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**ВОСПАЛИТЕЛЬНЫЕ ЗАБОЛЕВАНИЯ  
СЛЮННЫХ ЖЕЛЕЗ.  
СЛЮННОКАМЕННАЯ БОЛЕЗНЬ**

**INFLAMMATORY DISEASES  
OF SALIVARY GLANDS. SALIVARY  
CALCULUS DISEASE**

Учебно-методическое пособие



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**INFLAMMATORY DISEASES OF SALODENS. SIALOLITHIC DISEASE**

Учебно-методическое пособие

На английском языке

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# INFLAMMATORY DISEASES OF SIALODENS

## MOTIVATIONAL CHARACTERISTICS OF THE TOPIC

**Topic lesson time:** 270 minutes.

Sialoadenitis is one of the most common diseases of the salivary glands. Parotid glands are more often involved in the inflammatory process, which is explained by the presence of narrow and highly branched ducts, low mucin content and low resistance to toxic effects of serous enzyme-producing glandular acinus. The submandibular gland is more characterized by the development of an inflammatory process against the background of salivary stone disease as a result of thickening of saliva and its difficult outflow from the gland. It is extremely rare that sublingual and small salivary glands are involved in the inflammatory process.

**The purpose of the lesson:** to get acquainted with the clinical manifestations, diagnosis and basic principles of treatment of inflammatory diseases of the salivary glands.

**Tasks of the lesson.** The student must learn:

1. Collect complaints, anamnesis of the disease and identify early clinical symptoms characteristic of inflammatory diseases of the salivary glands.
2. Make a patient examination plan.
3. Make a treatment plan for patients.
4. Choose the method of treatment depending on the diagnosis and clinical course of the disease.

Requirements for the initial level of knowledge. To fully assimilate the topic, the student must repeat:

- from human morphology: anatomical and topographic position, blood supply and innervation, histological structure and structural features of salivary glands;
- maxillofacial surgery: examination of patients with pathology of the maxillofacial region.

**Control questions from related disciplines:**

1. What is mixed and isolated saliva?
2. How are the salivary glands divided depending on the nature of secretion?
3. What is the peculiarity of the structure of the parotid glands?
4. What is the peculiarity of the structure of the submandibular glands?
5. What functions do the salivary glands perform?

## ANATOMICAL AND FUNCTIONAL CHARACTERISTICS

Three pairs of large salivary glands (parotid, submandibular, and sublingual) and numerous small salivary glands (SG) — lip, palatine, cheek, and lingual glands — are organs of external and internal secretion. According to the nature of secretion, small SGs are divided into proteinous, having tubular structure,

mucous and mixed, having alveolar-tubular structure. Alveoli are round and lined by secretory cells, ducts have myoepithelial cells in walls structure. Major salivary glands have alveolar-tubular lobular structure: they are composed of alveoli, ducts and interstitial tissue. There are distinguished inset, intradollicular and main outlet ducts. The main parotid SG outlet duct (ductus parotideus) opens at the level of the 2nd upper jaw molar on the cheek mucosa; the main submandibular SG outlet duct (ductus submandibularis) opens on the mucosa of sublingual area at the level of front lower incisors (caruncula sublingualis), The outlet duct of the sublingual SG (ductus sublingualis) may have an independent outlet on the mucous membrane of the sublingual region (several outlet openings in case of scattered structure) or join the duct of the submandibular SG. The parotid SGs produce protein secretion, submandibular — mixed secretion, and submandibular — mucous secretion (A. V . Kraev, 1978).

### FUNCTIONS OF THE SALIVARY GLANDS

Salivary glands are a group of organs that perform certain functions, the main of which are the following:

1. Digestive — wetting of food and the formation of a food lump (saliva is 10–20 % of the amount of food), enzymatic processing of food (the secret contains digestive enzymes such as amylase, lipase, protease, phosphatase, etc.). Salivary glands are functionally connected with other organs of the digestive system.

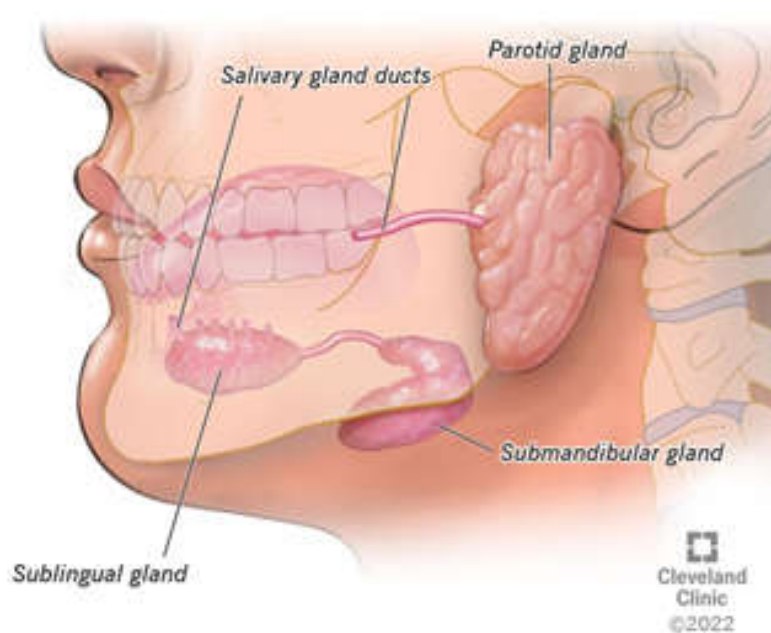
2. Excretory. Salivary glands remove metabolites, heavy metal salts and other substances from the body.

3. Protective. Mucin creates a protective film for the teeth and the oral mucosa. Antimicrobial protection is carried out due to the presence of nonspecific protection factors in saliva: lysozyme, interferon, RNase, DNase. The presence of blood clotting factors in saliva and fibrinolytic activity ensure adequate hemostasis, cleansing of the wound surface and regeneration of oral tissues in case of injuries.

4. Trophic for organs and tissues of the oral cavity.

5. Maintenance of water-salt homeostasis. Through the salivary glands, the circulation of water and organic and inorganic chemical compounds in the body is carried out: from the blood they enter the saliva, then into the gastrointestinal tract and again into the bloodstream.

6. Endocrine. Salivary glands secrete biologically active substances into the bloodstream: kallikrein; renin; parotin; calcitonin-like substance; nerve, epidermis and growth factors mesoderms; erythropoietin; insulin-like substance; mortality factor, etc. There is a clearly expressed structural and functional relationship of the salivary glands with the endocrine organs (fig. 1).



*Fig. 1.* Major salivary glands  
 (<https://my.clevelandclinic.org/health/body/23462-salivary-glands>)

## SIALOADENITIS

According to localization, a distinction is made between inflammatory diseases:

- parotitis of the parotid salivary glands;
- submandibular salivary glands — submandibulitis;
- sublingual salivary glands — sublingual glands;
- small salivary glands.

According to the course they are divided into:

### 1. Acute:

- viral (epidemic, influenza);
- bacterial (serous, purulent, gangrenous).

### 2. Chronic:

- nonspecific (parenchymatous, interstitial, sialodochitis, mixed);
- specific (tuberculosis, actinomycosis, and syphilis).

## ACUTE SIALOADENITIS

Viral epidemic sialoadenitis is an acute infectious disease that most often affects the parotid salivary glands. Therefore, it is more commonly referred to as viral epidemic mumps or mumps.

**Epidemic parotitis (MUMPS)** is an acute infectious disease caused by a filtering virus, the latter was first isolated in 1934 by Johnson and E. Goodpasture. It is characterized by inflammation of large salivary glands. In typical clinical form of the disease parotid glands are affected in 85.1 % of cases, more rarely submandibular glands in 10 % and sublingual glands in 4.9 % of cases (V. N. Remorov, 1961). In atypical form of the disease parotid glands are not involved in the inflammatory process. Mumps virus, in addition to salivary glands and saliva, is present in cerebrospinal fluid, nerve tissue and some organs (heart muscle, pancreas, testicles and their appendages). Children are more often affected, while adults are less common. Children of 5–6 years of age and those of early school age are the most common sufferers. A peculiar feature of mumps is that the disease spreads during epidemic outbreaks. Sick people are a source of infection and spread the disease. However, in some cases it is not always possible to identify contact with a sick person. Asymptomatic forms of epidemic mumps, detected only upon virological examination of a patient, have been described (V. N. Remorov, 1961). Infection occurs by droplet route. Virus with droplets of saliva enters the body through the nasal mucosa, oral cavity, palatine tonsils and conjunctiva of the eye. The incubation period varies from 11 to 23 days. Depending on the severity of the clinical manifestations of the disease, there are three forms: mild, moderate and severe. There are also uncomplicated and complicated clinical forms of the process

***Clinic.*** The disease is characterized by an acute onset.

A mild form of mumps occurs against the background of a weakly expressed general reaction of the body, which is expressed in a feeling of lack of awareness, and a slight swelling of the parotid salivary glands (sometimes at first one). After a week, as a rule, recovery occurs.

Epidemic mumps of moderate severity is accompanied by an increase in body temperature to 37.5–38 °C, headache, decreased appetite. Locally, there is an increase in salivary glands in volume, a decrease in salivary separation, sometimes hyperemia of the mouth of the excretory duct, pain in the affected salivary glands. After 3–4 days, acute phenomena begin to gradually disappear.

The severe form proceeds with pronounced intoxication of the body: an increase in body temperature to 39–40 °C, muscle pain appears, sometimes bradycardia, a decrease in blood pressure. Locally: pronounced enlargement of the parotid salivary glands, abscessing, sometimes the submandibular and sublingual salivary glands are involved in the process, the puffiness of the face appears, the mucous membrane of the oral cavity is hyperemic, the excretory duct may be compacted. There is a sharp decrease in salivation, sometimes salivation stops. On day 5–6, the temperature begins to decrease, there is an improvement in general well-being, inflammatory phenomena subside. Recovery occurs in 2–3 weeks.

