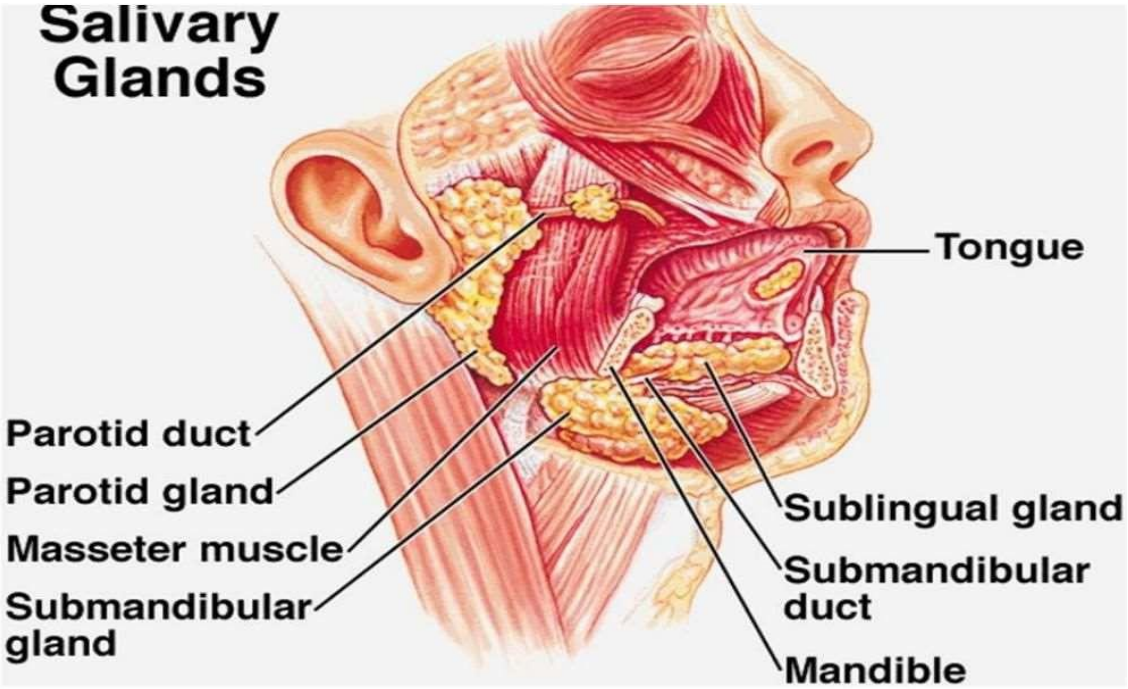
SALIVARY GLAND ANATOMY AND Physiology:

Salivary Glands:

Major groups of salivary glands which are: The parotid, submandibular and sublingual glands.

- The parotid and submandibular glands each drain into the mouth in a single long duct.
- Where as the sublingual glands drain via many small ducts.



The major salivary glands can also be classified based on the dominant saliva-producing acinar cell type:

1. Serous
2.Mucous
3.A mix of serous and mucous cells

Serous cells produce a more watery, enzyme-rich saliva, while mucous cells secrete a more viscous fluid with glycoproteins known as mucins.

The parotid gland is composed primarily of serous cells; those of the **submandibular gland** are a mix of mucous and serous types, while those of the sublingual and minor salivary glands are of the mucous type.

There are also between 600 and 1000 minor salivary glands named for the sites which they occupy (i.e., labial, buccal, lingual, palatal, retromolar).

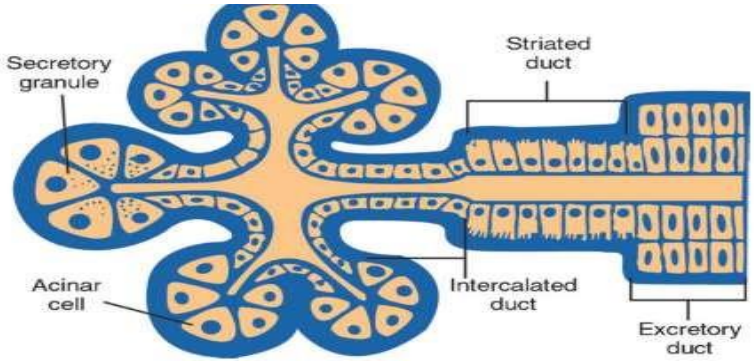
In addition, there are three sets of minor salivary glands of the tongue: the glands of Weber, found along the lateral border of the tongue; the glands of von Ebner, surrounding the circumvallate papillae, and the glands of Blandin and Nuhn, also known as the anterior lingual glands, found in the anterior ventral tongue.

- Parotid saliva is secreted through Stensen's ducts, then orifices of which are visible on the buccal mucosa against maxillary first or second molar.

- Submandibular gland saliva is secreted through the (Wharton's duct), which drains saliva from each submandibular gland and exits at the sublingual on either side of the lingual frenum.

