Salivary Gland Diseases

Orrett E. Ogle, DDS[a,*]

KEYWORDS

• Sialolithiasis • Sialadenitis • Sialadenosis • Sjögren syndrome • Xerostomia • Xerogenic medications • Pleomorphic adenoma

KEY POINTS

- Sialolithiasis is the most common problem in the salivary gland.
- Dry mouth is associated with xerogenic medications, dehydration, exposure to radiation, and smoking.
- Infections are either bacterial or viral.
- Most salivary tumors are benign.
- Several systemic diseases can cause enlargement of salivary glands.

There are 3 pairs of major salivary glands: parotid, submandibular, and sublingual glands and thousands of minor salivary glands dispersed throughout the oral cavity. The parotid is the largest of the major salivary gland and is situated lateral to the ramus of the mandible and anterior to the sternocleidomastoid muscle. This gland is encapsulated and secretes serous saliva. The submandibular glands are the second largest and are located below the angle of the mandible in the submandibular triangle of the neck and makes up part of the floor of the mouth. This gland secretes a mixed serous and mucous saliva. The sublingual glands are the smallest of the major salivary glands and lies below the mucosa of the floor of the mouth above the mylohyoid muscle. Unlike the parotid and the submandibular glands, the sublingual gland is not encapsulated and it is dispersed throughout the sublingual space. The sublingual gland secretes mucous saliva. The minor salivary glands are composed of 800 to 1000 small salivary glands concentrated along the buccal mucosa, labial mucosa, lingual mucosa, soft/hard palate, and floor of mouth.[1] These clusters of glands secrete primarily mucous saliva (**Box 1**).

SALIVARY GLAND DISEASES

A variety of disease processes, ranging from painful obstructions, infections, to benign and malignant tumors, can occur within the salivary glands. Despite the rarity in which

Disclosure: The author has nothing to disclose.

[a] University of The West Indies, Kigston, Jamaica
* 4974 Golf Valley Court, Douglasville, GA 30135.
E-mail address: oeogle@aol.com

Dent Clin N Am 64 (2020) 87–104
https://doi.org/10.1016/j.cden.2019.08.007 dental.theclinics.com

Box 1
Functions of saliva

Aids in digestion and taste perception

Moistens food bolus to assist swallowing

Lubricate the oral soft tissues to assist the movement against each other and against the teeth.

Neutralizes bacterial acids by its buffering action.

Promotes enamel remineralization

Protects the teeth and the oral mucosa by the presence of immunoglobulin's tissue repair factors and antibacterial system[2]

salivary gland diseases are encountered in the practice of general dentistry, it is essential that general dentists be knowledgeable about salivary gland function, abnormalities, and the diseases that can affect these glands. They should be able to recognize and diagnose problems involving the major and minor salivary glands as well as in the management of certain problems such as oral dryness associated with salivary problems and stones and other problems related to the ducts of the glands. This article reviews several important diseases affecting the glands, their clinical presentations, trends in diagnosis, and their general management (**Table 1**).

CLINICAL EXAMINATION, LABORATORY STUDIES, AND IMAGING

A careful history is the first step in the diagnosis of salivary gland conditions (**Table 2**). Nearly all diseases that affect the salivary glands present as painful or painless swelling of the gland. In addition, there may be dryness of the mouth (xerostomia), as well as local and systemic symptoms of an infection.

In a lot of cases the clinical examination by itself can provide a diagnosis. A ranula or mucocele is easily identified on clinical examination. Salivary stones and tumors can also usually be visualized and/or palpated and a good educated conditional diagnosis established (**Box 2**).

Laboratory Studies

For most of the salivary gland diseases, laboratory testing is not indicated. If Sjögren syndrome or sarcoidosis is suspected, however, then antinuclear antibodies, SS-A or SS-B (Sjögren syndrome antibodies to duct epithelium), and angiotensin-converting enzyme levels would be the indicated laboratory tests.[3] The workup of a suspected infection would consist of complete blood count with differential blood count and C-reactive protein. Salivary secretion rate is indicated in the assessment of xerostomia. Fine-needle aspiration biopsy is used to obtain tissue for the histologic diagnosis of neoplasms.

Imaging

Conventional radiography has a very limited role in the diagnosis of salivary gland pathology and is useful only for identifying salivary stones. Intraoral occlusal radiograph is useful in diagnosis and localization of stones in the submandibular duct.

Sialography is used to evaluate the ductal system of salivary glands using a contrast medium injected into the duct. It is useful in the assessment of salivary gland dysfunction secondary to obstructive disorders. Because of the risks in the use of contrast medium, this technique is no longer favored and is contraindicated in acute conditions

