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## **THE NATURE AND FEATURES OF TRAUMATIC INJURIES OF THE ORAL MUCOSA IN CHILDREN**

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**Abstract:** Among the various pathological conditions of oral mucosa in children, traumatic injuries are quite widespread, which can be the result of mechanical, thermal, chemical, electrical and radiation exposure. Diagnosis of traumatic injury to oral mucosa in children is often difficult, due to the variety of their manifestations in the oral cavity and the similarity of the clinical picture of diseases of different etiology and pathogenesis. Knowledge of the etiology, pathogenesis, features of the clinical course, the possibilities of prevention and adequate treatment is necessary for a dentist to carry out timely diagnosis and provide qualified assistance to children with traumatic injuries of the oral mucosa.

**Keywords:** traumatic lesions, young children, inflammation, oral mucosa, prevention, diagnostics, treatment.

### **Relevance**

In the first years of a child's life, there is a peak of traumatic injuries to the organs of the oral cavity, including the mucous membrane, so it is important for every dentist to be able to properly plan the provision of dental care to this category of children [2, 9, 12]. The mucous membrane of the oral cavity has direct contact with the external environment from the birth of a child and throughout life. In the practice of a pediatric dentist, it is often necessary to deal with the consequences of traumatic injuries of the oral mucosa. Traumatic stomatitis can develop at any age, but it is most often observed in children. This is associated with a high risk of injuries of various etiologies [1, 7, 11].

Ulcers, aphthae and other pathological formations formed during traumatic stomatitis on the mucous membrane cause discomfort and pain to the child when eating. The peculiarity of the oral cavity is that any traumatic damage to the mucous membrane is immediately accompanied by its infection [4, 17]. The degree of damage and clinical manifestations depend on the nature of the stimulus, the time and strength of the impact, the individual characteristics of the child's body [2, 10, 15].

Through injuries of the oral mucosa, bacteria, microbes, and some fungi penetrate, which multiply and parasitize. Prolonged treatment of patients with traumatic stomatitis has increased the interest in the use of magnetic-infrared-laser therapy. Lesions of the oral mucosa (SOR) having an infectious and traumatic genesis, occur with a pronounced pain symptom and manifest themselves with polymorphic elements of the lesion – erosions, aphthae, ulcers, plaques, etc. [3, 12].

The relevance of this problem is due to a fairly high level of injuries in children. Traumatic exposure reduces the barrier function of the mucous membrane,

which becomes the entrance gate of infection for the introduction of microorganisms and the development of inflammation [6, 8, 16]. The urgency of the problem increases due to the progressive decrease in the dental components of the quality of life of patients against the background of the appearance of additional clinically concomitant pathology of the oral cavity in patients with traumatic injuries [5, 7, 13].

An important problem of modern conservative and preventive dentistry is the search for optimal means for the prevention of inflammatory diseases of the oral mucosa that have arisen as a result of injuries, and the success of therapy depends not only on the correct choice of the active substance, but also on the dosage form, as well as the ways of administration [5, 12, 14].

### **Chemical trauma of oral mucosa in children**

Acute poisoning with chemical substances in children is the first in the frequency of accidents. The main route of entry of poison into the child's body is through the gastrointestinal tract, with the obligatory lesion of the oral mucosa. The causes of chemical burns of oral mucosa in children can be:

- accidental ingestion of acid and alkali solutions;
- drugs used in dentistry (devitalizing pastes, phenol-containing drugs, gel for etching hard tooth tissues);
- alcohol-containing tinctures, aspirin, and other drugs used by patients with toothache and when they get on oral mucosa.

Acute poisoning in children is more severe than in adults. This is due to the greater permeability and easy vulnerability of their skin and mucous membranes, the blood-brain barrier, pronounced lability of water-electrolyte metabolism and high energy exchange.

During acute poisoning, latent, toxinogenic, somatogenic periods are isolated, the duration of which depends on the specific pharmacological effect of the poison, its distribution in the body, concentration in tissues and ways of elimination.

Solutions of acids and alkalis have an effect not only at the point of contact with the tissue, but also cause disruption of microcirculation, trophism in healthy tissues surrounding the burn area. Therefore, wound healing with chemical burns is longer. Depending on the nature of the interaction of the chemical agent with the mucous membrane the membrane develops coagulation (dry) necrosis when exposed to acid radicals (acids) and colliquation (wet) necrosis in case of burns with alkalis.

Degree lesions depend on the duration of exposure, concentration, amount of the drug taken. A lethal dose of concentrated acids and alkalis when ingested is 30 - 50 ml. The defeat of the stomach is most pronounced when taking cauterizing liquid on an empty stomach. Resorptive (general toxic) effect depends on the depth and extent of the burned surface of the mucous membrane of the gastrointestinal tract. Organic acids have the greatest resorptive effect, strong inorganic acids have the least.