- Sublingual saliva may enter the floor of the mouth directly via the short, independent ducts of Rivinus.

FIGURE 10-2 Opening of Stensen's duct on the left buccal mucosa.



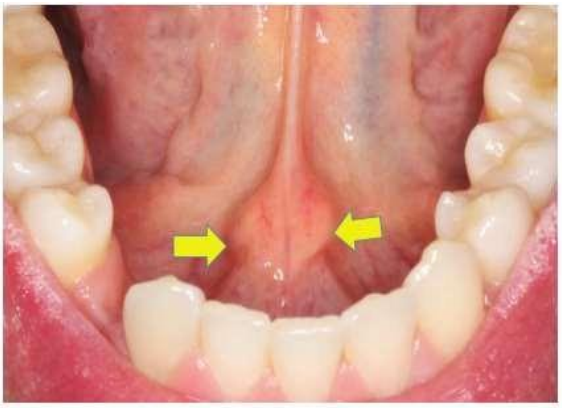


FIGURE 10-3 Opening of Wharton's duct on the floor of mouth.

SALIVA

- It is composed of greater than 99% water and less than 1% proteins and salts. WS(whole saliva) may also contain variable amounts of gingival crevicular fluid, microorganisms, food debris, exfoliated mucosal cells, and mucus.

  Normal daily production of WS ranges from 0.5 to 1.5 L

The most common salivary gland disease is

Xerostomia

- denoting a subjective complaint of dry mouth.
- Hyposalivation refers to a quantified reduced salivary flow rate and may or may not be accompanied by xerostomia.
- Similarly, xerostomia may or may not be associated with hyposalivation and can be a result of, for example, a change in salivary composition to a greater mucous content.
- *Hypersalivation (ptyalism) refers to an increase in* production of saliva and/or a decrease in oral clearance of saliva.
- *Salivary gland dysfunction is commonly used to indicate* decreased salivary flow or another quantifiable alteration in salivary performance.

Causes of salivary gland hypofunction include:-

- Medications including: antidepressants,anticholinergics, antispasmodics, antihistamines, antihypertensives , sedatives,diuretics,and bronchodilators)
- and other agents (e.g.,caffeine,alcohol,cigarette smoking) irradiation to the head and neck (i.e., external and internal beam radiation therapy)
- systemic disease (e.g.,diabetes mellitus),salivary gland masses.
- psychological conditions (e.g., depression),
- malnutrition (e.g., bulimia, dehydration),
- autoimmune disease (e.g.,SS),
- and other unspecified or undiagnosed conditions. (anxiety)

Symptoms of Salivary Gland Dysfunction

- May have an effect on mucosal hydration and oral functions.Patients may complain of dryness of all the oral mucosal surfaces,including the lips and throat, and difficulty chewing, swallowing, and speaking.
- Other associated complaints may include oral pain,an oral burning sensation,chronic sore throat and pain with swallowing.
- The mucosa may be sensitive to spicy or coarse foods.

FIGURE 10-14 Severe salivary hypofunction in a patient who was treated with head and neck radiation therapy.

the complaints of oral dryness while eating, the need to sip liquids to swallow food, or difficulties in swallowing dry food have all been highly correlated with measurable decreases in secretory capacity.

These complaints focus on oral activities (swallowing and eating) that rely on stimulated salivary function

Past and Present Medical History

Over 400 drugs are reported to have dry mouth as a side effect, individual who has recently started taking a tricyclic antidepressant.

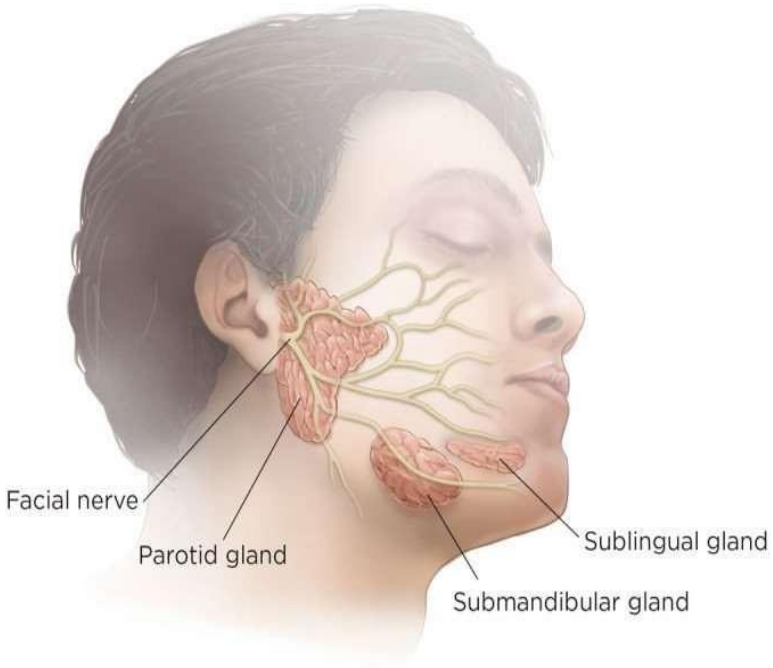
- A thorough history is essential. If the past and present medical history reveals medical conditions like a patient who has received radiotherapy for a head and the neck malignancy.
- A patient's report of eye, throat, nasal, skin, or a vaginal dryness, in addition to xerostomia, may be a significant indication of a systemic condition, such as Sjogren's syndrome.

