



Risk of Salivary Gland Pathology

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Abstract

Conditions of the salivary glands are common in the consultations of dental professionals of any specialty. Professionals must be prepared to adequately diagnose and treat these pathological processes. Therefore, an exhaustive literature review was carried out directly related to the main risks and complications of these injuries.

Keywords: Saliva Gland; Saliva; Glandular Tumor; Pleomorphic Adenoma

Introduction

In dentistry and oral and maxillofacial surgery consultations, patients with salivary gland conditions are common. Those affected are forced to seek professional help due to difficulty feeding, pain, limitation of mouth opening, general condition, among other causes that will be shown in this chapter. It is essential that professionals from different stomatological specialties are oriented on this topic.

General characteristics of saliva Human saliva is a clear, heterogeneous and slightly acidic biological fluid, with a pH between 6.0 and 7.0, it is composed of 99% water and 1% organic and inorganic substances. These substances are; electrolytes such as: sodium, potassium, calcium, chloride, bicarbonate, thiocyanate, inorganic phosphate (orthophosphate), magnesium, sulfate, iodide and fluoride, glucose, ammonia and urea, proteins such as: immunoglobulins, amylase, lysozyme, peroxidase, glucosidase, peptidase, glycoproteins, mucins, proline-rich proteins, carbonic anhydrase, secretory IgA, kallikrein, lactoferrin, fibronectin and lipids [1,2].

More than 309 proteins have been identified in saliva, including proline-rich acidic and basic proteins, high and low molecular weight glycoproteins, agglutinins, cystatins, histatins and statherins. Salivary proteins have a wide variety of functional properties. The different groups of proteins in saliva are involved in immunological reactions (lysozyme, lactoferrin, lactoperoxidase, immunoglobulin, defensin), in digestion (amylase), and in many other

processes that take place in the oral cavity. Saliva contains steroid hormones; non-steroidal; protein; and peptides, such as cortisol, testosterone, progesterone, estradiol, and aldosterone.

Numerous studies have demonstrated the correlation that exists between serum and salivary levels of different hormones. The measurement of salivary hormones for diagnostic purposes is a widely accepted, non-invasive, and simple method compared to the collection of plasma samples [1,2].

Objective

Describe the main complications and risks of diseases and injuries of the salivary glands.

Reference search methods

scientific information was collected through a search using the following descriptors in English: The Medical Subject Headings (MeSH): "salivary gland, saliva, sialopathy, salivary gland tumors.

Analysis strategy

the search was based solely on salivary gland conditions.

Developing.

Thanks to its composition, saliva plays important functions within the oral cavity (Table 1). The protective function by lubrication maintaining the integrity of the oral mucosa, taste buds and teeth, cleaning and salivary clearing, the buffering action against

Functions	Composition
Lubrication	Mucins, proline-rich glycoproteins, water
Antimicrobial	Lysozyme, lactoferrin, lactoperoxidase, mucins, cystins, histatins, immunoglobulins, proline-rich proteins, Ig A
Maintenance of mucosal integrity	Mucins, electrolytes, water
Cleaning	Water
Buffer capacity and remineralization	Bicarbonate, phosphate, calcium, statherin, anionic proteins rich in proline, fluorine
Preparation of food for swallowing	water, mucins
Digestion	Amylase, lipase, ribonucleases, proteases, water, mucins, kallikrein, glucosidase, peptidase
Flavor	Water, taste
Phonation	water, mucin

Table 1: Functions of saliva. [Four. Five] Daily saliva secretion ranges between 500 to 1000 ml and is produced in the major and minor salivary glands. Saliva is predominantly secreted by three bilateral major salivary glands: the parotid, sublingual and submandibular glands (together they are responsible for around 90% of total saliva production). Hundreds of minor salivary glands (vestibular, labial and palatine), scattered throughout the oral mucosa, also contribute to the secretion of saliva. Saliva has two main types of protein secretion: serous secretion containing amylase and mucous secretion containing mucin.

cavities neutralizing the action of sugars, acids and gastroesophageal reflux, the reduction of germs through its antibacterial action and antifungal and dental remineralization, inhibiting the precipitation of calcium phosphate salts, are as important as the role it plays in the digestive function (amylase, lipases, proteases and ribonucleases) of starch and lipids. It also contributes to the humidification of the mucous membranes, promotes speech, chewing, swallowing and the sense of taste, and regulates temperature. It is hypotonic compared to blood plasma, showing higher protein content [3,4].

The enzyme amylase is involved in initial digestion, while mucin helps lubricate and protect oral surfaces. The physical and chemical characteristics of saliva vary according to the different salivary glands. The sublingual glands produce a viscous saliva

rich in mucin while the serous parotid glands secrete a watery fluid rich in amylase. The regulation of salivary secretion is a reflex controlled by the sympathetic and parasympathetic branches of the autonomic nervous system. The impulses, induced by the action of taste, chewing, or smell, are sent from the afferent receptors to the salivary nuclei (salivation center) located in the medulla oblongata. The efferent part of the secretory reflex arc is made up of parasympathetic and sympathetic nerve bundles, which separately innervate the salivary glands. Salivary gland disorders include inflammatory, bacterial, viral, and neoplastic etiologies [3-5].

The presentation can be acute, recurrent or chronic. Acute suppurative sialadenitis presents as rapid-onset pain and inflammation and is treated with antibiotics, salivary massage, hydration, and sialagogues such as lemon drops or vitamin C pills. Viral etiologies include mumps and human immunodeficiency virus, and Treatment is directed at the underlying disease. Recurrent or chronic sialadenitis is more likely to be inflammatory than infectious; Examples include recurrent parotitis of infancy and sialolithiasis. The inflammation is usually caused by an obstruction, such as a stone or a stricture of a duct. Management is aimed at relieving the obstruction. Benign and malignant tumors can occur in the salivary glands and usually present as a solitary painless mass in the neck. Diagnosis is made by imaging (eg, ultrasound, computed tomography, magnetic resonance imaging) and biopsy (initially with fine-needle aspiration). In general, most salivary gland tumors are benign and can be treated with surgical excision [6].

Pathology due to alteration of salivary flow due to lack or excess salivary flow Hyposialia Hyposialia consists of a reduction in the salivary flow rate, the amount of saliva measured in ml per unit of time (second), and may be due to various etiological factors (Table 2) such as systemic diseases, taking different drugs, radiation therapy. head or neck cancer, water/metabolite loss, salivary gland injury or interference with neural transmission, due to chronic inflammation of the salivary glands, Sjögren’s syndrome, dehydration and psychological factors. We speak of asialia when the salivary hyposecretion is total and of xerostomia the subjective sensation of oral dryness; 1 in 4 adult women has the sensation of having a dry mouth [2].