At first, only one parotid gland may increase. The swelling appears against the background of a sharp increase in temperature. Then the body temperature

decreases somewhat and after 1–2 days the other parotid gland swells. The enlargement of the gland is again accompanied by a sharp increase in temperature. A constant symptom that accompanies the disease is pain in the enlarged parotid gland. Enlarged parotid glands fill the post-maxillary pits and lift the lobes of the auricles. The skin above the swelling is edematous, the color is usually not changed. Palpation of the gland is sharply painful. The swelling is of a testy consistency, without clear boundaries, there is no fluctuation. Opening the mouth is difficult due to soreness. Pain sensations are intensified when chewing, when eating spicy food. There is a symptom of Hatchcock (Hatchcock) — soreness when pressing in the area of the angle of the lower jaw, as well as a symptom of Tresilian-Murson (Tresilian-Mourson) — a hyperemic border of the mucous membrane around the mouth of the excretory duct of the parotid gland. Salivation is usually lowered. Salivation stops completely from the mouth of the excretory duct. Clinical manifestations of mumps are variable. Suppuration of the gland is extremely rare.

Less often, the submandibular and sublingual glands are involved in the inflammatory process. With submaxillitis, a dense and painful swelling is detected inside the lower edge of the lower jaw, sometimes swelling spreads to the upper third of the neck. The symptoms of the disease increase within 3–5 days, then remain at the maximum level for 4–7 days and the signs of the disease decrease within 4–7 days. In general, the disease lasts 2–4 weeks.

Most patients have no complications. In severe form, when various salivary glands are involved in the process, complications may occur in the form of damage to the central nervous system: meningitis, paralysis, mental disorders. Sometimes orchitis joins, which proceeds with severe pain, fever, ends, as a rule, safely, testicular atrophy rarely occurs. Cases are described when the course of mumps is complicated by mastitis, pancreatitis, nephritis, etc.

Differential diagnosis should be carried out with acute non-epidemic mumps, exacerbation of chronic mumps, sialoses, Mikulich's disease, false Herzenberg mumps.

**Laboratory blood** and urine tests in patients with mumps have no specific changes (except for high levels of blood alpha-amylases and urine diastases) and correspond to normal inflammatory processes. The degree of severity of changes in laboratory tests is directly dependent on the severity of the clinical course of the disease. Among the complications of mumps, which are usually rare, there may be lesions of the nervous system (meningitis, encephalitis, neuritis, etc.), orchitis, diseases of the gastrointestinal tract (pancreatitis, etc.) and respiratory organs (pneumonia), cardiovascular system, organs of vision, hearing, etc. In most cases, the outcome of the disease is favorable. After suffering an epidemic mumps, there remains a stable immunity.

**Differential diagnosis** should be carried out with cytomegaly of the salivary glands, influenza sialadenitis, acute bacterial sialadenitis, sialosis, Mikulich's disease, pseudoparotitis of Herzenberg.

**Treatment.** Patients are prescribed copious drinking, bed rest for 7–10 days, complex anti-inflammatory therapy (antibacterial agents, NSAIDs, antihistamines), detoxification, symptomatic therapy, local thermal procedures: warming compresses with camphor oil, sollux, UHF, oral irrigation with interferon solutions, deoxyribonuclease, ribonuclease, etc. vitamins A, C., multivitamins.

With the development of complications, PST of abscesses should be added to the complex treatment.

**Viral influenza sialoadenitis** is an inflammatory disease of the salivary glands caused by influenza viruses, adenoviruses, etc. There is a lesion of both large and small salivary glands. They are characterized by inflammatory infiltration of salivary gland tissue, lymphoid tissue surrounding the salivary glands of fiber. Accompanied by a decrease in the function of salivation to asialia, an increase in salivary glands in volume. There are mild, moderate and severe forms of the course of these diseases. The defeat of the salivary glands in viral etiology is more often manifested already against the background of pronounced signs of the underlying disease or against the background of the subsiding of acute phenomena, less often the salivary glands are affected primarily. As a rule, against the background of symptomatic treatment, acute inflammatory phenomena subside after 7–10 days, and inflammatory infiltration persists for a long time (from 2–3 weeks to several months), causing the main concern to patients. Sometimes these patients forget about whether they were sick with the flu or acute respiratory infections, or do not attach due importance to this. Therefore, they do not know which doctor they should go to, and often get to dentists after contacting surgeons, ENT doctors, oncologists, etc. Dentists should remember this and when collecting anamnesis, it is necessary to clarify the circumstances preceding the defeat of the salivary glands.

Other viral diseases of the salivary glands include such rare diseases as cytomegaly (caused by the herpes virus), enterovirus lesions (Coxsackie virus), etc.

More often observed in parotid SGs, which is associated with the absence of mucin in the secretion of these glands, which gives saliva viscosity and prevents the penetration of infection into the streaming system. Inflammatory process in submandibular, submandibular and small SGs is observed much less frequently, respectively.

Salivary gland cytomegaly is a viral disease (the virus enters the body through the placenta) that mainly affects newborns and infants. The disease may manifest itself by affecting only salivary glands or with predominance in the clinical picture of general changes (in the lungs, kidneys, liver and gastrointestinal tract). According to observations of L. Sazam (1971) in salivary glands it is manifested



by inflammation and formation of small cysts (due to blockage of small salivary ducts by giant epithelial cells). The prognosis is unfavorable. Patients die from the effects of viral toxemia.

### **BACTERIAL SIALODENITIS**

Purulent-necrotic parotitis (synonyms: postoperative, postinfectious, cachectic, marantic). This sialadenitis occurs more frequently in the parotid glands. This fact can be explained by the fact that the submandibular, hyoid and small salivary glands secrete saliva, which contains a large amount of mucin that prevents the penetration of microflora from the oral cavity into the ducts of the glands. Purulent-necrotic parotitis occurs more often in the elderly and the elderly with severe diseases (cardiovascular, infectious, cachexia, senile dementia, chronic diseases of the gastrointestinal tract, etc.). It may occur after surgical interventions on abdominal organs (appendicitis, peritonitis, gastric resection, etc.), as well as after gynecological operations. The secretory function of parotid glands is impaired in diseases of the gastrointestinal tract: chronic gastritis, gastric cancer, peptic ulcer and 12-period ulcer. The degree and character of the disorder depends on the type and duration of the disease, on the acidity of the gastric juice (E. F. A. Bichkene, 1989).

Inflammation of the gland develops, as a rule, during the first week after the surgery. A decisive factor in the development of the inflammatory process in the gland will be reduced or temporary absence of saliva secretion from the gland, which creates conditions for ascending (ductogenous) spread of infection from the oral cavity (staphylococci, streptococci, etc.). Predisposing factors in the development of purulent-necrotic parotitis are dehydration of the patient and the presence of foci of chronic infection in the oral cavity and pharynx (A. V. Klementov, 1975). An important role in the development of pathological process is given to toxic products of tissue decay, leading to activation of proteolytic enzymes and autolysis of glandular tissue (L. Sazama, 1971; V. M. Sapozhnikov, 1978 and others). In some cases hematogenous way of infection spreading is possible (in pneumonia pneumococcus can be isolated from purulent focus in the gland, and in meningitis — meningococcus, etc.). At the initial stage of the disease, serous inflammation develops in the parenchyma of the salivary gland, i.e. acute serous sialadenitis. As the activity of the inflammatory process increases, leukocytic infiltration of the gland tissue increases and foci of purulent inflammation are formed in it. But since the patient's body is often weakened (decreased reactivity) due to concomitant diseases or as a result of surgical intervention, there are foci of necrosis in the parenchyma of the affected gland, which can cover a large area of the salivary glands ometimes the entire gland (fig. 2).



*Fig. 2. Bacterial sialadenitis*

([https://probolezny.ru/media/bolezny/parotit-gnoynyy/otyok-i-pokrasnenie-okoloushnoy-zhelezy-12\\_s.jpeg](https://probolezny.ru/media/bolezny/parotit-gnoynyy/otyok-i-pokrasnenie-okoloushnoy-zhelezy-12_s.jpeg))

The appearance of parotid gland swelling is accompanied by a sharp dryness in the oral cavity. Body temperature ranges from subfebrile to high. On palpation, the gland is compacted and painful. The swelling is more often diffuse and captures anatomical areas adjacent to the gland. The skin is cyanotic or not changed in color, edematous, pasty, not going into a fold, infiltrated. The external auditory canal is narrowed. Due to the involvement of the masticatory muscle in the inflammatory process, inflammatory contracture of the masticatory muscles is possible. When the deep lobe of the parotid gland is affected, patients experience pain when swallowing. The mucous membrane of the oral cavity is dry and hyperemic. When massaging the parotid gland, saliva cannot be obtained, but sometimes you can get a drop of pus. In some cases, the inflammatory process in the parotid glands can be bilateral. The degree of severity of inflammatory changes on the left and right may be different. According to the observation of I. F. Romacheva et al. (1987) sometimes the submandibular glands may also be involved in the inflammatory process. Differential diagnosis should be carried out with other acute sialadenitis, as well as phlegmon of the parotid region. Treatment should begin from the moment the first clinical signs of the disease appear. Conservative treatment of purulent — necrotic mumps often remains unsuccessful. It makes no sense to expect the appearance of foci of fluctuation, because firstly, even if a small purulent focus is formed, it is located deep in the tissues — under the capsule of the gland and it is impossible to determine it; secondly, with purulent — necrotic mumps, necrotic changes in the gland tissues prevail; thirdly, untimely surgical intervention can lead to the spread of the inflammatory process to adjacent anatomical areas and to the generalization of infection (sepsis). Patients undergo surgical disclosure of the purulent-necrotic focus by extra-oral access (incision according to G.P. Kovtunovich), followed by necrotomy and drainage of the focus by tubular drains. In the postoperative period, patients are prescribed anti-inflammatory and detoxification treatment. The

healing of purulent-necrotic wounds takes a long time due to the fact that the entire gland tissue is necrotized in the future.