When taking acids and alkalis inside, a clinical picture of a burn disease of chemical etiology develops, which is characterized by 5 main clinical syndromes:

1. Various degrees and lengths of burns of the digestive tract, manifested by painful swallowing and pain along the esophagus, and with a burn of the stomach - pain in the epigastric region, sometimes in combination with moderate muscle tension of the abdominal wall and symptoms of irritation of the peritoneum.

2. A pronounced pain factor caused by irritation of the receptors of the burnt mucous membrane, plasma loss, as well as a sharp metabolic acidosis leads to the development of exotoxic shock.

3. Esophageal-gastric bleeding may occur in 1-2 days (early bleeding).

4. Respiratory failure.

5. With a pronounced resorptive effect (acetic and other organic acids), hemolysis develops, clinically manifested by a change in urine, which becomes red, brown.

In the course of burn disease, the following stages can be distinguished:

- stage of burn shock, lasting from several hours to 1 1/2 days;
- stage of toxemia (2-3 days);
- stage of infectious complications (from the 4th day to 1 1/2 weeks),
- the stage of scarring of the affected mucous membrane, starting from the end of the 3-4th week and lasting up to 2 months or more;
- stage of recovery.

When a chemical agent enters the OSR, a pathological process develops, during which 3 periods are distinguished, which have characteristic features. In the initial or acute period, as a result of the effect of a chemical agent on the mucous membrane, changes appear from subtle redness to severe hyperemia and swelling of the oral mucosa. In the second period, after 1-2 days, edema and hyperemia of the mucous membrane increase and against their background bubbles, erosive or necrotic lesions appear not only on the mucous membrane, but also on the mucous membrane of the esophagus, when a chemical is swallowed. The depth of tissue damage when exposed to inorganic acids is less than with burns with vinegar essence and alkalis. In the third period, healing processes occur in the oral cavity with cicatricial changes in the mucous membrane. This period, in the presence of deep and extensive lesions, can also last for several weeks.

Depending on the severity of the lesion of the OSS, there are 3 degrees of chemical burns. At I degree, catarrhal inflammation develops, at II - catarrhal inflammatory changes of the mucous membrane with foci of necrosis are expressed, at III - the mucous membrane becomes sharply hyperemic, edematous, with extensive necrosis. With burns of II and III degrees, nerve receptors are affected, therefore, as a rule, the child does not feel pain, such burns heal with the formation of a scar and narrowing of the affected sections of the mucous membrane.

Burns with hydrogen peroxide, including a 3% solution, of the oral mucosa in children are manifested by pronounced symptoms of diffuse catarrhal inflammation with the appearance of areas of necrosis of the surface layers of the epithelium (whitening of the mucous membrane).

In case of contact with the mucous membrane of such potent agents as a mixture of camphor and phenol, pure phenol and other phenol-containing drugs, it leads to

superficial necrosis, severe pain in the affected area, whitening, bright hyperemia and edema of the mucous membrane with erosion of its surface.

In case of burns with **potassium permanganate (KmnO<sub>4</sub>)**, pathogenic agents are atomic oxygen, caustic alkali, manganese dioxide, which are formed when potassium permanganate comes into contact with biological tissues. Caustic alkali, which is formed as a result of contact of potassium permanganate with biological tissues, causes colliquation necrosis of the OAS. Manganese dioxide, being a strong protoplasmic poison, causes severe changes in the cells of the nervous system. Shock and convulsions often occur.

Diagnostics and differential diagnostics. Diagnostics and differential diagnostics of chemical burns of the oral cavity is not difficult. However, in some cases, especially with extensive lesions of the mucous membrane, chemical burns should be differentiated from allergic reactions to drugs. Treatment of poisoning includes measures for the early removal of toxic substances from the stomach and symptomatic therapy aimed at treating the main syndromes of intoxication.

The easiest way to remove a toxic substance from the stomach is to induce vomiting. Emergency gastric lavage through a tube is carried out regardless of the patient's condition and the period that has passed since the moment of intoxication. The patient, when washing the stomach, should lie on his stomach with his head bowed. Chemical neutralization of acid or alkali in the stomach is not recommended. At the end of the gastric lavage, activated carbon is introduced through the probe to absorb the remaining poison in it.

From the mucous membrane of the oral cavity, the toxic substance is removed by repeated washing and rinsing the mouth with warm water, a weak solution of a neutralizing substance or an antidote. The most effective, simple and affordable is rinsing with water for 20-30 minutes.