The diagnosis of hyposialia is made by collecting a series of parameters that reveal dryness of the mouth; 1st completion of dry mouth assessment questionnaires (Table 3), 2nd completing the clinical history where the etiological factors are collected, 3rd

Causes of hyposalivation
Dehydration
Insufficient fluid intake (insufficient water intake)
glandular dysfunction
Decrease in peripheral stimuli (lack of chewing, tasteless foods)
CNS alterations (stress, anxiety, depression)
Anticholinergic drugs, drugs, tobacco, alcohol, enzyme induction
Intrinsic glandular alterations (destruction of the parenchyma: Sjögren’s syndrome [SS], sialadenosis, radiotherapy)
Glandular obstruction (lithiasis, inflammatory or tumor compressive processes)
Recurrent or chronic infectious diseases of the major glands (bacteria, viruses)

Table 2: Causes of hyposalivation [2].

Authors	Questionnaires	Response
Fox., <i>et al.</i> [8]	Does the amount of saliva in your mouth seem too little or not noticeable to you? Do you have any difficulty swallowing? Does your mouth feel dry when you eat? Do you sip liquids to help swallow dry foods?	Yes/No
Thomson., <i>et al.</i> [9]	My mouth feels dry I have difficulty eating dry foods I get up at night to drink My mouth feels dry when eating I sip to help swallow food I suck on hard candy or cough drops to relieve dry mouth I have difficulty swallowing certain foods My facial skin feels dry My eyes feel dry My lips feel dry My nose feels dry inside	Never=1 Almost never = 2 Occasionally=3 Quite often=4 Very often=5
Van de Putten., <i>et al.</i> [10]	My mouth feels dry when eating My mouth feels dry I have difficulty eating dry foods I have difficulty swallowing certain foods My lips are dry	Never=1 Occasionally=2 Always=3
Eisbruch., <i>et al.</i> [11]	Subjective grade 1 = without disability Subjective grade 2 = dryness requiring additional fluids for swallowing Subjective grade 3 = dryness that causes changes in diet or interferes with sleep, speech, or other activities	Does not apply
Pai., <i>et al.</i> [12]	Assess the difficulty you have in speaking due to dryness Assess the difficulty you have swallowing due to dryness Assess the amount of saliva in your mouth Assess the dryness of your mouth Assess the dryness of your throat Assess lip dryness Assess tongue dryness Rate thirst level	100 mm horizontal scale

Table 3: Assessment questionnaires. dry mouth [2].

intraoral examination where the clinical manifestations of dry mouth are collected and finally 4th the objective measurement of the salivary flow rate using sialometry [7].

Dry mouth assessment questionnaires

Clinical history, the dentist must carefully review and complete the medications that patients with this pathology take, in order to identify drugs that reduce salivary flow such as psycholeptic antidepressants (selective serotonin reuptake inhibitors), antidiabetics. oral (sulfonylureas), inhalers for the treatment of COPD, quinines, antihypertensives (thiazides, calcium channel blockers), antispasmodics, non-steroidal anti-inflammatory drugs, opioids... In addition, the medical history must be recorded if the patient suffers from systemic diseases such as Sjögren’s syndrome, others such as hypertension, asthma, diabetes mellitus, hematological, thyroid, rheumatological, psychiatric or eating disorders or if you

have received radiotherapy in the head and neck region [3,7].

Examination of the oral cavity manifestations of dry mouth During the intraoral examination, it is essential to identify the pathognomonic signs and symptoms of hyposalivation (Table 4), such as the dental mirror sticking to the oral mucosa and the tongue, scant, sticky and viscous saliva, loss of papillae on the back of the mouth. tongue (See figure), glassy and erythematous appearance of the oral mucosa, especially the palate, fissured tongue and lips, dryness of lips, tongue and mucous membranes, burning sensation, oral stinging, difficulty speaking, swallowing, chewing, loss of sense of taste, halitosis, traumatic oral injuries, difficulty wearing dental prostheses, predisposition to infections such as: oral candidiasis, angular cheilitis (See figure), gingivitis, bacterial sialadenitis, increase in cavities, especially cervical cavities (See figure), decreased clearance oral with food retention [7].

Functional Oral Symptomatology
Sensation of oral dryness (mouth and lips) Difficulty keeping the mouth moist (frequent need to drink water) Difficulty speaking (dysphonia), swallowing (dysphagia), chewing (especially foods) Dysgeusia (alterations in taste) Oral discomfort (lack of oral lubrication) Burning mouth (burning mouth syndrome) Need to get up to drink water (difficulty sleeping) Changes in nutritional pattern
ORAL SYMPTOMATOLOGY OF AN ORGANIC NATURE
Caries: Number, extent, location Gingivitis and periodontal disease Halitosis Prosthodontic problems (poor adaptation of the prosthesis) Predisposition to infections. Oropharyngeal candidiasis mainly Mucous problems: Atrophy, fissures and ulceration Involvement of the lips and corners Dryness, erythema, pain (burning sensation), loss of shine Traumatic injuries More sensitivity to irritating factors: tobacco, alcohol, etc.
Eyes: blurred vision, grittiness, need for artificial tears Genital: dryness, itching, burning, recurrent vaginitis Skin: peeling, cracking ENT: dry nose

Table 4: Signs and symptoms associated with salivary hyposecretion, based on López-Jornet P criteria [13].



Figure 1: 80-year-old patient who presents with a dry, fissured tongue, with loss of papillae, angular cheilitis and cervical caries and root remains, due to his hyposialia due to taking xerostomizing drugs. Salivary flow rate measurement The salivary flow rate at rest can vary from one person to another depending on different factors such as the degree of hydration, position and body weight, exposure to light, previous stimulation, circadian rhythms, sex, age, gland size or psychological factors [13].

We speak of resting saliva as the saliva that is produced spontaneously in the absence of exogenous or pharmacological stimuli and in a situation of relaxation, of stimulated saliva as the saliva that is obtained after subjecting the subject to different stimuli such as chewing paraffin or depositing drops of acid. citrus in the patient’s mouth, from total or complete saliva to the saliva obtained from all the salivary glands and from partial saliva to the salivary flow of a specific gland [13].

The diagnosis of hyposialia is made by objectively determining the measurement of the salivary flow rate, sialometry (See Figure 4), normally under standardized conditions, usually in the morning, in a relaxed body position with the head tilted forward, without ingesting food 2 hours before, do not smoke, drink coffee, or chew gum and in a relaxed and calm environment, the rate of total saliva at rest (STR) and total stimulated saliva (STE) is usually measured using the drainage technique. We consider that a patient has hyposialia when the STR < 0.1-0.2 ml/min and the STE < 0.5-0.7 ml/min [13].