Table 1
Classification of salivary gland diseases

Inflammatory Disorders	
Acute sialadenitis Viral: Mumps Coxsackie Cytomegalovirus Paramyxovirus • Bacterial: *Staphylococcus aureus* (acute suppurative parotitis)	Chronic sialadenitis • Granulomatous: TB Cat scratch disease • Actinomycosis • Sarcoidosis • HIV • Abscess (parotid and submandibular) • Recurrent subacute parotitis • Radiation sialadenitis
Noninflammatory Enlargement	
• Parotitis ○ Associated with alcohol cirrhosis ○ Diabetes mellitus ○ Bulimia ○ Malnutrition	
Obstructive Disorders	
Traumatic	• Mucocele • Ranula • Traumatic strictures of major ducts
Stones	Mostly submandibular
Impaction of foreign body into a duct	
Secretory Disorders	
Dry mouth (xerostomia) • Inflammation • Fibrosis of major glands • Dehydration states • Drug therapy • Autoimmune diseases • Chemotherapy • Postradiation changes • Alcoholism • Malnutrition	Excess saliva (sialorrhea) • Neuromuscular disorders • Psychosomatic problems • Insertion of new dentures • Decreased vertical dimension
Systemic Diseases	
Autoimmune	Sjörgen Mikulicz Sarcoidosis
Benign lymphoepithelial lesions Fibrocystic disease (mucoviscidosis)	Amyloidosis HIV-associated benign lymphoepithelial cysts of the parotid glands Rare
Drug and Hypersensitivity Reactions	
Clonidine (Catapres) Methyldopa (Aldomet) Tranquilizers Antihistamines Anticholinergics	Causes a reduction of saliva production or secretion

(*continued on next page*)

Table 1
(*continued*)

Neoplasms	
Benign • Pleomorphic adenoma • Monomorphic adenoma • Warthin tumor • Oncocytoma	Malignant • Mucoepidermoid • Acinic cell • Adenocarcinoma • Adenoid cystic • Malignant pleomorphic • Squamous cell • Malignant oncocytoma • Lymphoma • Metastatic

Abbreviation: HIV, human immunodeficiency virus.

of salivary glands.[4] Instead of sialography, sialoendoscopy and magnetic resonance Sialography can be used for evaluation of the ductal system of the salivary glands (Table 3).

INFLAMMATORY DISORDERS

Sialadenitis can be due to either infectious or noninfectious factors. Viruses and bacteria are the most common cause of acute sialadenitis. The parotid glands are most commonly involved and to a lesser extent the submandibular glands. Children, adolescents, and debilitated adults are the groups most commonly affected.

Viral infections are less common than bacterial infections. Viruses causing sialadenitis include paramyxoviruses (mumps—the most common), cytomegalovirus, Coxsackie virus, human immunodeficiency virus (HIV), parainfluenza types I and II, influenza A, and herpes.[6] The most important viral pathogens are the mumps virus and cytomegalovirus (Fig. 1). (Mumps is a rare problem today because of the MMR vaccine).Dental treatment is not indicated during an acute viral infection.

Staphylococcus aureus is the most common cause for acute bacterial parotitis. The infection is caused by a retrograde spread of infection up the duct secondary to

Table 2
Patient evaluation

History • Onset, duration, and course • Is it painful? • Other concurrent symptoms • History of systemic diseases • Medication history	• Painful diffuse swelling suggests sialadenitis • Painful swelling that fluctuates with meals suggests sialolithiasis • Nonpainful swelling suggests tumor Dry mouth Diabetes, HIV, HCV, alcoholism Drug-induced disorders
Physical Examination • Is the mass unilateral/bilateral • Is swelling diffuse or well circumscribed • Is swelling tender • Are there associated head and neck findings	Bilateral swelling indicates systemic disease Diffused swelling is usually inflammatory Tenderness suggests inflammation • Enlarged lymph nodes • Palpable calculi • Other signs of diseases

Abbreviation: HCV, hepatitis C virus.

Box 2
Quick summary: generalizations

- Diseases of the salivary glands can be diagnosed by lumps in the submandibular area, lumps on the side of the face in front of the ear. *OR:* lumps, ulcers, or fluid-filled sacks inside the mouth.
- With the submandibular gland the most common reason for lumps is stone formation. Tumors are less common.
- Benign salivary gland tumors grow slowly over months or even years.
- Salivary gland tumors occur with a higher incidence in the upper lip than in the lower lip.
- Lower lip masses are most frequently cystic masses.
  - Upper lip: tumor
  - Lower lip: cyst
- Palate—most common site of intraoral tumor. Pleomorphic adenoma—most common tumor.
- Malignancy should be suspected if the growth has been short or if there is any pain.
- Ulcerations should be considered malignancy until proved otherwise.

decreased salivary flow or ductal obstruction. Bacterial sialadenitis is most commonly seen in the elderly and chronically ill especially those with xerostomia or who are dehydrated. Sialadenitis presents as pain, tenderness, redness, and gradual localized swelling of the affected gland. Pus may drain through the duct into the mouth[6] (Fig. 2). Dental treatment unrelated to the infection should not be done.

Treatment

Most viral infections are benign, usually self-limiting, and will generally go away on their own. Treatment will be supportive care and the management of symptoms. Bacterial infections will require antibiotic, increasing fluid intake, and good oral hygiene.