Antidotes for phenol-containing drugs are: 50% alcohol, castor oil. For acid burns, alkaline solutions are used as neutralizing agents in the form of irrigations, lotions, oral baths (1 - 2% sodium bicarbonate solution, 0.1% ammonia solution - 10 drops of 10% solution per 200 ml of water, 1% solution calcium carbonate).

To neutralize alkali, weak solutions of acids are used (0.5% solution of acetic or citric acid, 0.01% solution of hydrochloric acid, 0.5% solution of acetic or citric acid, 2% solution of sulfuric acid). Antidotes of potassium permanganate are: 1% solution of ascorbic acid or a solution consisting of 2 liters of warm water + 10 ml of 3% solution of hydrogen peroxide + 200 ml of 3% acetic acid.

Attention is paid to the restoration of the circulating blood volume by the introduction of intravenous solutions. A diuretic is administered - furosemide (lasex). For local treatment of a burnt surface, 20 ml of the mixture (200 ml of 10% emulsion of sunflower oil, 2 g of geomycin, 2 g of anesthesin) is given every hour.

Local treatment is aimed at eliminating inflammation, swelling, soreness and accelerating epithelialization of oral mucosa lesions. Due to the sharp pain in the mouth, it is difficult to eat. Establishing nutrition is an essential component of the therapy. Locally used pain relievers, antiseptics, corticosteroids (in the initial period), drugs that accelerate epithelialization (in the third period).

### **Thermal trauma of oral mucosa in children**

**Burn** - damage to the mucous membrane of the oral cavity due to exposure to high temperature of a flame, hot liquid, steam and electric current. Depending on the height of the temperature and the duration of contact of the mucous membrane with the damaging factor, the burn is limited and diffuse, superficial and deep. Mainly the mucous membrane of the lips, the tip of the tongue, and the anterior part of the hard palate is affected.

When the temperature of the tissue rises, cells die, inflammation and necrosis of damaged tissues develop at the site of the burn, the endothelium of microvessels is damaged, and microcirculation is disturbed. Clinic. Depending on the temperature of the stimulus and the time of its exposure, burns of I, II and III degrees occur. In mild cases, catarrhal inflammation of the oral mucosa develops (1st degree burn).

With prolonged exposure to high temperatures, bubbles with serous-hemorrhagic contents are formed, which quickly open, forming erosion and necrotic superficial damage (second degree burn). A severe burn (III degree) is accompanied by symptoms of exudation and alteration (deep necrosis, ulcers).

A burn of the lips is accompanied by edema. The red border turns inside out, deforms and looks like a "fish mouth". With deep lesions, after opening the blisters, burn wounds appear, covered with necrotic plaque. After the rejection of necrotic tissues, the red border of the lips is not restored, a defect or microstomy may form, making it difficult to eat.

Burn treatment primarily includes the elimination of the damaging factor. For pain before meals, which should not be irritating, the use of anesthetics in the form of applications is indicated. Oral baths or irrigation with antiseptic solutions of low concentrations, herbal infusions, proteolytic enzymes, application of agents that accelerate epithelization are used.

**Prevention.** Prevention of burns in children is of great importance, especially during dental treatment procedures under anesthesia. The thin epithelial cover of the mucous membrane, rich vascularization, increased hydrophilicity contribute to the penetration of electric current, ultraviolet and helium-neon light, and heat to a greater depth. The listed features should be taken into account when carrying out physiotherapeutic procedures in children, since they develop responses earlier and at lower doses.

### **Frostbite of oral mucosa in children**

Low temperatures cause deep hypothermia of the tissues of the oral cavity, cause structural changes associated with intracellular and extracellular damage. At the same time, there is a violation of the blood circulation of the mucous membrane as a result of the resulting vascular spasm.

#### **Clinic**

The clinical manifestations of frostbite depend on the intensity, duration, area of contact of the low-temperature region with the tissue, as well as on the properties of the tissue itself. In the development of changes in frostbite, two periods are distinguished: pre-reactive and reactive, which occurs after the cessation of the action



of low temperature. In the first period, the child notes tingling, burning, slight soreness at the site of exposure to low temperatures.

Examination reveals pallor of the mucous membrane, a decrease in temperature at the affected area, and the disappearance of pain sensitivity. After the cessation of the action of low temperatures, soreness appears and a second period develops - reactive.

Clinical manifestations at this stage depend on the severity of the injury. There are 4 degrees of frostbite.

At grade I, tissue necrosis is absent. There is pain, burning, numbness at the site of contact with the damaging factor. On examination, hyperemia is determined, none pronounced edema, pain sensitivity is reduced. All changes that have occurred during this period are reversible and are eliminated after 3-5 days.