**Lymphogenic parotitis** (pseudoparotitis Herzenberg). The lymph nodes located in the parenchyma of the parotid gland receive lymph from the outer ear, eye, peritonsillar region, molars of the upper and lower jaws, nasopharynx, tongue root (R. P. Herzenberg, 1926; R. D. Sinelnikov, 1973; A. I. Paches, 1983). When the pathological focus is localized in the previously listed areas (acute periodontitis, periostitis, osteomyelitis of the upper and lower jaws in the molars, tonsillitis, otitis, conjunctivitis, etc.), acute serous lymphadenitis of the intracapsular lymph node of the parotid gland may occur. This acute serous lymphadenitis was suggested by R. L. Herzenberg in 1926 to be called false parotitis. In honor of the author, this disease is called false Herzenberg mumps. This disease cannot be attributed to sialadenitis, because it is essentially a lymphadenitis node, which is located in the parenchyma of the parotid gland. In the future, acute inflammation in the lymph node can be safely resolved and the patient recovers. But in some cases (with the progression of the inflammatory process in the area of the molars of the upper and lower jaws, palatine tonsils, etc.), suppuration of this intracapsular lymph node may be observed.

The capsule of the latter melts and the purulent focus drains into the ducts of the parotid gland. Thus, infection of the parenchyma of the gland occurs and lymphogenic mumps develops. Suppuration of the lymph node may not occur typically, i. e. without pronounced periadenitis. In the typical course of the inflammatory process, the size of the infiltrate in the parotid — chewing area increases sharply, its boundaries become less clear, the pain increases, there is a feeling of bursting in the area of the pathological focus, the symptoms of intoxication increase (body temperature rises, etc.). A pathognomonic symptom of the onset of acute lymphogenic mumps will be the appearance of purulent exudate in saliva (cloudy purulent saliva) and hyperemia of the mouth of the excretory duct. With lymphogenic mumps in the dynamics of the disease, it is possible to identify significant violations of the function of the salivary gland: a decrease in salivation and a decrease in the indicators of local resistance of the body (O. V. Titarenko, 1994). In chronic lymphogenic sialadenitis, a dense, slightly painful infiltrate is palpated in the thickness of soft tissues. With a prolonged course of the process and repeated relapses of the disease, the skin above the altered lymph node becomes cyanotic, there are scars on the site of previously opened abscesses or fistulas with mucopurulent discharge. The mouth of the excretory duct is edematous and hyperemic, sometimes gaping. When massaging, purulent exudate is released from the duct.

## CONTACT SIALADENITIS

Acute contact sialadenitis occurs as the passage of the inflammatory process by contact from the surrounding salivary gland (parotid, submandibular and sublingual) anatomical areas in cases of pyoinflammatory processes in the soft tissues (severe course of parotid-cheek or cheek phlegmon or periapharyngeal space, decreased body reactivity, insufficient or incorrect pustular dissection, etc.). It should be noted that contact sialadenitis is much more common than diagnosed. This is due to the fact that the patient receives drug therapy for the treatment of the underlying disease (phlegmon), and this leads to the cure of sialadenitis. Chronic contact sialadenitis occurs only in the parotid gland. A dense and little painful infiltrate resembling a tumor-like mass is palpable in the soft tissue thickness. There is contracture of the lower jaw, there can be extraoral and intraoral fistulas with purulent discharge. On the skin there were postoperative scars from previously opened pustules. Most often saliva cannot be obtained when massaging the vas deferens, and its orifice is unchanged. When the lower jaw is radiographed, an osteomyelitic focus in the bone can often be detected.

Sialadenitis caused by the introduction of a foreign body into the duct of the gland Acute obturation sialadenitis caused by the introduction of a foreign body into the outlet duct of the large salivary gland occurs more often in the submandibular gland, less often in the parotid gland. Patients can usually quite accurately indicate the moment of foreign body (straw or other) introduction into the duct of the gland, as they feel a prick under the tongue or in the mucous membrane of the cheek. During the first days after the introduction of the foreign body, the swelling may barely bother the patient (there is only a slight swelling in the area of the gland). There is an inflammatory reaction around the foreign body (in the duct wall). After a short period of time the patient notes that while eating he has pain and swelling in the corresponding gland. After a few hours, the swelling decreases or disappears completely. After eating or eating, the pain and swelling return. If you palpate the affected gland you will notice that it is hard and very painful. In some cases, when the duct is massaged, pus-like saliva can be obtained. The clinical picture of this sialadenitis is very similar to calculous. A foreign body can become the center of salivary stone formation (A. V. Klementov, 1960, 1975; I. F. Robustova et al., 1987). Later the affected gland may suppurate, i. e. a clinical picture of acute purulent sialadenitis develops (swollen and painful gland increases, no discharge from the duct, dense and sharply painful inflammatory infiltrate is determined by palpation, symptoms of intoxication appear). At opening of the outlet duct of the gland a foreign body may be found, which is excreted with a large amount of stagnant or purulent saliva. Spontaneous opening of the abscess is possible. Medication treatment for this sialadenitis is the same as for other acute inflammations of the salivary glands. If the foreign body could not be removed, the

inflammation turns into a chronic form with subsequent recurrences of the disease, which requires more radical treatment — removal of the gland.

Chronic sialadenitis most often occurs in the parotid glands, less often in the submandibular and sublingual glands. Chronic sialadenitis is most often caused by nonspecific pathogens, very rarely by specific ones (actinomycosis, tuberculosis, etc.). Paired salivary glands in some cases may both be involved in the inflammatory process, but it often does not happen simultaneously. At first, signs of the disease are detected in one gland and then in the other. Common clinical signs for all forms of chronic sialadenitis are the following: inconspicuous onset of the disease, recurrent and progressive character of the course, resistance to conservative therapy. We recommend to follow systematization of A. M. Solntsev et al. (1991), who allocate the following forms of chronic sialadenitis: parenchymatous parotitis; sclerosing (interstitial) submaxillitis; calculous; posttraumatic; lymphogenic; contact; sialodochitis; specific. I. F. Romacheva et al. (1987) consider it necessary in each form of chronic inflammation of the salivary gland to distinguish groups of patients with different degree of pathological symptoms, which correspond to the initial, clinically pronounced and late stages of the disease.

## CHRONIC NON-SPECIFIC SIALOADENITIS

### Chronic interstitial sialoadenitis

**Synonyms:** *sclerosing submaxillitis* (Küttner's inflammatory tumor, interstitial sialadenitis, chronic productive sialadenitis, fibroductive sialadenitis, etc.). Sclerosing submaxillitis occurs in 3.2 % of all chronic sialadenitis. This disease was first described by Küttner (1896). The etiology of this disease has not been elucidated. S. Rauch (1959) points to the possibility of a mycotic or parasitic etiology of the disease, mentioning that along with mixed microbial flora, leptotrichs, blastomycetes, etc. are found in preparations. Some authors believe that the disease may be caused by metabolic disorders, changes in the electrolyte composition of saliva, immunopathological reactions (G. Seifert, 1966). In the opinion of A. M. Solntsev et al. (1991) in the pathogenesis of sclerosing submaxillitis the clotting of saliva and obstruction of its outflow, which is promoted by the presence of congenital diverticula and ectasia of submaxillary duct is important.

**Clinic.** It occurs more often in young men. It may be affected bilaterally. Can be detected in children. It is characterized by a dense, painless enlargement of the submandibular gland. The boundaries of the gland are clear. In some cases, the gland can be fused with the surrounding tissues and even the skin, there is its painfulness, which resembles the development of a malignant tumor in the patient. Exacerbation of chronic inflammatory process is accompanied by an increase in swelling and pain, symptoms of intoxication. The tumor-like formation increases slowly (over

several years), the regional lymph nodes may be enlarged. The opening of the mouth is free. The mouth of the conduit is narrowed, but unchanged. There is no salivary secretion from the submandibular exit duct. A sialogram shows narrowing of an exit duct of the submandibular gland, intra-glandular ducts and parenchyma of the gland are not determined. In some cases a sialogram may show dilation and irregular discontinuity of salivary ducts, which resembles a sialographic pattern of a malignant tumor. Histological picture — there is an overgrowth of sclerosed connective tissue, containing areas with lymphoid follicles and duct remnants, surrounded by a thick layer of fibrous tissue.

The differential diagnosis of chronic sclerosing submaxillitis (Kuttner's inflammatory tumor) should be made with calculous submaxillitis, sialosis, syndromes with involvement of large salivary glands and salivary gland tumors. Clinical diagnosis of the disease is often difficult and the final diagnosis is made only after histologic examination of the tissue after extirpation of the submandibular gland (fig. 3).



*Fig. 3.* Chronic interstitial sialoadenitis

(<https://www.krasotaimedicina.ru/upload/iblock/c44/c4420fdc12318c1a0486557a12ea98bc.jpg>)

**Treatment.** Can be divided into general and local. General treatment is aimed at elimination of possible causes of hypossialism or treatment of the underlying disease. If immunological changes are revealed the thymus gland preparations are used, for example thymogen (Skuratov A. G., 1997). Local treatment is mainly symptomatic. During an exacerbation, treatment consists of heat procedures: dry heat, compresses with camphor oil, drilling through the ducts with antiseptic solutions: furacilin, revanol, proteolytic enzymes; inside analgesics, an oil solution of vitamin A, 6–8 drops three times a day after meals. Antibiotics are not prescribed for this form of lesion. During remission periods, follow-up observation is limited. In later stages, preparations of steroid hormones, X-ray irradiation of the salivary glands are prescribed (Solntsev et al., 1983). If conservative treatment is ineffective, surgical treatment — salivary gland extirpation.