Table 3
Imaging techniques

Ultrasonography	Displays high-definition images. Useful in evaluating the superficial structures of the affected salivary gland
Sonoelastography	Measures the elasticity of the glandular parenchyma and is useful in evaluating the hypofunction of saliva especially in postradiation hypofunction of salivary glands
Computed tomography (CT)	Useful in delineating the extent and location of a lesion. CT scans are helpful in differentiating benign and malignant tumors of salivary glands by delineating the characteristic irregular tumor margin and surrounding tissue infiltration of malignancy
MRI	The wide variety of soft tissue signals differences and multiplanar image acquisition have made MRI the most effective imaging modality for assessment of salivary gland tumors. MRI scans delineate the intraparotid course of facial nerve, which is an important landmark for surgeons operating on parotid glands[5]
Scintigraphy	Salivary gland scintigraphy uses Tc-99m pertechnetate to assess salivary gland dysfunction
PET	A PET scan focuses on areas of high cellular activity suggesting a sign of tumor growth. It aids in the diagnosed cancer.

Fig. 1. Unilateral (*A*) and bilateral mumps (*B*) ("chipmunk cheeks"). (*Courtesy of* Orrett E. Ogle, DDS, Atlanta, GA.)

HIV infections can involve the salivary glands, most commonly the parotid (**Fig. 3**). The condition is chronic and generally presents as a progressive unilateral or bilateral parotid enlargement with associated xerostomia. The swelling is most often localized, painless, and sometimes fluctuant. The enlargement of the salivary glands is due to the formation of benign lymphoepithelial cysts within the gland.[7] These patients can receive routine dental care with adherence to Standard Precautions.

Radiation sialadenitis occurs as a result of exposure to radiation treatment of head and neck cancer. The symptoms will be xerostomia and mucositis. The serous parotid gland is considerably more radiation sensitive than the submandibular gland with its seromucous structure or the purely mucous sublingual gland.[8] The dental treatment will be management of the mucositis and xerostomia.

NONINFLAMMATORY ENLARGEMENT

Sialadenosis is a noninfectious, noninflammatory gland enlargement usually affecting the parotid bilaterally. This swelling is generally painless but in some instances it can

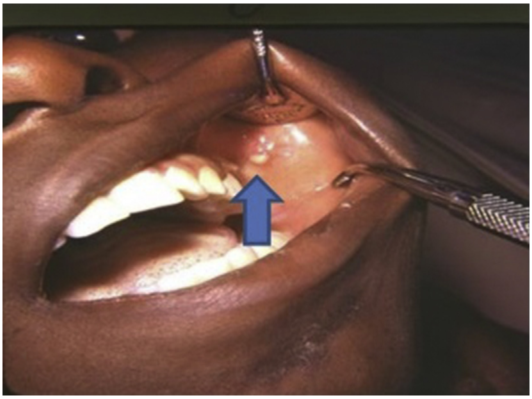

Fig. 2. Pus from parotid duct. (*Courtesy of* Orrett E. Ogle, DDS, Atlanta, GA.)

Fig. 3. Lymphoepithelial cyst of parotid secondary to HIV. (*Courtesy of* Orrett Ogle, DDS, Atlanta, GA and Earl I. Clarkson, DDS, Woodhull Hospital, Brooklyn, NY.)

be tender. Dental practitioners need to be able to differentiate sialadenosis from an inflammatory or neoplastic process to prevent unnecessary referrals.

Sialadenosis may be idiopathic or may be associated with the following:

1. Chronic malnutrition
2. Obesity
3. Diabetes mellitus
4. Alcoholism
5. Liver disease (usually advanced liver disease and hepatitis C virus infection)
6. Eating disorders (bulimia)
7. Drugs (ie, antihypertensives)[9]

The disease is most frequent in 3 distinct groups of patients: alcoholics, diabetics, and the malnourished. Diabetes mellitus and alcoholism are the most common causes. To establish a diagnosis the dentist should first question the patient regarding any endocrine or nutritional disorders, the chronic use of alcohol, or any other factors that are known to be associated with sialadenosis such as hepatic diseases. If the dentist is unable to explain bilateral parotid enlargement from the history, the patient should then be referred to an oral and maxillofacial surgeon or an otorhinolaryngologist. A medical consult may also be necessary.

Patients with sialadenosis may sometimes complain of reduced salivary flow. The treatment is the management of the underlying systemic condition. Dental treatment is not contraindicated. But the dentist should be aware of the possibility of coagulation issues in alcoholism.

OBSTRUCTIVE DISORDERS

Obstructive sialadenitis is the most frequently encountered salivary gland disease in dental practice. Stones in the excretory ducts are most frequently the cause of the obstruction. Other less frequent causes are impaction of the duct orifice, trauma to the orifice, idiopathic inflammatory stenosis, and radioiodine-induced stenosis.[10] The symptoms are usually very characteristic, consisting of recurrent swelling of the affected gland, particularly with meals, which may be associated with postprandial salivary pain. Bacterial infection of the gland may at times be the first presenting symptom.