In these patients with hyposialia, it is essential to change, reduce or eliminate the xerostomizing drugs they are taking, so a consultation with the family doctor will be carried out. In addition, diet control must be carried out, especially diets that favor a certain degree of dehydration such as diets with reduced salt intake in hypertensive patients. In these cases, the patient must be adequately hydrated and must drink at least 2 liters of liquids per day. It is also important to avoid dietary irritants such as coffee, alcohol or smoking. It is important to consider the psychopathological factors that are increasingly common in the appearance of xerostomia, such as chronic anxiety and stress, and treat them appropriately [14]. It is important to know if there is a functioning salivary

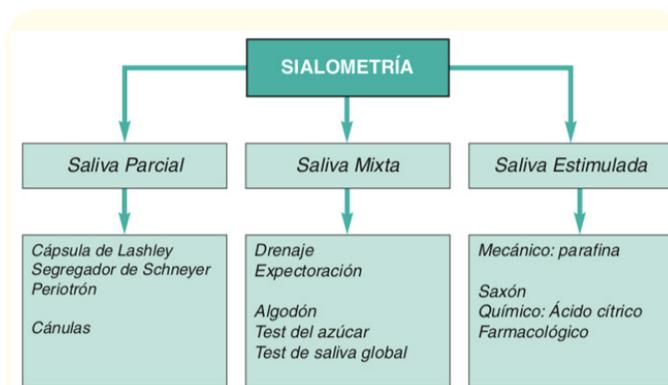


Figure 2: Different techniques to perform sialometry. Taken from Lopez- Jornet P, Cerero- Lapedra R. Diagnosis of xerostomia. Seoane JM Xerostomia course (13) In the treatment of dry mouth, the etiological factors must be identified and controlled, the underlying systemic disease controlled, and a series of measures established to keep the mouth moist; measures to stimulate salivary flow and increase hydration and measures to protect the hard and soft tissues of the oral cavity, in all of this the patient must participate by promoting health education. It is worth highlighting the importance of recognizing whether the glandular involvement is reversible or irreversible, establishing preventive measures as early as possible so that the patient with dry mouth has a better prognosis and maintenance of their quality of life [14].

parenchyma in the patient with dry mouth that can be stimulated mechanically, chemically or gustatory. This stimulation can be done with simple measures to improve hydration such as eating more frequent meals, increasing hydration of the mouth at night, drinking lemonade or acidic drinks, dissolving sugar-free candies in the mouth or chewing gum. with xylitol. In addition to mucosal moisturizing gels, salivary substitutes and sialogogue drugs that

directly stimulate the salivary parenchyma, such as pilocarpine, cevimeline and anetholtrithione [7,14].

We can see in table 6 the different treatment options. Pilocarpine and cevimeline are two systemic sialogues approved by the USA Food and Drug Administration for the treatment of dry mouth. Their effect depends on the presence of functional glandular tissue. Oral pilocarpine is a parasympathomimetic medication with muscarinic action. Cevimeline is a salivary gland stimulant with greater affinity for muscarinic M3 receptors, both providing a similar benefit in patients with dry mouth. Pilocarpine is usually administered at a dose of 5 mg 3 times a day for at least 3 months and cevimeline is prescribed at a dose of 30 mg 3 times a day for at least 3 months. Side effects are excessive sweating, skin dilation, vomiting, nausea, diarrhea, persistent hiccups, bronchoconstriction, hypotension, bradycardia, increased urinary frequency, and vision problems.

Both medications are contraindicated in patients with uncontrolled asthma or chronic lung disease and patients taking beta-adrenergic blockers should also be used with caution in patients with active gastric ulcer or patients with uncontrolled hypertension. Pilocarpine is also contraindicated in individuals with glaucoma and iritis and should be used with caution in patients with chronic lung disease, asthma, or cardiovascular disease [7].

Anetholtrithione is a muscarinic agonist and its mechanism of action is not well known, although it appears to favor the effect of parasympathetic neurotransmitters. Its combined use with pilocarpine improves its effectiveness. It comes in 50 mg tablets and is prescribed starting with 3 tablets a day for a week and then maintaining it at 2 tablets a day. Discoloration of urine and diarrhea may appear as side effects [14].

Bethanechol is an analogue of acetylcholine, it has muscarinic and somewhat nicotinic activity. It comes in 20 mg tablets, dosed every 8 hours. It has many side effects such as headaches, nausea, diarrhea, abdominal discomfort, urinary incontinence, redness, sweating, bronchiolar constriction and tearing. Pyridostigmine is another drug that stimulates muscarinic and nicotinic receptors with a prolonged effect due to inhibition of cholinesterase. These last two drugs are not usually used clinically due to the side effects and risks they entail due to a prolonged muscarinic action [14].

When dry mouth is extreme and there is no functioning salivary parenchyma, substances are used that aim to replace the components and functions of the saliva that has been lost. Recently, a topical spray containing 1% malic acid appears effective for the man-

agement of dry mouth symptoms in patients on antidepressant and antihypertensive medication [15].

The use of spray, gel, toothpaste or rinse containing olive oil, betaine and xylitol in polymedicated patients also seems beneficial. Orthana saliva, an oral spray that contains mucins, is a salivary substitute also used in these cases. These substitutes are usually composed of fluorides, calcium, phosphate, carboxymethylcellulose, hydroxyethyl cellulose. Electrostimulation using Saliwell Crown or the GenNarino device seems effective in increasing saliva production. Finally, in irradiated patients it seems effective to reduce the dose and modify the intensity together with amifostine. [14] Sialorrhea Sialorrhea, hypersialia, hypersalivation, and ptyalism are applied to describe increased salivary flow. Furthermore, it is accompanied by the involuntary and passive loss of saliva from the mouth due to the inability to manage oral secretions. Hypersalivation may be due to the stimulation of chemoreceptors or mechanoreceptors as an irritative stimulus produced by ulcers, infections or trauma to the oral mucosa, inflammatory pathology of the pharyngotonsillar area and increased salivary flow during the secretory phase of the menstrual cycle, pregnancy and hypoparathyroidism. Afferent impulses may be affected by the use of epileptics, encephalitis or tumors that affect the salivary centers or alterations in the digestive system. The efferent response can be affected by the sialogogue activity of some drugs such as pilocarpine, cholinesterase inhibitors, benzodiazepines, captopril, risperidone or clozapine. Salivary incontinence is due to oral motor dysfunction, an inability to swallow, an anatomical or functional deficit of the oral sphincter due to anatomical conditions such as macroglossia or problems of lip incompetence, open bite, orofacial muscle hypotonia or surgical defects of surgery. head and neck oncology that reduce the ability to swallow saliva [16,17].