Clinical Examination

- Most patients with hypofunction have signs of dryness.
- Candidiasis , Enlargement of salivary gland. Viscous or scant secretions.
- enlargement can be associated with a variety of inflammatory, infectious, or neoplastic and other conditions
- A cloudy exudates may be a sing of bacterial infection. The

exudates should be cultured .

- It is important to document function of the facial nerve when evaluating parotid tumors.
- Tumors of the minor salivary glands are usually smooth masses located on the hard or soft palate.
- Ulceration of the overlying mucosa should raise suspicion of malignancies.



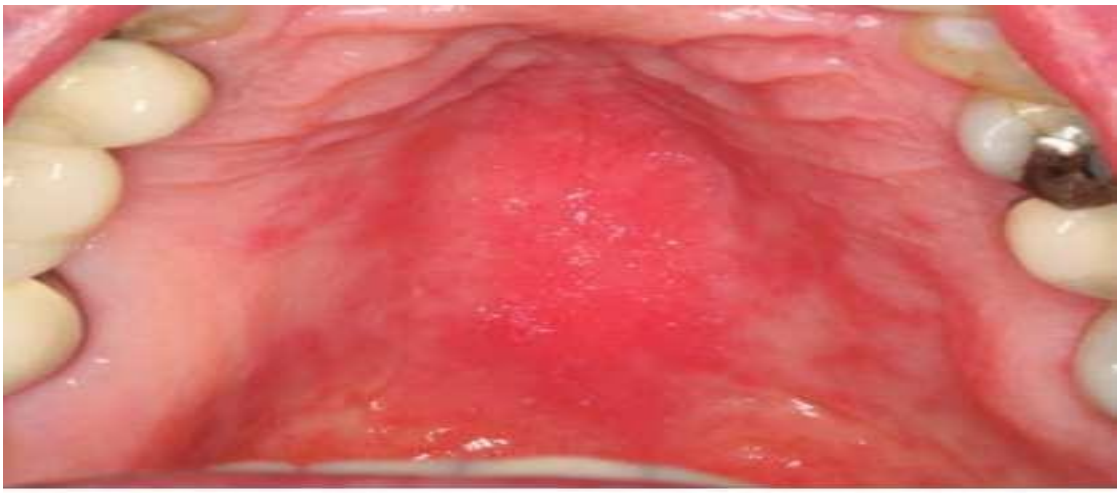


FIGURE 10-5 Erythematous candidiasis of the hard palate in a patient with salivary gland hypofunction.

Major Salivary Glands

- The parotid glands, the largest gland, are positioned on lateral aspect of the face antero -inferiorly to the auricle.
- Traditionally, the gland has thought to have a superficial and deep lobe based on the course of the facial nerve as it traverses the gland.
- Because of its relationship to the parotid gland, it is important to document function of the facial nerve when evaluating parotid masses.

Facial nerve paralysis is usually indicative of malignancy.

Rarely, infection or rapidly growing benign tumors may cause facial nerve paralysis.

Other findings suggesting malignancy include multiple masses, a fixed mass with invasion of surrounding tissue, and the presence of cervical lymphadenopathy.

Bilateral parotid gland masses are usually due to lymphadenopathy

,Warthin'stumors, lymphoepithelial cysts (LECs) and enlarged lymph nodes in the setting of HIV,SS,or rarely other salivary gland tumors such as the acinic cell adenocarcinoma.

Multiple painless masses within a single parotid gland may be due To Warthin'stumors, lymph nodes, metastatic disease, and other benign and malignant tumors.

Tumors in the submandibularor sublingual glands usually present as painless,solitary,slow-growing mobile masses.Bimanual palpation, with one hand intraorally on the floor of the mouth and the other extraorally below the mandible, is necessary to evaluate the glands adequately.

Tumors of the minor salivary glands are usually smooth masses located most commonly on hard or soft palate but may present anywhere minor salivary glands are present.

Salivary gland neoplasms arise most commonly in the parotid glands followed by the submandibular, sublingual, &minor salivary gland

- Sialolithiasis is the most frequent cause of salivary gland swelling, affecting the major salivary glands: parotid, submandibular, and sublingual glands.The condition predominantly affects individuals of 30 to 60 years old and is more common in males.
- The most frequent symptom is cyclical gland swelling and pain associated with meals. Initial management is conservative, with various minimally invasive surgical options available for persistent cases.