## Chronic parenchymatous sialoadenitis

Parenchymatous parotitis Synonyms of this disease include: chronic recurrent parotitis, primary chronic parenchymatous parotitis; cystic parotitis; ductular parotitis; chronic sialectatic parotitis; lymphosialadenopathy, etc. According to O. V. Rybalov (1985) among all patients with chronic sialadenitis, chronic parotitis occurs in 90 % of cases in children. According to observations of B. S. Kolesov (1987), parenchymatous parotitis is also the most frequent form of chronic inflammation of salivary glands and accounts for 41.5 % of the total number of chronic sialadenitis (this group also includes sialodochitis). The most argued point of view on the cause and mechanism of chronic parotitis is that this disease arises due to congenital anomaly of salivary glands — cystic dilatation of end (intralobular) branches of gland ducts, which is called globular ectasia or sialangiectasia (O. V. Rybalov, 1985; I. F. Romacheva et al., 1987; A. M. Solntsev et al., 1991; etc.). According to B. C. Kolesov (1987) progression of parenchymatous parotitis is connected, on the one hand, with the influence of oral microflora, which penetrates into gland by ductogenous (ascending, ductal) way, and on the other hand — with alteration of gland parenchyma, appearance of denatured proteins, which are autoantigens and cause immunopathological reactions development. One of the manifestations of immunopathological reactions is proliferation of epithelium and myoepithelium of intralobular ducts discovered by the author in the late stages of the disease, which makes it similar to autoimmune process revealed in Sjögren's syndrome. However, unlike Sjögren's syndrome, parenchymatous parotitis never shows formation of epimyoepithelial islets, which are one of the typical morphological features of Sjögren's syndrome. Parenchymatous parotitis occurs more often in women than in men. The age of patients varies from 1.5 to 75 years, but most frequently (about 51 %) in childhood (A. M. Solntsev et al., 1991). According to the authors, unilateral lesion is observed in 44 % and bilateral — in 56 % of cases. The evidence of bilateral involvement of parotid glands will be changes that are found in sialography. According to O. V. Rybalov (1985), parotitis parenchyma can have three forms: asymptomatic (latent), subclinical (inactive) and clinically active (manifest). At the same time, these forms can be combined in the same patient, i. e. latent or inactive in one gland and manifest in another.

**Clinic.** In the initial stage of the disease, mumps is asymptomatic. Chronic parenchymatous parotitis can be detected only during casual examination of a patient or due to exacerbation of inflammatory process (I. F. Romacheva et al., 1987). A sialogram will show single round-shaped cavities (1–2 mm in diameter) filled with X-ray contrast against the background of unchanged ducts and parenchyma of the gland. Examination of patients at this stage of the disease does not reveal facial asymmetry, and unchanged saliva is secreted from the parotid gland's discharge duct. Sialometry is normal.

In the clinically pronounced stage, patients complain of intermittent pain in the gland, its swelling, changes in the taste of saliva (brackish, a taste of pus, etc.). Examination of patients may reveal one or two parotid glands that are enlarged and have a dense elastic consistency. Viscous saliva, possibly with streaks of mucus, fibrinous inclusions, or white flakes, is secreted from the exit duct, the mouth of which is unchanged. Sialometry usually reveals no changes. Cytological studies by I. F. Romacheva et al. (1987) prove the presence of mumps in patients, as the saliva shows areas of mucus, a moderate number of neutrophils, cubic epithelial cells, bacilloid cells, epithelial cells with altered morphology.

And during exacerbation, the number of inflammatory exudate elements increases. Sialograms show changes — a large number of cavities (2–3 mm in size) filled with radiopaque substance, intraglandular ducts are not determined, I-order ducts are discontinuous. The same changes are observed in the accessory parotid gland lobe. Main patent duct is dilated, a little deformed, less often — unchanged. In the advanced stage of the disease patients complain of recurrent swelling of the parotid region, pain in the gland, dry mouth. On examination the gland, and in case of bilateral process — both glands are enlarged, dense, little or no pain. There may be scars on the skin of the parotid-chewing area from earlier incisions for purulent parotitis. Oral mucosa is usually unchanged, but may be less moist in some cases. The orifice of the vas deferens is gaping; when massaged, viscous, jelly-like saliva with streaks of mucus and fibrous inclusions is secreted. Sialometry indicates a sharp decrease in salivary flow from the affected gland. Sialography — cavities in the gland reach the largest size (from 3–4 mm to 8–10 mm), an accumulation of radiopaque contrast mass of large size and irregular or rounded shape. Contrast levels can be determined. And on the third X-ray image, i. e. in the phase of resorption and emptying, there is always retention (delay) of radiopaque substance. Parenchyma of the gland is not defined. The ducts of all orders are poorly contoured, except for ducts of order I, which may be discontinuous. The discharge duct of parotid gland is usually deformed (narrowed in some places and dilated in others). There are similar anatomical changes in the accessory lobe.

With an exacerbation of the chronic process, swelling and pain in the gland increase. The body temperature rises to 38 °C. On examination, the parotid gland is dense, lumpy and painful. The skin is usually unchanged in color, collected in a fold. The mouth could be opened freely. The orifice of the discharge duct is gaping, and viscous saliva with a touch of pus is discharged from the duct when the gland is massaged. Only in some cases, when occlusion of the duct lumen with lumps of mucus is observed, purulence (abscessing) of the gland may be observed — a sharp increase in its size, the skin over the swelling is tense, not taken into the fold, hyperemic. It is difficult to open the mouth. The duct orifice is gaping, there is no discharge from the duct. Changes typical for acute inflammatory processes are observed in laboratory blood tests.



Differential diagnosis of chronic parenchymal parotitis in the acute phase should be made with epidemic parotitis, acute lymphadenitis, abscesses and phlegmons. In the remission phase — with other chronic sialadenitis, sialodochitis, sialosis, syndromes with involvement of large salivary glands.

**Prognosis.** The disease is characterized by recurrent and progressive clinical course. It lasts for years and sometimes decades. It is poorly amenable to the conservative treatment. Remission lasts for several years, and with a decrease in the reactivity of the body (concomitant diseases, hypothermia, etc.) the exacerbation of parenchymatous parotitis reappears.

Treatment of chronic parenchymatous parotitis in the acute phase is no different from that of acute sialadenitis. Abscesses are opened if indicated. Good results were obtained when using in the complex treatment of intrajejunal irradiation with helium-neon laser (A. A. Timofeev, D. V. Topchiy, 1992). Salivary secretion function in the parotid gland can be stimulated by applying a course of stellate ganglion blocks. Treatment of chronic parenchymatous parotitis is a difficult task, since the disease has a progressive and relapsing character. Insufficient efficiency of conservative therapy leads in some cases (frequent relapses of the disease, complete destruction of the gland) to application of surgical methods of treatment (parotid duct extirpation, parotidectomy, etc.).

The sialographic indication for surgery is complete destruction of the gland. Cure of patients with chronic parenchymatous parotitis can only be achieved using surgical treatment

## SIALODOCHITIS

**Clinic.** Patients complain of periodic swelling of the salivary glands, sometimes associated with eating or chewing gum, as well as pain occurring when the salivary» glands are enlarged. During an exacerbation, the discharge ducts become pus-filled. In the initial stage, the clinical symptoms are mild, so patients may not seek treatment. At the stage of distinct symptoms clinical manifestations are of regular character; there are changes along the main ducts, infiltration of tissue, edema, sometimes hyperemia of mucous around the ducts, the duct outlet, thickening and deformity of ducts themselves. Sialograms show dilation of the main exit ducts in the initial stages and dilation of smaller ducts in the stage of pronounced signs and in later stages. Morphological examination reveals thickening of the duct walls and lymphoid infiltration around the ducts.

**Treatment.** Concludes in blocking the salivary glands through the ducts with solutions of antiseptics, antibiotics, proteolytic enzymes. Measures to stimulate salivation: 1 % pilocarpine hydrochloride solution in 6–8 drops before meals, 0.5 % galantamine solution daily subcutaneously in 1.0 ml for treatment course of 30 injections, it can also be administered by electrophoresis, potassium

iodide electrophoresis can also be appointed, novocaine blocks by Vishnevsky, using 0.5 % solution, injected into the tissue surrounding SG. In case of frequent exacerbations and ineffectiveness of conservative treatment surgical treatment is applied: ligation of the main outlet duct and orifice and subsequent therapy aiming at suppression of SG functions: atropine subcutaneously 1.0 mm in 5 injections, X-ray therapy or SG excision.

**Mixed sialoadenitis.** Have a clinical picture similar in course to the parenchymatous form or sialodochitis. It is revealed only with sialographic examination. Treatment approaches are practically the same as in other forms of sialoadenitis (see above).

## CHRONIC SPECIFIC SIALOADENITIS

### Tuberculosis

The causative agent of tuberculosis is tuberculosis bacillus. Primary involvement of the salivary glands is very rare. More often there is dissemination of tubercle bacilli from the primary focus, especially from the lungs. Clinical course is similar to chronic sialoadenitis nonspecific: increase of SG volume, decrease of salivation — at productive (sclerosing) form and exacerbation of chronic sialoadenitis: pain, swelling, skin hyperemia, fluctuation — at exudative (abscessed form). Differential diagnostics is difficult. On sialograms in case of diffuse affection a circular cavity is determined, in case of focal one irregular-shaped cavity (cavern) is evident. Morphological examination reveals miliary tubercles with granulation tissue and caseous decay in the center. This examination allows to make the final diagnosis. The treatment is specific and is carried out by phthisiatricians. Phthisiatricians also treat patients with sarcoidosis. In this case beside lymph node affection in parotid glands there are pathological changes in parotid SG, clinically proceeding as chronic parotitis (Varshavsky A. N. et al., 1997).

### Actinomycosis

The causative agent is a ray fungus, Actinomycetes. The main route of entry is through the duct from the oral cavity. A distinction is made between actinomycosis of the SG proper and lymph nodes in the SG tissue. The primary form of actinomycosis of SG proper is productive inflammation, less often it is exudative.

Clinically, there is a swelling of SG without clear boundaries, the skin color is usually unchanged, salivation is reduced. In exudative form it is determined by skin tension, lividity, in the center there is a gradual softening, an abscess is formed, which may rupture if it is not opened surgically. Contents: liquid pus with more dense mucous lumps.

Differential diagnosis is difficult, and should be done with non-tumor lesions and tumor processes. Sialographic examination allows to see at abscessed (exudative form) cavities of various sizes and shapes, ducts deformations. Morphological examination rarely reveals drusen of fungus, changes in SG tissue are similar to chronic inflammation. Diagnosis is mainly made on the basis of clinical course, serological, cytological study.

Treatment: complex: locally — dry heat compresses, bougie, antibiotic therapy. Compulsory is the inclusion of actinolysate, potassium iodide preparations, actinomycetes polyvalent vaccine in the complex therapy. Surgical treatment is indicated, rarely X-ray therapy.