Sialoliths are more frequently located in the submandibular gland (84%), than in the parotid gland (13%). Most of the submandibular stones are located in Wharton duct (90%) (**Figs. 4** and **5**), whereas parotid stones are more often located within the gland itself[11] (**Fig. 6**). Salivary stones consist of an amorphous mineralized nucleus, surrounded by concentric laminated layers of organic and inorganic substances. The organic components of salivary stones include collagen, glycoproteins, amino acids, and carbohydrates. The major inorganic components are hydroxyapatite, carbonate apatite, whitlockite, and brushite.[11]

Diagnosis in the dental office will be based on history of pain and swelling associated with eating. The swelling will be present in the region of the duct behind the stone and will slowly dissipate after meal time. Stones in the region of the Wharton duct may be visualized through the thin mucosa of the floor of the mouth or/and palpated at examination. Occlusal radiograph and, sometimes, panoramic imaging will visualize the stone. Other more sophisticated diagnostic methods are ultrasonography, non–contrast-enhanced computed tomography, magnetic resonance sialography, and sialendoscopy. Digital subtraction sialography, combined with ultrasonography, is the method of choice in visualization of salivary gland calculi[12] when the stone cannot be detected by occlusal radiographs or by palpation. Sialography is a very old and controversial diagnostic method, but it still seems to be the best diagnostic tool in the imaging of salivary gland duct system in dental practice. It is inexpensive and capable of demonstrating subtle anatomy within the salivary gland ductal system.

Treatment

Treatment consists of first treating any acute infection if present, followed by surgical removal of the stone. Stones that are located from near the orifice up to the hilum in the submandibular gland can be removed transorally, but stones near the hilum of the gland will require gland excision. Sialendoscopy (a 0.8–1.6 mm semirigid endoscope is introduced into the salivary duct and is used to remove the stone) is an alternative to open surgery. Some studies have demonstrated its superiority over open surgery in stone clearance, symptom resolution, gland preservation, and safety.[13,14] Stones in the parotid duct is best treated with Extracorporeal shockwave lithotripsy.

Fig. 4. Stone in Wharton duct. Swelling of submandibular gland at meal time. (*Courtesy of* Orrett E. Ogle, DDS, Atlanta, GA.)

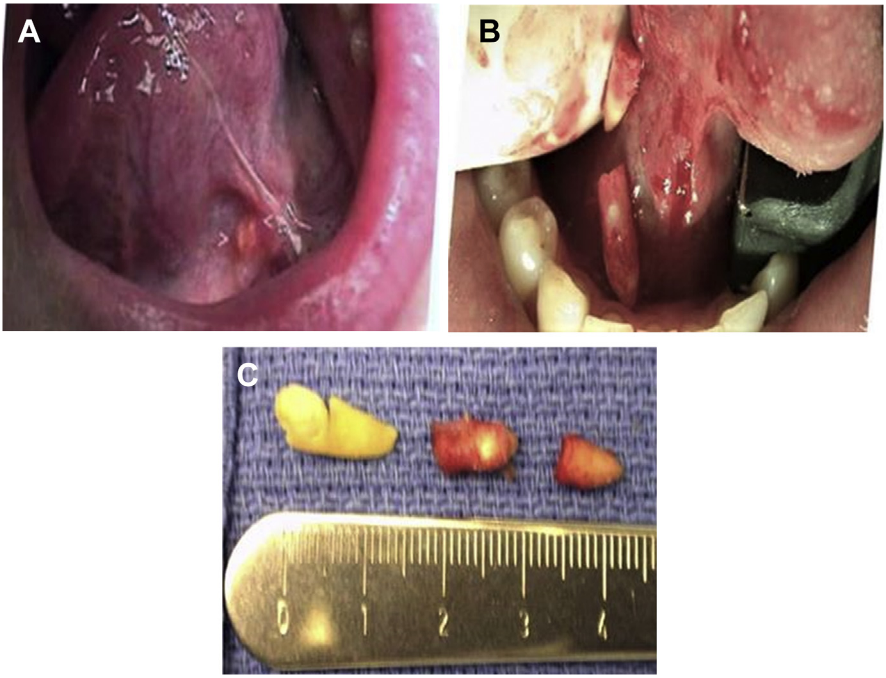

Fig. 5. (*A*) Stone at orifice of Wharton duct. (*B*) Stones removed from duct. (*C*) Stones. (*Courtesy of* Orrett E. Ogle, DDS, Atlanta, GA.)

