Methodical Guides

on Pediatric Dentistry (Surgery)

for the 4th-year students of dental faculty

LVIV - 2012
<table>
<thead>
<tr>
<th>№</th>
<th>Topic</th>
<th>Acad. Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Anesthesia. Types, means, methods, their characteristic. Indication and contraindication for the choice of the method of anesthesia. Psychicopharmacological preparation of the child.</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Local and general anesthesia during the surgical intervention in children of the different age. Potentiative anesthesia. Types of the anesthesia on the upper and lower jaws. Complications, their prevention, emergency management.</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Teeth extraction operation. Indications to the temporary and permanent teeth extraction. Preoperative and postoperative complications of teeth extraction.</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Chronic odontogenic osteomyelitis. Clinical and roentgenological types (forms). Clinic, diagnostic. Treatment on the different developmental stages. Complications, consequences.</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Odontogenic and non-odontogenic lymphadenitis of the maxillo-facial area. Clinic, treatment, differential diagnostic.</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Surgical anatomy of the cellular space of the maxillo-facial area at children. The ways of the odontogenic infection extension. Etiology, pathogenesis, classification of the abscesses and phlegmonas of the maxillo-facial area at children.</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Clinical features of abscesses and flegmones of the maxillo-facial area at children, diagnostical methods. Complex treatment, rehabilitation.</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>Sialoadenitis. Differential diagnostic, clinic, diagnostic, treatment.</td>
<td>2</td>
</tr>
<tr>
<td>№</td>
<td>Topic of the Lecture</td>
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<tr>
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<tr>
<td>1</td>
<td>Odontogenic inflammatory jaw cysts of the temporary and permanent teeth. Clinical and roentgenological features. The diagnostic methods. Treatment.</td>
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<tr>
<td>2</td>
<td>Traumas of the soft tissues. Clinic, diagnostic.</td>
<td></td>
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<td>3</td>
<td>Traumas of the teeth (displacement, dislocation and fracture). Methods of diagnostic, peculiarities of the treatment, consequences.</td>
<td></td>
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<tr>
<td>1</td>
<td>Clinic of the short-cut frenulum of the tongue, upper and lower lips.</td>
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<tr>
<td>6</td>
<td>Clinic, operation in outpatient department.</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Summary lesson</td>
<td></td>
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<tr>
<td>7</td>
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</tbody>
</table>

**LECTURES**

(Surgery for the IVth year students of Dentistry Department, 8th term)
<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td>3</td>
<td>Inflammatory processes of the soft tissues of the maxillo-facial area at children (abscesses, phlegmons, limphoadenitis). Clinical features, diagnostics, diff. diagnostic. Treatment.</td>
</tr>
<tr>
<td>5</td>
<td>Traumas of the teeth, bones and facial soft tissues. Clinic, treatment, preventive measures, consequences.</td>
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Practical class 1


*Teaching objective:* to familiarize students with the methods and means of the anaesthesia in the ambulatory, classification of the local and general anaesthesia.

*Plan of the practical class*
<table>
<thead>
<tr>
<th>№</th>
<th>Steps</th>
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<tr>
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<td>20</td>
<td></td>
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<tr>
<td>3</td>
<td>Practical training</td>
<td>60</td>
<td>Tables, thematic patients, instruments for anaesthesia.</td>
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<tr>
<td>4</td>
<td>Summarizing of the class</td>
<td>5</td>
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**Pre-study test questions**

1. Innervations of the teeth and jaws in a children age.
2. Local anaesthesia and its classification.
3. Classification of the medicines which are used during local anaesthesia.
4. The main features of the amides anaesthetics.
5. The main features of the ether anaesthetics.
6. The choice of the medicines and types of the local anaesthesia during the dental procedure in the children of the different age.
7. The armamentarium for the local anaesthesia.

**Content of the class.**

**General anesthesia**

<table>
<thead>
<tr>
<th>Inhalation</th>
<th>Noninhalation</th>
<th>Combined</th>
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<tr>
<td>Mask</td>
<td>Endotracheal</td>
<td>i / v</td>
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<tr>
<td>Nasotracheal</td>
<td>i / m</td>
<td>Ataralgesia</td>
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<tr>
<td>Orotracheal</td>
<td>per rectum</td>
<td>Central</td>
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<td>Tracheostoma</td>
<td>electronarcosis</td>
<td>Combined</td>
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**Indication for general anesthesia in children:**

NLA is a form of analgesia achieved by the concurrent administration of a neuroleptic such as droperidol and an analgesic such as fentanyl. Anxiety, motor activity, and sensitivity to painful stimuli are reduced; the person is quiet and indifferent to surroundings and is able to respond to commands. If nitrous oxide with oxygen is also administered, neuroleptanalgesia can be converted to neuroleptanesthesia.
- Emergency in children which is connected with acute odontogenic and nonodontogenic inflammatory processes in oral cavity or maxillo-facial area (periostitis, abscesses, lymphadenitis) specially in the early age.
- Sanative intervention because of the chronic periodontitis, radicular and follicular cysts, lengthening of the short frenulum etc.

**Contraindications for general anesthesia in children:**
- Acute or exacerbated chronic inflammatory processes of the respiratory tract;
- Acute stage of an infectious diseases;
- Acute inflammatory diseases of the kidneys or urinary tracts, liver, lungs, exudative diathesis.

**Peculiarities of the different systems in children.**

Respiratory system – upper airways are narrow, vulnerable, disposed to swelling. The hypertrophy of tonsils, hyperglossy, hypersecretion of the salivary glands are often observed. The movement of the chest is also reduced in children. The alveolar surface of the lungs is three times smaller than in adults, and necessity of the oxygen is per 25-30 percent higher in children in case of the temperature rising. The children have demonstrated hyperergic reaction to the irritants, sickness of mucosa of the lungs for 1 mm leads to diminishing of the lung space for 75% (in adults – 19%). The insignificant changes in the respiratory system can lead to significant changes in breathing.

CVS. The children are highly sensitive to the blood loss. Blood dissipation more than 12-15% of blood volume should be resumed.

**There are two types of local anesthesia which are used during dental treatment:**

Injectable

- Infiltration
- Physical (cooling)
- intraosseous
- intraligamentous
- papillary

Noninjectable

- Conduction
- Peripheral
- Central

Chemical

**Local anesthetics** are the most commonly used drugs in dentistry. Local anesthetics work by interfering with nerve signals. Anesthetics prevent the production and propagation of nerve signals. Dental local anesthetics fall into two groups: amides and esters. The names are derived from the type of chemical link between the two ends (aromatic and base) of the local anesthetic molecule. The names of each locally clinical anesthetic have the suffix "-caine". Esters are prone to producing allergic reactions, which may necessitate the use of an Amide.
**Esters:** Procaine, Benzocaine, Chloroprocaine, Cocaine, Cyclomethycaine, Dimethocaine/Larocaine, Piperocaine, Propoxycaine, Procaine/Novocaine, Proparacaine, Tetracaine/Amethocaine.

**Amides:** Lidocaine, Articaine, Bupivacaine, Cinchocaine/Dibucaine, Etidocaine, Levobupivacaine, Lidocaine/Lignocaine, Mepivacaine, Prilocaine, Ropivacaine, Trimecaine.

Most ester local anesthetics are metabolized by pseudocholinesterases, while amide local anesthetics are metabolized in the liver. This can be a factor in choosing an agent in patients with liver failure.

The modern anesthetic solutions of choice for today are the solutions of the fourth generation, which are more effective and safety comparatively the solutions of the second and third generation. To the anesthetic solutions of fourth generation belong

**Articaine** based solutions (synthesized by J. E. Winther in 1974).

All local anesthetics are amphipatic. That is, they have both lipophilic and hydrophilic characteristics - usually at opposite ends of the anesthetic molecule. The lipophilic end of the molecule is attracted to lipids, and the hydrophilic end is attracted to water.

Local anesthetics create a chemical roadblock between the source of the pain or stimulation – and the brain. The function of a nerve is to carry information from one part of the body to another. These messages are in the form of electrical signals called action potentials. Local anesthetics block the operation of a specialized gate, called the sodium channel. When the sodium channel of a nerve is blocked, nerve signals cannot be transmitted. The only site at which the local anesthetic molecules have access to the nerve membrane is at the nodes of Ranvier, where there is an abundance of sodium channels. The interruption of a nerve signal in a myelinated nerve (dental nerve) occurs when nerve depolarization (the nerve signal) is blocked at 3 consecutive nodes of Ranvier – a length of about 8 to 10 mm. A vasoconstrictor (which constricts blood vessels) is usually added to local anesthetic solution to prolong the duration of anesthetic action. The vasoconstrictor, such as epinephrine, works by slowing the removal of the anesthetic from the vicinity of the nerve. **It is recommended not to use anesthetics with vasoconstrictor in children under 5 years old because of lability of CVS in children.**

The potency of a local anesthetic is directly related to its lipid solubility, since 90% of the nerve cell membrane is composed of lipid. The more acidic the local anesthetic solution is, the slower the onset of action, however. In addition, the more closely the equilibrium pH for a given anesthetic approximates physiologic pH, the more rapid the onset of anesthetic action. Finally, the better the local anesthetic molecule binds to the protein in the sodium channel of the nerve, the longer the anesthetic will be effective.

An important requirement for administering a local anesthetic is for the dentist to be familiar with the manner in which the teeth are innervated. Second, the dentist should use the smallest possible dose which achieves adequate anesthesia. The maximum dose for lidocaine injection in children is 4.5 mg/kg per appointment. The dose of local anesthetic should be adjusted downward when children are sedated,
however. When anesthetizing in the maxillary arch, the dentist should recall that the permanent first molar’s mesiobuccal root is innervated by fibbers from the middle superior alveolar nerve branch, while the remaining roots are innervated by the posterior superior alveolar nerve branch. This means that at least two injections are required for anesthetizing this tooth.

The primary maxillary second molar is innervated by both the posterior superior alveolar nerve and the middle superior alveolar nerve branches. Dentists should remember that the greater palatine nerve has accessory nerve fibbers that innervate the palatal roots of the upper primary and permanent molars. In the mandibular arch, the only guaranteed way to accomplish profound pulpal anesthesia is to perform an inferior alveolar nerve block. Primary incisors, however, can be anesthetized using supraperiostial injections – which anesthetizes branches of the incisive nerve.

Apply topical anesthetic to the injection site(s) for one minute prior to giving the injection.

Consider using a small mouth prop during the injection procedure. This will help provide access and visibility, prevent injury, and will help direct the needle to the correct injection site.

Don’t let the child see the needle. Use the Explain-Practice-Do technique for giving local anesthetic to children. Tell the child what he/she will feel during the procedure. Stress the importance of holding still during the administration of local anesthetic. Make sure that you or your assistant will be able to control any of the child’s sudden head or hand movements during the injection.

Be gentle when administering local anesthetic to a child. Give the injection very slowly to avoid discomfort. Aspirate frequently to avoid injecting into a blood vessel. Use an aspirating-type syringe which has a tiny harpoon that engages the rubber stopper of the anesthetic carpule.

Use the smallest and shortest needle which will do the job. Use the smallest dose of local anesthetic which will achieve adequate anesthesia. The dentist should consider the child’s weight and medical history in determining the correct dose of local anesthetic. Never give more than 4.5 mg/kg of lidocaine per dental appointment. Remember that the mandibular foramen in a child is located slightly below the plane of occlusion. In addition, the foramen is located more anterior than in adults – due to the narrow anteroposterior width of a child’s mandible. If an upper primary or permanent molar is not “getting numb,” try giving a greater palatine nerve injection. In children, it is usually adequate to infiltrate under pressure into the gingival sulcus of the troublesome upper molar. The long buccal nerve will sometimes innervate the lower primary or permanent molars, especially when placing a rubber dam clamp. This nerve passes lateral to the body of the mandible, and should be anesthetized slightly buccal to the last tooth being treated. The mylohyoid nerve sometimes gives accessory innervations to the lower teeth. A submucosal deposition of anesthetic at the medial surface of the mandible, at its junction with the floor of the mouth, will usually stop the problem. Remember to warn the child not to bite the “numb” cheek or lips. Give the warning during the dental appointment as well at the end of the appointment.
Comprehension control

1. Innervations of the upper jaw.
2. Innervations of the lower jaw.
3. Characteristic of the anaesthetics and vasoconstrictors.
4. Premedication.
5. Armamentarium for life-threatening conditions during administrating of the local anaesthesia.

Independent work

1. To write the recipes for local anaesthetics for children of the different age.
2. To draw the scheme of the innervations and vascularisation of the teeth of upper and lower jaws.

Recommended literature:

Practical class 2

Local and general anesthesia during the surgical intervention in children of the different age. Potentiative anesthesia. Types of the anesthesia on the upper and lower jaws. Complications, their prevention, emergency management

Teaching objective: to familiarize students with the methods of applicative, infiltrative, conductive and general anesthesia in the ambulatory, peculiarities of their administration.

Plan of the practical class

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Pre-study test questions

1. Local potentiate anesthesia (premedication).
2. Medicines that are used for the premedication.
3. Indications for the applicative anesthesia in children.
4. Types of the infiltrative anesthesia. Indications.
5. Types of the conductive anesthesia. Indications and contraindications.
6. Possible complications during administration of the local anesthesia. Its classification, emergency, prevention.
7. Central anaesthesia on the mandible.
8. Peripheral anaesthesia on a lower jaw.
9. Central anaesthesia on the maxilla.
10. Peripheral anaesthesia on the upper jaw.
11. Indications for the general anaesthesia in children.
12. Characteristics of the modern inhalative and noninhalative drugs.

Content of the class.

Topical anesthesia is a fundamental part of the administration of infiltration local anesthesia. It has psychological and pharmacologic importance. Topical anesthesia reduces or completely eliminates the pain of the needle penetration. Topical anesthetic is effective on surface tissues (2-3 mm in depth) to reduce painful needle penetration of the oral mucosa. A variety of topical anesthetic agents are available in gel, liquid, ointment, patch, and aerosol forms.

The topical anesthetic benzocaine is manufactured in concentrations up to 20%; lidocaine is available as a solution or ointment up to 5% and as a spray up to a 10% concentration. Benzocaine has a rapid onset. Benzocaine toxic (overdose) reactions are virtually unknown. Localized allergic reactions, however, may occur after prolonged or repeated use. Topical lidocaine has an exceptionally low incidence of allergic reactions but is absorbed systemically and can combine with an injected amide local anesthetic to increase the risk of overdose.

Recommendations:
1. Topical anesthetic may be used prior to the injection of a local anesthetic to reduce discomfort associated with needle penetration.
2. The pharmacological properties of the topical agent should be understood.
3. A metered spray is suggested if an aerosol preparation is selected.
4. Systemic absorption of the drugs in topical anesthetics must be considered when calculating the total amount of anesthetic administered.

Local anesthesia is the temporary loss of sensation including pain in one part of the body produced by a topically-applied or injected agent without depressing the level of consciousness.

Needle selection should allow for profound local anesthesia and adequate aspiration. Larger gauge needles provide for less deflection as the needle passes through soft tissues and for more reliable aspiration. The depth of insertion varies not only by injection technique, but also by the age and size of the patient. Dental needles are available in 3 lengths: long (32 mm), short (20 mm), and ultrashort (10 mm).

Needle gauges range from size 23 to 30. Needle breakage is a rare occurrence. The primary cause of needle breakage is weakening the needle due to bending it before insertion into the soft tissues; another cause is patient movement after the needle is already inserted.

10
Injectable local anesthetic agents

Local amide anesthetics available for dental usage include lidocaine, mepivacaine, articaine, prilocaine, and bupivacaine. Absolute contra-indications for local anesthetics include a documented local anesthetic allergy. True allergy to an amide is exceedingly rare. Allergy to one amide does not rule out the use of another amide, but allergy to one ester rules out use of another ester. A bisulfate preservative is used in local anesthetics containing epinephrine. For patients having an allergy to bisulfates, use of a local anesthetic without a vasoconstrictor is indicated. Local anesthetics without vasoconstrictors should be used with caution due to rapid systemic absorption which may result in overdose.

A long-acting local anesthetic (ie, bupivacaine) is not recommended for the child or the physically or mentally disabled patient due to its prolonged effect, which increases the risk of soft tissue injury. Claims have been made that articaine can diffuse through hard and soft tissue from a buccal infiltration to provide lingual or palatal soft tissue anesthesia. Studies using articaine, lidocaine, and prilocaine, however, did not substantiate these claims.

Epinephrine decreases bleeding in the area of injection. Epinephrine concentrations of 1:50,000 may be indicated for infiltration in small doses into a surgical site to achieve hemostasis but are not indicated in children to control pain. Local anesthetics that contain vasopressors help reduce toxicity by slowing the rate of absorption of the anesthetic and/or vasopressor into the cardiovascular system. A vasopressor-containing local anesthetic should be used when treatment extends to 2 or more quadrants in a single visit.