In many cases, drooling is associated with complete central neurological disorders such as cerebral palsy, amyotrophic lateral sclerosis, Parkinson's disease, cerebrovascular accidents, and peripheral disorders such as facial paralysis. These diseases cause incoordination during the oral phase of swallowing, which results in saliva accumulation in the anterior portion of the mouth and its subsequent spillage. In these patients it is understandable that sialorrhea is not caused by excessive production of saliva by the salivary glands, but rather is a sequel to a failure to swallow it [16,17].

The clinical manifestations favored by the overflow of saliva can favor fungal and bacterial infections, wooding of the perioral skin, and ingestion and language may also be compromised. In patients

where the swallowing reflex is altered, aspirations may also occur due to the passage of salivary secretion into the respiratory system. In very severe cases, saliva can wet clothing and the floor, limiting the patient's social activity and causing isolation. The diagnosis is made through a thorough clinical history, physical examination and inspection of the oral cavity and quantification of salivary secretion production. The drooling coefficient can be used, a validated direct observational and semi-quantitative method that consists of detecting the presence/absence of salivary overflow every 15 seconds during two periods of 10 minutes separated by an interval of 60 minutes. The therapeutic management of the patient with sialorrhea is based on

- Behavior modification that consists of verbal or gestural reminders to swallow more frequently,
- Physiotherapy to stimulate salivary sealing, improve control of tongue movements and increase the tone of the facial muscles,
- Pharmacological treatment using drugs such as benztropine at a dose of 4mg per day, glycopyrrolate, administered in doses of 0.04 -0.4 mg/kg/day distributed in 2 or 3 doses, scopolamine used in transdermal patches whose effect lasts from 15 minutes to 72 hours, atropine sulfate orally or sublingually, hyoscine or clonidine patches and scopolamine in a nebulizer,
- Dose radiotherapy lower parts of the parotid and submandibular glands and 5.- the surgical approach by ligating the Wharton and Stenon (Stensen) ducts [16,17].

Inflammatory pathology Sialadenitis is the inflammation of the salivary glandular parenchyma and can be due to different etiologies such as infectious (bacterial, viral) due to physical factors such as ionizing radiation, mechanical factors due to sialoliths or autoimmune factors.

Viral sialadenitis Epidemic parotitis or mumps It is a benign and self-limiting contagious viral disease caused by paramyxovirus. The virus is spread by droplets that travel through the air, entering through the upper respiratory tract. It has an incubation period of two to three weeks, followed by a period of viremia of three to five days. It mainly affects children under fifteen years of age. Once the condition is suffered, lifelong immunity is created, as is the immunization provided by the triple viral vaccine (measles-mumps-rubella).

The disease has an incubation period of 7-25 days, a state period of 7-10 days and an infectious period of 2-5 days before the glandular tumor and 4-10 days after the disappearance of symptoms. A prodromal condition occurs that consists of fever, chills,

general malaise, headache, and anorexia. At the beginning, the inflammation is asymmetrical and accompanied by localized pain, trismus and dysphagia. The pain may be exacerbated by salivary stimulation, with non-purulent saliva coming out of the Stenon's duct and approximately ten days after the onset of the condition, a decrease in inflammation is noted. The inflammation can be bilateral, in 70-7% of the affected gland is swollen and indurated, firm but not erythematous or warm, a typical sign being the elevation of the earlobe. Treatment is supportive, or maintenance, rest, hydration and analgesia, due to the self-limiting nature of viral infections, the vast majority recover without specific treatment or adverse sequelae. Prevention through vaccination at 12 months of age and a booster dose at 4-6 years of age is essential. Actually, the complications that occur are not true complications of the glands, but rather of other affected organs. Orchitis has occurred in 20-30% of affected men and oophoritis in 5%, mastitis 30%, aseptic meningitis 15%, pancreatitis 5%, sensorineural hearing loss 0.05-4%, additional complications include myocarditis, polyarthritis, hemolytic anemia, plasmacytosis, lymphocytic reactions and thrombocytopenia, these associated conditions are usually self-limiting, and resolve with or without steroid therapy [3].

Other viruses can also cause this disease such as cytomegalovirus, parainfluenza, and it can also manifest in HIV-positive patients. Bacterial sialadenitis Acute bacterial sialadenitis It usually manifests itself in the parotids, in patients who have received complex gastrointestinal surgery or after a serious infection or neoplasia. It is more common in older people, although it can occur in children. It is caused by *Staphylococcus aureus*, *Streptococcus viridans* and other anaerobic bacteria. These bacteria access the gland by retrograde route through the excretory duct or by blood or lymphatic route. It manifests as a sudden, painful unilateral parotid tumor; with systemic involvement with fever, asthenia, headache and general malaise. The skin appears hyperthermic, erythematous, shiny and painful to the touch. Pus will come out through the Stenon duct (See Figure 5) during the exploration of the gland [18].

Untreated infections will become complications, causing extension to the underlying tissues or aponeurotic spaces, TMJ temporomandibular joint, external auditory canal or causing septic processes via hematogenous in systemically compromised patients. Nerve dysfunction or compression perineuritis has also been described and when this condition persists, it should be taken into account, because it is commonly associated with neoplastic processes; prognosis is related to the systemic condition and the initiation of therapy; A small group of patients suffer from chronic recurrent parotitis [16,17].



Figure 5: Woman with acute bacterial sialadenitis Treatment should be aimed at controlling the systemic conditions that trigger or predispose to the infectious process, reinforcing oral hygiene measures and irrigations, massaging the compromised gland can help drainage, if no drainage is achieved, then one can think about cannulation of the duct and its dilation. Penicillinase-resistant antibiotics such as semisynthetic penicillin (Oxacillins, Cycloxacillin, Methicillins) should be administered; or penicillins reinforced with clavulanic acid and second-generation cephalosporins. The combination with metronidazole or clindamycin to increase the spectrum against anaerobes. In chronic infections that are difficult to manage, third-grade cephalosporins or vancomycin can be added [3].

Chronic or relapsing bacterial sialadenitis

It mainly affects the parotid glands, although sometimes it also affects the submandibular glands bilaterally or alternately but asymmetrically. It is caused by *Streptococcus viridans*, *Escherichia coli*, and *Haemophilus influenzae* bacteria. It manifests itself with repetitive inflammatory episodes of fever, swelling, pain that limits mouth opening, and otalgia; general malaise, irritability, anorexia, trismus, cellulitis (edema, erythema and heat) of the surrounding skin; cloudy or purulent saliva may spontaneously emerge from the caruncles at the mouth of the duct when applying pressure, separated by asymptomatic periods and without accompanying systemic disease, three to four times a year, which makes the clinical picture a chronic process.