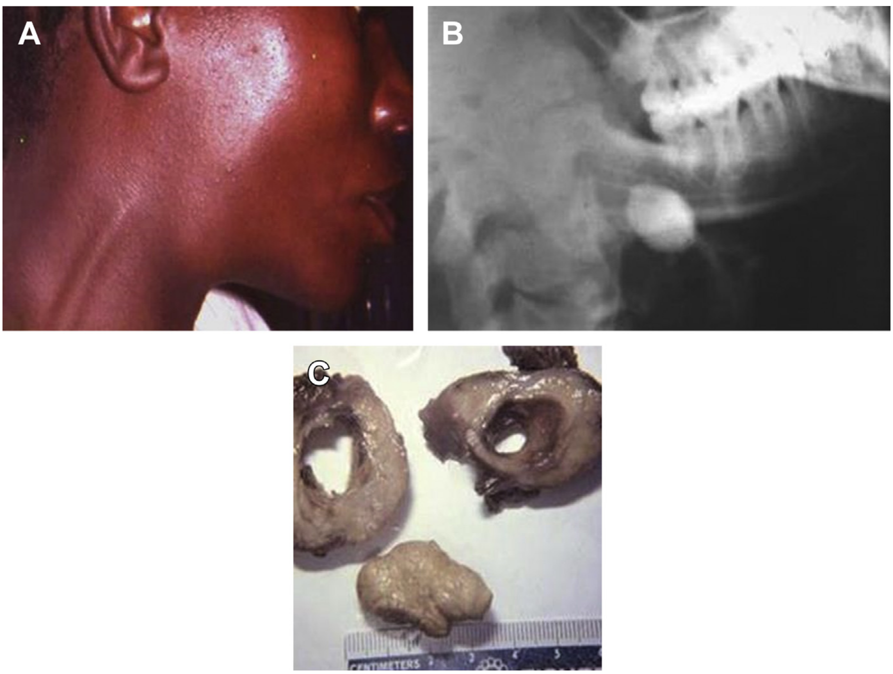

Fig. 6. (*A*) Painful swelling of submandibular gland. (*B*) Stone at hilum of the submandibular gland. (*C*) Specimen of dilated duct and stone. Gland was removed extraorally. ([*C*] *Courtesy of* Orrett E. Ogle, DDS, Atlanta, GA.)

Mucocele

The mucocele is caused by rupture of a duct of a minor salivary gland, most commonly on the lower lip, typically due to trauma resulting in spillage of mucin into the adjacent tissues. Typically, it appears as a bluish thin walled lesion that is fluctuant (**Figs. 7** and **8**).

Ranula

A ranula is a type of mucocele found in the floor of the mouth. It is an extravasation cyst consisting of collected mucin from a traumatic rupture of a duct of a sublingual salivary gland. The occurrence is unilateral and the swelling is away from the midline. Ranulas are classified as oral, plunging, or mixed based on their site of presentation. Oral ranulas are confined to the floor of the mouth, whereas plunging ranulas descend below the mylohyoid muscle to be seen below the inferior border of the mandible or as a lateral neck swelling termed a cervical ranula (**Figs. 9** and **10**).

SECRETORY DISORDERS

The normal daily production of saliva is between 0.5 and 1.5 L (**Table 4**). The submandibular glands are the major contributors to resting (unstimulated) saliva, and the parotid glands are the major contributors to stimulated saliva. The contribution of sublingual glands to unstimulated and stimulated whole saliva is low.[15]

Secretory disorders can be caused by a wide range of factors. The most frequent causes of dry mouth among dental patients are the use of xerogenic medications, head and neck radiotherapy, and Sjögren syndrome.[16]

Xerostomia is a combination of signs and symptoms in which the patient complains of a sensation of dry mouth. Women have a significantly higher rate than men, and the condition usually results in a lower quality of life. Xerostomia is associated with dental caries, oral candidiasis, and bacterial infection, along with the functional problems of dysgeusia (distortion of the sense of taste) and dysphagia (difficulty swallowing) (**Tables 5** and **6**).

Fig. 7. Mucocele of lower lip. (*Courtesy of* Orrett E. Ogle, DDS, Atlanta, GA.)

Fig. 8. Mucocele on the midline ventral surface of the tongue involving the glands of Blandin and Nuhn. (*Courtesy of* Orrett E. Ogle, DDS, Atlanta, GA and Earl I. Clarkson, DDS, Woodhull Hospital, Brooklyn, NY.)

Treatment of Xerostomia-Associated Problems

Dental caries: use of fluorinated dentifrice (0.05% NaF)/fluoride gel in the concentration of 1% NaF; 0.4% stannous fluoride application; 0.5% sodium fluoride varnish to teeth; and regular use of remineralizing tooth paste. Dental examination every 6 months and bitewing radiograph once a year for early diagnosis of dental caries.[17]

The dry mouth should be hydrated regularly using water, sucking ice cubes, or lozenges with citric acid to stimulate salivation, artificial salivary substitutes (Biotene and Roxane), lubricants such as lanolin-based product Vaseline or lip balm, and oral gels such as oral balance. Mouthwashes and sprays, sugar-free gums, mint water, or ice chips are also recommended. Sialogogues such as pilocarpine, 5 mg, 3 times a day

Fig. 9. (*A*, *B*) Ranula in the floor of mouth. (*Courtesy of* Orrett E. Ogle, DDS, Atlanta, GA.)