In pediatric dentistry, the dental professional should be aware of proper dosage (based on weight) to minimize the chance of toxicity and the prolonged duration of anesthesia, which can lead to accidental lip or tongue trauma. Knowledge of the gross and neuroanatomy of the head and neck allows for proper placement of the anesthetic solution and helps minimize complications (e.g., hematoma, trismus, intravascular injection). Familiarity with the patient’s medical history is essential to decrease the risk of aggravating a medical condition while rendering dental care. Appropriate medical consultation should be obtained when needed.

The procedures requiring local anesthesia in dental clinic are:

- Cosmetic dentistry procedures
- Deep dental fillings
- Root canal treatment
- Removal of teeth
- Crown and bridge work
- Implants
- Periodontal gum surgeries

Techniques of Dental Local Anesthesia

Regional dental anesthesia can be divided into component parts, depending on the technique employed. There are three different techniques used in dental anesthesia: local infiltration technique, nerve block and periodontal ligament...
injection. In local infiltration technique, small nerve endings in the area of the dental treatment are flooded with local anesthetic solution, preventing them from becoming stimulated and creating an impulse. Local infiltration technique is commonly used in anesthesia of the maxillary teeth and the mandibular incisors. In nerve block anesthesia (conduction anesthesia), the local anesthetic solution is deposed within close proximity to a main nerve trunk, and thus preventing afferent impulses from traveling centrally beyond that point. Nerve block is used in anesthesia of the inferior mandibular nerve, the lingual nerve, the buccal nerve, the greater palatine nerve and the nasopalatine nerve. Nerve block technique is required for anesthesia of mandibular molars and premolars because anesthetic solution is not able to penetrate the compact vestibular bone. Thus, local infiltration technique does not provide a successful anesthesia. Disadvantages of nerve block technique is an increased risk of traumatisation of the nerve trunk and an accidental intravascular injection of the local anesthetic solution.

In periodontal ligament (PDL) technique (intraligamentary injection), the local anesthetic solution is injected into the desmodontal space. The PDL technique is useful for anesthesia of mandibular molars as an alternative to the nerve block technique. The injection is painless and the anesthetic effect is limited to the pulp and desmodontal nerve of the tooth anesthesized. Duration of anesthesia is in the range of 15 to 20 minutes, which allows most routine dental treatment. The PDL injection is useful for extremely anxious patients and children, who do not tolerate conventional technique. The dose of anesthetic solution, which is required for complete anesthesia, is lower than in infiltration technique. For PDL technique, a high concentration of the local anesthetic is required due to the limited volume, which can be injected into the narrow desmodontal space.

**General complications during administering of local anesthesia:**
- loss of consciousness;
- anaphylactic reaction (collapse, anaphylactic shock);

**Local complications during administering of local anesthesia:**
- entering of the infection into the tissues;
- damage of nerves and vessels, appearance of hematomas, abscesses, paresthesia;
- damage of the adjacent organs;
- breakage of the needle;
- trismus (lockjaw) of the mandible;
- direct injection of the solution into the blood stream;
- temporary paresis of the muscles

Children may receive dental treatment in conjunction with general anesthesia. An anesthesiologist can provide general anesthesia, while a paediatric dentist provides dental treatment. This may be done in either a hospital or dental office. General anesthesia is defined as a controlled state of unconsciousness, accompanied by a partial or complete loss of protective reflexes, including the inability to
independently maintain an open airway, and respond purposefully to physical stimulation or verbal commands.

An adequate preoperative evaluation is the most important part of the general anesthesia process.

Some of the major components of the evaluation include:
1. A thorough review of the child's medical history.
2. A complete physical examination.
3. A review of systems. This means evaluating each of the child's functional systems, such as the: cardiopulmonary, airway, hematologic, central nervous, renal, hepatic, gastrointestinal, endocrine, and metabolic systems.
4. Knowledge of the child's current medications and allergies.
5. Knowledge of the child's previous anaesthetic experiences.
6. Diagnostic lab tests and additional consultations.

Sedative medication may be administered by many routes, including oral, intranasal, transmucosal, rectal, intramuscular, inhalational, and intravenous. The advantage of the intravenous route is that it results in the most rapid onset, rapid offset, and predictable effect. The disadvantage is that it entails establishing intravenous access. A percentage of children do not cooperate and allow an intravenous catheter to be inserted. Many children report the needle puncture from either intravenous placement or intramuscular injection as the worst part of their care. The inhalational induction of anesthesia with a potent anesthetic agent also provides rapid onset, rapid offset, and a predictable effect. The advantage of this technique, similar to the intravenous route, is the option to use short-acting agents enabling the anesthetic state to be rapidly terminated at the end of the procedure. The traditional inhalation induction is accomplished by administering oxygen or a mixture of oxygen (minimum concentration of 30%) and nitrous oxide using a full face mask.

Ketamine Ketamine is a pharmacologic agent that induces a distinct anesthetic state that resembles catalepsy. The patient appears awake but is noncommunicative. Nonpurposeful movements may occur but are not disruptive. The eyes are commonly open with a blank stare and intact corneal and light reflexes. A lateral nystagmus is also very characteristic. Ketamine also produces amnesia and analgesia. The clinical effect created by ketamine results from a dissociation between the thalamoneocortical and limbic systems, which disrupts the brain from interpreting visual, auditory, and painful stimuli. Ketamine is also unique in its effects on the respiratory system. In clinical doses commonly used in oral and maxillofacial surgery, ketamine usually preserves upper airway musculature tone, spontaneous respirations. This minimizes the incidence of upper airway obstruction and hypopneas/apneas, and maintains the pulmonary oxygen reserve. In contrast, most other anesthetics contribute to a decrease in muscular tone, respirations. In addition to maintaining upper airway muscular tone, ketamine tends to better maintain the pharyngeal and laryngeal airway reflexes. This allows the patient to maintain the ability to swallow and cough, which minimizes the risk of pulmonary aspiration. Ketamine has also been shown to relax bronchial smooth muscle and cause bronchial
dilatation. It has been used in the management of wheezing during anesthesia. A disadvantage of ketamine is its stimulation of dreams and hallucinations described as “out of body” experiences, sensations of floating, and delirium. Although the incidence is less in children < 16 years of age, the incidence may be as high as 10%. Ketamine is also contraindicated in patients who may have a globe or intracranial injury as ketamine increases both intraocular and intracranial pressure.

**Midazolam** is a water-soluble short-acting benzodiazepine. As a class of agents, the benzodiazepines provide anxiolysis, sedation, and amnesia. Midazolam can be administered IV, IM, orally, sublingually, intranasally, or rectally. Because of its water solubility, intramuscular injection of midazolam is pain free, and absorption is predictable. Unlike ketamine, however, as a single agent there is no unique anesthetic benefit to the intramuscular administration of midazolam. Intranasal administration of midazolam was popular in the past. It was once the most common intranasally administered medication. However, because of an acidic pH, it produces irritation to the nasal mucosa. The medication if administered slowly is discomforting and if administered rapidly passes through the nose into the nasal pharynx and is swallowed. In a study that compared oral to intranasal administration of midazolam, children were found to be less tolerant of the intranasal administration. Oral midazolam is probably the most widely used premedicant in children. The recommended dose of midazolam is 0.5 to mg/kg to a maximum of 20 mg.

Midazolam 0.5 mg/kg achieves anxiolysis in 70 to 80% of patients. Adequate monitoring during general anesthesia is essential to ensure that the appropriate level of anesthesia is administered, as well to detect any developing complications.

**Comprehension control**

1. Peculiarities of the local anesthesia in pedodontic dentistry.
2. Indications and contraindications for the local anesthesia.
3. Local anesthesia of the mandible.
4. Local anesthesia of the maxilla.
5. General complications during administering of local anesthesia. Clinic, treatment, prevention.
7. Indications and contraindications for the general anesthesia.

**Independent work**

1. To write the recipes for emergency for children of the different age.
2. To draw the anatomical landmarks which are used during administering of the conduction anaesthesia of the lower and upper jaws.
Practical class 3

Teeth extraction operation. Indications to the temporary and permanent teeth extraction. Complications during and afterwards teeth extraction

Teaching objective: to familiarize students with the methods of extraction of primary and permanent teeth in the ambulatory, indications and contraindications to the tooth extraction.

Plan of the practical class

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Content of the class.

Surgical extraction is the method by which a tooth is removed from its socket. The technique of teeth extraction is relatively simple procedure within a general practitioner’s scope if the basic principles of the surgical technique are followed.

Indications for the primary teeth extraction:
- The tooth is responsible of the acute septic state;
- The tooth is the source of the acute odontogenic processes (permanent exacerbated periostitis, osteomyelitis);
- the hosts defense system is weakened;
- arresting of the root formation before ending of the root development;
- damaging of the cortical lamina of the permanent tooth follicle by inflammatory process;
- pathological or physiological root resorption more than for 1/3 of its length;
- tooth mobility (II-III degree);
- the crown of the tooth is destroyed and the physiological tooth changing occurs in 18 months;
- root or tooth floor perforation;
- inner resorption of the roots;
- extensive pathological destroying of the bone;
- the failure of the conservative treatment;
- the patients with complicated anamnesis vitae;
- retained primary tooth with radiographic evidence of the presence of permanent tooth.
**Indications for the extraction of the permanent teeth:**
- Teeth which are responsible for the acute odontogenic osteomielitis of the jaws (mainly molars);
- Teeth with chronic periodontitis which can not be cured with conservative or surgical methods of treatment (dental hemisection, replantation, apicectomy, root amputation);
- Severe decay of coronal part of the tooth, when it is impossible to make use of tooth root for prostodontic purpose;
- Supplemental and impacted tooth without possibility of their eruption;
- Deciduous teeth without changing till 15 years with roentgenological confirmation of the permanent tooth presence in second dentition;
- Intact teeth which are located into the line of jaw fracture and prevent bone fragment from reposition;
- Teeth with periapical inflammation which are located into the line of jaw fracture and do not prevent bone fragment from reposition;
- Longitudinal or splintered root fracture;
- Orthodontic purpose

**Conditional contraindication for the teeth extraction:**
- Cardio-vascular disorders (stenocardia, arrhythmia, rheumatism, endocarditis and myocarditis in the stage of exacerbation, cardiac decompensation);
- Renal diseases (acute glomerulonephritis, renal insufficiency);
- Acute infectious disease;
- CNS disorders;
- Mental disorders in the exacerbation period;
- Acute inflammatory disorders of the oral mucosa;
- Teeth which are located in the focus of malignant tumor or bone hemangioma;
- Acute disorders of airways

**Pre- and postoperative complications.**

**Postoperative pain.** Discomfort after the surgical trauma of dental extractions is to be expected and may be alleviated with an analgesic such as paracetamol or a non-steroidal antiinflammatory drug (NSAID) such as ibuprofen. Severe pain after a dental extraction is unusual and may indicate that another complication has occurred.

**Postoperative swelling.** Mild inflammatory swelling may follow dental extractions but is unusual unless the procedure was difficult and significant surgical trauma occurred. More significant swelling usually indicates postoperative infection or presence of a haematoma. Management of infection may require systemic antibiotics or drainage. A large haematoma may need to be drained. Less likely is surgical emphysema (see below).

**Trismus.** Trismus or limited mouth opening after a dental extraction is unusual and is likely to be infective in origin.
**Fracture of teeth.** Teeth may fracture during forceps extraction for a variety of reasons and this is not an unusual event. The crown may fracture because of the presence of a large restoration, but this may not prevent the extraction from continuing as the forceps are applied to the root. However, if the fracture occurs subgingivally, then a transalveolar approach will be necessary to visualise the root. If a small (3 mm) root apex is retained after extraction, this may be left in situ, providing it is not associated with apical infection. The patient must be informed of the decision to leave the apex to avoid the morbidity associated with its surgical retrieval and the decision recorded. Antibiotics should be prescribed.

**Excessive bleeding.** It may be difficult to gauge the seriousness of the blood loss from the patient's history, because they are usually anxious. However, it is important to establish whether or not the patient is shocked by measuring the blood pressure and pulse. This can be done while the patient bites firmly on a gauze swab to encourage haemostasis. Typically, if the systolic pressure is below 100 mgHg and the heart rate in excess of 100 beats/min, then the patient is shocked and there is an urgent need to replace lost volume. This may be done by infusion of a plasma expander such as Gelofusine or Haemaccel or a crystalloid such as sodium chloride via a large peripheral vein. For this purpose, the patient should be transferred to hospital. More commonly, the patient is not shocked and can be managed in the primary care setting.

The next step in management is to investigate the cause of the haemorrhage by taking a history and carrying out an examination.

**History**
- Local causes
  - mouthrinasing
  - exercise
- General causes
  - previous postextraction or surgical haemorrhage
  - medications
  - liver disease
  - family history of disorders of haemostasis.

**Examination**

Determine the source of the haemorrhage by sitting the patient upright (unless feeling faint) and using suction and a good light. This is commonly from capillaries of the bony socket or the gingival margin of the socket, or more unusually from a large blood vessel or soft tissue tear. Achieve haemostasis If the history has suggested a general cause, then local methods will not adequately result in haemostasis and the patient should be transferred to hospital where specialist haematological management is available.

Otherwise the following techniques are used:
- socket capillaries: pack the socket with resorbable cellulose, such as Surgicell
- gingival capillaries: suture the socket with a material that will permit adequate tension, such as vicryl or black silk
- large blood vessel: ligate vessel, usually by passing a suture about the vessel and soft tissues.
**Dry socket (alveolar osteitis).** In some cases, a blood clot may inadequately form or be broken down. Predisposing factors of osteitis include smoking, surgical trauma, the vasoconstrictor added to a local anaesthetic solution, oral contraceptives and a history of radiotherapy. The exposed bone is extremely painful and sensitive to touch.

Dry socket is managed by:
- reassuring the patient that the correct tooth has been extracted
- irrigation of socket with warm saline or chlorhexidine mouthrinse to remove any debris
- dressing the socket to protect it from painful stimuli: bismuth-iodoform-paraffin paste (BIPP) and lidocaine (lignocaine) gel on ribbon gauze are useful.

**Postoperative infection.** In some cases, sockets may become truly infected, with pus, local swelling and perhaps lymphadenopathy. This is usually localised to the socket and can be managed in the same way as a dry socket, although antibiotics may be necessary in some instances. A radiograph should be taken to exclude the presence of a retained root or sequestered bone. Positive evidence of such material in the socket indicates a need for curettage of the socket.

**Damage to soft tissues.** Crush injuries can occur to soft tissues when a local or general anaesthetic has been used and the patient does not respond to the stimulus and, therefore, inform the operator. This may happen to a lower anaesthetised lip when extracting an upper tooth; the lip can be crushed between forceps and teeth if it is not rotated out of the way.

**Damage to nerves.** Paraesthesia or anaesthesia can result from damage to the nerves in the infradental canal during extraction of lower third molars.

**Opening of the maxillary sinus.** Creation of a communication between the oral cavity and maxillary sinus, an oroantral fistula (OAF), may result during extraction of upper molar teeth.

**Loss of tooth.** A whole tooth may occasionally be displaced into the maxillary sinus, when it is managed as for displacement of a root fragment. A tooth may also be lost into the infratemporal fossa or the tissue spaces about the jaws, but this usually only occurs when mucoperiosteal flaps are raised.

**Loss of tooth fragment.** Typically, a fractured palatal root of an upper molar tooth is inadvertently pushed into the maxillary sinus by the misuse of elevators. Rarely, a fragment may be lost elsewhere, such as into the inferior alveolar canal.

**Fracture of the maxillary tuberosity.** Fracture of the maxillary tuberosity can result from the extraction of upper posterior molar teeth.

**Fracture of jaw.** A fracture of the jaw is a rare event and is most likely to be the result of application of excessive force in an uncontrolled way. More commonly, small fragments of alveolar bone are fractured, which may be attached to the tooth root. Any loose fragments should also be removed.

**Dislocation of the mandible.** Dislocation may occur when extracting lower teeth if the mandible is not adequately supported. It is more likely to occur under general anaesthesia and should be reduced immediately.

**Displacement of tooth into the airway.** The airway is at risk when extracting teeth on a patient in the supine position. It can be protected when the patient is being
treated under general anaesthesia but not when the patient is conscious or being treated under conscious sedation. It is, therefore, essential that an assistant is present and high velocity suction and an appropriate instrument for retrieval of any foreign body are immediately available. A chest radiograph is essential if a lost tooth cannot be found, to exclude inhalation.

**Surgical emphysema.** Air may enter soft tissues, producing a characteristic crackling sensation on palpation. However, this is unlikely if a mucoperiosteal flap has not been raised. Air-rotor dental drills should not be used during surgery because they may force air under soft tissue flaps.

The patient should be reassured and antibiotics prescribed.

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**Comprehension control**

1. Indications and contraindications to the tooth extraction.
2. Armamentarium for the tooth extraction.
3. Peculiarities of the preparation of the patient for the tooth extraction.
4. Peculiarities of the primary teeth extraction.
5. Peculiarities of the permanent teeth extraction.
6. Preoperative tooth extraction complications, their prevention.
7. Postoperative tooth extraction complications (hemorrhage, alveolitis, socket pain), their prevention and treatment.