### **Syphilis**

The causative agent is the pale treponema. It is extremely rare; only cases of parotid salivary gland involvement in the secondary period of syphilis are described in the literature. The course of the disease reminds of chronic nonspecific parotitis, sometimes bilateral. Glands are enlarged, thickened, regional lymphadenitis is noted. In the tertiary period the death of parenchyma of the gland, and scarring. On sialographic examination the deformation of ducts, cavities with indistinct edges are determined. At morphological examination there is a picture of specific inflammation — gumma, which allows to make the final diagnosis.

Treatment is conducted in conjunction with dermatovenerologist. Surgical treatment to eliminate cicatricial deformities is performed after the conducted course of treatment (course of bicillin, bismuth preparations, etc.).

### **SELF-CONTROL OF TOPIC ASSIMILATION**

#### **1. Possible ways of infection penetration into the salivary gland are:**

- a) stomatogenic retrograde;
- b) hematogenic;
- c) transplacental;
- d) lymphogenic;
- e) contact.

#### **2. Specify the salivary gland that produces more saliva by volume:**

- a) parotid;
- b) submandibular;
- c) sublingual;
- d) all in the same quantity.

#### **3. Acute sialoadenitis of viral origin includes:**

- a) epidemic mumps;
- b) post-influenza mumps;
- c) Sjogren's disease;
- d) salivary stone disease.

#### **4. Name a special examination method that is not used for chronic inflammatory diseases of the large salivary glands outside of exacerbation:**

- a) sialography;
- b) scintigraphy;
- c) MRI;
- d) angiography;
- e) CT.

**5. With epidemic mumps, the level in the blood increases significantly:**

- a) AST;
- b) lactate dehydrogenase;
- c) amylase;
- d) ALT.

**6. Filatov's pain points in acute sialoadenitis of the parotid salivary gland are located:**

- a) in front of the earlobe;
- b) in the external auditory canal;
- c) in the area of the apex of the mastoid process;
- d) in the area of the semilunar notch of the lower jaw branch;
- e) along the edge of the lower jaw.

**7. Indicators of blood amylase in mumps are as follows:**

- a) within normal limits;
- b) 12–24 UNITS;
- c) 64–128 units and above.

**8. Specify possible complications of mumps:**

- a) orchitis;
- b) mastitis;
- c) pancreatitis;
- d) osteomyelitis of the jaw bone.

**9. Name the local causes of acute sialoadenitis:**

- a) injury of the gland;
- b) lymphadenitis of intraorgan lymph nodes;
- c) wisdom tooth eruption diseases;
- d) stomatitis;
- e) ingestion of a foreign body into the duct.

**10. Specify the most important links in the pathogenesis of chronic sialoadenitis:**

- a) inhibition of factors of nonspecific protection of the body;
- b) decreased secretory function of the gland;
- c) violation of salivary function;
- d) ascending infection of the gland;
- e) previous acute sialoadenitis.

**11. Chronic parenchymal sialoadenitis is characterized by:**

- a) frequent exacerbations;
- b) discharge of cloudy bitter-salty saliva with flakes;
- c) early xerostomia;
- d) rare exacerbations.

**12. Name the radiological symptoms characteristic of chronic parenchymal sialoadenitis:**

- a) the parenchyma of the gland is not clearly visible;
- b) there is a stenosis of the main excretory duct;

- c) in the end sections of the ducts there are cavities of different sizes filled with contrast mass;
- d) there is a narrowing of all the ducts of the gland, they have clear and even contours;
- e) there is no image of the IV–V order ducts.

**13. Select the radiological symptoms characteristic of chronic interstitial sialoadenitis:**

- a) the parenchyma of the gland is not clearly visible;
- b) there is no image of the IV–V order ducts;
- c) in the end sections of the ducts there are cavities of different sizes filled with contrast mass;
- d) there is stenosis of all ducts of the gland with clear and smooth contours;
- e) there is an expansion of the main excretory duct.

**14. The main functions of the large salivary glands are:**

- a) digestive;
- b) cumulative;
- c) excretory;
- d) endocrine;
- e) protective.

**15. Probing of the mouth of the excretory duct of the salivary gland is carried out:**

- 1) to detect a foreign body in the duct;
- 2) detection of duct wall soreness;
- 3) determining the bending direction of the duct;
- 4) determination of the nature of the salivary gland secretion;
- 5) detection of salivary stone.

**16. Specify the main radiological characteristics of the structure of the parotid salivary gland in normal sialography:**

- a) the width of the main outlet duct is 1 mm;
- b) the width of the main outlet duct is 2 mm;
- c) the contours of the ducts are smooth, clear;
- d) the duct exits the gland after an arcuate bend;
- e) intradermal ducts fan out;
- f) the intradermal ducts depart perpendicularly.

**17. What are the main radiological characteristics of the structure of the submandibular salivary gland in normal sialography:**

- a) the width of the main outlet duct is 1 mm;
- b) the width of the main outlet duct is 2 mm;
- c) the contours of the ducts are smooth, clear;
- d) the duct exits the gland after an arcuate bend;

- e) intradermal ducts fan out;
- f) the intradermal ducts depart perpendicularly.

**18. The analysis of the received sialogram includes:**

- a) study of the image of the main outlet duct (degree of contrast filling, position, length, width, shape, contours);
- b) study of the relationship between the soft tissues of the maxillofacial region and the contrasted gland;
- c) study of the image of the intragastric part of the ducts (their relationship, degree of contrast filling, position, length, width, shape, contours);
- d) determination of the size, shape, structure and topography of the salivary gland under study.

**Answers:** 1 — a, b, d, e; 2 — b; 3 — a, b; 4 — d; 5 — c; 6 — a, c, d; 7 — c; 8 — a, c; 9 — a, b, d, e; 10 — a, b, c, d; 11 — a, b; 12 — a, c, d; 13 — a, c; 14 — a, c, d, e; 15 — a, e; 16 — a, c, e; 17 — b, c, d, f; 18 — a, c, d.

# SIALOLITHIC DISEASE

## MOTIVATIONAL CHARACTERISTICS OF THE TOPIC

**Total lesson time:** 270 minutes.

Sialolith disease is manifested by the formation of concretions in the salivary glands and their discharge ducts. Salivary gland disease accounts for 20.5 % to 61.1 % of all salivary gland pathology, with the predominant lesion (91–95.4 %) of submandibular glands. The frequency of the disease development is almost the same in men and women. People at any age, including even early childhood, are prone to this process. It is generally accepted that both surgical and conservative methods are used in the treatment of salivary stone disease. However, some methods of treatment sometimes exclude each other, and the long-term results indicate their insufficient effectiveness in an attempt to preserve the affected organ, which usually ends in the extirpation of the salivary gland. Knowledge of salivary calculi disease will allow the future doctor to qualitatively diagnose it using modern informative methods of examination, to determine the adequate treatment tactics using the arsenal of surgical techniques, which will make it possible to reduce the number of possible complications. Mastering the manual skills of examining patients with salivary calculi disease is an integral part of the practical training of dental students for independent activity as a surgeon-dentist or maxillofacial surgeon.

The purpose of the lesson: to study the clinic of salivary stone disease and learn how to diagnose it with the preparation of a comprehensive treatment plan for this disease. Lesson objectives:

1. To study the etiology, pathogenesis and clinical symptoms of salivary stone disease.
2. Learn to examine patients with salivary stone disease and master the basic manual skills of objective clinical methods of its diagnosis.
3. Learn to interpret the data of radiation diagnostics taking into account the clinical manifestations of salivary stone disease (survey radiography, sialography, RCT, MRI, etc.).
4. Learn to make plans for the comprehensive treatment of patients (including during periods of exacerbation of salivary stone disease) and preventive measures in the postoperative period.
5. Get acquainted with the main modern methods of surgical treatment of salivary stone disease, learn the indications for their use.

Requirements for the initial level of knowledge. To fully master the topic, it is necessary to repeat the material:

- from human morphology: topographic-anatomical and histological structure of the large salivary glands, features of their blood supply and innervation;
- normal human physiology: functions of the salivary glands;

- biochemistry: biochemical composition of oral fluid; biochemical composition of saliva of submandibular and parotid salivary glands;
- radiology: methods of radiation diagnostics of diseases of the salivary glands;
- maxillofacial surgery: examination of a patient with surgical pathology of the face and neck.

**Control questions from related disciplines:**

1. List the main anatomical structures of blood supply and innervation of the large salivary glands.
2. Describe the topographic anatomy of the large salivary glands and their main excretory ducts.
3. Specify the features of the morphological structure of the large salivary glands.
4. Name the main functions inherent in the salivary glands.
5. Give the characteristic features of the composition of the oral fluid and saliva of the parotid and submandibular glands.
6. List the methods of objective examination that are used to diagnose surgical pathology of the salivary glands.
7. What are the main additional methods of examination for the diagnosis of surgical pathology of the salivary glands.
8. List the main methods of radiation diagnosis of diseases of the salivary glands.
9. Name the main special examination methods for the diagnosis of surgical pathology of the salivary glands.

**Control questions on the topic of the lesson:**

1. Define salivary stone disease. Specify the etiology and pathogenesis of this disease.
2. Describe the mechanism of formation of salivary stones, give a macroscopic description of the shape of salivary stones depending on their localization.
3. Give a classification of salivary stone disease and describe the clinical picture at different stages of its course.
4. Name the clinical methods of research in patients with salivary stone disease of the large salivary glands.
5. Specify additional research methods in patients with salivary stone disease of the large salivary glands.
6. Describe the contrast sialogram with different localization of the salivary stone (in the distal part, in the proximal part in the extra-vascular part of the excretory duct, in the intragastric part of the submandibular salivary gland).
7. List special research methods in patients with salivary stone disease of the large salivary glands and indicate their informative value.



8. Make a comprehensive treatment plan for a patient with salivary stone disease.

9. Determine the indications for organ-preserving surgery according to the method of the department with the formation of a sialodohostoma when the concretion is localized in the distal part of the main excretory duct of the submandibular salivary gland. The methodology of its implementation.

10. Determine the indications for organ-preserving surgery according to the method of the department with microsurgical removal of the stone when the concretion is localized in the proximal part of the main excretory duct and the intragastric ductal part of the submandibular salivary gland. Its methodology carrying out.