When the condition is acute, it can occur bilaterally; In chronic cases, it is almost always unilateral [19]. It can affect children aged 3-6 years with septic mouth (See Figure 6,7), the inflammatory process lasts 7 days, recurrences last until puberty and then disappear. It also affects women between 30-40 years old, in relation to menstruation, the inflammatory process lasts 14 days and recurrences usually progress in frequency and symptoms and require surgery for treatment. Treatment is specific antibiotic according to antibiogram. It should be prevented with oral hygiene, good hydration, local antiseptics, intracanalicular washings and sialogogues.



Figure 6 and 7: Six-year-old female patient with relapsing chronic sialadenitis with more than a month of evolution at the time she came for consultation. Courtesy of Dr. Otto Alemán Miranda.

It is important in these cases to institute therapy quickly, when exacerbation processes occur. There may be cases that have already suffered several processes together with the fact that they have not been treated adequately or the parents simply have not taken them to the consultation and when they come the patient may present an increase in volume of a hard consistency that limits mouth opening. and even, imaging has tumor characteristics because the parenchyma is not with its normal anatomy. In these cases of children, you have to be very cautious and carry out all the necessary procedures to make an adequate diagnosis.

Depending on the case and characteristics, prescribe anti-inflammatories, analgesics if pain, warm thermotherapy, mechanotherapy with opening and closing movements if there is limitation of mouth opening. Never think about going directly to surgery without being completely sure that it is a tumor and not an inflammatory process. Bacterial sialadenitis can also be specific when the etiology is specific microorganisms such as *Mycobacterium tuberculosis*, *Treponema pallidum* or *Actinomyces*. Obstructive sialadenitis It is the most common of all sialadenitis. Its etiology is related to the presence of stones (in this case we speak of sialolithiasis) or it may be due to other causes such as: malformations, cysts, inflammatory disorders, neoplasms, ionizing radiation. Any of the glands can be affected, although in 90% of cases it affects the submandibular glands or their excretory duct. In addition, it is more common in men (2:1 ratio compared to women) between 40 and 60 years of age.

These entities can become large in size since these conditions are not painful, except when they present with sialadenitis, where pain and functional impotence make patients come to our office.

Sialoliths are usually mucous plugs or microcalculi not visible radiographically in the parotid or radiopaque calcium carbonate and phosphate structures in the submandibles. It manifests clinically with intense and acute pain and swelling that increases when eating with signs of secondary infection: purulent exudate on painful and soft glandular palpation. Sometimes it can be accompanied by general symptoms: fever, poor general condition, leukocytosis. For the diagnosis, in addition to the patient’s symptoms, we rely on imaging tests that usually send a panoramic view, a lower occlusal view (See Figure 8), an oblique lateral view of the jaw where the calculus appears as a rounded radiopaque image. or elongated depending on the size of the sialolith. Additionally, an ultrasound or tomography may be ordered. When soft tissue obstruction of the duct is suspected, a sialogram is used. Once extracted, it appears yellowish in color (See Figure 9). A CT scan can also be requested to locate the stone, rule out other processes, chronic evolution [18].

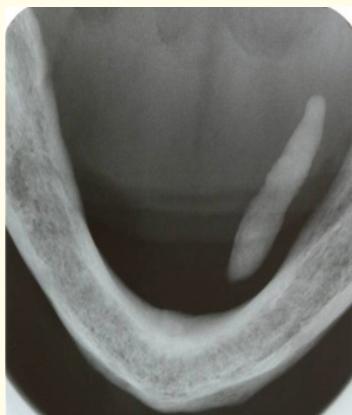


Figure 8: Occlusal x-ray of the floor of the mouth of an edentulous patient where the submandibular calculus is identified.



Figure 9: Moment of surgical removal of a submandibular sialolith in a completely edent older patient.

The presence of multiple stones is rare and even more rare is partial or total calcification of the gland. They can be single or multiple and their shape can vary between oval or rounded. The true cause is not known exactly, but there are several hypotheses and they agree that sialoliths are formed by the mineralization of various materials (detritus) that accumulate in the lumen of the duct, such as: bacterial colonies, foreign bodies, ductal epithelial cells. exfoliated or peeling, mucous plugs, cellular debris and microorganisms. In some cases, an organic matrix is first deposited, probably glycoproteins, on which the inorganic material is subsequently deposited and its mineralization begins. Chemically, the precipitating substances are made up mostly of phosphate and calcium carbonate. Microscopically, it presents concentric laminations of calcium deposits, inside which the organic focus that gave rise to the process can be found. Prerequisites for the formation of a salivary stone

- Condition that causes salivary stasis.
- Existence of an ideal site, niche or matrix for the formation of the sialolith.
- Metabolic alteration that facilitates the precipitation of mineral compounds. Clinically it manifests itself with swelling and pain, especially during eating. Bimanual palpation shows the presence of irregularly shaped stones with a hard, stony consistency.



Figure 10: 45-year-old male patient with a stone in the duct of the right submandibular gland. Courtesy of doctors José Jardón Caballero and Otto Alemán Miranda.



Figure 11: Calculus removed in its entirety. Courtesy of doctors José Jardón Caballero and Otto Alemán Miranda.

Sialadenitis due to ionizing radiation Radiotherapy treatment to the head and neck produces the destruction of the functioning parenchyma with fibrosis and decreased saliva production. From doses of 10 Gy and with doses of 50-60 Gy, the destruction of the parenchyma is irreversible [18]. Other less frequent sialadenitis are due to immunological, allergic causes... autoimmune pathology Sjogren's syndrome Sjögren's syndrome is a chronic systemic autoimmune disease characterized by the presence of a lymphocytic inflammatory infiltrate at the level of the salivary and lacrimal glands, which causes destruction of glandular tissue.

The most frequent and earliest symptoms are ocular and oral dryness, although extraglandular musculoskeletal, pulmonary, gastric, hematological, dermatological, renal and neurological manifestations may also develop. We are talking about primary Sjögren's Syndrome, which appears in isolation, and secondary, which is associated with other autoimmune diseases such as rheumatoid arthritis and systemic lupus erythematosus. Its prevalence varies from 0.5-4% of the general population, it is more common in women, between 40-60 years old, with a ratio of 9:1. The scarcity of symptoms, in the initial stages, causes a significant delay in diagnosis that can be up to 3 and a half years [20]. The classification criteria most frequently used are the 2002 European-American consensus [21].

In 2012, the American College of Rheumatology and the Sjögren's International Collaborative Clinical Alliance group developed new classification criteria [22].