Salivary Gland Imaging:

A-plain-Film Radiography

lateral oblique and anteroposterior(AP) projections are used to visualize the parotid glands.

A standard occlusal film can be placed intraorally adjacent to the parotid duct to visualize a stone close to the gland orifice.

It is useful particularly for the visualization of radiopaque Sialoliths & the evaluation of bony destruction associated with malignant neoplasms and it can provide a background for interpretation of the sialogram

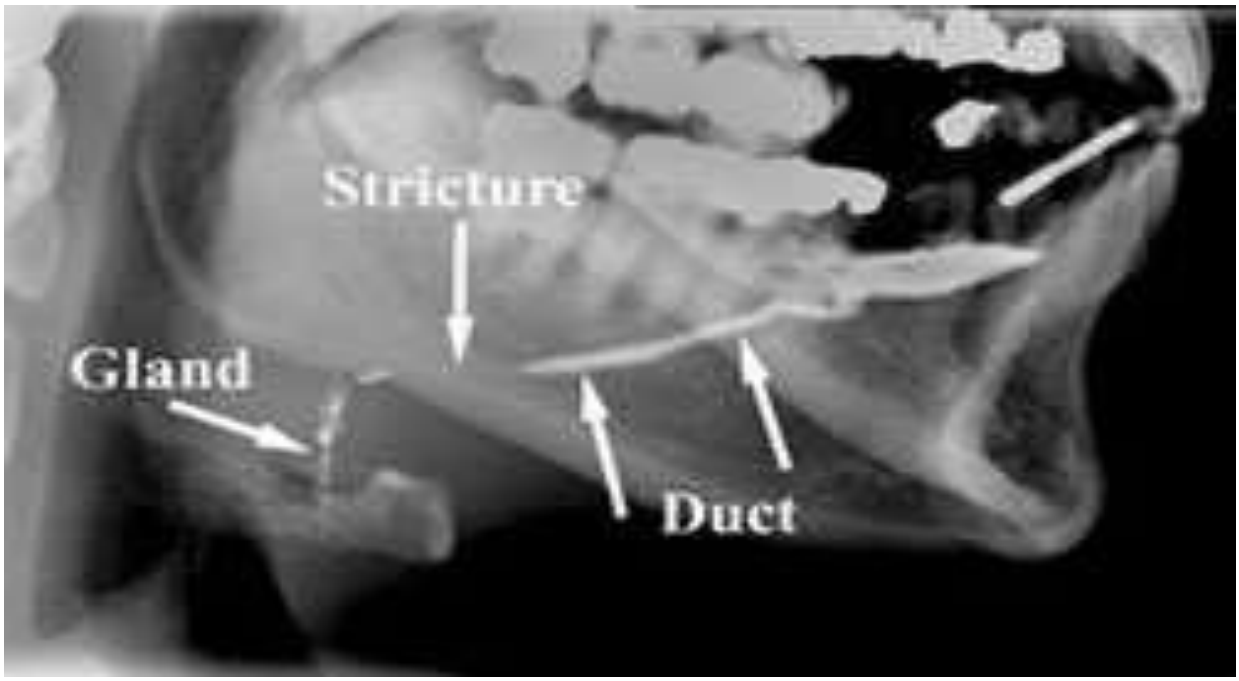


FIGURE 10-6 (A) Sialolith within the left submandibular gland duct

B-Sialography

- radiographic visualization of the parotid & Submandibular salivary glands and ducts following retrograde instillation of soluble contrast material into the Stensen's or Wharton's ducts .
- The ducts of the sublingualglands are too small for reliable injection of contrast medium .
- It provides the clearest visualization of the branching ducts and acinar end pieces.
- It is the recommended method for evaluating intrinsic & acquired abnormalities of the ductal system (e.g., ductal stricture, obstruction, dilatation, and ruptures) and for identifying and localizing sialoliths.

The two contraindications to sialography are: active infection & allergy to contrast media

- Oil-and water-based contrast media are available. (both containing iodine and therefore contraindicated in patients with iodine Sensitivity)
- Radiographic views for sialography include panoramic, lateral
- oblique, AP.
- Following the sialographic procedure, the patient should be instructed to massage the gland and/or to suck on lemon.

  A postprocedure radiograph is performed after approximately one hour.

If a substantial amount of contrast material remains in the salivary gland, follow-up visits should be scheduled until the contrast material is fully resorbed

- Incomplete clearing can be due to obstruction of salivary outflow, extraductalor extravasated contrast medium, collection of contrast material in abscess cavities, or impaired secretory function.
- Sialography performed during active infection may further irritate and potentially rupture the already inflamed gland. In addition, the injection of contrast material might force bacteria throughout the ductal structure and worsen an infection.
- The iodine in the contrast media may induce an allergic reaction and can also interfere with thyroid function tests and with thyroid cancer evaluation by nuclear medicine if these are done

C-ULTRASONOGRAPHY

- Ultrasonographyis best at differentiating between intra-and extraglandular masses, as well as between cystic and solid lesions.