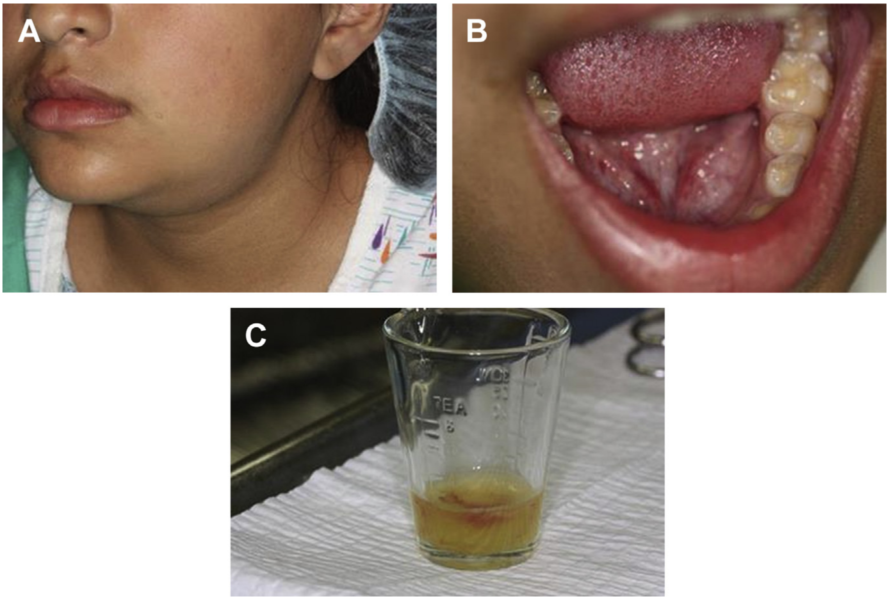

Fig. 10. (*A*) Plunging ranula. Facial view. (*B*) Plunging ranula. Intraoral view. (*C*) Aspirant from submandibular swelling. (*Courtesy of* Orrett E. Ogle, DDS, Atlanta, GA.)

and cevimeline, 30 mg, 3 times a day may be used in conditions where there is some functional gland remaining. Use of saliva substitute solutions mainly containing electrolytes stimulates natural saliva (eg, Salivart, OraLube, Xero Lube), Plax may also be recommended.[17]

Sialorrhea is salivary hypersecretion. The diagnosis is difficult to make and the condition is rare. The most common cause is neuromuscular dysfunction. Mental retardation and cerebral palsy are conditions in which sialorrhea may be seen in children, whereas in adults, Parkinson disease is the most common cause. In most cases of drooling there is not an increase of salivary flow but the oral handling of the saliva is disturbed. Dental-related causes could be due to insertion of new dentures or decreased vertical dimension in complete dentures.

Anticholinergic medications, such as glycopyrrolate and scopolamine, can be used to reduce drooling, but their side effects may limit their use. The injection of botulinum

Table 4
Salivary gland flow rates

Unstimulated whole saliva flow rate in a normal person	0.3–0.4 mL/min
Abnormal unstimulated flow rate	<0.1 mL/min
Flow rate during eating, chewing, and other stimulating activities	4–5 mL/min
Abnormal stimulated saliva flow rate	<0.5 mL per gland in 5 min

Data from Coulthard P, Horner K, Sloan P, et al. Salivary gland disease. In: Oral and maxillofacial surgery, radiology, pathology and oral medicine. 3rd ed. Edinburgh: Churchill Livingstone/Elsevier; 2013. p. 296.

Table 5
Causes of xerostomia

Reversible Causes	Irreversible Causes
Anxiety and depression	Sjogrens syndrome:
Drugs	Radiotherapy
Ductal obstruction—stones	Nerve damage
Infections	Parkinson disease
Dehydration	
Nutritional deficiencies	
Snoring and mouth breathing	
Smoking	

toxin type A into the parotid and submandibular glands is safe and effective in controlling drooling, but the effects fade in several months, and repeat injections are necessary.[18]

SYSTEMIC DISEASES

The salivary glands are affected by systemic diseases because they are secretory glands that are part of the gastrointestinal system. The diseases most frequently described are Sjögren syndrome and Mikulicz disease. Xerostomia will be the major presenting symptom.

Sjögren Syndrome

Sjögren syndrome is an autoimmune disorder. The primary presenting symptoms are dry eyes and dry mouth. Depending on the studies, female to male ratio varies from as high as 20:1 to 9:1. The disease is more prevalent in Caucasian women, and, although it may present at any age, the mean age of onset is usually in the fourth to fifth decade.[19]

The prevalence of primary Sjögren syndrome in a US population was estimated to be between 2 and 10 per 10,000 inhabitants.[20]

Table 6
Some of the most commonly prescribed drugs that causes xerostomia

Anticholinergic	Atropine, scopolamine
Antidepressant	Tricyclic antidepressants (amitriptyline, doxepin, nortriptyline, amoxapine), selective serotonin reuptake inhibitors (Lexapro, Prozac, Paxil, Zoloft), and lithium (Lithobid)
Antihistamine	Alavert, Allegra, Atarax Benadryl, Chlor-Trimeton, Claritin, Dimetane, Vistaril, Xyzal, and Zyrtec
Antihypertensive	Atenolol (Tenormin), clonidine (Catapres, Kapvay, Nexiclon XR), methyldopa (Aldomet), prazosin (Minipress), and propranolol (Inderal, InnoPran, Propranolol HCl Intensol).
Antiparkinsonian drugs	Procyclidine, Sinemet (carbidopa-levodopa)
Benzodiazepines (commonly used to treat epilepsy, panic disorders [anxiety])	Diazepam (Valium), alprazolam (Xanax), clonazepam (Klonopin), lorazepam (Ativan), clorazepate (Tranxene)