**Recommended literature:**


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**Practical class 4**


**Teaching objective:** to familiarize students with features of the etiology, pathogenesis, clinical course and treatment of periostitis on the upper and lower jaws in children.

**Plan of the practical class**

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2. Inquiry of the students

3. Practical training

4. Summarizing of the class

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**Pre-study test questions**

1. Anatomy and physiology of the primary and permanent teeth, jaw bones in children.
2. The ways of infection spreading in maxillo-facial region in children.
3. An importance of the early diagnostic and treatment of the inflammatory processes of MFR in children.

**Content of the class**

Periostitis is a medical condition caused by inflammation of the periosteum, a layer of connective tissue that surrounds bone.

The classification of periostitis:

**By clinical course:**
- Acute (serous, purulent)
- Chronic (hyperplastic, ossifying)

**By the etiology:**
- Odontogenic;
- Nonodontogenic (posttraumatic, by spreading, haematogenic, lymphogenic, stomatogenic);

**By the type of infection:**
- Specific;
- Non-specific.

**Acute odontogenic serous periostitis.**

Rarely this form of periostitis is diagnosed at children due to its fast develop into the festering form (1-2 days).

**Complaints:** - tooth pain during chewing;
  - worsening of the self condition (decreasing of the appetite and disturbances of the night sleep);
  - painful edematous swelling of the cheek and the mucosa of alveolar process.

**Clinic:**
- asymmetry of the face due to edema of the soft tissues around the painful thickening of the periosteum;
- “Causal” tooth is injured by periodontitis;
- Discoloration of the blasted crown of the tooth;
- Tenderness to percussion;
- Mucogingival fold is filled-in and swelled from the one side (mainly on the vestibular), infiltrated, painful, reddening of the mucosa is observed;
- No fluctuation.
- No specific roentgenologic picture.

**Treatment:** - the first of all dentist should make the decision regarding the “causal” tooth, depending on its functional status, stage of the root resorption at the primary tooth, possibility of the conservative treatment of the permanent tooth. If there is no effectiveness of conservative therapeutic treatment, the tooth should be extracted;

- the relief is not always present after the tooth extraction; that is why the periostotomy and drainage (for 3-4 days) supposed to be carried out with the tooth extraction; the periostotomy is provided for decreasing of the tissue pressure in the inflamed area;
- antimicrobial and antihistaminic drugs.

**Complication** - the acute suppurative odontogenic periostitis.

**Acute odontogenic suppurative periostitis.**

This form is mainly observed at 6-8 years old children with mixed dentition.

**Complaints:** - facial deformation in the lower or upper jaw area;
- difficulties during chewing on the injured side;
- general intoxication (body temperature rises, decreasing of the appetite, disturbances of the night sleep);
- limited mouth opening;
- pain during swallowing, etc.

**Clinic:** - facial asymmetry due to tissue edema with slightly skin reddening;
- limited mouth opening due to painful tissue edema;
- filled-in mucogingival fold on vestibular side on level of “causal” tooth and of the 1-2 adjacent teeth; mucosa is reddened and swelled, frank fluctuation;
- “causal” tooth is destroyed, mobile;
- slight tenderness to percussion;
- regional lymphoadenitis on the injured side
- when the roots of primary teeth are on the resorption stage, the obvious clinical features are not revealed during observation. The infiltration of the periosteum is located closely to the marginal gingival side. That is why abscesses in such cases are revealed subgingivaly.

**Differential diagnosis** should be carried out with chronic periodontitis, lymphoadenitis, osteomyelitis, and purulent radicular and follicular cysts of the jaw, malignant tumors.

**Treatment.** The treatment should be started as soon as possible – straight after the setting of the diagnosis. The peristotomy and drainage should be provided with primary tooth extraction. When the permanent tooth is involved to the inflammatory process the drainage of pus through the root canal should be performed. If there are evidences of body’s weakness, frank local clinical features of periostitis, presence of allergic reactions and chronic diseases in anamnesis, the child should be hospitalized.

**Surgical treatment:**

- the incision during peristotomy should be provided parallel to the mucogingival fold and lower or upper of the latter one (depending of the jaw);
- when the palatal peristitis is observed, the triangle or oval mucoperiosteum flap excision should be performed, the drainage is not needed.

After the surgical intervention the dentist prescribes the mouth bath with antiseptics, dymexid compression with furaceline and physiotherapeutic procedures.

**Complication:** osteomyelitis, abscess and phlegmon of the soft tissues.

**Chronic periostitis.**

This form is rarely observed at children. Mainly it occurs as the result of untreated inflammatory process in the periodontum during 10-14 days from the beginning of the disease. The acute trauma of the jaw could be the reason of nonodontogenic chronic inflammation of the periosteum.

There are **two forms** of the chronic periostitis:
- Common;
- Ossifying (older aged children).

**Complaints:** - unpainful or slightly painful deformation of the certain area of the jaw.

**Clinic:** - changed facial configuration due to enlargement of the certain area of the jaw with normal skin above it;
- painless or slightly painful palpation, enlargement of the lymphatic nodules could be observed;
- free mouth opening;
- cyanosis of the mucosa above filled-in mucogingival fold;
- thickening of the alveolar processus during the palpation is observed;

  If the adequate treatment is not provided, the common periostitis will transform into the ossifying.

  Roentgenologically on the common stage the shade of the periosteum thickening of the bone on the jaw edge is observed. On the X-ray of the ossifying form the areas with new developed bone are present.

Dif. Diagnosis: with fibrous osteodysplasia, giant-cell tumor, chronic osteomyelitis, tuberculosis.

**Treatment**

- Surgical incision of the infiltrate should be performed to the bone in the area of enlarged periosteum;
- The wound should be drainage (5-7 days) and irrigated with antiseptics;
- Physiotherapeutic procedures;
- Surgical leveling of the enlarged part of the bone when ossifying form is present;
- Extraction or treatment of the “causal” tooth;
- Symptomatic therapy.

**Comprehension control**

1. The modern concerns on the etiology and pathogenesis of acute and chronic periostitis.
2. Clinical forms of odontogenic periostitis in children, their diagnostic.
3. Differential diagnostic of periostitis with other diseases of the MFA in children.
5. Indications for the surgical treatment.
6. Prognosis of the disease.
Practical class 5


Teaching objective: to familiarize students with modern concerns about pathogenesis, clinic, diagnostic, treatment of the acute osteomyelitis of upper and lower jaws in children.

Plan of the practical class

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Pre-study questions
1. Anatomy and physiology of the primary and permanent teeth, jaw bones in children.
2. The ways of infection spreading in maxillo-facial region in children.
3. An importance of the early diagnostic and treatment of the inflammatory processes of MFR in children.

Osteomielitis

Osteomielitis is a purulent, necrotic, infectious- allergic inflammatory process in a bone that occurred due to influence of exo- and endogenic factors on the base of previous sensibilisation and secondary immunosupression of the organism. Osteomyelitis is accompanied by necrosis of the bone tissue. Osteomyelitis is defined as an inflammation of the bone marrow with a tendency to progression. This is what differentiates it in the jaw from the ubiquitous dentoalveolar abscess, “dry socket” and “osteitis,” seen in infected fractures.

Pathogenesis. In the maxillofacial region, osteomyelitis primarily occurs as a result of contiguous spread of odontogenic infections or as a result of trauma. Primary hematogenous osteomyelitis is rare in the maxillofacial region, generally occurring in the very young. The adult process is initiated by an inoculation of bacteria into the jawbones. This can occur with the extraction of teeth, root canal therapy, or fractures of the maxilla or mandible. This initial insult results in a
bacteria-induced inflammatory process or a cascade. With inflammation there is hyperemia and increased blood flow to the affected area. Additional leukocytes are recruited to this area to fight off infection. Pus is formed when there is an overwhelming supply of bacteria and cellular debris that cannot be eliminated by the body’s natural defense mechanisms. When the pus and subsequent inflammatory response occur in the bone marrow, an elevated intramedullary pressure is created which further decreases the blood supply this region. The pus can travel via haversian and Volkmann’s canals to spread throughout the medullary and cortical bones. Once the pus has perforated the cortical bone and collects under the periosteum, the periosteal blood supply is and this further aggravates the local condition. The end point occurs when the pus exits the soft tissues either by intraoral or extraoral fistulas.

**Classification**

Osteomyelitis of maxillofacial area at children is classified in the following way:

1. **By the spreading of infection:**
   - Odontogenic;
   - Nonodontogenic:
     a) vascular: - hematogenous; - lymphogenous;
     b) stomatogenous;
     c) post-traumatic;
     d) contiguous.

2. **By the type of infection:**
   - specific (actinomycetous, syphilitic, tuberculous) is rarely observed at children;
   - nonspecific (commonplaced), caused by mixed microbial infection.

3. **By the course of disease:**
   - Acute;
   - Primary chronic;
   - Chronic as the result of the acute osteomyelitis:
     a) destructive form;
     b) productive or hyperplastic form;
     c) destructive-productive form;
   - Exacerbation.

4. **By the anatomy:** - Osteomyelitis of the upper or lower jaw (with clear localization of the process);
   - Osteomyelitis of the other bones of maxillofacial area.

5. **By the spreading:** - localized;
Clinical Presentation. Very often, as with any infection, the patient with osteomyelitis of the maxillo-facial region will present with classic symptoms:

- Pain
- Swelling and erythema of overlying tissues in the region of causal and adjacent teeth
- Deformation of the alveolar processus from the both sides
- The pus is observed during the palpation
- The causal tooth is injured with periodontitis
- Mobility of the adjacent teeth (2-3)
- Adenopathy
- Fever
- Paresthesia of the inferior alveolar nerve (Vensan’s symptom)
- Trismus
- Malaise
- Fistulas, abscesses, phlegmon of the soft tissues

The pain in osteomyelitis is often described as a deep and boring pain, which is often out of proportion to the clinical picture. In acute osteomyelitis it is very common to see swelling and erythema of the overlying tissues, which are indicative of the cellulitic phase of the inflammatory process of the underlying bone. Fever often accompanies acute osteomyelitis, whereas it is relatively rare in chronic osteomyelitis. Paresthesia of the inferior alveolar nerve is a classic sign of a pressure on the inferior alveolar nerve from the inflammatory process within the medullary bone of the mandible. Trismus may be present if there is inflammatory response in the muscles of mastication of the maxillofacial region. The patient commonly has malaise or a feeling of overall illness and fatigue, which would accompany any systemic infection. Lastly both intraoral and extraoral fistulas are generally present with the chronic phase of osteomyelitis of the maxillofacial region.

In the acute phase of osteomyelitis it is common to see a leukocytosis with left shift, common in any acute infection. Leukocytosis is relatively uncommon in the chronic phases of osteomyelitis. The patient may also exhibit an elevated erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP). Both the ESR and CRP are very sensitive indicators of inflammation in the body and they are very nonspecific. Therefore, their main use is to follow the progress of the osteomyelitis.

Nearly all patients will have form of maxillofacial imaging. The orthopanoramic view is indispensable in the initial evaluation of osteomyelitis. One must bear in mind that radiographic images lag behind the clinical presentation since cortical involvement is required for any change to be evident. Therefore, it may take several weeks before the bony changes appear radiographically. Hence, it is possible to see a patient with acute osteomyelitis that has a normal-appearing orthopantomogram.
However, one can often see the appearance of “moth-eaten” bone or sequestrum of bone, which is the classic appearance of osteomyelitis.

Computerized tomography (CT) scans have become the standard in evaluating maxillofacial pathology such as osteomyelitis. They provide three-dimensional imaging not available on an orthopanoramic view.

Dif. Diagnostic: with odontogenic and nonodontogenic abscesses and phlegmons, sialoadenitis, specific processes, periostitis, Ewing sarcoma, suppurative jaw cysts.

Hematogenic osteomyelitis. This type of osteomyelitis occurs in 7% of all cases of osteomyelitis in kids; more often present on an upper jaw in kids of 1-2 years old. Staphylococcus is the main etiological factor which leads to hematogenic osteomyelitis. Entry of infection are umbilical sepsis, purulent dermal lesions, microtraumas of mucosa, chroniosepsis, otitis, the disturbance of the nursing care of the child due to mother’s mastitis There is acute beginning of the disease with frank intoxication. The symptoms of the general malaise predominate over the local ones. By the clinical course there are three forms of the hematogenic osteomyelitis:

- toxic;
- septicopiemic form;
- focal ( rarely present in kids)

Toxic form is characterized by tempestuous course – high temperature, severe intoxication of the organism, tachycardia, hypo- and tachypnoe, left shift, leucocytosis, anemia, increasing of the ESR in the blood. The symptoms of the jaw involvement appear only on the fourth- sixth days after the onset of the disease.

Septicopiemic form also is characterized by rapid course and violent worsening of the general condition of the child. But in spite of the toxic form the local signs appear quickly.

Comprehension control

1. Etiology, pathogenesis of acute osteomyelitis.
2. Classification of acute osteomyelitis.
5. The scheme of treatment of acute odontogenic osteomielitis.
Practical class 6

Chronic odontogenic osteomyelitis. Clinical and roentgenological types (forms).
Clinic, diagnostic. Treatment on the different developmental stages.
Complications, consequences.

Teaching objective: to familiarize students with modern concerns about pathogenesis, clinic, diagnostic, treatment of the chronic osteomyelitis of upper and lower jaws in children.

Plan of the practical class

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Pre-study questions:
1. The reasons of the chronic osteomyelitis development.
2. An importance of the early diagnostic and correct treatment of the chronic inflammatory processes of MFR.

Content of the class:
Atypical forms of reaction on microorganisms, decreasing of the defense of the child’s organism, unreasonable intake of antibiotics, incorrect treatment of the acute form of odontogenic inflammatory processes may lead to primary chronic osteomyelitis (osteomyelitis Garre) development.

The disease mainly occurs in children of 7-12 years old on the mandible in the premolars and molars region. The thickening of the alveolar bone or angle of the jaw is the principal symptom of the disease. The clinical manifestation of the inflammation may be absent or slightly expressed. The solid, painless lesion with unchanged mucosa is revealed during the palpation. The pus is not present in case of excision. On X-ray examination: extension and consolidation of the cortex, small areas of the bony resorption in the marginal region, periosteum thickening are present.
Chronic odontogenic osteomyelitis is a result of an untreatable or incorrectly treatable of acute osteomielitis which happens after 7-9 days of acute onset. Ch.O.O. mainly develops on the lower jaw in children of 5-10 years old. Exacerbation and long-lasting course are characteristic features of these forms of osteomyelitis:

- Destructive
- Productive
- Destructive-productive

**Treatment.** The management of osteomyelitis of the maxillofacial region requires both medical and surgical interventions. In rare cases infantile osteomyelitis, intravenous antibiotic therapy alone may eradicate the disease. Antibiotic therapy is rarely curative in later-onset cases, and the overwhelming majority of osteomyelitis cases surgical intervention. Clearly the first step in the treatment of osteomyelitis is diagnosing the condition correctly. The tentative diagnosis is made from clinical evaluation, radiographic evaluation, and tissue diagnosis. The clinician must be aware that malignancies can mimic the presentation of osteomyelitis and must be kept in the differential diagnosis until ruled out by tissue histopathology. Tissues from the affected site should be sent for Gram stain, culture, sensitivity, and histopathologic evaluations. The clinical response to the treatment of any patient will be compromised unless altered host factors can be optimized. Medical evaluation and management in defining and treating any immunocompromised state is indicated and often helpful. For example, glucose control in a diabetic patient should be stabilized for best response to therapy. Empiric antibiotic treatment should be started based on Gram stain results of the exudates or the suspected pathogens likely to be involved in the maxillofacial region. Definitive culture and sensitivity reports generally take several days or longer to be obtained but are valuable in guiding the surgeon to the best choice of antibiotics based on the patient’s specific causative organisms. Infectious disease consultation may illustrate the most current antimicrobials and/or regimens.

**Surgical Options**

Classic treatment is sequestrectomy and saucerization. The aim is to debride the necrotic or poorly vascularized bony sequestra in the infected area and improve blood flow. Sequestrectomy involves removing infected and avascular pieces of bone—generally the cortical plates in the infected area. Saucerization involves the removal of the adjacent bony cortices and open packing to permit healing by secondary intention after the infected bone has been removed. Decortication involves removal of the dense, often chronically infected and poorly vascularized bony cortex and placement of the vascular periosteum adjacent to the medullary bone to allow increased blood flow and healing in the affected area. The key element in the above procedures is determined clinically by cutting back to good bleeding bone. Clinical judgment is crucial in these steps but can be aided by preoperative imaging that shows the bony extent of the pathology. It is often necessary to remove teeth adjacent to an area of osteomyelitis. In removing adjacent teeth and bone the clinician must be aware that these surgical procedures may weaken the jaw bone and make it
susceptible to pathologic fracture. Supporting the weakened area with a fixation device (external fixator or reconstruction type plate) and/or placing patient in maxillomandibular fixation is frequently used to prevent pathologic fracture. Some authors have proposed adjunctive treatment methods that deliver high doses of antibiotic to the area using antibiotic impregnated beads or wound irrigation systems. Resection of the jaw bone has traditionally been reserved as a last-ditch effort, generally after smaller debridements have been performed or previous therapy has been unsuccessful or to remove areas involved with pathologic fracture. This resection is generally performed via an extraoral route, and reconstruction can be either immediate or delayed based on surgeon’s preference. Rigid internal fixation has simplified the postoperative course by providing a means for immediate function of the jaws. We believe that early resection and reconstruction shorten the course of treatment. Once the patient develops paresthesia in mandibular osteomyelitis, resection and immediate reconstruction are indicated. At this point preservation of the mandible is highly unlikely and one should attempt to shorten the course of the disease and treatment.