11. Name the indications for extirpation of the submandibular gland in salivary stone disease. The methodology of its implementation.

12. List the recommendations that patients should follow on an outpatient basis after organ-preserving treatment of salivary stone disease.

## ETIOLOGY

General and local predisposing factors are important in the formation of concrements in the ducts of salivary glands. Local factors include congenital changes of the ductal system in the form of alternating sections of its ectasia and strictures, tortuous shape of the duct due to sharp bends of the discharge channel, disorders of the secretory activity of salivary glands in various diseases of organs and systems, less often — the presence of foreign bodies in the duct or gland.

The general factors that predispose to concrement formation are a disorder of the mineral and, in particular, calcium-phosphorus metabolism, hypo- and avitaminosis A, and patients taking psychotropic, antibacterial, and other drugs.

Salivary calculi formation occurs against the background of duct dyskinesia, chronic inflammation, salivary stagnation and alkalinization (pH 7,1–7,4), which causes dropping of salts from saliva and their crystallization on the organic base — matrix consisting of sloughing epithelial cells and mucin.

In the majority of cases, concrements are located in the submandibular salivary gland and submandibular duct, and less frequently in the parotid salivary gland and parotid duct. Stones in the sublingual and small salivary glands are extremely rare.

The shape of the stones may be different: stones in the intra-jejunal part of the duct are rounded, often with a jagged surface; stones in the outlet duct of the gland are usually oblong. Their size is different: from several millimeters to several centimeters. The weight of stones also varies: from fractions of grams to several tens of grams. The color of salivary stones is usually yellowish, sometimes with a grayish hue.

Stones have a layered structure, when cut in the center of the stone is sometimes found a foreign body, which is the basis for crystallization of salts of saliva. Stones consist mainly of inorganic salts — calcium phosphate and calcium carbonate.

Traces of potassium, sodium, iron, epithelial cells, bacteria, fungi, and mucus are also present in salivary nodules.

Characteristic *complaints* of patients are:

1. Appearance of swelling in the submandibular area during meals, which usually disappears on its own after some time.

2. Pain syndrome. Appearance of rasping pain in the submandibular region together with swelling in the submandibular area, the so-called «salivary colic».

The *clinical picture* is determined by the localization and size of the salivary stone. There are the following stages of the disease: primary (without clinical symptoms of inflammation), clinically evident inflammation (periodical exacerbation of sialadenitis) and the late stage (with symptoms of chronic inflammation).

The initial stage is asymptomatic for a certain period. Stone may be detected by accident during X-ray examination for another disease.

The first clinical sign of salivary calculi are symptoms of delayed secretion. When eating, patients will notice the salivary gland is enlarged and feels taut, followed by pain called the salivary colic. These phenomena occur within a few minutes, less frequently within a few hours and gradually subside, but recur with the next meal and sometimes even when they think about eating. The mechanism of «salivary colic» is a pain reflex due to blockage of the duct by a stone and distension of the duct by saliva. Pain disappears after spontaneous reduction of the gland due to the saliva coming out of the gland.

However, a long asymptomatic course of the disease is also possible, when a salivary nodule is found as an accidental radiological finding during radial diagnosis.

On external examination the salivary gland is enlarged, its palpation is painless. Bimanual palpation of the outlet duct may reveal a small circumscribed thickening. Prosthath probing allows to define the presence of this thickening in the duct. As a rule the mucous membrane at the ductus orifice shows no signs of inflammation.

If there is no treatment the disease is in its second stage — clinically evident inflammation, with signs of exacerbation of chronic sialoadenitis. Some patients have symptoms of inflammatory gland is the first manifestation of the disease. This is observed in cases when the patient has not previously been bothered by painful sensations in the gland, as the stone has not always created an obstacle to the outflow of saliva.

Patients are complaining of general malaise, painful swelling in the sublingual, submandibular or cheek areas, increased body temperature, and difficulty eating. On external examination the corresponding gland is enlarged, sometimes there is collateral edema. Palpation of the gland is painful.

In the oral cavity, there is hyperemia of the mucosa of the hyoid or cheek areas on the respective side. On palpation, there is a dense, painful infiltrate along the duct, which is dilated, infiltrated and palpable as a thrust. After probing the duct and pressing on the affected salivary gland mucopurulent exudate is discharged from the orifice.

Bimanual palpation of submandibular gland and its discharge duct is used during examination of patient. For this purpose, the fingers of one hand are placed in the oral cavity on the mucosa of the hyoid region, and the other on the skin of the submandibular region. The method of bimanual palpation makes it possible to determine quite clearly a dense concrement located in the extra-glandular part of the glandular duct, its relative sizes, as well as changes in size and consistency of the salivary gland itself. When massaging the gland, the relative degree of preservation of its secretory function and the character of secreted secretion are evaluated visually. Probing of an excretory duct with special probes allows to reveal a non-displaceable concrement located in the duct lumen. It is not recommended to probe the duct during exacerbation of the inflammatory process, because it can lead to perforation of the inflamed duct wall.

**Radiological methods** of investigation are the key in terms of differential diagnosis of salivary calculi disease with other diseases and determining the exact diagnosis and providing the correct treatment. Due to the presence of inorganic component in salivary concretions, most of them are X-ray-positive.

1. Visualization of a nodule during ***intraoral observation radiography of the oral cavity floor***. The diagnostic efficiency of the method, according to our data, was 70.8 %. The peculiarity of this radiography is that the film should be placed not «under the tongue» but «on the tongue», which makes it possible to considerably expand the field of study without significant loss of image quality

That method is effective if the concrement is located in the anterior and middle sections of the excretory duct (fig. 4).

2. ***Overview extraoral radiographs*** rarely give us the information we are interested in (diagnostic efficiency was 64.3 %) and can be used in case of suspicion of an intragastric location of the concretion or for differential diagnosis with other diseases.

The disadvantage of this method is also the complete lack of information about the state of the glandular tissue and ductal system of the gland under study (fig. 5)



*Fig. 4.* Visualization of concretion during intraoral survey radiography of the oral cavity floor ([https://pandia.ru/text/77/512/images/image004\\_46.jpg](https://pandia.ru/text/77/512/images/image004_46.jpg))



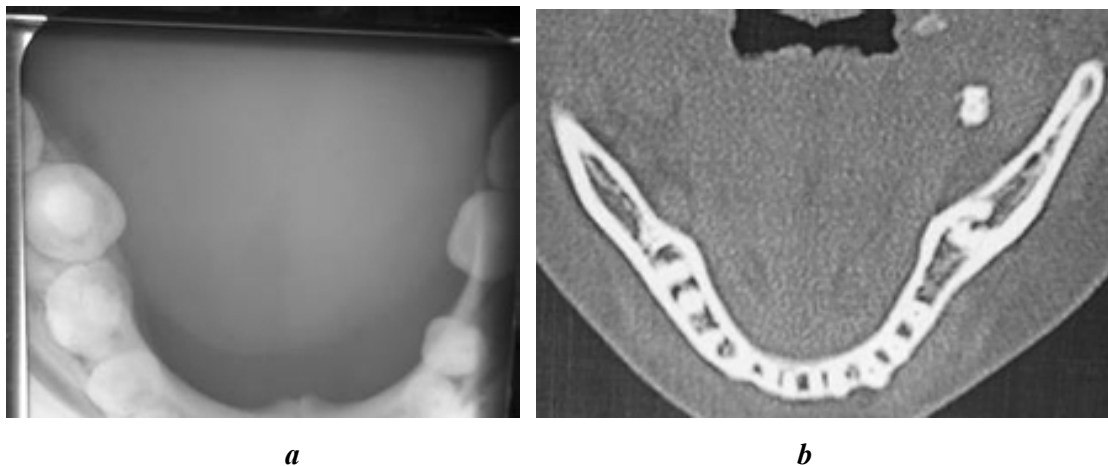
*Fig. 5.* Visualization of concretions during overview radiography of the submandibular region. ([https://pandia.ru/text/77/512/images/image006\\_34.jpg](https://pandia.ru/text/77/512/images/image006_34.jpg))

However, 15–40 % of salivary concretions are X-ray-negative.

3. **X-ray computed** tomography (XCT) and cone beam computed tomography (CRT) in 98 % of cases allows to detect both radiographically positive and non-positive concretions, determine their localization, size, and relative change of size and structure of the affected gland.

The method of X-ray computed tomography is relatively expensive and exposes the patient's body to a certain radiation load, but its use in cases of salivary calculi of submandibular salivary glands is quite justified in some cases (diagnostic efficiency of the method was 94.2 %). It helps to specify in details the localization of a concretion (including X-ray-negative), its relation to the gland itself and the muscular diaphragm of the oral cavity floor as well as relative changes of the glandular tissue in comparison with a healthy gland. At the present time X-ray computed tomography of submandibular glands is practically the main

method of research, which allows to determine with high accuracy the localization of a concretion in relation to the muscular diaphragm of the floor of the mouth (below, at the level, above) (A.S. Lastovka et al., 2000, 2007). When carrying out this method of research the peculiarity is that scans should be made in minimal increments, because smaller concretions may not be diagnosed if the thickness of «slices» is 5–8 mm (fig. 6).



*a*

*b*

*Fig. 6. X-ray examination sialolithic disease:*

*a* — an X-ray negative stone in the proximal duct of the left submandibular salivary gland, which is not visible on the radiograph of the bottom of the oral cavity; *b* — which is visualized during X-ray computed ([https://pandia.ru/text/77/512/images/image007\\_27.jpg](https://pandia.ru/text/77/512/images/image007_27.jpg))

4. **Digital subtractive** sialography avoids overlap of salivary glands with cranial bony structures by first recording an image of the area under study in computer memory prior to contrast injection, which is then subtracted from the image of that area obtained after contrast injection.

Digital subtractive sialography avoids the overlapping of the salivary glands with the bony structures of the skull due to the fact that in the beginning, before contrast is injected, the image of the studied area is recorded in the computer memory, which is then subtracted from the image of this area obtained after contrast is injected.

5. **Ultrasound examination** (sonography) of salivary glands is based on the different ability of tissues to reflect ultrasonic vibrations depending on the density of their structure.