Oral dryness makes it difficult for the patient to speak correctly, taste and chew food properly. Dry mouth is often the first symptom reported by these patients, who need to chew gum or suck candy constantly to stimulate their saliva production and wake up several times a night to drink a large amount of water. Oral dryness, therefore, significantly influences the quality of life of these patients [23,24].

Hyposialia must be confirmed through a thorough clinical history, a dry mouth questionnaire that reflects how xerostomia influences the patient's quality of life; This will record the symptoms and drugs taken, a measurement of salivary flow (sialometry) and a quantification of the degree of severity of oral dryness perceived by the patient using a visual analogue scale [20]. Symptoms are characterized by difficulty speaking, chewing and swallowing, taste disturbances and the need to continually drink water (even at night). In addition, there are a series of clinical signs associated

with hyposialia: the presence of dry and fissured lips, a coated, erythematous, fissured and depapillated tongue (See Figure 12,13), saliva with a stringy appearance, angular cheilitis, rampant caries in atypical locations, Occlusal wear, inflammation of the glands, mucositis and oral ulcerations.

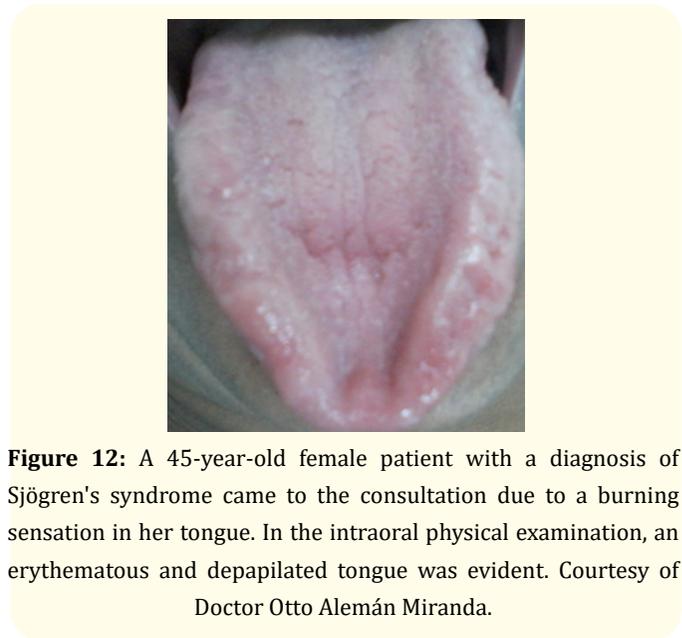


Figure 12: A 45-year-old female patient with a diagnosis of Sjögren's syndrome came to the consultation due to a burning sensation in her tongue. In the intraoral physical examination, an erythematous and depapillated tongue was evident. Courtesy of Doctor Otto Alemán Miranda.

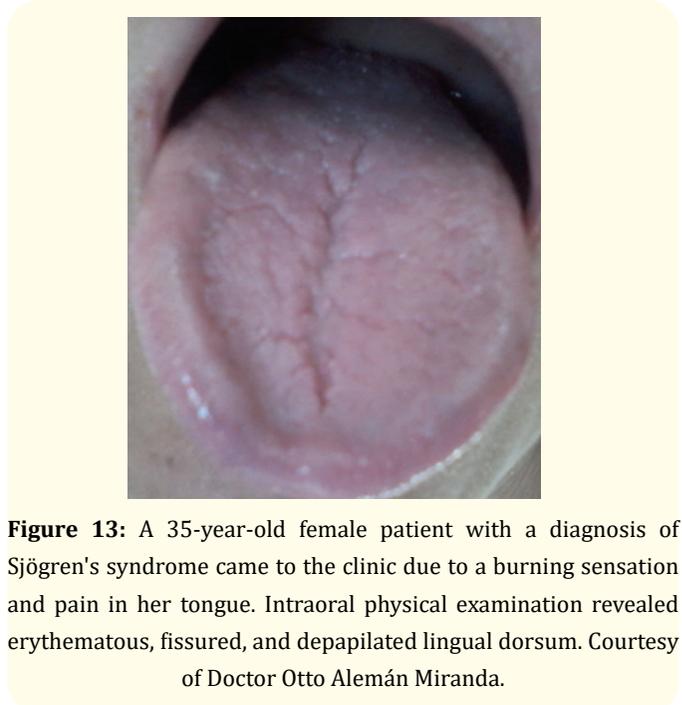


Figure 13: A 35-year-old female patient with a diagnosis of Sjögren's syndrome came to the clinic due to a burning sensation and pain in her tongue. Intraoral physical examination revealed erythematous, fissured, and depapillated lingual dorsum. Courtesy of Doctor Otto Alemán Miranda.

The main orofacial complications in this pathology are the loss of teeth, which makes it difficult for the patient to eat, and the development of lymphoma. Patients with primary Sjögren’s syndrome have a higher risk of developing lymphoma than the general population, which varies according to the series (SIR 2.52-48.1). 5-10% of cases will develop it [20]. You can also find patients who come to consultation due to an increase in the volume of the parotid gland, mainly bilaterally but it can be unilateral (See Figure 14).



Figure 14: A 56-year-old female patient diagnosed with Sjögren’s syndrome came to the clinic due to an increase in volume in the left parotid gland. The intraoral physical examination revealed xerostomia characteristic of the disease and the extraoral examination revealed facial asymmetry due to increased volume in the left parotid region of fibroelastic consistency, with normal-colored skin that was not painful on palpation. Courtesy of Doctor Otto Alemán Miranda.

Cystic pathology Mucocele They are cystic-looking formations that contain mucin inside, secreted mainly by minor salivary glands and the sublingual gland. They can be produced by:

- Extravasation of mucin from the excretory ducts to the surrounding tissue, occurs due to trauma in 80-90% of cases such as microtrauma, bites, repeated trauma from orthodontics or piercing. They are more common in children and adolescents in the minor salivary glands.
- Retention of saliva retained in a duct due to chronic irritation, more common in adults in the posterior part of the hard and soft palate. Clinically, mucoceles are characterized by presenting as a circumscribed, soft, painless swelling covered by a normal-looking mucosa.

They are superficial lesions, located under the lining mucosa, most frequently on the lips, buccal mucosa, ventral surface of the tongue and palate. They are translucent or bluish in color, of variable size, they may be asymptomatic or they may interfere with speech or chewing if they are large. They can recur and evolve into fibrotic tissue. **Ranula** It is a mucocele of the floor of the mouth

at the expense of the sublingual gland. They occur due to trauma, infections, congenital anomalies, or a history of intraoral surgery. Clinically, it is characterized as a painless, progressively growing, fluctuating, depressible lesion on one side of the floor of the mouth. They can reach several centimeters in size. We can find 2 clinical types of this injury: The simple or dissecting superficial ranula, which is located superficially on the floor of the mouth (See Figure 15).