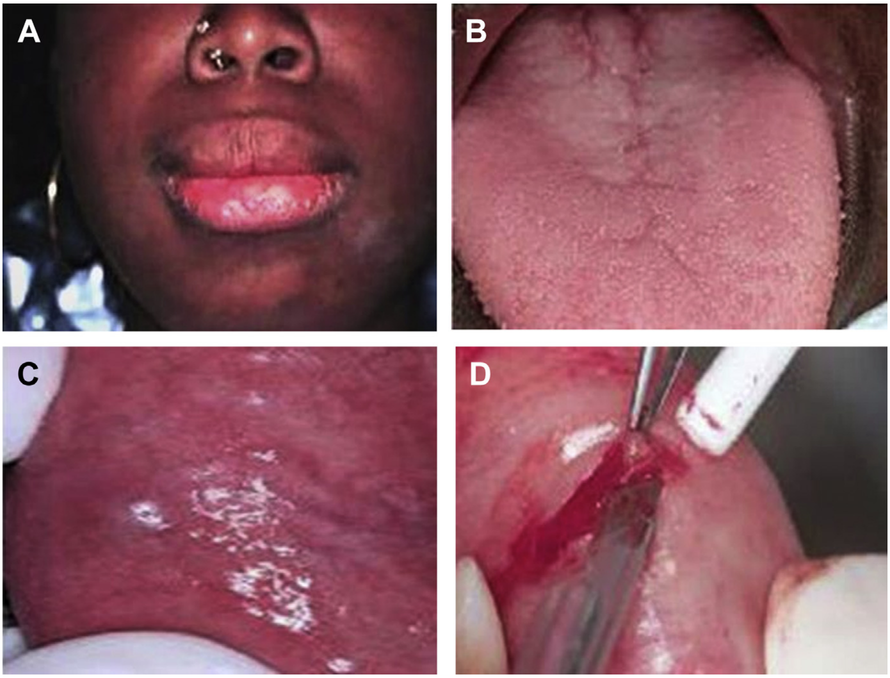

Fig. 11. (*A*, *B*) Sjögren syndrome. (*C*, *D*) Sjögren syndrome. Lip biopsy. ([*A*, *B*] *Courtesy of* Orrett E. Ogle, DDS, Atlanta, GA.)

The diagnosis is often based on a lip biopsy showing lymphocytes around salivary glands (**Fig. 11**). The other tests are Schirmer test, Rose Bengal dye test, sialography, and sialochemistry.[17]

The dental treatment should be aimed at relief of symptoms by the administration of saliva substitutes, fluoride applications, and good oral hygiene.

Mikulicz Disease

Mikulicz disease is of unknown cause, but is believed to be autoimmune by some authorities. The disease resembles Sjögren syndrome except that the salivary and lacrimal depletion in secretion is far less than that seen in Sjögren syndrome. Patients

Table 7
Neoplasms of salivary glands

Benign Neoplasms	Malignant Neoplasms
Pleomorphic adenoma	Mucoepidermoid carcinoma
Monomorphic adenoma	Adenoid cystic carcinoma
Papillary cystadenoma lymphomatosum (Warthin tumor)	Malignant pleomorphic adenoma
Oncocytoma	Acinic cell carcinoma
Canalicular adenoma	Adenocarcinoma
Myoepithelioma	
Sebaceous adenoma	
Ductal papilloma	

Box 3
Generalization of salivary gland neoplasms

	Benign	Malignant
Parotid	80%	20%
Submandibular	60%	40%
Sublingual	10%	90%
Minor glands[a]	20%	80%

Benign labial salivary gland neoplasms are more common in the upper lip, and malignant labial tumors are more common in the lower lip.

[a] Number varies widely in published reports.

with Mikulicz disease will have asymptomatic, bilateral swelling of the parotid, submandibular salivary glands, and lacrimal glands.

The diagnosis of Mikulicz disease is based on the following criteria: (1) symmetric and persistent swelling of the lacrimal glands and either or both of the major salivary glands (parotid and submandibular) and (2) the exclusion of other diseases that may mimic this presentation, such as Sjögren syndrome, sarcoidosis, viral infection, or lymphoproliferative disorders.[21] Laboratory test will distinguish between the two.

The dental treatment would be the same as for Sjögren syndrome.

NEOPLASMS

Salivary gland tumors most often present as painless, slow-growing masses (Table 7). Most of the salivary neoplasms are benign with only 20% being malignant (Box 3). Eighty percent of major salivary gland tumors occur in the parotid glands, and most minor salivary gland tumors are located in the palate.[22] The most common benign tumor is the pleomorphic adenoma, also called benign mixed tumor (Fig. 12). It occurs in both major and minor salivary glands. The commonest malignant salivary tumor in the parotid gland is mucoepidermoid carcinoma (Fig. 13). Adenoid cystic carcinoma is the commonest cancer in the submandibular and minor salivary glands, although mucoepidermoid carcinoma is not uncommon (Fig. 14).

Fig. 12. Pleomorphic adenoma on hard palate. (*Courtesy of* Orrett E. Ogle, DDS, Atlanta, GA.)

Fig. 13. Mucoepidermoid carcinoma of palate. (*Courtesy of* Orrett E. Ogle, DDS and Earl I. Clarkson, DDS, Woodhull Hospital, Brooklyn, NY.)

Diagnosis is made from biopsy specimen. Clinically, the overlying mucosa is normal in appearance unless it has been traumatized. Fine-needle aspiration biopsy is the preferred biopsy technique but requires equipment that most likely will not be available in dental offices. An incisional biopsy is an alternative if fine-needle aspiration does not provide a large enough tissue sample for a definitive diagnosis. Treatment of salivary gland tumors is surgical excision.