**Comprehension control:**
2. Clinical symptoms of the chronic osteomyelitis in children.
8. Rehabilitation of the patients.

**Practical class 7**

**Odontogenic and non-odontogenic lymphadenitis of the maxillo-facial area.**
**Clinic, treatment, differential diagnostic.**

**Teaching objective:** to familiarize students with peculiarities of the clinical course of the acute and chronic lymphadenitis in children, their treatment.
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**Pre-study questions:**
1. Anatomical and physiological peculiarities of the lymphatic system in children.
2. The ways of the infection spreading into the regional lymphatic nodes.

**Content of the class:**

Lymphadenopathy is a term meaning "disease of the lymph nodes." It is, however, almost synonymously used with "swollen/enlarged lymph nodes". It could be due to infection, autoimmune disease or malignancy.

Inflammation of a lymph node is called lymphadenitis. In practice, the distinction between lymphadenopathy and lymphadenitis is rarely made. Inflammation of lymph channels is called lymphangitis.

The majority of enlarged lymph nodes are the result of an acute or chronic response to an infectious organism (lymphadenitis), but they can also indicate the growth of a metastatic tumor or a primary malignant neoplasm (lymphoma). These infections and malignancies may continue to spread by way of the lymphatic system.

The lymph nodes are bean-shaped organs found in clusters along lymph channels of the body. They have two functions- to remove toxic products from lymph and to prevent their entry into systemic circulation and the production of lymphocytes.

In general, lymph nodes must be larger than 1 cm in diameter to be palpable. Nodes that become palpable due to an acute inflammatory condition tend to be tender, soft, enlarged, and freely movable. They may eventually return to their original size or they may stay enlarged as a result of scar tissue. On the other hand, those lymph nodes that become palpable due to malignant diseases are often fixed surrounding tissues, nontender, hard, and involve multiple nodes.

Despite the frequent and wide communications between smaller and larger lymph vessels, the lymph of any specific region is carried to certain well-defined lymph nodes. Lymph drainage from the superficial tissues of the head and neck generally travels first to groups of superficially placed lymph nodes before passing to the deep cervical lymph nodes. Lymph nodes that received the lymph of a definite region before it has passed through other lymph nodes are called regional lymph nodes. They are the first sites at which pathologic processes will manifest themselves.
if those processes spread from their primary location via lymph channels. In turn, regional nodes drain into central (or secondary) nodes. Secondary nodes may drain into tertiary ones.

There are few groups of the head and neck lymph nodes:
- Calvarium region (occipital, mastoideus superficial and deep, auricular);
- Facial (buccal, submandibular, epimandibular, submental);
- Cervical (superficial and deep)

**Classification of lymphadenitis**

**By topography and anatomical principles:**
- By deepness of localization- superficial and deep
- By localization- (occipital, mastoideus, submandibular, epimandibular etc.)

**By way of invasion:**
- Odontogenic
- Nonodontogenic- as a result of respiratory and viral infection, sepsis, specific infection

(Tuberculosis, syphilis, actynomicosis. HIV- infection), metastasis

**By the acuteness of process:**
- Acute – serous and purulent
- Chronic – hyperplastic, purulent, exacerbated chronic.

**Acute serous odontogenic lymphadenitis**

**Complaints:** appearance movable, painful “ball” during the palpation in the certain area. The child would note that it was tooth ache before of the lymph node enlargement.

**Clinical course:** General condition without significant changes: minimal rising of the body temperature, insignificant intoxication. During examination: spherical lump which is painful during palpation. Mobility of the lump could be limited and it would be the sign of spreading of the process to the surrounding tissues. The skin above the lymph node is without changes. There is no enlargement of the lymph node from the other site. During oral cavity examination the causative tooth with positive percussion can be revealed. In most cases the diagnosis of periapical inflammation is easily determined.

**Acute purulent odontogenic lymphadenitis**

Acute purulent lymphadenitis is the next step of the serous form without treatment. If it is no treatment of the serous form during 5-7 days –the serous inflammation goes to purulent form.
**Complaints** of: enlarged node with pulsative pain, significant increasing of the body temperature, loss of appetite, behavior changes.

**Clinical course:** Asymmetry of the face due to swelling of the certain region. Swollen and hyperaemic skin. Painful, enlarged lymph node without clear borders during palpation. Fluctuation is not always present because of tight capsule of the lymph node. Opening of the mouth is not limited, the causative tooth can be easily found. In the blood: left shift of the leucocytes.

**Chronic odontogenic lymphadenitis**

Chronic odontogenic lymphadenitis is rarely observed in kids.

**Complaints** of the presence of lump for the long time without inconvenience. During oral cavity examination the causative tooth with pain in anamnesis is often revealed.

**Clinical course:** Slight facial asymmetry in the area of lesion with unchanged skin over it. Slightly painful, solid, round or oval lymph node with restricted mobility is revealed by palpation with fluctuation in the center of it. Mouth opening is not limited. The causative tooth is changed in color or could be absent.

**Treatment**

The main principle of the treatment of lymphadenitis is elimination of the etiology factor that leads to disease appearance.

**Conservative treatment:** - compress of 5% sol. of Dimexid with anti-inflammatory means in it (Hydrocortisone, Analgin, Dimedrol).

Physiotherapeutic treatment (during first 2-3 days after the onset): phonophoresis of Hydrocortisone, electrophoresis of Dimexid with antibiotics and Dimedrol, Laser.

The main method of purulent forms treatment of lymphadenitis is the surgical one which is performed in the hospital under the general anesthesia.

**Comprehension control:**

1. Anatomical and physiological peculiarities of the jaw-facial area in children which influence on the development of the acute and chronic lymphadenitis.
2. Immunological characteristic of the child’s organism.
3. The ways of infection spreading into the regional lymph nodes.
5. General clinical characteristic of the acute and chronic lymphadenitis.
6. Surgical and medicamental methods of treatment of the different forms of lymphadenitis.
Practical class 8

Surgical anatomy of the cellular space of the maxillo-facial area in children. The ways of the odontogenic infection extantion. Etiology, pathogenesis, classification of the abscesses and phlegmons of the maxillo-facial area at children.

**Teaching objective:** to familiarize students with anatomy of the cellular space of the maxillo-facial area in children, to reveal the abscesses and phlegmons of MFA.

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**Pre-study questions:**

1. Anatomical and physiological peculiarities of the teeth, jaw bones and soft tissues in children.
2. The ways of the infection spreading into the soft tissues of MFA and neck.

**Content of the class:**

Abscess is the limited purulent dissolution of the soft tissues. The hypoderm in well expressed in children in MFA. It has protective ammortalitative functions, makes round counters of the face. But due to lack of the blood supply this hypoderm is involved into the inflammatory processes very often. As a result the cavity is formed and is filled in with the pus.

Phlegmon is spreaded purulent dissolution of the soft tissues. This condition is an acute, diffuse inflammatory infiltration of the loose connective tissue found underneath the skin. It is believed today that cellulitis and phlegmon are interchangeable terms. The term cellulitis has prevailed and so the term phlegmon has just about been abandoned.

Etiology: causative agent of abscesses and phlegmons are mixed microflora with dominating of Streptococcus and Staphylococcus in combination with Escherichia coli and other kinds of bacillus.
Clinical Presentation. This disease is characterized by edema, headache, and reddish skin. The edema, whose margins are diffuse and not defined, may present in various areas of the face and its localization depends on the infected tooth responsible. For example, if the mandibular posterior teeth are involved, the edema presents as submandibular, and, in more severe cases, spreads towards the cheek or the opposite side, leading to grave disfigurement of the face. When the infection originates in the maxillary anterior teeth, the edema involves the upper lip, which presents with a characteristic protrusion. In the initial stage, cellulitis feels soft or doughy during palpation, without pus present, while in more advanced stages, a board-like induration appears, which may lead to suppuration. At this stage, the pus is localized in small focal sites in the deep tissue.

Abscesses and phlegmons of odontogenic region appear as the result of infection spreading from the apical region due to exacerbation of chronic periapical inflammation of primary and permanent teeth, suppuration of the radical cysts. Osteomielitis can be accompanied with abscesses and phlegmons. They can be as a complication of periostitis.

Peculiarities of the clinical course:

1. Soft tissues in children are characterized with the less tightness of fascias and aponeurosis which limit the anatomical space.
2. The hypoderm is more loosen.
3. Immaturity of the cellular barrier leads to the infection spreading on the new tissues.
4. Functional lymph system immaturity leads to lymph nodes involving in the inflammatory process more often.
5. Facial blood supply is better expressed in comparison with other areas and it has positive and negative (quick infection spreading) sides.
7. Rapid formation of the purulent process (2-3 days).
8. Superficial abscesses and phlegmons are accompanied with well expressed deformation of the face, and deep ones – with disturbances of chewing, swallowing and speech.

Classification:

1. Odontogenic, nonodontogenic
2. 
   Superficial
   - Mental and submental area space
   - Canine fossa
   - Buccal area space
   - Temporal area cavity
   Deep
   - Retroorbital cellular
   - Subtemporal fossa
   - Pterygomandibular
   - Bottom of the oral cavity
- Zygomatical area - Peripharyngeal space
- Parotideomasseterica area - Temporal area
- Submandibular area
- Sublingual area
- Alveololingual groove
- Submandibular area
- Subtemporal and pterygopalatinal fossae
- Hard and soft palate
- Peripharyngeal space
- Temporal area

3. **Upper jaw**
- Fossa canina (infraorbital area)
- Zygomatical area
- Orbital area
- Temporal fossa
- Subtemporal and pterygopalatinal fossae
- Hard and soft palate

3. **Lower jaw**
- mental and submental area
- buccal
- submandibular area
- pterygomandibular area
- peripharyngeal
- parotideomasseterica area

**Comprehension control:**
1. Modern classification of abscesses and phlegmons of the MFA.
2. What cellular spaces do belong to the superficial ones?
3. What cellular spaces do belong to the deep ones?
4. Possible ways of the upper jaw odontogenic infection spreading.
5. Possible ways of the lower jaw odontogenic infection spreading.
6. Hematogenic, lymphogenic and contact ways of the infection spreading.
7. Clinical symptoms of the abscesses and phlegmons.

**Practical class 9**

**Clinical features of abscesses and flegmones of the maxillo-facial area in children, diagnostical methods. Complex treatment, rehabilitation**

**Teaching objective:** to familiarize students with peculiarities of the clinical course of abscesses and phlegmons of MFA in children, their treatment.

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**Pre-study questions:**
1. Anatomical and physiological peculiarities of the teeth, jaw bones and soft tissues in children.
2. The ways of the infection spreading into the soft tissues of MFA and neck.

**Content of the class:**

**Canine Fossa Abscess**

**Anatomic Location.** The canine fossa, which is where this type of abscess develops, is a small space between the levator labii superioris and the levator anguli oris muscles.

**Etiology.** Infected root canals of premolars and especially those of canines of the maxilla are considered to be responsible for the development of abscesses of the canine fossa.

**Clinical Presentation.** This is characterized by edema, localized in the infraorbital region, which spreads towards the medial canthus of the eye, lower eyelid, and side of the nose as far as the corner of the mouth. There is also obliteration of the nasolabial fold, and somewhat of the mucolabial fold.

The edema at the infraorbital region is painful during palpation, and later on the skin becomes taut and shiny due to suppuration, while its color is reddish.

**Treatment.** The incision for drainage is performed intraorally at the mucobuccal fold (parallel to the alveolar bone), in the canine region. A hemostat is then inserted, which is placed at the depth of the purulent accumulation until it comes into contact with bone, while the index finger of the nondominant hand palpates the infraorbital margin. Finally, a rubber drain is placed, which is stabilized with a suture on the mucosa.

**Buccal Space Abscess**

**Anatomic Location.** The space in which this abscess develops is between the buccinator and masseter muscles. Superiorly, it communicates with the pterygopalatine space; inferiorly with the pterygomandibular space. The spread of pus in the buccal space depends on the position of the apices of the responsible teeth relative to the attachment of the buccinator muscle.

**Etiology.** The buccal space abscess may originate from infected root canals of posterior teeth of the maxilla and mandible.

**Clinical Presentation.** It is characterized by swelling of the cheek, which extends from the zygomatic arch as far as the inferior border of the mandible, and from the anterior border of the ramus to the corner of the mouth. The skin appears taut and red, with or without fluctuation of the abscess, which, if neglected, may result in spontaneous drainage.

**Treatment.** Access to the buccal space is usually intraoral for three main reasons:
1. Because the abscess fluctuates intraorally in the majority of cases.
2. To avoid injuring the facial nerve.
3. For esthetic reasons.

The intraoral incision is made at the posterior region of the mouth, in an anteroposterior direction and very carefully in order to avoid injury of the parotid duct. A hemostat is then used to explore the space thoroughly. An extraoral incision is made when intraoral access would not ensure adequate drainage, or when the pus is deep inside the space. The incision is made approximately 2 cm below and parallel to the inferior border of the mandible.

**Infratemporal Abscess**

**Anatomic Location.** The space in which this abscess develops is the superior extension of the pterygomandibular space. Laterally, this space is bounded by the ramus of the mandible and the temporalis muscle, while medially, it is bounded by the medial and lateral pterygoid muscles, and is continuous with the temporal fossa. Important anatomic structures, such as the mandibular nerve, mylohyoid nerve, lingual nerve, buccal nerve, chorda tympani nerve, and the maxillary artery, are found in this space. Part of the pterygoid venous plexus is also found inside this space.

**Etiology.** Infections of the infratemporal space may be caused by infected root canals of posterior teeth of the maxilla and mandible, by way of the pterygomandibular space, and may also be the result of a posterior superior alveolar nerve block and an inferior alveolar nerve block.

**Clinical Presentation.** Trismus and pain during opening of the mouth with lateral deviation towards the affected side, edema at the region anterior to the ear which extends above the zygomatic arch, as well as edema of the eyelids are observed.

**Treatment.** The incision for drainage of the abscess is made intraorally, at the depth of the mucobuccal fold, and, more specifically, laterally (buccally) to the maxillary third molar and medially to the coronoid process, in a superoposterior direction. A hemostat is inserted into the suppurated space, in a superior direction. Drainage of the abscess may be performed extraorally in certain cases. The incision is performed on the skin in a superior direction, and extends approximately 3 cm. The starting point of the incision is the angle created by the junction of the frontal and temporal processes of the zygomatic bone. Drainage of the abscess is achieved with a curved hemostat, which is inserted through the skin into the purulent accumulation.

**Temporal Abscess**

**Anatomic Location.** The temporal space is the superior continuation of the infratemporal space. This space is divided into superficial and deep temporal spaces. The superficial temporal space is bounded laterally by the temporal fascia and medially by the temporalis muscle, while the deep temporal space is found between the medial surface of the temporalis muscle and the temporal bone.
**Etiology.** Infection of the temporal space is caused by the spread of infection from the infratemporal space, with which it communicates.

**Clinical Presentation.** It is characterized by painful edema of the temporal fascia, trismus (the temporalis and medial pterygoid muscles are involved), and pain during palpation of the edema.

**Treatment.** The incision for drainage is performed horizontally, at the margin of the scalp hair and approximately 3 cm above the zygomatic arch. It then continues carefully between the two layers of the temporal fascia as far as the temporalis muscle. A curved hemostat is used to drain the abscess.

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**Mental Abscess**

**Anatomic Location.** The accumulation of pus in this space is located at the anterior region of the mandible, near the bone, and, more specifically, underneath the mentalis muscle, with spread of the infection towards the symphysis menti.

**Etiology.** The infection is usually the result of infected mandibular anterior teeth (incisors).

**Clinical Presentation.** Firm and painful swelling in the area of the chin is observed, while later the skin becomes shiny and red.

**Treatment.** The incision for drainage of the abscess may be performed at the depth of the mucobuccal fold, if the abscess fluctuates intraorally. If the pus has spread extraorally, though, an incision is made on the skin, parallel to the inferior border of the chin, 1–1.5 cm posteriorly. After drainage is complete, a rubber drain is placed.

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**Submental Abscess**

**Anatomic Location.** The submental space in which this abscess develops is bounded superiorly by the mylohyoid muscle, laterally and on both sides by the anterior belly of the digastric muscle, inferiorly by the superficial layer of the deep cervical fascia that is above the hyoid bone, and finally, by the platysma muscle and overlying skin. This space contains the anterior jugular vein and the submental lymph nodes.