Figure 15: Pediatric female patient diagnosed with cervical ranula. Courtesy of Doctor Roilán Niebla Chávez.

And the cervical or suprahyoid ranula or plunging ranula that is located at the submandibular level, giving an hourglass image due to perforation of the mylohyoid muscle (See Figure 16)



Figure 16: Pediatric female patient diagnosed with cervical ranula. Courtesy of Doctor Roilán Niebla Chávez.

The diagnosis is made clinically, a FNA can be performed where a mucous, viscous liquid with inflammatory cells and foamy macrophages will be obtained, a computed tomography or magnetic resonance imaging can also be performed where we can assess the anatomical extent of the lesion. Based on the clinical characteristics, we can make a differential diagnosis with other angiomatous lesions, vesiculo-ampullary lesions, benign tumors (lipomas, lymphangiomas, neurofibromas), malignant mucus-producing tumors (mucoepidermoid carcinoma) or cystic lesions of the neck (branchial cyst, thyroglossal duct, dermoid...) The treatment of these cystic lesions is their surgical removal. Tumor pathology Salivary gland tumors represent 3-6% of head and neck tumors in

adults and 8% in children. The most frequent location is the parotid glands in 80% of cases, with 90% of cases affecting the superficial lobe, 10% the submandibular glands and the remaining 10% the minor salivary glands, preferably on the palate, followed by the tongue, buccal mucosa and maxillary antrum. In relation to the malignancy or benignity of the tumors, 2/3 of the tumors are benign and their most frequent location is the parotid glands, 1/3 of the tumors are malignant and are most frequently located in the sublingual glands [20].

The most frequent age of diagnosis is the 4th decade, being uncommon in children under 15 years of age, they are also more common in women. The most common benign tumors are pleomorphic adenoma or mixed tumor, Warthin’s tumor or cystadenolymphoma. The most common malignant tumors are mucoepidermoid carcinoma, adenoid cystic carcinoma, and pleomorphic exadenoma carcinoma. Table 5 shows the clinical characteristics shared by benign and malignant salivary tumors.

Characteristics of benign salivary tumors	Characteristics of malignant salivary tumors
Slow growth (years)	Fast growth (months) or first slow and then fast
Non-adherent, mobile, painless	Adhered, fixed
Soft or hard-elastic consistency	Hard, stoney consistency
Without involvement of the facial nerve	Painful
Absence of limitation of mouth opening	Facial paralysis (parotid)
Not ulcerated	Limitation of mouth opening
No metastasis	Ulcerated
Little recurrence	Metastasis
Generally in young patients	Pyramidal growth shape
	Very recurrent.

Table 5: Clinical characteristics of benign and malignant salivary tumors. Benign salivary gland tumors Pleomorphic adenoma (mixed tumor, enclavoma, branchioma, endothelioma, enchondroma).

It is the most common benign salivary tumor. It appears mainly in the parotid gland in 84% of cases, in the submandibular gland in 50% , in the minor salivary glands of the palate, upper lip and buccal mucosa in 40 to 70% , and in the sublingual gland in 0.5% . It is more frequently diagnosed in women, with a maximum incidence in the 4th decade and is generally unilateral. Clinically, it presents as a single, hard, mobile, well-defined mass, not adhered to the skin or deep planes, slow growing, not painful, it can ulcerate if it affects the palate. They can be lobulated and irregular well delimited by a fibrous capsule, be multicentric and do not affect the skin or the facial nerve. Histologically, it is an epithelial tumor with great histological diversity, fibrous capsule, cellular pleomorphism, with epithelial and myoepithelial cells in a mesenchymal stroma [20-22].

The diagnosis is made clinically along with complementary tests such as computed tomography or magnetic resonance imaging where a well-defined tumor is seen, which does not infiltrate neighboring structures. And histopathology (BAAF), where hyaline cells, epithelial proliferation in bands or sheets, etc. have been observed. Other authors describe it as modified myoepithelial cells

with a myxoid, mucoid and chondroid appearance. The treatment consists of surgical removal with a safety margin to avoid recurrences (See Figure 17,18) [20].

The surgery has certain difficulties due to the proximity of the facial nerve. Periodic reviews should be carried out. They can malignant 3-5% of long-standing pleomorphic adenomas. Make it clear that the minimum surgical intervention that should be performed on the parotid gland is subtotal parotidectomy; incisional biopsy is contraindicated in the major salivary glands. In the case of the submandibular and sublingual glands, they are removed completely [20-22].

Lymphomatous papillary cystadenoma (Adenolymphoma, Warthin tumor) It is the second most common benign salivary neoplasm. The most frequent location is the parotid. It is the most common of all monomorphic adenomas (a term that is currently out of use). It is more common in patients in their 5th decade, males, and can be bilateral or multicentric. Clinically, it presents as a slowly evolving, fluctuating tumor with an asymptomatic cystic consisten-



17 18

Figure 17 and 18: Female patients of 55 and 54 years of age, with diagnoses of pleomorphic adenoma, who underwent subtotal parotidectomy with modified Blair and Finochietto incisions with good evolution. Courtesy of Doctor Otto Alemán Miranda.

cy. Histologically, it is a well-defined, encapsulated, cystic tumor with oncocytes in a stroma of lymphoid tissue. The diagnosis is made clinically along with complementary tests such as computed tomography or magnetic resonance imaging where a well-defined tumor is seen, which does not infiltrate neighboring structures [20,23,24].

A hyperuptake nodule will be observed in the scintigraphy. Treatment consists of conservative parotidectomy, superficial and partial lobectomy, recurrences are rare and second locations do not usually become malignant (See Figure 19).



Figure 19: 55-year-old male patient diagnosed with lymphomatous papillary cystadenoma. A subtotal parotidectomy was performed with a modified Finochietto incision, with good outcome. Courtesy of Dr. Otto Alemán Miranda.

Malignant salivary tumors Primary malignant tumors are 10 to 30% of salivary gland tumors and metastatic tumors are 3% of them. They are more common between 50 - 60 years old. The prognosis from best to worst in terms of location ranges from palate, parotid, submandibular and sublingual glands [20,23,24].

