-growing), ACCs are quite persistent in their potential for local recurrences and distant metastases, often many years later. Local and multiple recurrences may occur in up to half of patients. Recurrences and metastases after 3 to 10 years are common, especially after inadequate primary tumor removal. Recurrences more than 20 or 30 years after initial treatment are also noted in the literature. Due to the notably high tendency of ACC to recur and to produce latent metastasis, long-term follow-up is mandatory after treatment.