Sonography visualizes salivary concretions quite well, including X-ray-negative ones, you can determine their size and localization. The method allows determining the size of the gland itself, and by the change of echogenicity gives certain information about the degree of structural changes of glandular tissue — its replacement by acoustically denser connective tissue. Most researchers note high informative value of this method (up to 92–97 %) in diagnostics of salivary calculi disease. Harmlessness of this method for a patient's organism allows to use it for

dynamic observation of pathological process development, to control treatment efficiency.

Ultrasound method in 90,7 % of the studies allowed us to get the necessary information both about concretions, including X-ray-negative ones (their number, shape, size and localization) and about the degree of pathological changes from the glandular tissue of the gland itself (A. S. Lastovka, 2007). Structural changes of salivary gland were estimated according to such criteria as: size of the gland and its contours, parenchyma inhomogeneity, echogenicity of parenchyma in comparative aspect with healthy contralateral gland.

However, it should be noted that, in the absence of special transducers, concretions of relatively small size localized in the anterior part of the sublingual region may not be visualized by this method. Difficulties arise also when a concrement is located in the proximal part of the pharyngeal duct, when it is impossible to answer convincingly whether the stone is in the gland or is «superimposed» on the gland. We also do not get a specific answer to the question about the location of the stone in relation to the muscular diaphragm of the oral cavity floor.

Harmlessness of the method for a patient's organism allows to use it for dynamic observation of the pathological process development, for control of treatment efficiency (fig. 7).



Fig. 7. Ultrasonograms for salivary stone disease of the submandibular glands visualization of the concretion in the excretory duct of the gland  
([https://pandia.ru/text/77/512/images/image009\\_23.jpg](https://pandia.ru/text/77/512/images/image009_23.jpg))

6. **Magnetic resonance** computed tomography can be used in the diagnosis of salivary stone disease. Magnetic resonance computed tomography allows us to assess the degree of changes on the side of the salivary gland itself as compared to the contralateral one, but salivary concretions are not clearly visualized by this method. They can be identified only by the «loss» of signal at the site of the concrement, which is more often found in the situation when we already know

the localization of this concrement (A.S. Lastovka et al., 2000, 2007). Diagnostic efficacy of the method was 33.3 %. We believe that the use of magnetic resonance computed tomography in the diagnosis of submandibular salivary gland stones is inexpedient because this method is not sufficiently informative in this disease compared to other available methods of radial diagnosis.

7. **Contrast sialography** is based on retrograde filling of the ductal system and gland parenchyma with X-ray contrast substance followed by radiography.

*Indications* for the examination:

- 1) chronic inflammatory diseases of the salivary glands
- 2) tumors of the salivary glands
- 3) salivary stone disease

*Contraindications* for the examination:

- 1) acute and exacerbation of chronic sialoadenitis
- 2) acute inflammatory processes of the oral mucosa and papilla of the excretory duct of the salivary gland,
- 3) pregnancy
- 4) allergic reactions to drugs containing iodine.

Sialography consists in the study of the ducts of large salivary glands by filling them with iodine-containing drugs. For this purpose, water-soluble contrast or emulsified oil preparations are used (dianosyl, ultrafluidic lipoiodinol, etiidol, mayodil, etc.). Before administration, the preparations are heated to a temperature of 37–40 °C to exclude cold vascular spasm.

The study is carried out in order to diagnose mainly inflammatory diseases of the salivary glands and salivary stone disease.

A special cannula, a thin polyethylene or non-nylon catheter with a diameter of 0.6–0.9 mm or a blunted and somewhat curved injection needle is inserted into the opening of the excretory duct of the salivary gland under study. After the duct is booged, a catheter with a mandrel inserted into it to a depth of 2–3 cm is tightly covered by the walls of the duct. To study the parotid gland, 2–2.5 ml is injected, the submandibular — 1–1.5 ml of a contrast preparation.

Radiography is carried out in standard lateral and direct projections, sometimes axial and tangential images are performed.

With simultaneous contrasting of several salivary glands, panoramic tomography (pantomosialography) is preferred, which allows to obtain a sufficiently informative picture in one image at low radiation loads on the patient.

Analysis of the images taken after 15–30 minutes makes it possible to judge the function of the salivary glands. Citric acid is used to stimulate salivation.

Currently, it is generally accepted to use only water-soluble contrast agents used in medicine (verografín, urografín and others) as a radiopaque contrast agent in sialography. Contrast sialogram determines both radiopositive and radionegative (by the presence of filling defect) concrements, their localization and relative

sizes. Besides, one additionally receives information about changes in the ductal system of the gland, and by the rate of contrast resorption one can judge about preservation of functional activity of the affected organ. Application of this method of investigation is not desirable during exacerbation of an inflammatory process, because introduction of contrast agent into the duct can cause additional trauma of the gland tissue and complicate outflow of the secretion from it due to displacement of a concrement, and also in case of hypersensitivity to iodine preparations. Contrast sialography is a relatively long-known method of investigation, the qualitative performance of which is associated with the availability of necessary medical skills and special instruments, and therefore it is often sought to be excluded from the list of obligatory methods of salivary gland examination. In our opinion, it is not quite justified because this method allows you to get detailed information about the concrement with clarification of its localization (A. S. Lastovka, 2007). The diagnostic efficiency of the method was 80.9 %. X-ray-negative concretions are also visualized by the contrast filling defect (fig. 8).



*Fig. 8.* Contrast sialograms for salivary stone disease of the submandibular glands X-ray negative concretion

([https://pandia.ru/text/77/512/images/image011\\_15.jpg](https://pandia.ru/text/77/512/images/image011_15.jpg))

At the same time contrast sialography gives a real possibility to estimate condition of duct system and parenchyma of the gland, and as a result one can make an indirect conclusion about structural and functional condition of an affected organ. However if a concrement is localized of small size near the orifice and in the middle part of the feeding duct with stones capability to move freely along the duct, this diagnostic manipulation presents a certain risk of retrograde concrement shift to more unfavorable zone in surgical respect. It is also necessary to remember that at



the expense of errors in the technique of manipulation, on a contrast sialogram it is possible to consider as radionuclide-negative a defect of filling with a contrast substance, caused by the penetration of air into the duct (fig. 9).



*Fig. 9.* Contrast sialograms for salivary stone disease of the submandibular glands: X-ray positive concretion

([https://pandia.ru/text/77/512/images/image012\\_15.jpg](https://pandia.ru/text/77/512/images/image012_15.jpg))

8. Outside of exacerbation, fibroendoscopy of salivary glands may be performed, based on the use of ultrafine fiber optics inserted through the main duct of the salivary gland.

Differential diagnosis of salivary stone disease is carried out with other salivary gland diseases: sialoadenitis (especially with myoepithelial sialoadenitis, which is characterized by intense lymphoid infiltration with inclusion of epimyoepithelial islets with calcified stones in infiltrates); tumors; cysts; reactive dystrophic changes of salivary glands. Also differentiate the disease with pathological processes not associated with salivary glands, but localized in the area of their anatomical location or their discharge ducts: lesions of lymph nodes of various etiology with phenomena of their calcification (petrification); cavernous hemangioma with the presence of phlebolites (calcified intravascular thrombi); foreign bodies of soft tissues of the mouth floor (fragments of extracted teeth and bone tissue); pathological changes from the lower jaw (osteoma, osteophytes, retained teeth, odontoma, chronic osteomyelitis).

Preoperative examination of a patient with salivary stone disease includes clarification of a number of other points that determine the choice of treatment method:

1. Determination of localization, number, size and shape of concretions.

In this connection we consider it expedient to distinguish the following clinical variants of submandibular gland stone disease.

According to nodule localization in the ductal system of salivary gland:

A. In the distal part of the extra-glandular part of the gland's outlet duct.

B. In the proximal part of the extra-glandular part of the exit duct of the gland above the level of the muscular diaphragm of the mouth cavity floor.

C. In the proximal part of the extra-glandular part of the exit duct of the gland at the level of the muscular diaphragm of the floor of the mouth.

D. In the proximal part of the extra-glandular part of the exit duct of the gland below the level of the muscular diaphragm of the mouth floor.

E. Intra-glandular localization.

F. Intra-glandular and extra-glandular localization in the presence of several concretions.

2. Determination of structural and functional changes of salivary gland and its discharge ducts.

Since the etiology and pathogenesis of salivary calculi disease are not fully defined, the key to the treatment of this disease is to eliminate its main manifestation — the removal of salivary concretions.

Noninvasive and low-invasive methods of removal of salivary concretions. These methods of treatment are based on the fragmentation of the concrete by applying some physical factor that destroys its structure, with the subsequent release of these fragments with saliva in the oral cavity, or the use of special devices to remove the salivary concretions «closed» way.

**Extracorporeal** shock wave lithotripsy is based on the application of ultrasound (piezoelectric) lithotripters from the skin side. The authors note appropriateness of this method when the size of a concretion is up to 10 mm with its intra-glandular localization or in the proximal part of the extra-glandular part of the outlet duct of the gland, which is an alternative to gland extirpation at this location of the concretion. Efficiency of the method makes up 14–88 %. At the same time the possibility of complications development in the form of bleeding from the duct, intracellular hematomas, reactive edema of the gland, obturation of the duct lumen by a large fragment, requiring its additional surgical removal is marked.

**Intracorporeal** shock-wave lithotripsy is based on the use of special intraductal laser and electro-hydraulic lithotripters. This method is recommended for localization of concretions in the proximal part of the extra-glandular part of the outlet duct.