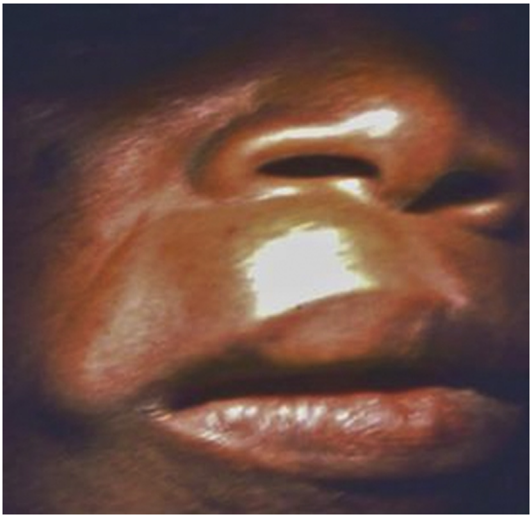

Fig. 14. Adenoid cystic carcinoma (cylindroma) of upper lip. (*Courtesy of* Orrett E. Ogle, Atlanta, GA.)

REFERENCES

1. Som PM, Brandwin-Gensler MS. Anatomy and pathology of the salivary glands. In: Som PM, Curtin HD, editors. Head and neck imaging. 5th edition. St Louis (MO): Mosby; 2011. p. 2449.
2. Schenkels LC, Veerman EC, Nieuw Amerongen AV. Biochemical composition of human saliva in relation to other mucosal fluids. Crit Rev Oral Biol Med 1995;6(2):161–75.
3. Iro H, Zenk J. Salivary gland diseases in children. GMS Curr Top Otorhinolaryngol Head Neck Surg 2014;13:Doc06. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4273167/. Accessed April 2019.
4. Rastogi R, Bhargava S, Mallarajapatna GJ, et al. Pictorial essay: salivary gland imaging. Indian J Radiol Imaging 2012;22(4):325–33.
5. Chu J, Zhou Z, Hong G, et al. High-resolution MRI of the intraparotid facial nerve based on a microsurface coil and a 3D reversed fast imaging with steady-state precession DWI sequence at 3T. AJNR Am J Neuroradiol 2013;34(8):1643–8.
6. Jothi S. Salivary gland infection. MedlinePlus; 2015. Available at: http://www.nlm.nih.gov/medlineplus/ency/article/001041.htm. Accessed March 2019.
7. Shanti RM, Aziz SR. HIV-associated salivary gland disease. Oral Maxillofac Surg Clin North Am 2009;21(3):339–43.
8. Dreyer JO, Sakuma Y, Seifert G. Radiation-induced sialadenitis stage classification and immunohistology. Pathologe 1989;10:165–70. Springer Verlag [Article in German]. Available at: kfkronenberg.com/Sialadenitis-Eng.pdf. Accessed March 2019.
9. Chen S, Benjamin C, Myssiorek D. An algorithm approahc to diagnosing bilateral parotid enlargement. Otolaryngol Head Neck Surg 2013;148(5):732–9.
10. Koch M, Iro H, Zenk J. Sialendoscopy-based diagnosis and classification of parotid duct stenoses. Laryngoscope 2009;119(9):1696–703.
11. Kraaij S, Karagozoglu KH, Forouzanfar T, et al. Salivary stones: symptoms, aetiology, biochemical composition and treatment. Br Dent J 2014;217(11):1038–54.
12. Rzymska-Grala I, Stopa Z, Grala B, et al. Salivary gland calculi – contemporary methods of imaging. Pol J Radiol 2010;75(3):25–37.
13. Wilson KF, Meier JD, Ward PD. Salivary gland disorders. Am Fam Physician 2014;89(11):882–8.
14. Luers JC, Grosheva M, Reifferscheid V, et al. Sialendoscopy for sialolithiasis: early treatment, better outcome. Head Neck 2012;34(4):499–504.
15. Navazesh M. Salivary gland hypofunction in elderly patients. J Calif Dent Assoc 1994;22(3):62–8.
16. Miranda-Rius J, Brunet-Llobet L, Eduard Lahor-Soler E, et al. Salivary secretory disorders, inducing drugs, and clinical management. Int J Med Sci 2015;12(10):811–24.
17. Krishnamurth S, Vasudeva SB, Vijayasarathy S. Salivary gland disorders: a comprehensive review. World J Stomatol 2015;4(2):56–71.
18. Hockstein NG, Samadi DS, Gendron K, et al. Sialorrhea: a management challenge. Am Fam Physician 2004;69(11):2628–35.
19. Patel R, Shahane A. The epidemiology of Sjögren's syndrome. Clin Epidemiol 2014;6:247–55.

20. Maciel G, Crowson CS, Matteson EL, Cornec D. Prevalence of primary Sjögren's syndrome in a US population-based cohort. Arthritis Care Res 2017;69(10): 1612–6.
21. Lee S, Tsirbas A, McCann JD, et al. Mikulicz's disease: a new perspective and literature review. Eur J Ophthalmol 2006;16(2):199–203.
22. Speight PM, Barrett AW. Salivary gland tumours. Oral Dis 2002;8(5):229–40.