**Etiology.** Infection of the submental space usually originates in the mandibular anterior teeth or is the result of spread of infection from other anatomic spaces (mental, sublingual, submandibular).

**Clinical Presentation.** The infection presents as an indurated and painful submental edema, which later may fluctuate or may even spread as far as the hyoid bone.

**Treatment.** After local anesthesia is performed around the abscess, an incision on the skin is made beneath the chin, in a horizontal direction and parallel to the anterior border of the chin. The pus is then drained in the same way as in the other

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**Sublingual Abscess**
There are two sublingual spaces above the mylohyoid muscle, to the right and left of the midline. These spaces are divided by dense fascia. Abscesses formed in these spaces are known as sublingual abscesses.

**Anatomic Location.** The sublingual space is bounded superiorly by the mucosa of the floor of the mouth, inferiorly by the mylohyoid muscle, anteriorly and laterally by the inner surface of the body of the mandible, medially by the lingual septum, and posteriorly by the hyoid bone. This space contains the submandibular duct (Wharton’s duct), the sublingual gland, the sublingual and lingual nerve, terminal branches of the lingual artery, and part of the submandibular gland.

**Etiology.** The teeth that are most commonly responsible for infection of the sublingual space are the mandibular anterior teeth, premolars and the first molar, whose apices are found above the attachment of the mylohyoid muscle. Also, infection may spread to this space from other contiguous spaces with which it communicates (submandibular, submental, lateral pharyngeal).

**Clinical Presentation.** The abscess of the sublingual space presents with characteristic swelling of the mucosa of the floor of the mouth, resulting in elevation of the tongue towards the palate and laterally.

The mandibular lingual sulcus is obliterated and the mucosa presents a bluish tinge. The patient speaks with difficulty, because of the edema, and movements of the tongue are painful.

**Treatment.** The incision for drainage is performed intraorally, laterally, and along Wharton’s duct and the lingual nerve. In order to locate the pus, a hemostat is used to explore the space inferiorly, in an anteroposterior direction and beneath the gland. After drainage is complete, a rubber drain is placed.

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**Submandibular Abscess**

**Anatomic Location.** The submandibular space is bounded laterally by the inferior border of the body of the mandible, medially by the anterior belly of the digastric muscle, posteriorly by the stylohyoid ligament and the posterior belly of the digastric muscle, superiorly by the mylohyoid and hyoglossus muscles, and inferiorly by the superficial layer of the deep cervical fascia. This space contains the submandibular salivary gland and the submandibular lymph nodes.

**Etiology.** Infection of this space may originate from the mandibular second and third molars, if their apices are found beneath the attachment of the mylohyoid muscle. It may also be the result of spread of infection from the sublingual or submental spaces.

**Clinical Presentation.** The infection presents as a moderate swelling at the submandibular area, which spreads, creating greater edema that is indurated and redness of the overlying skin. Also, the angle of the mandible is obliterated, while pain during palpation and moderate trismus due to involvement of the medial pterygoid muscle are observed as well.

**Treatment.** The incision for drainage is performed on the skin, approximately 1 cm beneath and parallel to the inferior border of the mandible. During the incision,
the course of the facial artery and vein (the incision should be made posterior to these) and the respective branch of the facial nerve should be taken into consideration. A hemostat is inserted into the cavity of the abscess to explore the space and an attempt is made to communicate with the infected spaces. Blunt dissection must be performed along the medial surface of the mandibular bone also, because pus is often located in this area as well. After drainage, a rubber drain is placed.

Submasseteric Abscess

Anatomic Location. The space in which this abscess develops is cleft-shaped and is located between the masseter muscle and the lateral surface of the ramus of the mandible. Posteriorly it is bounded by the parotid gland, and anteriorly it is bounded by the mucosa of the retromolar area.

Etiology. Infection of this space originates in the mandibular third molars (pericoronitis), and in rare cases because of migratory abscesses.

Clinical Presentation. It is characterized by a firm edema that is painful to pressure in the region of the masseter muscle, which extends from the posterior border of the ramus of the mandible as far as the anterior border of the masseter muscle. Also, severe trismus and an inability to palpate the angle of the mandible are observed. Intraorally, there is edema present at the retromolar area and at the anterior border of the ramus. This abscess rarely fluctuates, while it may present generalized symptoms.

Treatment. Treatment of this abscess is basically intraoral, with an incision that begins at the coronoid process and runs along the anterior border of the ramus towards the mucobuccal fold, approximately as far as the second molar. The incision may also be performed extraorally on the skin, beneath the angle of the mandible. In both cases, a hemostat is inserted, which proceeds as far as the center of suppuration and until it comes into contact with bone. Because access is distant from the purulent accumulation, often it is difficult to drain the area well, resulting in frequent relapse.

Pterygomandibular Abscess

Anatomic Location. This space is bounded laterally by the medial surface of the ramus of the mandible, medially by the medial pterygoid muscle, superiorly by the lateral pterygoid muscle, anteriorly by the pterygomandibular raphe, and posteriorly by the parotid gland. The pterygomandibular space contains the mandibular neurovascular bundle, lingual nerve, and part of the buccal fat pad. It communicates with the pterygopalatal, infratemporal, submandibular, and lateral pharyngeal spaces.

Etiology. An abscess of this space is caused mainly by infection of mandibular third molars or the result of an inferior alveolar nerve block, if the penetration site of the needle is infected (pericoronitis).

Clinical Presentation. Severe trismus and slight extraoral edema beneath the angle of the mandible are observed. Intraorally, edema of the soft palate of the affected side is present, as is displacement of the uvula and lateral pharyngeal wall, while there is difficulty in swallowing.
**Treatment.** The incision for drainage is performed on the mucosa of the oral cavity and, more specifically, along the mesial temporal crest. The incision must be 1.5 cm long and 3–4 mm deep. A curved hemostat is then inserted, which proceeds posteriorly and laterally until it comes into contact with the medial surface of the ramus. The abscess is drained, permitting the evacuation of pus along the shaft of the instrument.

**Lateral Pharyngeal Abscess**

**Anatomic Location.** The lateral pharyngeal space is conical shaped, with the base facing the skull while the apex faces the carotid sheath. It is bounded by the lateral wall of the pharynx, the medial pterygoid muscle, the styloid process and the associated attached muscles and ligaments, and the parotid gland. The lateral pharyngeal space contains the internal carotid artery, the internal jugular vein with the respective lymph nodes, the glossopharyngeal nerve, hypoglossal nerve, vagus nerve, and accessory nerve. It communicates directly with the submandibular space, as well as with the brain by way of foramina of the skull.

**Etiology.** Infections of this space originate in the region of the third molar and are the result of spread of infection from the submandibular and pterygomandibular spaces.

**Clinical Presentation.** Extraoral edema at the lateral region of the neck that may spread as far as the tragus of the ear, displacement of the pharyngeal wall, tonsil and uvula towards the midline, pain that radiates to the ear, trismus, difficulty in swallowing, significantly elevated temperature, and generally malaise are noted.

**Retropharyngeal Abscess**

**Anatomic Location.** The retropharyngeal space is located posterior to the soft tissue of the posterior wall of the pharynx and is bounded anteriorly by the superior pharyngeal constrictor muscle and the associated fascia, posteriorly by the prevertebral fascia, superiorly by the base of the skull, and inferiorly by the posterior mediastinum.

**Etiology.** Infections of this space originate in the lateral pharyngeal space, which is close by.

**Clinical Presentation.** The same symptoms as those present in the lateral pharyngeal abscess appear clinically, with even greater difficulty in swallowing though, due to edema at the posterior wall of the pharynx. If it is not treated in time, there is a risk of:
- Obstruction of the upper respiratory tract, due to displacement of the posterior wall of the pharynx anteriorly.
- Rupture of the abscess and aspiration of pus into the lungs, with asphyxiation resulting.
- Spread of infection into the mediastinum.

**Treatment.** Therapy entails drainage through the lateral pharyngeal space, which is where the infection usually begins. Administration of antibiotics is mandatory.
Parotid Space Abscess

Anatomic Location. The space in which this abscess develops is located in the area of the ramus of the mandible and, more specifically, between the layers of the fascia investing the parotid gland. It communicates with the lateral pharyngeal and the submandibular spaces. It contains the parotid gland and its duct, the external carotid artery, the superficial temporal and facial artery, the retromandibular vein, the auriculotemporal nerve, and the facial nerve.

Etiology. Infection of this space originates from odontogenic migratory infections of the lateral pharyngeal and submandibular spaces.

Clinical Presentation. It presents with characteristic edema of the retromandibular and parotid region, difficulty in swallowing and pain mainly during chewing, which radiates to the ear and temporal region. In certain cases there is redness of the skin and subcutaneous fluctuation. Also, a purulent exudate may be noted from the papilla of the parotid duct after pressure is applied.

Treatment. Depending on the margins of the edema, therapy entails a broad incision posterior to the angle of the mandible, taking particular care not to injure the respective branch of the facial nerve. Drainage of pus is achieved after blunt dissection using a hemostat to explore the purulent collection.

Ludwig’s Angina

Anatomic Location. Ludwig’s angina is a grave acute cellular infection and is characterized by bilateral involvement of the submandibular and sublingual spaces, as well as the submental space. In the past this condition was fatal, although today adequate surgical treatment and antibiotic therapy have almost eliminated fatal episodes.

Etiology. The most frequent cause of the disease is periapical or periodontal infection of mandibular teeth, especially of those whose apices are found beneath the mylohyoid muscle.

Clinical Presentation. The disease presents with severe difficulty in swallowing, speaking and breathing, drooling of saliva, and elevated temperature. The bilateral involvement of the submandibular spaces and submental space results in severe and painful indurated board-like hardness, without apparent fluctuation, because the pus is localized deep in the tissues, while the bilateral involvement of the sublingual spaces causes painful indurated edema of the floor of the mouth and the tongue. The middle third of the tongue is elevated towards the palate, while the anterior portion projects out of the mouth. The posterior portion displaces the edematous epiglottis posteriorly, resulting in obstruction of the airway.

Treatment. This is treated surgically with surgical decompression (drainage) of the spaces of infection and concurrent administration of a double regimen of antibiotics. Surgical intervention must be attempted to drain all the abscessed spaces. The incisions must be bilateral, extraoral, parallel, and medial to the inferior border of the mandible, at the premolar and molar region, and intraoral, parallel to the ducts of the submandibular glands. Exploration and an attempt to communicate with the spaces of infection, by breaking the septa dividing them and drainage of the contents, are achieved with the incisions. Rubber drains are placed in order to keep the
drainage sites open for at least 3 days, until the clinical symptoms of the infection have resolved. Many people believe that in the case of continued obstruction, a surgical airway must be established.

**Comprehension control:**
1. Anatomical and physiological peculiarities of the MFR in children which lead to the development of abscesses and phlegmons.
2. General clinic characteristic of abscesses and phlegmons.
3. Immunologic characteristic of the child’s organism.
4. The ways of the infection spreading into the soft tissues of MFA in children.
5. Classification of abscesses and phlegmons.
7. Rehabilitation of the patients with abscesses and phlegmons of MFA.

**Practical class 10**


**Teaching objective:** to familiarize students with peculiarities of the clinical course of the acute and chronic sialadenitis in children, their treatment.

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**Pre-study questions:**
2. Chemical composition of the saliva.
3. Methods of the salivary glands examination: anamnesis, bimanual palpation of the glands and lymph nodes, roentgenography and sialography, ultrasound examination.
4. Classification of the salivary glands diseases.

**Content of the class:**

Saliva is produced by the three pairs of major salivary glands - the parotid, submandibular and sublingual glands as well as the many hundreds of small salivary glands scattered throughout the buccal and pharyngeal mucosa. The majority of surgical pathology affects the parotid or submandibular gland, with the sublingual and minor salivary glands being less frequently affected.

**Anatomy Parotid gland**

The parotid gland is the largest of the salivary glands. It lies just in front of the ear extending from the zygomatic arch downwards to between the angle of the mandible and the mastoid process. This inferior portion is also known as the tail of the parotid gland. The anterior border corresponds approximately to the ascending ramus of the mandible. It is important to appreciate that the tail of the parotid gland extends into the neck and that lesions in this area can affect the parotid gland and are sometimes mistaken for lymph nodes in the neck. Swellings in this area should be assumed to be arising from the parotid until proven otherwise. The facial nerve is intimately associated with the parotid gland and runs through the gland, dividing it into a superficial lobe, which arises lateral to the facial nerve, and a deep lobe, which arises deep to the facial nerve. This is an artificial division and no true anatomical plane exists between the superficial and the deep lobe. A normal parotid gland consists of 80% superficial lobe and 20% deep lobe. The facial nerve enters the parotid gland from the stylomastoid foramen and, shortly after entry, divides into an upper and lower division. The upper division gives off a temporal branch that supplies the muscles of the forehead and eye, a zygomatic branch that supplies the muscles of the eye, and occasionally a buccal branch that supplies the muscles of the nostril and upper lip. The lower division gives off a mandibular branch that supplies the muscles of the lower lip and a cervical branch that supplies platysma in the neck. The lower division often also gives off the buccal branch. The facial nerve controls the muscles of facial expression. The parotid gland is drained by the parotid duct, which opens into the mouth opposite the second upper molar tooth.

**Submandibular gland**

The submandibular gland lies in the submandibular triangle bordered anteriorly by the digastric muscle, posteriorly by the stylomandibular ligament and superiorly by the mandible. This gland also has a superficial and deep part, the superficial being the largest. The superficial lobe lies superficial to the mylohyoid muscle, whereas the deep lobe lies deep to the mylohyoid muscle and is drained by a duct that drains forwards and upwards to open close to the frenulum in the floor of the mouth. Three nerves are closely linked to the submandibular gland - the marginal mandibular branch of the facial nerve, the lingual nerve and the hypoglossal nerve. As mentioned above, the marginal mandibular nerve supplies the muscles of the lower lip and damage to this nerve will leave the patient with deformity. The lingual nerve supplies
sensation to the anterior two-thirds of the tongue whereas the hypoglossal nerve supplies motor function to the tongue muscles.

**Sublingual gland**

The sublingual gland is the smallest of the major glands and lies beneath the mucosa of the floor of the mouth near the midline. It drains into the mouth by small ducts, as well as by ducts that open directly into the submandibular gland duct. It is closely associated with the lingual nerve.

**Classification of the salivary gland inflammation diseases:**

1. By the etiology: - viral, - bacterial, - traumatic, - calculous
2. By the spreading: - acute (serous, purulent, purulent necrotic),
   - chronic (parenchymatous, interstitial),
   - chronic recurent.
3. By the localization: - parotitis, - submaxillatis.
4. By the concrement content: -non-calculous, calculous with the localization of the stone in:
   - the frontal region of the duct,
   - the medium region of the duct,
   - the back region of the duct,
   - in the gland.

Most surgical pathology of the salivary gland presents as a swelling in the associated gland and it is helpful clinically to characterise the swelling as one that affects the whole of the gland or as a discrete swelling that affects only part of the gland. Most discrete swellings are caused by a tumour, whereas swellings affecting the whole of the gland are usually caused by sialolithiasis, sialadenitis or sialadenosis. There is obviously some overlap in this classification but it is helpful in the clinical context.

**Sialadenitis**

Sialadenitis is inflammation of the salivary glands, most commonly the parotid, and can be categorised into acute and chronic types.

**Mumps** (epidemic parotitis) is a viral disease, caused by the Paramixovirus. Before the development of vaccination and the introduction of a vaccine, it was a common childhood disease worldwide. Painful swelling of the salivary glands (classically the parotid gland) is the most typical presentation. Painful testicular swelling (orchitis) and rash may also occur. The symptoms are generally not severe in children. In teenage males and men, complications such as infertility or subfertility are more common, although still rare in absolute terms. The disease is generally self-limited, running its course before receding, with no specific treatment apart from controlling the symptoms with pain medication.

The more common symptoms of mumps are:
- Parotid inflammation (or parotitis) in 60–70% of infections and 95% of patients with symptoms. Parotitis causes swelling and local pain, particularly when chewing. It can occur on one side (unilateral) but is more common on both sides (bilateral) in about 90% of cases.
  - Fever
  - Headache
  - Pain behind the ear during palpation (Filatova’s symptom)
  - Characteristic painful dots: in front of the tragus, top of the processus mastoideus, incisura of the mandible, angle of the lower jaw (Hatchcock’s symptom)
  - Hyperemic orifice of the duct (Tresilian – Mourson’s symptom)
  - Orchitis, referring to painful inflammation of the testicle. Males past puberty who develop mumps have a 30 percent risk of orchitis.
  - Other symptoms of mumps can include dry mouth, sore face and/or ears and occasionally in more serious cases, loss of voice. In addition, up to 20% of persons infected with the mumps virus do not show symptoms, so it is possible to be infected and spread the virus without knowing it.

Fever and headache are prodromal symptoms of mumps, together with malaise and anorexia.