Endoscopic removal of a nodule is based on the integral removal of the latter with the help of special devices under the control of ultrafiber optics introduced into the outlet duct through a small incision. The use of this method is indicated in case of a relatively small size of the concrement localized in the extra-glandular part of the salivary gland outlet duct. The success rate does not exceed 80 %. Endoscopic intracorporeal or extracorporeal lithotripsy is based on lithotripsy under the control of endoscopic ultrafiber optics. The method is used in case of nodule localization both in the extra-glandular and intra-glandular part of the glandular outlet duct. However, the authors note that the failure rate of this technique is from 2 to 60 % of cases, which depends on the particular localization of a concrement and its size. Removal of a concrement with balloon dilatation of the duct is also used. Speaking about noninvasive (minimally invasive) methods of removal of salivary concretions, it should be noted that all of them require special expensive equipment and, even with the strictest selection of patients according to the indications, have a certain percentage of unsuccessful results. However, taking into account the organ-preserving nature of these techniques in salivary concomitant disease of the submandibular gland, they certainly deserve further development and improvement. As a minimally invasive method of salivary concretions

#### **THE SURGICAL METHOD IS CURRENTLY THE MAIN ONE IN THE TREATMENT OF SALIVARY STONE DISEASE OF THE SUBMANDIBULAR GLANDS**

The the method is reduced to the open removal of salivary calculus by performing a surgical operation — calculusectomy. However, this task can be solved in different ways, up to the use of an extremely radical method — removal of a calculus by extirpation (i. e., complete removal whole organ) salivary gland. Surgical tactics and the choice of a specific method of treatment depend on on the location, size and number of calculi, the nature of clinical manifestations, as well as the structural and functional state of the salivary gland affected by the disease. In relation to the latter, all surgical methods of treatment used for this disease can besubdivided into organ-preserving and organ-non-preserving.

Organ-preserving treatment methods include surgical removal of the calculus, in order to eliminate the mechanical obstacle to free outflow of saliva from the gland into the oral cavity, which creates favorable conditions for the relief of acute inflammatory phenomena, as well as the normalization of the structure and function of the affected organ.

Currently, with salivary stone disease of the submandibular glands, it is generally accepted to remove calculi by intraoral access. The indication for this operation is the localization of the calculus in the extraglandular section of the excretory duct of the submandibular gland, mainly in its *middle and distal parts*. The operation can be performed under local infiltration anesthesia, conduction

anesthesia of the lingual nerve or under general anesthesia. It is believed that the use of conduction anesthesia or general anesthesia eliminates tissue infiltration in the surgical area intervention and allows the surgeon to well palpate the calculus located in the excretory duct. Parallel to the course of the excretory duct of the submandibular gland (along the medial slope of the hyoid roller), in the projection of the determined calculus, a linear incision is made in the mucous membrane of the sublingual areas with subsequent detection of the excretory duct of the salivary gland. After that, the excretory duct of the gland is isolated and longitudinally dissected its wall before opening the lumen, i.e., a sialodochotomy is performed, and with the help of surgical instruments (hemostatic or special clamp, tweezers, surgical trowel, curettage spoon or dental excavator) the detected calculus is removed outside.

The technical performance of this operation is greatly facilitated when the surgeon's assistant takes away the patient's tongue with one hand. in the direction opposite to the operation site, and the second one lifts the tissues of the bottom of the oral cavity with pressure from the outside. Before sialodochotomy, in order to prevent retrograde displacement of the calculus to the side salivary gland, some authors propose to fix the excretory duct on a ligature held around it behind a salivary calculus.

Other surgeons prefer to perform sialodochotomy along the probe inserted into the lumen of the duct along its entire length — from its mouth to the level the stone in it. There is no single view on the issue of further actions after the stage of the operation — removal of the salivary calculus. On this account there is a fairly large number of conflicting opinions. Some believe that by removing the calculus from the excretory duct of the submandibular gland, the operation can be considered complete, that is, the postoperative wound is not sutured or drained at all. Eligibility the authors explain their actions by the fact that in this case the wound heals safely on its own (like all other wounds in the oral cavity) or in its place an intraoral salivary fistula is formed, which happens extremely rarely with this surgical tactic, but is also considered quite acceptable result.

However, after sialodochotomy with removal of the calculus without any subsequent impact, the following complications were detected in the long-term follow-up period: cicatricial narrowing of the duct — 68 %; actively ongoing chronic inflammatory process with frequent exacerbations — 76 % and relapses of calculus formation — 52 % of the total number of operated patients. Other surgeons consider it sufficient to suture only the mucous membrane of the sublingual region, without sewing up the dissected wall of the excretory duct. Common to all these actions is the possibility of restoring the former path of passage of saliva through the excretory duct from the submandibular gland into the oral cavity.

Several techniques are used to form an artificial saliva outlet into the oral cavity (sialodohostomy). Some authors(first) believe that this is facilitated by

simple drainage of the postoperative wound with a drainage in the form of a strip of glove rubber, fixed with sutures to the mucous membrane of the oral cavity, without directly introducing it into the lumen of the dissected excretory duct. Others(second) for this purpose sew the dissected wall of the excretory duct with the mucous membrane of the sublingual area without the introduction of drains. Third authors, in addition to stitching the dissected wall of the excretory duct with the additional mucous membrane of the sublingual area, drainage in the form of a polyethylene catheter is inserted into the lumen of the central part of the excretory duct and fixed with sutures to the mucous membrane of the sublingual area. Speaking about the effectiveness of the formation of sialodohostoma, there is an indication of the persistent preservation of its functioning and normalization of gland function in 81.5 % of patients even 7 years after surgery.

When the **concretion is located in the proximal part of the extraglandular** part of the excretory duct of the submandibular gland, its removal is associated with certain technical difficulties.

Proponents of organ-preserving surgery believe that with the relative preservation of the structural and functional ability of the gland, it is possible to try to remove such a concretion by intraoral access with subsequent drainage of the wound. However, these authors note that such an operation is more often successful with relatively large concretion sizes (more than 4 mm).

If the concretion is located in the intraglandular part of the excretory duct of the submandibular gland, then carrying out an organ-preserving operation becomes problematic. There are isolated works indicating the possibility of removing such a concretion by intraoral access.

Thus, indications for organ-preserving treatment of submandibular glands in salivary stone disease are:

1. Localization of the concretion in the distal or proximal part of the extracellular part of the excretory duct above or at the level of the muscular diaphragm of the bottom of the oral cavity, regardless of the structural and functional state of the salivary gland.

2. Localization of the concretion in the proximal part of the extracellular part of the excretory duct below the level of the muscular diaphragm of the bottom of the cavity mouth or in the intragastric part of the duct with the preservation of the structurally functional usefulness of the salivary gland.

The **choice of the method of organ-preserving surgery** depends on the specific localization of the concretion.

1. When the concretion is located in the distal and middle part of the extracellular part of the excretory duct of the submandibular gland, the optimal method of treatment, in our opinion, is a microsurgical technique for removing the concretion and active formation of sialodohostomy using figured drainage.

2. Localization of the concretion in the proximal part of the extraglandular part of the excretory duct of the submandibular gland above or at the level of the muscular diaphragm of the bottom of the oral cavity makes it difficult to use microsurgical equipment. In such a situation, it is more expedient to remove the concretion by intraoral access with the formation of a sialodohostoma by stitching the edges of the dissected wall of the excretory duct with the adjacent edges of the oral mucosa and introducing it into the central the end of the drainage outlet flow made of glove rubber. The part of the drainage extending into the oral cavity in the form unfolded along the wound is fixed along the edges to the oral mucosa with two sutures.

3. When the concretion is localized in the intraglandular part of the excretory duct or the proximal part of the excretory duct of the submandibular gland below the level of the muscular diaphragm of the bottom of the oral cavity, it is possible to perform an organ-preserving operation by applying a microsurgical technique for removing this concretion *externally (submandibular) surgical access*. If, during the course of this operation, significant technical difficulties arise or some unfavorable anatomical and topographic features are revealed, the surgeon at any stage of this operation has the opportunity to proceed to extirpation of the submandibular gland.

If the concretion is located below the muscular diaphragm of the bottom of the oral cavity and has dimensions up to 3 mm, you can try to «move» it above this level by prescribing a salivary diet and active massage salivary gland. In this case, the concretion can be removed not by external, but by intraoral access. However, it should be noted that this is possible only with a relatively small size of the concretion.

**After organ-preserving treatment** of salivary calculi patients in the outpatient setting should follow a number of recommendations aimed at reducing the likelihood of recurrence of salivary concrements, relieving residual inflammation in the parenchyma of the salivary glands and preventing possible exacerbations. Patients with this pathology should be followed up by a surgeon in the outpatient clinic at the place of residence with frequency of follow-up examination at least twice a year (it is advisable in spring and autumn period when the risk of exacerbation of salivary calculi disease is most probable) with monitoring of salivary glands, including X-ray and ultrasound examinations. During the rest of their lives, patients should:

1) avoid hypothermia and seasonal prevention of colds and viral diseases that can cause exacerbation of chronic inflammation in the salivary glands;

2) adhere to a salivary diet, reducing the risk of recurrence of salivary concrements (for this purpose, you can use lemon slices, caramel with sourness), under indications to take the doctor prescribed medications that enhance salivary secretion;

3) after any meal to conduct effective manual massage salivary gland to avoid salivary stagnation in the duct system of the gland. The doctor should teach the patient the technique of such massage and make sure that the patient has properly mastered this technique and can perform it independently.

**Indications for extirpation of the submandibular gland:**

1. The presence of multiple calculi in various parts of the intraglandular ductal system;

2. The presence of a calculus in the intraglandular and proximal parts of the extraglandular excretory duct below the level of the muscular diaphragm of the floor of the mouth with pronounced structural and functional changes in the salivary gland;

3. A long course of the disease in the presence of pronounced changes in the side of the affected salivary gland, accompanied by repeated formations of calculi after their removal;

4. Frequent exacerbations of the inflammatory process.

In addition to removing the submandibular gland itself during its extirpation, some authors recommend additionally performing a longitudinal dissection throughout the remainder of the extraglandular section of the excretory duct of this gland and suturing the edges of the dissected duct wall with the mucous membrane of the sublingual region in order to prevent further progression of sialodochitis of the remaining part of the excretory duct of the gland.

After the extirpation of the submandibular gland, the postoperative period may be complicated by the phenomena of traumatic neuritis of the lingual, sublingual and marginal branches of the facial nerve, the progression of chronic inflammation in the remaining part of the excretory duct removed salivary gland. With an exacerbation of the inflammatory process, most specialists consider it expedient to first achieve relief of acute inflammatory phenomena by conservative methods (drug therapy, instillation of the ductal system of the gland with solutions of antibiotics and antiseptics, physiotherapy, massage of the gland, etc.), and then in the «cold» period, remove the calculus.

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