When the location is in the Parotid, the most common tumor is usually mucoepidermoid carcinoma, followed by malignant mixed tumor. When the location is in the submandibular, sublingual gland and minor salivary glands, it is adenoid cystic carcinoma. Mucoepidermoid carcinoma It is a mucin-producing epithelial malignant tumor that presents variable behavior depending on the histological grade. Its maximum incidence is in the 3rd to 5th decade, the most frequent in children and women, the most frequent location is in the parotid (See Figure 20), followed by minor salivary glands and submandibular gland. Clinically, it presents as a tumor with variable evolution time. If it is a low-grade or well-differentiated carcinoma, it will be a circumscribed swelling or nodule, slow growing, painless, and may fluctuate. They are the most frequent (75%) If, on the other hand, it is a highly malignant or poorly differentiated carcinoma: they grow quickly, are accompanied by pain, mucosal ulceration, and facial paralysis. Tendency toward recurrence and lymphatic and blood metastatic dissemination [20,23,24].

They have lower survival Histologically, if it is a carcinoma of: Low grade of malignancy, it will be < 4 cm, abundant cystic spaces filled with mucus, epidermoid cells and mucus-producing cells. Few mitoses, minimal cellular pleomorphism. In the case of highly malignant carcinomas, they will be > 4 cm, solid, few cystic areas, undifferentiated squamous cells, few mucoid elements and abundant evidence of malignancy. The treatment of choice is surgery followed by adjuvant radiotherapy.



Figure 20: 66-year-old male patient, diagnosed with mucoepidermoid carcinoma with intermediate degree of malignancy. For which surgical treatment was planned to carry out a radical parotidectomy extended to the skin with selective lymph node dissection of levels I, II, and III, and reconstruction with a deltoïd flap. Courtesy of German doctor Otto Miranda.



Figure 21: Recurrent mucoepidermoid carcinoma that infiltrated the skin. Courtesy of Dr. Carlos Juan Puig González.



Figure 22: Mucoepidermoid carcinoma that infiltrated the skin. Courtesy of Dr. Carlos Juan Puig González.

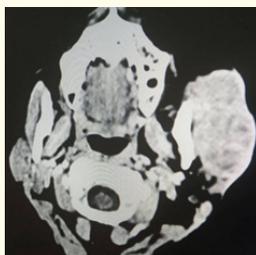


Figure 23: Computed axial tomography of the mucoepidermoid carcinoma presented above. Courtesy of Dr. Carlos Juan Puig González.



Figure 24: Mucoepidermoid carcinoma that infiltrated the skin. Courtesy of Dr. Carlos Juan Puig González.

Adenoid cystic carcinoma or cylindroma Malignant salivary tumor whose characteristic is infiltration, perineural, vascular and bone. He is known as “the wolf in sheep’s clothing.” Clinically it affects patients between 50 and 70 years old, especially women, and is located in the minor salivary glands (palate), submandibular and sublingual, and parotid. It is usually a nodular, firm, painful or sensitive tumor, ulceration of the mucosa, slow growth, nerve invasion (facial paralysis) and bone with a great tendency to local recurrence. It can produce distant metastasis (See Figure 25) (lung, cervical lymphadenopathy) [20,23,24].

Survival at 5 years is 65% and at 15 years it is 12% . Histologically, it is an isomorphic tumor without striking features of malignancy. Epithelial proliferation of ductal and myoepithelial cells bordering microspaces or cylinders following a tubular or solid pattern, difficult to diagnose and with perineural invasion. Treatment is surgical with margins and adjuvant radiotherapy. Local recurrences are frequent.

Malignant pleomorphic adenoma Primary malignant salivary tumor or malignancy of a mixed tumor of 10-20 years of evolution. Clinically, it is a rapidly growing tumor, poorly defined, adhered to deep planes and skin, pain, ulceration of the mucosa, neural involvement (facial paralysis), great aggressiveness and distant lymphatic and blood metastases. Recurrence may occur after 5 years in 55% of cases.



Figure 25: A 57-year-old male patient was diagnosed with adenoid cystic carcinoma with a cribriform pattern and lymph node metastasis. Radical parotidectomy with exhaustive lymph node dissection was planned. Courtesy of Doctor Otto Alemán Miranda.



Figure 26: Adenoid cystic carcinoma of the hard and soft palate. Courtesy of Dr. Carlos Juan Puig González.



Figure 27: Surgical excision with hemimaxylectomy of an adenoid cystic carcinoma of the maxillary mucosa that infiltrated bone. Courtesy of Dr. Carlos Juan Puig González.

The diagnosis is made through clinical symptoms, histology, and imaging tests such as CT or MRI. And the treatment consists of surgical removal with wide margins. Metastatic tumors in salivary glands Metastatic tumors in different locations of the body represent 25% of all malignant tumors and 3% of them are located in the salivary glands. The most common location is the parotid gland and the most common primary tumors are: melanoma, respiratory and digestive carcinomas, breast, kidney and colon [24].

The treatment is that of the primary tumor. If this is controlled, local surgery and pre- and post-operative radiotherapy can be considered in a metastatic tumor of the salivary glands, knowing that the prognosis will be poor. This topic is one of the most complex within the career; constant updating on the subject is important and necessary. Below, we leave you a summary table of the main complications and risks to which these patients are generally exposed.

Benign lesions	Lesiones malignas malignant lesions For surgical treatment Facial asymmetries and deformities Paresthesia Dysesthesias Unsightly scars or keloids Necrosis dehiscences Hemorrhages Infection Facial paralysis paresis Insufficient excision recurrence Inoculation of malignant cells to other tissues
For surgical treatment	Por el tratamiento quirúrgico
Facial asymmetries and deformities	Asimetrías faciales y deformidades
Paresthesia	Parestesias
Dysesthesias	Disestesias
Unsightly scars or keloids	Cicatrices inestéticas o queloides
Necrosis	Necrosis
dehiscences	dehiscencias
Hemorrhages	Hemorragias
Infection	Infección
Facial paralysis	Parálisis facial
paresis	Paresia
Insufficient excision	Excéresis insuficiente
recurrence	recidiva
Malignant transformation	Inoculación de células malignas a otros tejidos

Table 6: Board. Main risks and complications of benign and malignant processes, in relation to surgical procedures. Source: self made.

Benign lesions	Malignant lesions
Due to the benign lesion	Due to the malignant lesion
Facial asymmetry and deformity	Facial asymmetry and deformity
Pain	Pain
Limitation of mouth opening	Limitation of mouth opening
Taking of the general condition	Infiltration of the skin and neighboring tissues
Salivary physiology condition	Facial paralysis
Remote organ involvement	Regional metastasis
Malignant transformation	Distant metastasis
	Patient death

Table 7: Board. Main risks and complications of benign and malignant processes, in relation to injuries in general. Source: self made.

Conclusion

The main complications and risks of salivary gland conditions, as well as their sequelae, were described. Based on an exhaustive review of the literature, as well as the author's previous experience. These injuries have a high international morbidity rate and cause multiple physical, mental and social conditions.

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