**Cause.** Mumps is a contagious disease that is spread from person to person through contact with respiratory secretions such as saliva from an infected person. When an infected person coughs or sneezes, the droplets aerosolize and can enter the eyes, nose, or mouth of another person. Mumps can also be spread by sharing food and drinks. The virus can also survive on surfaces and then be spread after contact in a similar manner. A person infected with mumps is contagious from approximately 6 days before the onset of symptoms until about 9 days after symptoms start. The incubation period (time until symptoms begin) can be from 14–25 days but is more typically 16–18 days.

**Diagnosis.** A physical examination confirms the presence of the swollen glands. Usually the disease is diagnosed on clinical grounds and no confirmatory laboratory testing is needed. If there is uncertainty about the diagnosis, a test of saliva, or blood may be carried out; a newer diagnostic confirmation, using real-time nested polymerase chain reaction (PCR) technology, has also been developed. An estimated 20%-30% of cases are asymptomatic. As with any inflammation of the salivary glands, serum amylase is often elevated.

**Prevention.** The most common preventative measure against mumps is immunization with a mumps vaccine. The vaccine may be given separately or as part of the MMR immunization vaccine which also protects against measles and rubella. The WHO (World Health Organization) recommends the use of mumps vaccines in all countries with well-functioning childhood vaccination programmes.

**Treatment.** There is no specific treatment for mumps. Symptoms may be relieved by the application of intermittent ice or heat to the affected neck/testicular area and by acetaminophen/paracetamol (Tylenol) for pain relief. Aspirin is not used due to a hypothetical link with Reye's syndrome. Warm salt water gargles, soft foods, and extra fluids may also help relieve symptoms. Patients are advised to avoid fruit
juice or any acidic foods, since these stimulate the salivary glands, which can be painful.

**Prognosis.** Death is very unusual. The disease is self-limiting, and general outcome is good, even if other organs are involved. Known complications of mumps include:

- Infection of other organ systems
- Mumps viral infections in adolescent and adult males carry an up to 30% risk that the testes may become infected (orchitis or epididymitis), which can be quite painful; about half of these infections result in testicular atrophy, and in rare cases sterility can follow.
- Spontaneous abortion in about 27% of cases during the first trimester of pregnancy.
- Mild forms of meningitis in up to 10% of cases (40% of cases occur without parotid swelling) Oophoritis (inflammation of ovaries) in about 5% of adolescent and adult females, but fertility is rarely affected.
- Pancreatitis in about 4% of cases, manifesting as abdominal pain and vomiting.
- Encephalitis (very rare, and fatal in about 1% of the cases when it occurs).
- Profound (91 dB or more) but rare sensorineural hearing loss, uni- or bilateral. Acute unilateral deafness occurs in about 0.005% of cases.

After the illness, life-long immunity to mumps generally occurs; reinfection is possible but tends to be mild and atypical.

**Acute Sialadenitis**

Acute sialadenitis may be bacterial or viral in nature. Bacterial infection usually presents with a sudden sense of swelling of the affected gland and there may be redness of the overlying skin. Pus is often seen exuding from the salivary gland duct into the mouth and the patient is unwell. Most acute bacterial infection is related to a reduction in the flow of saliva but the quality of saliva is without changes in the serous form and in the purulent stage the saliva is secreted with the pus. Regional lymphadenitis is often present.

In children an acute bacterial sialadenitis is mostly observed in the age of 7-12 years. There is often an association with poor oral hygiene. It used to be a common postoperative finding but now, with the use of antibiotics and better fluid management and postoperative oral toilet, it has become an uncommon disease.

There are two forms of the disease: - serous and purulent.

Diagnosis is setted due to complaints and clinical signs (inlarged, painful salivary gland, hyperemic and shiny skin over it; saliva with pus is secreted during massage of the gland).

Treatment is usually with antibiotics (macrolids, penicillin-row), antihystamins, immunostimulating drugs and correction of the underlying disease processes if present. Sialogogues (e.g. citrus-flavoured sweets) are often given to encourage the flow of saliva. With the presence of the purulent secretion the proteolytic enzymes are prescribed. If an abscess develops it may need draining externally. Care must be taken not to damage the facial nerve when the parotid gland is affected.
**Chronic sialadenitis**

Chronic sialadenitis has several causes and usually presents with persistent inflammation and enlargement of the affected gland. Mainly it is observed four times often then the acute stage and in children of 8-15 years old.

**Chronic recurrent sialadenitis.** This presents mainly as a unilateral or alternating swelling of the parotid gland, which can be painful. Also the general condition of the child is disturbed. It is mainly a disease of children and the saliva can be very milky or purulent. Few recurrences are revealed due to anamnesis. Clinical picture is mostly the same as with acute bacterial sialadenitis but inflammation is less marked. Attacks occur at variable intervals and in between attacks the child is totally symptom free. The gland is solid and hilled in the remission stage and can enlarge after recurrence. The underlying cause is not known but it is thought that duct ectasia may be a predisposing factor.

Diagnosis is again made from the history and sialography can be considered. Duct ectasia supports the diagnosis when seen on sialography.

Treatment is symptomatic as the underlying cause is not fully understood. It often involves antibiotics, antihistamins, vit. B, C and analgesia and sialogogues are often given. Most cases in childhood disappear after puberty. If the attacks continue, ligation of the parotid duct or a tympanic neuroectomy can be recommended. It is very occasionally necessary to perform a parotidectomy.

For prevention of recurrences the massage of the gland three times a day (3-5 min.) is recommended. Ultrasound and laser therapy facilitate of the improvement of the microcirculation of the gland.

**Sialolithiasis**

Sialolithiasis, or salivary gland stone disease, is caused by the presence of stones either within the gland itself or in the duct that is draining the gland, symptoms being more common when the stones are found in the ducts.

The main complaint is painful enlargement of the gland during eating (specially due to sour and salted meal), but later – slow decreasing of its size.

Clinical features: asymmetry of the submandibular area, free mouth opening, mucosa around the duct is hyperemic, saliva is transparent or with the pus. If the stone is located inside the gland, the gland becomes enlarged with smooth surface. The stone in the duct can be revealed during bimanual palpation in the direction from the gland to the duct. As the result of the sialolithiasis the significant reformation of the gland tissues is happen. X-ray examination is helpful for the setting of the diagnosis. But it is important to take into consideration that stones are not always clearly visible during X-ray in children.

Stones in the anterior part of the submandibular duct (submandibular gland is the most characternal gland for stone appearance – because of its S-shaped duct anatomy) can be removed via the mouth by opening (and marsupialising) the duct.
but if the stone is further back in the duct, or in the submandibular gland itself, then it is safer to remove the gland externally by a neck incision to avoid damage to the lingual nerve. Recurrent parotid duct stones are rare and if they cannot be removed through the mouth and are considered very troublesome then they require a parotidectomy, but this is very unusual. Dilatation of the parotid duct has been tried for parotid duct stones, especially when they are associated with a stricture in the parotid duct, and this is worth trying as it is a lot less invasive and has lower morbidity than a parotidectomy, but its effectiveness is doubtful.

**Comprehensive control**

1. Clinical peculiarities of the chronic parenchymatous parotitis.
2. Sialography as the method of the diagnostic of parenchymatous parotitis in different time periods of the disease.
3. Differential diagnostics of the salivary glands diseases.
5. Prognosis.
6. Clinical features and diagnostics of the sialolithiasis.
7. Roentgenography and sialography in the diagnostic of sialolithiasis.
10. Clinical features, diagnostics and differential diagnostics of the mumps.
11. Treatment peculiarities and prognosis of the mumps.

**Practical class 11**

**Arthritis and arthrosis of the temporomandibular joint at children. Clinic, diagnostic, diff. diagnostic, treatment. Complications, prognosis.**

**Teaching objective:** to familiarize students with peculiarities of the clinical course of the acute and chronic sialadenitis in children, their treatment.

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**Pre-study questions:**

1. Definition of arthritis, arthrosis, secondary deforming arthrosis, ankylosis, recurrent TMJ dislocation.

50
2. Reasons of the TMJ bone diseases.
4. Pathogenesis of the junior functional disturbances of the TMJ.
5. Dispensary of the children with TMJ diseases.

**Content of the class:**

The temporomandibular joint (TMJ) is composed of the temporal bone and the mandible, as well as a specialized dense fibrous structure, the articular disk, several ligaments, and numerous associated muscles. The TMJ is a compound joint that can be classified by anatomic type as well as by function. Anatomically the TMJ is a diarthrodial joint, which is a discontinuous articulation of two bones permitting freedom of movement that is dictated by associated muscles and limited by ligaments. Its fibrous connective tissue capsule is well innervated and well vascularized and tightly attached to the bones at the edges of their articulating surfaces. It is also a synovial joint, lined on its inner aspect by a synovial membrane, which secretes synovial fluid. The fluid acts as a joint lubricant and supplies the metabolic and nutritional needs of the nonvascularized internal joint structures.

Functionally the TMJ is a compound joint, composed of four articulating surfaces: the articular facets of the temporal bone and of the mandibular condyle and the superior and inferior surfaces of the articular disk. The articular disk divides the joint into two compartments. The lower compartment permits hinge motion or rotation and hence is termed *ginglymoid*. The superior compartment permits sliding (or translatory) movements and is therefore called *arthrodial*. Hence the temporomandibular joint as a whole can be termed *ginglymoarthrodial*.

**Classification:**

1. **By the etiology:**
   - innate malformation,
   - acquired: - inflammatory (arthritis)
     - dystrophy (arthritis, secondary arthrosis deformans )
     - inflammatory-dystrophy ( arthritis- arthrosis).

2. **By the course:**
   - acute, chronic, chronic in the stage of the exacerbation.

3. **Ankylosis (fibrous, osseous):**
   - innate, acquired;
   - unilateral, bilateral;
   - inflammatory, traumatic.

**Infectious arthritis.**

Infection of the TMJ may result from direct extension of adjacent infection or hematogenous spread of bloodborne organisms. The child complains of the edema and pain in the parotidomasseterica region with the irradiation into the ear and occiput, limited lower jaw movement, rise of temperature. The pain in the both TMJs
appears in the case of rheumatic arthritis, in case of rheumatoid - in one TMJ and knee or shoulder joint.

Clinically the area is inflamed, asymmetry of the face is present due to edema of the soft tissues of parotid area and jaw movement is limited. The mouth opening is painful and limited. The lower jaw is shifted towards the affected side. Local signs of infection associated with evidence of a systemic disease or with an adjacent infection suggest the diagnosis. X-ray results are negative in the early stages but may show bone destruction later. If suppurative arthritis is suspected, the joint is aspirated to confirm the diagnosis and to identify the causative organism. Diagnosis must be made rapidly to prevent permanent joint damage.

Diagnosis of the **chronic arthritis** is based on:

Typical complaints: “crunch” during mouth opening, morning limitation of movements and moderate pain, which increases during eating, headache, dizziness, ear noise, poor hearing, sometimes – dryness in the mouth/burning of the tongue, long-lasting course of the disease.

Clinical picture: painfull joint and tragus palpation, increasing of the pain during pressing of the mental region.

X-ray picture: unequal expansion of the joint space.

**Treatment** includes antibiotics, proper hydration, pain control, and motion restriction (immobilization with orthodontic apparatus or bandage), physiotherapeutic procedures, antinflammatory nonsteroid drugs. Parenteral penicillin G is the drug of choice until a specific bacteriologic diagnosis can be made on the basis of culture and sensitivity testing. Suppurative infections are aspirated or incised. Once the infection is controlled, jaw-opening exercises help prevent scarring and limitation of motion.

Treatment of the chronic arthritis depends on the reasons and changes occurred in the joint. When the functional occlusion is disturbed the main goal of management should be referred to eliminate the etiology factor by the selective reseating of the teeth and occlusion correction.

**Traumatic arthritis**

Rarely, acute injury (eg, due to difficult tooth extraction or endotracheal intubation) may lead to arthritis of the TMJ. Pain, tenderness, and limitation of motion occur. Diagnosis is based primarily on history. X-ray results are negative except when intra-articular edema or hemorrhage widens the joint space. Treatment includes NSAIDs, application of heat, a soft diet, and restriction of jaw movement.

**Osteoarthritis**

The TMJ may be affected, usually in people > 50 yr. Occasionally, patients complain of stiffness, grating, or mild pain. Crepitus results from a hole worn through the disk, causing bone to grate on bone. Joint involvement is generally bilateral. X-rays or CT may show flattening and lipping of the condyle, suggestive of dysfunctional change. Treatment is symptomatic.

**Rheumatoid arthritis**
The TMJ is affected in > 17% of adults and children with RA, but it is usually among the last joints involved. Pain, swelling, and limited movement are the most common findings. In children, destruction of the condyle results in mandibular growth. Ankylosis may follow. X-rays of the TMJ are usually negative in early stages but later show bone destruction, which may result in an anterior open-bite deformity. The diagnosis is suggested by TMJ inflammation associated with polyarthritis and is confirmed by other findings typical of the disease.

Treatment is similar to that of RA in other joints. In the acute stage, NSAIDs may be given, and jaw function should be restricted. A night guard or splint is often helpful. When symptoms subside, mild jaw exercises help prevent excessive loss of motion. Surgery is necessary if ankylosis develops but should not be done until the condition is quiescent.

**Secondary degenerative arthritis**

This type of arthritis usually develops in people aged 20 to 40 after trauma or in people with persistent myofascial pain syndrome. It is characterized by limited opening of the mouth, unilateral pain during jaw movement, joint tenderness, and crepitus. Diagnosis is based on x-rays, which generally show condylar flattening, lipping, spurring, or erosion. Unilateral joint involvement helps distinguish secondary degenerative arthritis from osteoarthritis.

Treatment is conservative, as it is for myofascial pain syndrome, although arthroplasty or high condylectomy may be necessary. An occlusal splint (mouth guard) usually relieves symptoms. The splint is worn constantly, except during meals, oral hygiene, and appliance cleaning. When symptoms resolve, the length of time that the splint is worn each day is gradually reduced. Intra-articular injection of corticosteroids may relieve symptoms but may harm the joint if repeated often.

**Ankylosis** – complete or partly limited mobility of the mandible due to changes in the joint.

The main reasons are: purulent otitis, trauma of the processus condilaris and fossa condilaris, impact into the mental region, trauma during delivery, osteomielitis of the processus condilaris.

**Unilateral**: facial configuration changes, limitation of the mouth opening, impossibility of the food intake. Anamnesis: trauma, otitis, parotitis, infectious diseases.

Clinicaly: facial assymetry due to decreasing of the size of one half of the jaw, soft buccal tissues have chubby appearance on the affected joint while on the healthy side tissues look flatted. Middle line of the chin and incisal line on the lower jaw are always shifted to the affected joint side. During bimanual palpation of TMJ movements of the head are limited or absent. In the area of the angle of mandible on the affected side the osseus outgrowth (bony spur) is present. Also it can be seen on the X-ray. As the result of the mandible ramus and body shortening dental arches can be deformed as well. On the X-ray: disappearing of the joint space due to fusion of joint surfaces on the affected side, decreasing of the ramus mandibular
height, the ramus is wider on the affected side. Processus coronoideus is enlarged by height and looks like pricker.

**Bilateral:** more often as the result of septic diseases or delivery trauma.

Complaints of deformity of the lower third of the child’s face, impossibility of the mouth opening, difficulties during feeding, breathing disturbances, snoring.

Clinically: face has bird-like look, open distal bite, mouth opening is restricted, movements of the TMJ heads is not revealed during palpation, roentgenologic – partial or total absence of the joint space, bony tissue which looks like conglomerate; shortening of the rami and body of the mandible, osseous outgrowth on both angles, enlargement of the processus coronoideus from both sides.

Surgical treatment – arthroplasty (osteotomy).

**Arthrosis** – primary chronic inflammation of the joints of degenerative genesis with primary deformation of the joint cartilage and with following reactive-degenerative processes of the joint surfaces. In children arthrosis is the continuation of the long-lasting and untreated arthritis and doctors have the deal with arthritoarthrosis.

Complaints of limitation of mouth opening, discomfort during jaw movements, slight facial asymmetry.

Clinical signs are divided into joint-related and non-joint-related.

Joint related: movements limitation, rapid fatigability during eating. “Started pain” appears after rest period.

Non-joint related: unilateral microgenia which increases with time, clearly seen on X-ray.

**Comprehensive control:**

1. Anatomy, physiology and function of TMJ.
2. Classification of the TMJ diseases.
3. Methods of examination of patients with TMJ diseases.
5. Chronic arthritis, clinical features, differential diagnostics, treatment, reasons and eventual consequences of disease.
6. Etiology, pathogenesis and pathological picture of primary bone disorders and diseases of TMJ (osteoarthritis, osteoarthrosis, ankylosis).

**Practical class 12**

**Odontogenic inflammatory jaw cysts of the temporary and permanent teeth.**

Clinical and roentgenological features. The diagnostic methods. Treatment
**Teaching objective:** to familiarize students with peculiarities of the clinical course of the odontogenic inflammatory jaw cysts in children, their treatment

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**Pre-study questions:**
2. Role of the reactivity of the child’s organism in the development and clinical course of the jaw cysts.
3. Role of the early detection and adequate treatment of the inflammatory jaw cysts.
4. Definition of the “Cyst” and the cyst morphology.