- Ultrasonography is a noninvasive and cost-effective imaging modality that can be used in the evaluation of masses occurring in the submandibular gland and the superficial lobe of the parotid gland.

Advantages

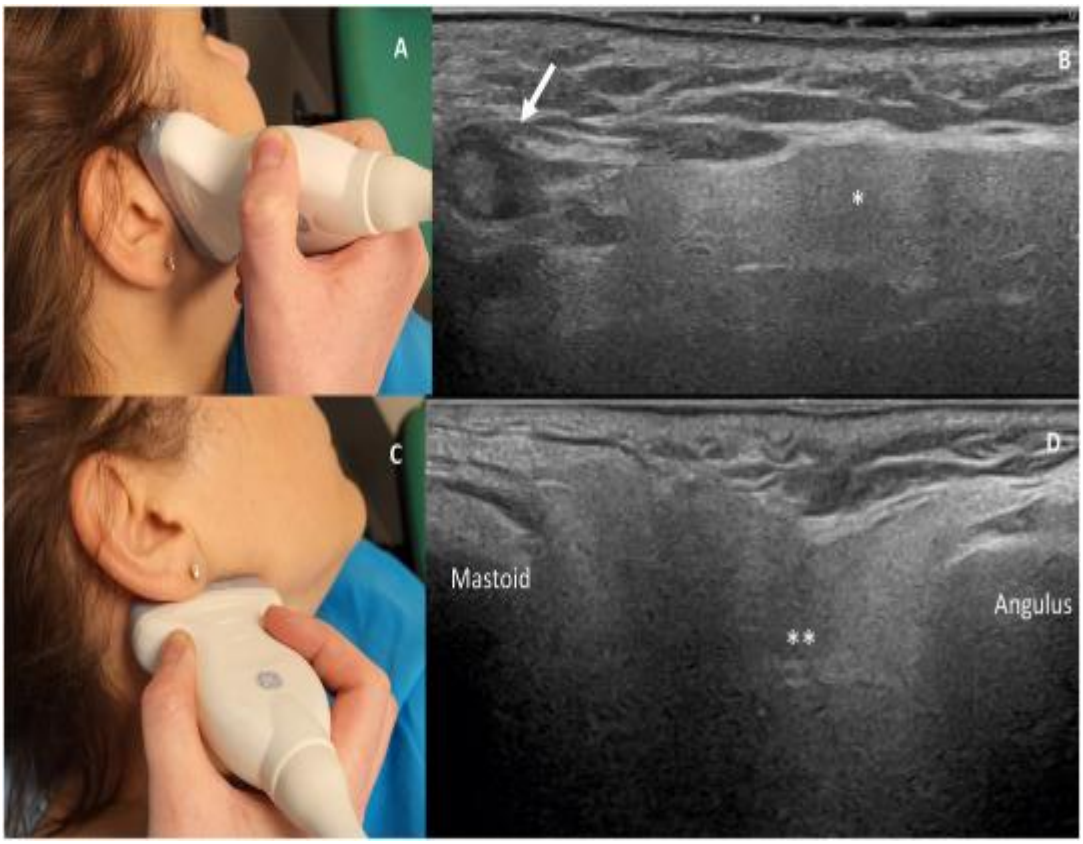
US is becoming the method of choice for the initial evaluation of the salivary glands, especially in children and pregnant women particularly when evaluating for suspected sialolithiasis&salivary gland abscesses.