For II degree of frostbite, the same complaints are characteristic as in I. However, the pain intensifies at night and persists for a long time, up to 2-3 days. Examination reveals pronounced edema, the epithelium exfoliates, small vesicles with yellow or hemorrhagic exudate are formed. When the lining of the bubble is opened, painful erosion appears, which heals within 8-10 days without scarring.

With deep and prolonged exposure to low temperatures, frostbite of the III degree can develop with damage to all layers of the mucous membrane. Severe, prolonged pain is characteristic. Blisters with hemorrhagic contents are formed. At the site of the opened bubbles, dark crusts appear, which are rejected after 2-3 weeks. The wound surface heals with the formation of a scar.

IV degree of frostbite leads to the death of soft tissues and damage to the muscle layer. Complaints are the same as in grade III. Edema is pronounced, spreads beyond the dead tissue. A dense necrotic scab forms, which is slowly rejected. The outcome of the IV degree of frostbite of the mucous membrane is the formation of a scar, the formation of a tissue defect with a violation of its vital functions.

With frostbite of the oral mucosa, after 2-3 hours the frostbite zone becomes hyperemic, edematous, and a day later a necrotic film forms, which is tightly adhered to the surrounding tissue and has a yellow-gray color, and on the lips a dark gray color. The necrotic tissue is clearly delimited from the surrounding healthy mucous membrane by a narrow rim of hyperemia.

Rejection of necrotic masses begins on the 5-6th day. Epithelization of frostbite foci occurs under the necrotic film and ends by 12-16 days. By this time, the mucous membrane acquires the usual color, becomes smooth, shiny. The process ends with the formation of an inconspicuous scar.

Treatment of frostbite of the oral mucosa is determined by its severity. An important place in the treatment process is given to the child's nutrition, the food should not be irritating. For pain, the use of anesthetics in the form of applications is indicated. Oral baths or irrigation with antiseptic solutions of low concentrations, herbal infusions, proteolytic enzymes, application of agents that accelerate epithelization are used. With frostbite of the oral mucosa of the IV degree, treatment of children should be carried out in a hospital setting.

### **Radiation injuries of OSSR**



Radiation injuries under the action of penetrating radiation are rare in children, but they are possible in case of massive injuries of people by ionizing radiation or in other emergency situations. Most often, in childhood, radiation damage to the oral mucosa occurs as complications after radiation therapy of neoplasms of the maxillofacial region and manifests itself in the form of reactive changes (radiomucositis): radiation mucositis, desquamation of the epithelium, edema and hyperemia of the oral mucosa, gingivitis, sensory disturbances, erosion and ulcerative necrotic lesions. The severity of the reaction of the mucous membrane depends on the type of radiation, the quality and quantity of rays, the sensitivity of the tissues and the state of the oral cavity before radiation. The most sensitive to radiation are lymphocytes, bone marrow cells, epithelial cells of the digestive tract, and salivary glands.

First of all, the radiation reaction occurs on the mucous membrane of the soft palate, the floor of the mouth, lips, cheeks, that is, in places where the keratinizing epithelium is absent. The mechanism of development of disorders of the oral mucosa is based on changes in the epithelium (violation of mitosis, degeneration and increased keratinization of cells), in its own and submucosal layers (changes up to necrobiotic phenomena in the cellular state).

**Clinic.** The mucous membrane of the oral cavity is hyperemic, edematous, then the mucous membrane loses its luster, becomes cloudy, thickens, folds form on it and keratinization occurs. The rejection of the keratinized epithelium further leads to the formation of erosions covered with a yellowish-white necrotic plaque. The salivary glands are highly sensitive to radiation exposure.

In the initial period of irradiation, hypersalivation is possible, and then the secretion of the salivary glands is suppressed, after 12-14 days dryness occurs in the oral cavity, accompanied by dysphagia, loss of taste, and difficulty speaking. An early clinical symptom of a taste disorder is tingling at the tip and lateral surfaces of the tongue.

Treatment of radiation injuries should be comprehensive: general and local. General treatment is aimed at increasing the reactivity of the body with the use of drugs that improve carbohydrate, protein, fat metabolism, redox processes in tissues, reduce vascular permeability, accelerate tissue regeneration, increase immunity.

In the case of a secondary infection - broad-spectrum antibiotics, antifungal, antiviral drugs. Local treatment is carried out in accordance with the severity of clinical symptoms: pain relievers, applications of proteolytic enzymes, rinsing or mouth baths with weak solutions of antiseptics, agents that enhance salivation, applications of agents that promote epithelialization

**Prevention.** In the prevention of radiation reaction of the oral mucosa, an important role is played by sanitation.

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