**Content of the class:**
Cysts of the Jaws belong to tumor-like neoplasm.

A cyst is a pathological cavity with fluid, semi-fluid or gaseous contents, which is not created by accumulation of pus. Jaw cysts predominantly arise from odontogenic epithelium and grow by involving epithelial proliferation, bone resorption by prostaglandins, and variations in intracystic osmotic pressure.

Most jaw cysts behave similarly—they grow slowly and expansively. They differ mainly in relationship to teeth and radiographic features. They form sharply-defined radiolucencies with smooth borders and are frequently a chance radiographic finding.

**Classification of cysts of the jaws:**
1. Odontogenic cysts of the inflammatory origin (55% of all cysts – epithelial rests of Malassez):
   - radicular (periapical)
   - radicular tooth-containing
   - residual (cyst remains following removal of non-vital tooth).
2. Odontogenic cysts of the non-inflammatory origin:
   - follicular (dentigerous, impacted tooth)- arise in bone around crown of unerupted tooth
   - eruption (primordial) cyst (often burst spontaneously, rarely require excision).
3. Non-odontogenic cysts-defect of the development:
   - fissural (incisive canal, nasopalatine duct cysts, globulomaxillary, nasolabial)
-traumatic (solitary, haemorrhagic, withoutmembranous).

**RADICULAR CYST (Periapical cyst, apical cyst)**

The most frequent cyst of the teeth bearing areas is the radicular, also called periapical or apical cyst. Around 60% of all jaw cysts are radicular or residual cysts. Radicular cysts can occur in the periapical area of any teeth, at any age. This cyst is classified as inflammatory, because in the majority of cases it is a consequence to pulpal necrosis following caries, with an associated periapical inflammatory response. The first line of defense to pulpal necrosis in the periapical area is the formation of a granuloma. A granuloma is a highly vascularized tissue containing a profuse infiltrate of immunological competent cells i.e., lymphocytes, macrophages, plasma cells, etc.

The epithelial rests of Malassez are remnants from the root sheath of Hertwig which are found in large numbers within the periapical area of all teeth. These epithelial cells derive from the ectoderm that gave rise to the tooth germ and they preserve their metaplastic embryonal potential. Therefore, they can differentiate into any type of epithelium, under the proper stimuli. These rests play a central role in the formation of radicular cysts. In the midst of the rich vascular area provided by the periapical granuloma, the rests of Malassez proliferate and eventually form a large tridimensional mass of cells. With continuous growth the inner cells of the mass are deprived of nourishment and they undergo necrosis by liquefaction. This conduces to the formation of a cavity which is located in the center of the granuloma, giving rise to a radicular cyst.

The radiological image of the radicular cyst is a peri- or para-apical, round or oval radiolucency of variable size which is generally well delineated and most likely with a marked radiopaque rim. Other lesions, such as: granulomas, neoplasms of various origin and some diseases of bone can also present a similar radiolucent periapical appearance. Therefore, a periapical radiolucency can not be automatically assumed to be a cyst. Several studies have indicated that it is not possible to rely on the radiographic size of a periapical radiolucency to establish the diagnosis of either cyst or granuloma unless the lesion is larger than 2 cm in diameter. Rarely radicular cysts will induce resorption of the root of the affected tooth.
This is a typical appearance of apical radiolucency. Note the well delineated cavity with a marked radiopaque rim. The biopsy proved this to be a radicular cyst. Note the radicular rest corresponding to the roots of a first mandibular molar.

The diagnosis of radicular cyst or granuloma can only be made after histologic examination of the lesion. The size of these radiolucencies is not indicative of their diagnosis, either lesion can present great variation in its size, reflected by the amount of bone resorption as a result of pressure applied by the growing lesion into the surrounding bone.

Radicular cysts are generally asymptomatic unless they are secondarily infected, in which case they will be accompanied by pain and the other signs and symptoms of inflammatory-infectious processes. Radicular cysts may vary in size from 1/2 to 2 centimeters or more in diameter. When a cyst reaches a large size it may produce intraoral or facial asymmetry and even paresthesia due to compression of nerves. Occasionally a large cyst may erode the bone cortical plate or invade the maxillary sinus or the nasal fossae. Around 60% of all radicular cysts occur in the maxilla and rarely extend palatally. Patients with extremely large radicular cysts may be at risk of accidental secondary fractures of bone.

RESIDUAL CYST

A residual cyst arises as a consequence of an improper surgical elimination of a radicular cyst. Its clinical and histological characteristics are identical to those of a radicular cyst. Radiologically it will be seen as a radiolucency of variable size at the site of a previous tooth extraction. Treatment consists of endodontic therapy or extraction of the associated tooth with curettage of the cyst.

PARADENTAL CYST

The paradental cyst is an inflammatory cyst which develops on the lateral surface of a tooth root. Histologically the paradental cyst can not be differentiated from a radicular cyst. Some authors refer to this cyst as an inflammatory periodontal cyst or collateral cyst. This cyst is of rare occurrence and must be radiographically differentiated from the lateral periodontal cyst. It is treated by surgical ablation and does not have a tendency to recur.

The arrows point to the periphery of a paradental cyst associated to the distal wall of a 3rd mandibular molar. This cyst is also considered inflammatory in etiology.

DENTIGEROUS (follicular) CYST
Dentigerous cyst is an odontogenic cyst of developmental origin - associated with the crown of an unerupted (or partially erupted) tooth. Since the dentigerous cyst develops from follicular epithelium it has more potential for growth, differentiation and degeneration than a radicular cyst. Due to the tendency for dentigerous cysts to expand rapidly, they may cause pathological fractures of jaw bones. The usual radiographic appearance is that of a well-demarcated radiolucent lesion attached at an acute angle to the cervical area of an unerupted tooth. The border of the lesion may be radiopaque. The radiographic differentiation between a dentigerous cyst and a normal dental follicle is based merely on size.

**Surgical treatment**

There are 2 ways of surgical treatment of odontogenic cysts - cystectomy and cystotomy. Indications for choosing one of these methods depend on the pathogenesis of the disease, the size of the cyst, number of teeth involved in the process.

**Cystectomy** - is a radical operation with the complete removal of the cyst with the capsule, followed by suturing the wound tightly.

The indications for this operation are:
* The radicular cyst, which is separated from the genyantrum. Cyst large, located on the upper jaw, in the absence of teeth in its area, while maintaining the bottom wall of the nasal cavity and adjacent to the maxillary sinus, in the absence of inflammation in it
* The radicular cyst of small size (in the range of 1-2 teeth).
* If the thickness of the preserved bones is 0.5-1 cm, which prevents the fracture
* Follicular cyst, when the follicle of the permanent tooth is dead.

**Cystotomy** - a method of a surgical treatment of cysts, which removed the front wall of the cyst and combine it with the vestibule or the oral cavity proper. This operation is less traumatic, easier tolerated, but has a longer postoperative period.

The indications for this surgery are:
* Cyst in a projection which includes 3 intact teeth
* Follicular cysts of the jaw
* Radicular cyst from the primary tooth (tooth-containing), which has the permanent follicle inside of the cyst
* Radicular cysts on the upper jaw with the destruction of the bone of the nasal cavity and palatal plate
* The large radicular cyst in the mandible with a severe thinning of the jaw base.

**Comprehension control:**

1. Etiology, pathogenesis, pathomorphology of the inflammatory jaw cyst from primary and permanent teeth.
2. Statistic of the inflammatory cysts development, their localization.
3. Peculiarities of the clinical features of the inflammatory cysts course.
4. Roentgenologic examination of the cysts and its valuable role in the differential diagnostics of the cysts and other disorders of MFA.
5. Methods of the surgical treatment of the cysts, technics.
7. Prognosis and eventual complications.
8. Prophylaxis of the cysts.

Practical class 13
Traumas of the soft tissues. Clinic, diagnostic, treatment, consequences.

Teaching objective: to familiarize students with etiology and different types of soft tissue traumas in children, peculiarities of the clinical course, their treatment.

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Pre-study questions:
1. Definition of the trauma.
3. Classification of the traumas of the soft tissues.

Content of the class:
The initial examination involves evaluating and stabilizing the trauma patient. Any life-threatening conditions should be identified and managed immediately. The conditions of the airway, breathing, and circulation are examined, followed by a general neurologic assessment with particular attention to cervical spine and cranial injuries.

It is important to achieve hemostasis when stabilizing and evaluating the patient who has sustained trauma. Most bleeding will respond to application of a pressure dressing. Occasionally surgical exploration and packing of the wound under general anesthesia may be indicated. In rare instances vessels in the neck may need to be ligated. Indiscriminate clamping inside the wound should be avoided because
damage to important structures such as the facial nerve or parotid duct may result. It is unusual for bleeding from soft tissue injuries to the face to result in a shock state. Lacerations involving the scalp can occasionally be difficult to control with pressure and may require clamping, ligation, or electrocautery.

In soft tissue injuries not involving the face the length of time from initial injury to treatment is important. Secondary risk of infection increases with the lapse of time.

Because of the rich vascularity of the face there is no “golden period” for suture repair of facial wounds. In fact healing of facial wounds is unaffected by the interval between injury and repair.

Patients who are immunized and have received a booster injection within the last 10 years do not require tetanus prophylaxis if the wound is not tetanus prone. Tetanus-prone wounds are those with heavy contamination from soil or manure, devitalized tissue, or deep puncture wounds. If the wound is tetanus prone and the patient has not received a booster injection within 5 years prior to the injury, a 0.5 mL tetanus toxoid boost injection should be given. If the patient has not received a booster within 10 years prior, they should receive a booster injection for any wound. Patients who are not immunized should receive both a booster injection and 250 units of tetanus immunoglobulin, followed by a full course of immunization.

**Types of Injuries**

**Abrasions.** Shear forces that remove a superficial layer of skin cause abrasions. The wound should be gently cleansed with a mild soap solution and irrigated with normal saline. These superficial injuries usually heal with local wound care. It is important to determine whether foreign bodies have been embedded in the wound. Failure to remove all foreign material can lead to permanent “tattooing” of the soft tissue. After the wound is cleansed the abrasion is covered with a thin layer of topical antibiotic ointment to minimize desiccation and secondary crusting of the wound. Reepithelialization without significant scarring is complete in 7 to 10 days if the epidermal pegs have not been completely removed. If the laceration significantly extends into the reticular dermal layer, significant scarring is likely.

**Contusions.** Contusions are caused by blunt trauma that causes edema and hematoma formation in the subcutaneous tissues. The associated soft tissue swelling and ecchymosis can be extensive. Small hematomas usually resolve without treatment; hypopigmentation or hyperpigmentation of the involved tissue can occur, but is rarely permanent. Large hematomas should be drained to prevent permanent pigmentary changes and secondary subcutaneous atrophy.

**Lacerations.** Lacerations are caused by sharp injuries to the soft tissue. Lacerations can have sharp, contused, ragged, or stellate margins. The depth of penetration should be carefully explored in the acute setting. Closure is performed using a layered technique. If the margins are bevelled or ragged they should be conservatively excised to provide perpendicular skin edges to prevent excessive scar formation. Rarely is there an indication for changing the direction of the wound margins by Z-plasty at the time of primary wound repair. Flap-like lacerations occur
when a component of the soft tissue has been elevated secondary to trauma. Eliminating dead space by layered closure and pressure dressings is especially important in these “trapdoor” injuries.

**Avulsive Injuries.** Avulsive injuries are characterized by the loss of segments of soft tissue. Undermining the adjacent tissue, followed by primary closure, can close small areas. When primary closure is not possible, other options are considered. These include local flaps or allowing the wound to heal by secondary intention followed by delayed soft tissue techniques. If a significant amount of soft tissue is missing, then a skin graft, local flaps, or free-tissue transfer may be necessary.

**Animal and Human Bites.** Dog bites are most common in children and the midface is frequently involved. Canines can generate 200 to 450 psi when biting, and examination for fractures should be performed.

Management of bite injuries involves liberal amounts of irrigation and meticulous primary closure.

Wound irrigation and debridement are important in reducing infection. Animal and human bites are most often polymicrobial, containing aerobic and anaerobic organisms. Dog bites are often open and lend themselves to vigorous irrigation and debridement. Cats have a large quantity of bacteria in their mouth, with the most frequent and important pathogen being Pasteurella multocida. Cat bites are associated with a two-fold higher risk of infection than the more common dog bite wounds. Because their bites usually cause puncture wounds, they are difficult to clean. Having the patient follow up 24 to 48 hours after the initiation of therapy allows the surgeon to monitor the wound for any signs of infection. Antibiotic prophylaxis for animal bites continues to be debated with few good prospective studies available. Amoxicillin-clavulanate is the current drug of choice for bite wounds. Antibiotic prophylaxis should be directed at Pasteurella multocida for infections presenting within 24 hours of injury.

For wounds that present after 24 hours of injury, Streptococcus and Staphylococcus species are more common, and antibiotic prophylaxis with a penicillinase-resistant antibiotic should be chosen.

Immediate closure of bite injuries is safe, even with old injuries. There is approximately a 6% rate of infection when bite wounds are sutured primarily in lacerations where there are cosmetic concerns. Extensive animal bite wounds involving the face should be treated according to the criteria of esthetic reconstructive surgery. Rabies prophylaxis should be given for bite wounds that occurred from an unprovoked domestic dog or cat that exhibits bizarre behaviour or from an attack by a wild animal such as a raccoon, skunk, bat, fox, or coyote.

**Gunshot Wounds to the Face.** Gunshot wounds require careful attention and evaluation for associated facial fractures. Both entry and exit wounds should be evaluated. Exit wounds often produce marked tissue destruction and require acute debridement. Regional flaps can be useful in treating facial soft tissue defects caused by gunshot wounds.

Ballistic facial injuries are grouped by etiology: gunshot, shotgun, and high-energy avulsive injuries.
Over the past 20 years advances in imaging and the introduction of craniofacial approaches with rigid fixation have led to an evolution of treating facial injuries. The esthetic and functional results of facial injury are improved dramatically by the combination of a definitive open reduction of bone with early replacement of soft tissue into its primary position. Immediate definitive reconstructions with rigid fixation of the facial fractures and closure of the lacerations are recommended. Standard incisions often need to be modified because of the soft tissue wounds.

**Comprehension control:**
1. Classification of injuries of the soft tissues of MFR in children.
2. Peculiarities of child examination with injuries of the soft tissues.
4. Main principles of the primary surgical wound processing.
5. Dispensarization and rehabilitation of the patient with injuries of MFA.
7. First aid and treatment of the termical and chemical injuries of the soft tissues.

**Practical class 14.**

**Traumas of the teeth (displacement, dislocation and fracture). Methods of diagnostics, peculiarities of the treatment, consequences**

*Teaching objective:* to familiarize students with etiology and different types of teeth traumas in children, peculiarities of the clinical course, their treatment.

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*Pre-study questions:*
1. Classification of the traumas of the teeth.
2. Different types of injuries of the teeth.
3. Examination of the patient with trauma of the teeth.
4. First aid and specialized care of the children in the in-patient department and in ambulatory.
5. Complications and consequences.

*Content of the class:*
Injury to both the primary and permanent teeth and the supporting structures is one of the most common dental problems occurred in children.

Researchers have shown that 30% of school children suffer traumatic dental injury in the primary dentition and 22% - in the permanent dentition. Therefore, just over 50% of children will sustain a traumatic dental injury before leaving school.

Trauma to the dentition should always be considered an emergency situation. It occurs frequently and results in functional and esthetic disturbances accompanied by concern from both the patient and the parent. The dentist’s responsibility is to act objectively and efficiently in such a situation.

**Etiology.** Trauma to the dentition can be either direct or indirect. Direct trauma occurs when the dentition is struck by one of a variety of objects such as a hard ball, stick, or a fist. Indirect trauma is produced by sudden forceful closure of the mandibular teeth with their maxillary opponents as may follow a blow to the chin in a fall, a fight, or road accident.

The etiology of the various types of dental trauma is, to a large extent, dependent on age. The age and the type of trauma experienced can be divided into well-defined sections.

**Age 18 Months to 2 Years.** The age from 18 months to 2 years is an important time in the child’s development. He is discovering and exploring his environment. The ability to stand unsupported has not been perfected, and locomotive movement is provided by crawling on hands and knees. Children at this age are notoriously adventurous and inquisitive, resulting in many traumatic incidents, fortunately mostly of a trivial nature. In the primary dentition, injury is usually confirmed to the supporting structures, resulting in displacement or avulsion of the tooth rather than fracture of the crown or root.

**Age 2 to 5: The Toddler Stage.** At the beginning of the period between the age of 2 and 5, the child is just learning to walk and is very unsteady on his feet. This may result in a fall injury to the anterior teeth. Quite often the child is taken to a park where there are swings, slides, and the like. A common cause of dental injury in this setting is the swing.