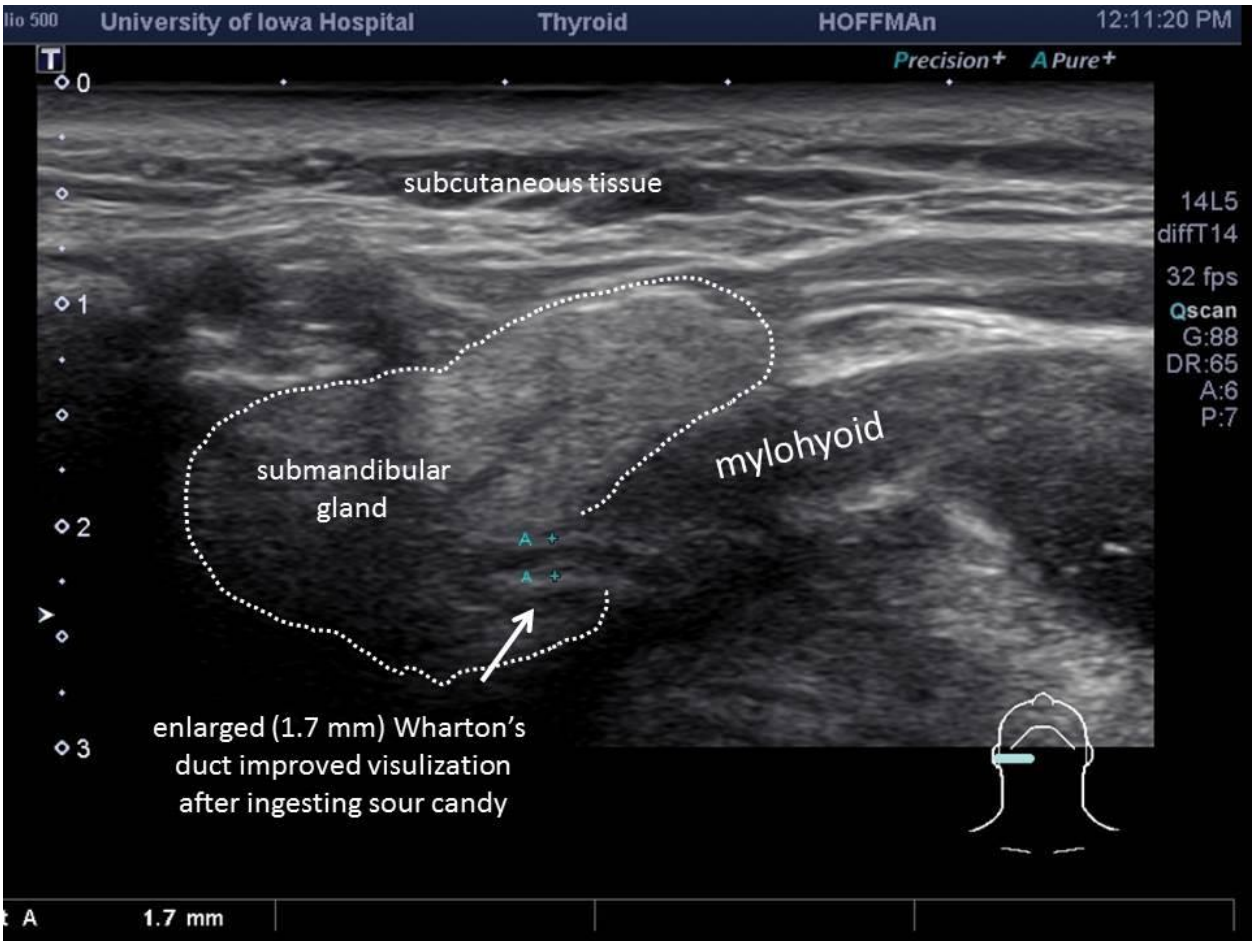
US can be used to distinguish focal from diffuse disease, assess adjacent vascular structures and vascularity, distinguish solid from cystic lesions, guide fine needle aspiration biopsy (FNAB), and perform nodal staging.

It can also correctly differentiate malignant lesions from

benign lesions in 90% of cases, distinguish glandular from extraglandular masses with an accuracy of 98%, and confirm the clinical suspicion of a mass.

US may be employed as an initial imaging technique to guide the clinician in determining whether further imaging is required. Additional characterization of tumors can then be accomplished using cross-sectional imaging techniques such as CT or MRI

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Precision+
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subcutaneous tissue
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diffT14
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Qscan
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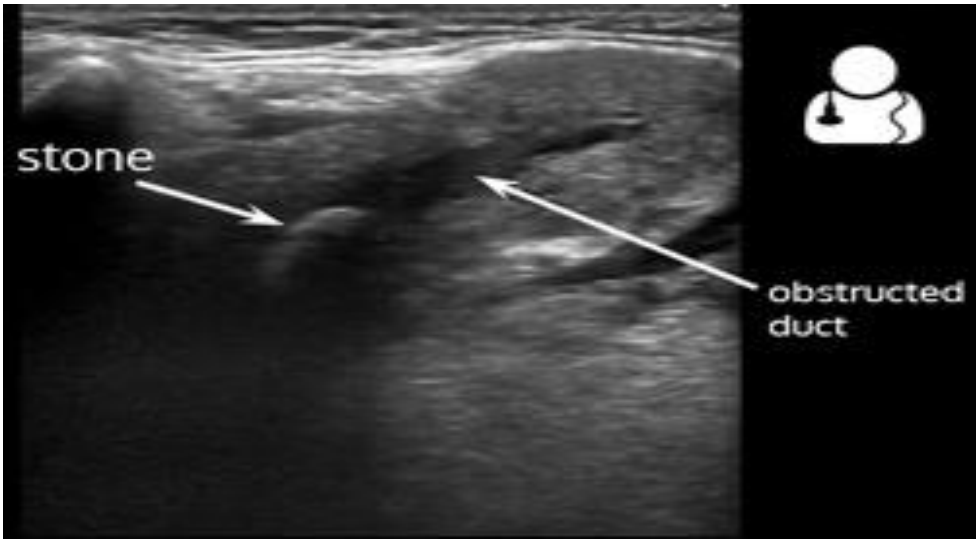
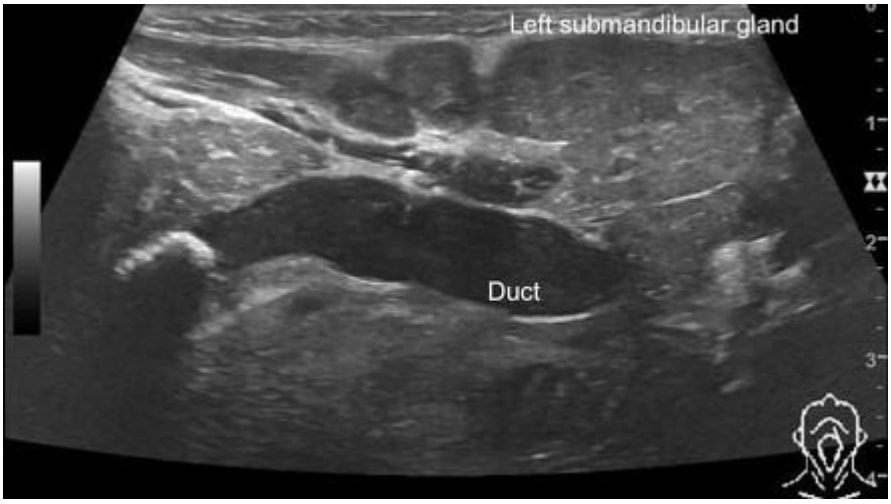
A:6
P:7
submandibular gland
mylohyoid
enlarged (1.7 mm) Wharton's duct improved visulization after ingesting sour candy
1.7 mm


GE
Stones
123 radiology

Submandibular gland stone





E-CTand MRI

- CT provides definition of cystic walls, making it possible to distinguish fluid-filled masses from abscess.
- Dental restoration may interfere with CT imaging and may require repositioning the patient to a semi axial position.
- None enhanced and enhanced CT imaging are obtained routinely.
- Ultra fast CT and three-dimensional-image CT sialography are indicating.

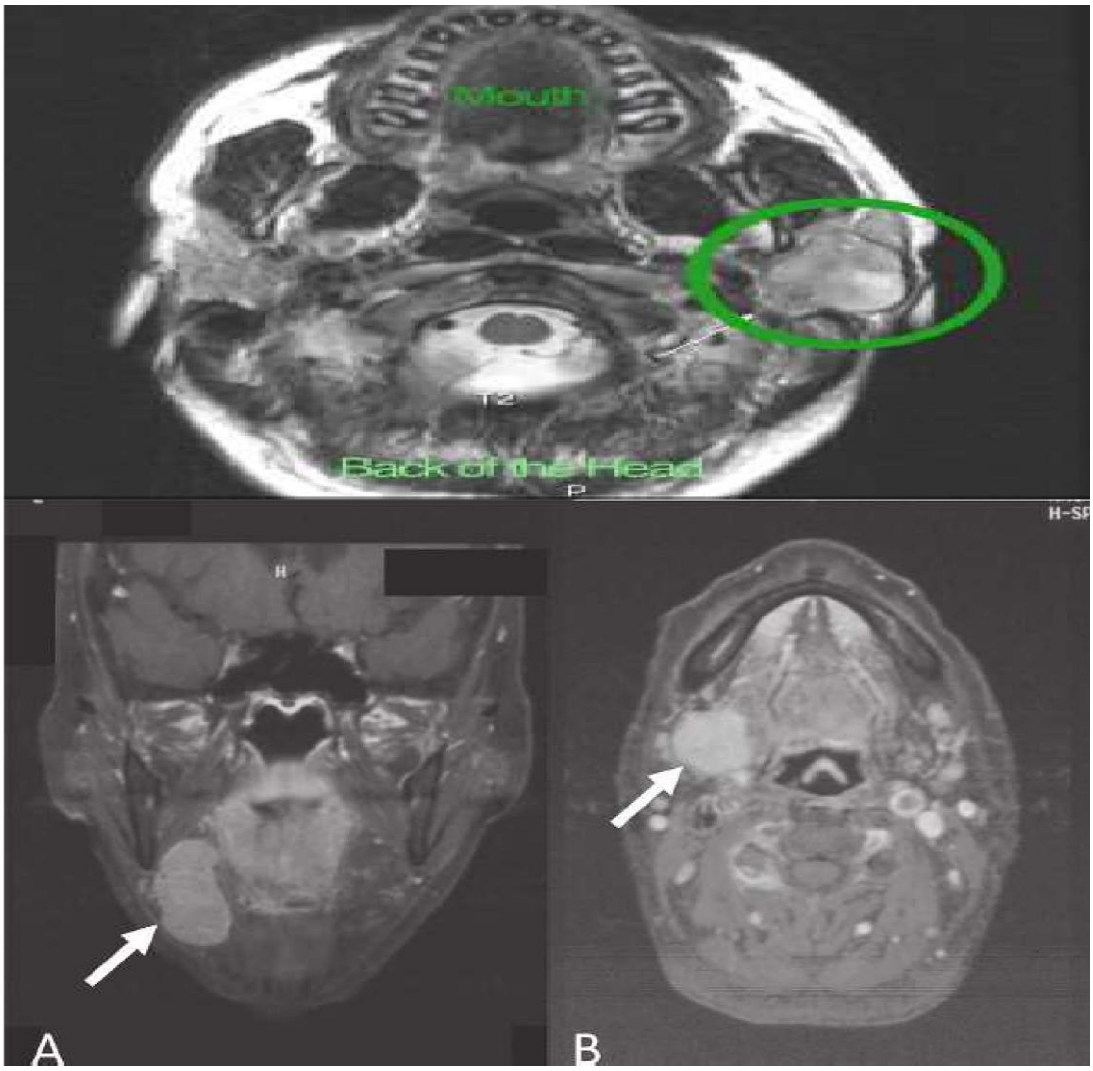
  For visualizing masses that are poorly defined on MRI.
- For patients who are unable to lie still long enough for adequate MRI (pediatric, geriatric, claustrophobic, and mentally or physically challenged patients).
- For patients for whom MRI is contraindicated.

The disadvantage of CT include radiation exposure, administration of iodine-containing contrast media for enhancement, and potential scatter from dental restoration.

MRI provides images for evaluation salivary gland pathology, adjacent structure, and proximity to the facial nerve.

MRI is contraindicated for :

1. Patients with pacemakers or implants such as aneurismal bone clips. If the implant contains magnetic metal, an MRI cannot be performed; however, dental implants are not magnetic and so are not contraindicated.
2. Patients who have difficulty maintaining a still position.
3. Patients with claustrophobia.



Cone beam CT (CBCT)

Is increasingly being employed in dentomaxillofacial imaging since it provides high resolution of osseous structures at a lower dose of radiation than conventional CT. Using a cone- shaped x-ray beam & two-dimensional

detectors,theCBCTscannercollects volume data by means of a single rotation taking 9–40 seconds

Salivary gland biopsy

Definitive diagnosis of salivary pathology may require Histologic examination.The labial minor salivary glands are most commonly biopsied since they provide the most accessible source of tissue, especially where SS is suspected

This approach is both diagnostic and curative in the majority of salivary gland tumors.

•Minor gland biopsy is a minimal operative procedure that can be done with limited morbidity.

•Care must be exercised to avoid damage to the minor glands adjacent to the biopsy site as this can induce formation of a mucocele.

•Biopsy of the parotid and submandibular glands usually requires extraoral approach,although the sublingual glands are often approached intraorally

FNA biopsy is a simple and effective technique that aids the diagnosis of solid lesions. It may be particularly useful for elderly patients who cannot tolerate an excisional biopsy due to medical considerations.

In almost all salivary gland tumors, the treatment of choice is an excisional biopsy.

Salivary Gland Biopsy (MSGB)

Biopsy of the parotid and submandibular glands usually requires an extraoralapproach, although the sublingual glands are often approached intraorally.

With respect to SS, biopsy of the parotid gland has not been shown to offer diagnostic superiority to the minor gland procedure but may offer unique value in assessing disease activity and progression.

The parotid gland biopsy has, however, been shown to be superior to the MSGB with respect to diagnosis of several conditions including Sarcoidosis and lymphomas.

In cases of suspected lymphoma, histopathologic analysis combined with flow cytometry, fluorescence in situ hybridization, and fluorescence-activated cell sorting analysis may be employed for definitive diagnosis and characterization of a lymphoma.

SEROLOGIC Evaluation:

No single definitive laboratory test for the diagnosis of SS,a combination of abnormal test results is frequently observed:elevated (ESR), mild normocytic anemia, leukopenia, and polyclonal hypergammaglobulinemia.

Autoantibodies are present in the majority of SS cases elevated Igs (Particularly IgG),: rheumatoid factor (RF),antinuclear antibodies (ANAs), anti-SSA/Ro and anti-SSB/La are strongly indicative of SS, although not exclusive.

The most recently proposed classification criteria for SS by the American College of Rheumatology (ACR) requires at least two of three criteria for case definition;

one of which is a positive serum anti SSA/Ro and/or anti-SSB/La or positive RF and ANA.•Another serologic marker that may prove useful for the diagnosisof salivary glands disorders is serum amylase.