At this stage the child’s oral cavity is just about on the same level as the average swing seat. Often, the child will stand in front or behind a moving swing and will receive the full force of the blow at the level of the teeth, resulting in their fracture or displacement.

**Between 5 and 10 Years.** At the stage between the ages of 5 and 10, the child has reached school age, and playground accidents are very common. These accidents tend to be falls, characterized by a high frequency of crown fracture. Also, it is the time to learn to ride a bicycle, to roller skate, and to ice skate. Falls from bicycles and skates cause multiple crown fractures with associated soft tissues injuries to the upper lip and chin.

**The Teenage Years.** Injuries during the teenage years tend to be due sporting activities, especially contact sports such as soccer, baseball, football, basketball, and hockey.

**Road Traffic Accidents.** Facial injury owing to road traffic accidents is frequently seen in the late teens. In such an accident the passenger next to the driver
is often thrown forward and may contact the windshield, causing lacerations of the soft tissues of the lip and chin.

The driver and the front seat passenger are not most risk, especially if seat belts are not worn. The trauma experienced is typified by soft tissue and bony injuries as well as damage to teeth due to contact with the windshield, dashboard, or steering wheel. Young children in rear seats are particularly at risk. If no restraint is worn, they can be thrown around the car interior in an accident, resulting in severe total body injury.

**Injuries to the Tooth**

**Crown**

A crack or craze of the enamel without loss of tooth structure can be horizontal or vertical (Fig.1-A).

Fracture of the crown can be enamel only (Fig.1-B); involving enamel and dentine (Fig.1-C); or enamel, dentine, and pulp (Fig.1-D).

*Fig. 1* (A) Enamel crazing. (B) Crown fracture involving enamel. (C) Crown fracture involving enamel and dentine. (D) Crown fracture involving enamel, dentine and pulp.

The fracture can be either horizontal (Fig.2-A); vertical (Fig.2-B); or oblique (Fig.2-C).
Fig.2 A) Horizontal crown fracture  (B) Vertical crown fracture. (C) Oblique crown fracture.

Fracture of the crown and root involving cementum may have pulpal involmen or no pulpal involmen (Fig.3-A and B).
**Fig. 3**  (A) Crown root fracture involving cementum. (B) Crown root fracture involving cementum and pulp.

**Root**

Fracture of the root can involve the apical third (Fig. 4-A), the middle third (Fig. 4-B), or the cervical third.

**Fig. 4**  (A) Apical third root fracture.  (B) Middle third root fracture.  (C) Cervical third root fracture.

**Fig. 5**  (A) Horizontal root fracture.  (B) Oblique root fracture.
**Entire tooth**

**Concussion.** A mild blow to the teeth may result in injury only to the periodontal membrane, so “concussion” the tooth. The tooth may be sensitive to touch and tender to percussion. No mobility or displacement will be observed.

**Subluxation.** More severe blow may result in more drastic injury to the periodontal membrane resulting in tooth mobility. Any displacement is not observed.

**Displacement.** Various types of displacement can result from trauma:
- Intrusion—displacement of the tooth into the socket (Fig 6-A);
- Extrusion—partial displacement of the tooth out of its socket (Fig 6-B);
- Labial displacement—displacement of the tooth labially (Fig. 6-C);
- Linguopalatal displacement—displacement toward the tongue/palate (Fig. 6-D);
- Lateral displacement—displacement of the tooth mesially or distally (Fig. 6-E);
- Avulsion—complete loss of the tooth from its socket (Fig. 6-F).

Fig. 6. (A) Intrusive tooth displacement. (B) Extrusive tooth displacement. (C) Labial tooth displacement. (D) Linguopalatal tooth displacement. (E) Lateral tooth displacement. (F) Avulsion.
FIRST AID FOR AN AVULSED TOOT

I. PRIMARY TOOTH

• A primary tooth that has been avulsed is usually not reimplanted. The risk of injury to the developing permanent tooth bud is high.

II. PERMANENT TOOTH

• 1. Do not touch the root of the tooth. Handle the tooth by the crown only.
• 2. Rinse the tooth off only if there is dirt covering it. Do not scrub or scrape the tooth.
• 3. Attempt to reimplant the tooth into the socket with gentle pressure, and hold it in position.
• 4. If unable to reimplant the tooth, place it in a protective transport solution, such as Hank's solution, milk, or saline. This will hydrate and nourish the periodontal ligament cells which are still attached to the root. A small container of Hank's Balanced Salt Solution can be purchased in dental emergency kit form at many drug stores. Contact lens solution is not an acceptable storage medium.
• 5. The tooth should not be wrapped in tissue or cloth. The tooth should never be allowed to dry.
• 6. Take the child to a dentist or hospital emergency room for evaluation and treatment.
• 7. Radiographs may need to be taken of the airway, stomach, and mouth if the tooth cannot be found.
• 8. Tetanus prophylaxis should be considered if the dental socket is contaminated with debris.

DENTAL OFFICE TREATMENT FOR AN AVULSED TOOTH

I. PRIMARY TOOTH

• The primary avulsed tooth is generally not reimplanted – to avoid injury to the developing permanent tooth bud.

II. PERMANENT TOOTH

• 1. Place the tooth in Hank's Balanced Salt Solution.
• 2. Take a medical and dental history, and perform a physical examination. Rule out CNS injury.
• 3. Examine the orofacial area. Inspect the oral soft tissue for embedded tooth fragments, lacerations, or ecchymosis (bruising). Palpate the teeth and dentoalveolar area to check for mobility. Evaluate TMJ function.
• 4. If the tooth is missing, rule out aspiration or ingestion.
• 5. Take a maxillary occlusal radiograph, as well as a lateral anterior radiograph of the injured area. Consider taking a panoramic radiograph to rule out condylar or mandibular fractures.
• 6. Gently aspirate the injured area without entering the socket. If a clot is present, dislodge and remove it using light saline irrigation. Do not curette the socket.
• 7. The tooth should be carefully held by the crown, and not by the root. The avulsed tooth should be reintroduced into the dental socket slowly.

TOOTH REIMPLANTATION GUIDELINES
• 1. For A Mature Tooth With A Closed Apex: If the extraoral dry time is <60 minutes, reimplant as soon as possible. If the extraoral dry time is >60 minutes, soak in citric acid or curette the root; then soak in stannous fluoride for 10 minutes. Rinse with saline. Perform root canal therapy one week following the trauma.
• 2. For An Immature Tooth With An Open Apex: If the extraoral dry time is <60 minutes, soak in doxycycline (1mg/20 ml saline) for 5 minutes. If the extraoral dry time is >60 minutes, provide the same treatment as for a closed apex.
• 3. Apply a flexible, functional splint for 7 to 10 days. If an alveolar fracture is present, provide a very rigid splint for 4-6 weeks.
• 4. After reimplantation, gently compress the facial and lingual bony plates. Suture any lacerations.
• 5. Provide antibiotic coverage for 10 days to prevent infection. Consider prescribing tetracycline or penicillin. Penicillin is prescribed as: PenVK 500mg, 4X per day, for 10 days.
• 6. Prescribe chlorhexidine gluconate rinses, and provide oral hygiene and diet instructions.
• 7. Provide analgesics to control pain. For children, consider prescribing acetaminophen and codeine (Tylenol #3) for mild to moderate pain. The dose is 15 mg/kg/dose of acetaminophen, every 4 hours. Do not exceed 2.6 g/day of acetaminophen.
• 8. Arrange for tetanus vaccination if the wound was dirty, or if the vaccination requires updating.

FIRST AID WITH TOOTH DISPLACEMENT
I. PRIMARY TOOTH
Place a cold wet cloth over the mouth, and bring the child to a dentist. Provide pain
relief by giving children’s Tylenol.

II. PERMANENT TOOTH

Rinse with cold water, and keep an ice pack over the lip and mouth to reduce swelling. Give Tylenol for pain relief. Try to reposition the luxated tooth back to its normal position using gentle to moderate finger pressure. The patient is then instructed to gently hold the tooth in position. Obtain definitive dental care as soon as possible.

DENTAL OFFICE TREATMENT OF TOOTH DISPLACEMENT

I. PRIMARY TOOTH

- A primary tooth with a luxation in the labial direction needs to be extracted, to avoid further damage to the developing permanent tooth bud.
- In other cases, however, it is possible to splint the luxated primary tooth back into normal position using resin-modified glass ionomer cement. The cement is mixed fairly thick, and placed on the labial and lingual surfaces of the luxated tooth – and a few adjacent teeth. The luxated tooth is held in the ideal position while the cement is setting. The splint is removed after 10 days using a composite finishing bur.

II. PERMANENT TOOTH

- For any severe luxation injury: an anti-inflammatory agent (Motrin), an analgesic (Tylenol #3 or Percoset), and an antibiotic (Penicillin) are prescribed.
- For a lateral luxation, treatment includes: repositioning after local anesthesia, and applying a semi-rigid splint for 2-3 weeks. A post-treatment radiograph should be performed to assure proper position of the tooth in the socket.

For an extrusive luxation, treatment includes: immediate repositioning and placement of a semirigid (flexible) splint for 7-14 days.

Comprehension control:
1. Classification of the injuries of the teeth.
2. Contusion of the tooth. Clinical course, diagnostics, treatment, prevention.
3. Traumatic dystopia of the tooth.
4. Fracture of the crown.
5. Complications of the acute trauma of the teeth.
6. Dispanserization.

Practical class 15
Traumas of the maxillo-facial bones of the children. Classification, methods of diagnostics. Treatment. Rehabilitation
**Teaching objective:** to familiarize students with etiology and different types of traumatic injuries of the jaw bones in children, peculiarities of the clinical course, their treatment.

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**Pre-study questions:**
1. Classification of the traumas of the jaw bones.
2. Different types of injuries of the jaw bones.
3. Examination of the patient with trauma of the jaw bones.
4. First aid and specialized care of the children in the in-patient department and in the ambulatory.
5. Complications and consequences.

**Content of the class:**

Maxillary fractures most often occur in conjunction with other facial fractures and are most often associated with injuries such as lacerations, other facial fractures, orthopaedic injury, and neurologic injury.

**Le Fort Classification System**

In his description of maxillary fractures Le Fort considered several factors: the vector of force overcoming the inertia of the face; the thickness of the bone and buttresses counteracting the mass, velocity, and point of application; and the maxilla, which he noticed was unaffected by muscle pull, unlike the long bones. These considerations resulted in a classification of three levels of fracture.

**Le Fort I Level.** Maxillary fractures at the Le Fort I level traverse the lateral antral wall, the lateral nasal wall, and the lower third of the septum, and they separate at the pterygoid plates. Thus, the entire mobilized segment consists of the maxillary alveolar bone, the palatine bone, the lower third of the nasal septum, and the lower third of the pterygoid plates. The superior two-thirds of these bones remain associated with the face.

**Le Fort II Level.** Maxillary fractures at the Le Fort II level involve most of the nasal bones, the maxillary bones, the palatine bones, the lower two-thirds of the nasal septum, the dentoalveolus, and the pterygoid plates. Unlike the horizontal separation noted in the Le Fort I fracture, the Le Fort II fracture is pyramidal in shape. The fracture extends from below the nasofrontal suture through the nasal bones along the maxilla to the zygomaticomaxillary suture and includes the medial inferior third of...
the orbit. The fracture then continues along the zygomaticomaxillary suture to and through the pterygoid plates. The septum is also separated superiorly. The segments may be intact below this line of fracture, but they are most often comminuted.

**Le Fort III Level** Fractures at the Le Fort III level involve the nasal bones, the zygomas, the maxillae, the palatine bones, and the pterygoid plates. These fractures essentially separate the face along the base of the skull. The fracture line extends from the nasofrontal suture along the medial wall of the orbit through the superior orbital fissure. It then extends along the inferior orbital fissure and the lateral orbital wall to the zygomaticofrontal suture. The zygomaticotemporal suture is also separated. The fracture then extends along the sphenoid bone, separating the pterygoid plates. The septum becomes separated at the cribriform plate of the ethmoid. Le Fort III fractures are most often comminuted. With highly comminuted fractures, patients may sustain fractures at more than one level. Virtually all combinations of Le Fort I, II, and III fractures are possible on either side of the face.

**Clinical Examination**

Advanced trauma life-support protocols should be followed for all patients who have suffered trauma. Detailed examination of maxillofacial fractures is completed in the secondary survey, after the primary survey and successful resuscitation have been completed. As has been done historically the clinical examination should begin with the initial observation of the patient, followed by palpation of the fractures.

Lacerations, abrasions, and ecchymotic areas should be recorded. Periorbital ecchymosis and facial edema should be noted and are very typical of these fractures. Epistaxis with any evidence of cerebrospinal fluid leakage (clear fluid mixed with blood, “tram lines”) should be identified. Asymmetry of the nose, traumatic telecanthus, a flat nasal bridge, and a dish-shaped face should all be noted. Intraorally the examiner may see fractured teeth, vestibular ecchymosis and edema, palatal ecchymosis, mucosal lacerations and bleeding, steps or diastema in the maxillary teeth, and malocclusion.

The skeletal framework of the face should be carefully palpated. With respect to the maxilla, the alveolus should be palpated and any fractures or mobility noted. The examiner should also observe the maxilla for movement as a unit, while palpating the forehead, the nasal bridge, and the zygomaticofrontal sutures. The nose should be examined grossly for contour irregularity. A nasal speculum should be used to identify compound fractures of the septum or septal hematoma. Both hands should be used to palpate the orbital rims and in particular the zygomaticomaxillary suture. The intraoral examination should be complete, and the examiner should note accumulation of blood, debris, or avulsed teeth that could compromise the airway, as well as the presence of laceration, abrasion, or ecchymosis. Abnormal occlusion with an anterior open bite and posterior prematurities should be noted and correlated with pretraumatic occlusion if possible (family members, photographs, dental records).

**Imaging**

Fractures are identified clinically and confirmed radiographically. In the past the Waters’ view and lateral facial radiographs were used in identifying maxillary fractures and may still be used today in remote areas without access to a computed tomography (CT) scanner.
Fine details of the fracture sites are difficult to visualize. Axial and coronal CT scans of the midface should be obtained if a scanner is available. If clinical evidence strongly indicates maxillary fracture (midface mobility and malocclusion with intact mandible), then CT imaging is a confirmatory test for maxillary fractures. Important indications for CT scanning are suspected orbital floor fractures (best diagnosed in the coronal view) and surgical planning. CT scans can also demonstrate the soft tissue differences of hematoma or edema of the subcutaneous tissue, muscle, and fat. For severe midface trauma or maxillary displacement, the three-dimensional CT scan is a valuable tool.

**Treatment**

Patients do not die of maxillary fractures, but they may die of concomitant injury or failure to manage the sequelae of maxillary fractures. As is true for all injuries initial attention should be directed at establishing an airway and controlling hemorrhage. The most frequent cause of hemorrhage in Le Fort level fractures is a fractured septum. This bleeding may be addressed by placing nasal packs of one of a number of materials, including gauze packing. Bleeding from sites of laceration or abrasion may be controlled by tamponade. Exsanguinating hemorrhage is rarely encountered with facial fractures; however, its occasional occurrence has long been noted: “Hemorrhage, which is not readily amenable to successful treatment, as in the case of rupture of the internal maxillary artery or its terminal branches, may be followed by fatal results.

**Pediatric Maxillary Fractures**

Pediatric maxillary fractures occur infrequently. Because the pediatric sinuses are not highly pneumatized, these fractures tend to be less comminuted in children than in adults. No long-term studies have been undertaken with populations large enough to determine what alterations in maxillary growth will occur after pediatric maxillary fractures. When fixation is undertaken, consideration should be given to the contour and the root length of the primary dentition. The use of occlusal splints and skeletal fixation should be entertained. Resorbable plating systems have been advocated for use in pediatric patients so that potential complications of translocation, extrusion, and growth restriction can be avoided.

The mandible is the second most commonly fractured part of the maxillofacial skeleton because of its position and prominence. Basic principles of orthopedic surgery also apply to mandibular fractures including reduction, fixation, immobilization, and supportive therapies. Reduction of the fracture can be achieved either with an open or closed technique. In open reduction, as the name implies, the fracture site is exposed, allowing direct visualization and confirmation of the procedure. This is typically accompanied by the direct application of a fixation device at the fracture site. A closed reduction takes place when the fracture site is not surgically exposed but the reduction is deemed accurate by palpation of the bony fragments and by restoration of the functioning segments, for example, restoration of the dental occlusion by wiring the teeth together, using splints, or employing external pins. Fixation must be able to resist the displacing forces acting on the mandible. It can take one of two forms: direct or indirect. When direct fixation is used, the fracture site is opened, visualized, and reduced; then stabilization is applied across
the fracture site. The rigidity of direct fixation can range from a simple osteosynthesis wire across the fracture (ie, nonrigid fixation) to a miniplate at the area of fracture tension (ie, semirigid fixation) or a compression bone plate (ie, rigid fixation) to compression screws alone (lag screw technique). Indirect fixation is the stabilization of the proximal and distal fragments of the bone at a site distant from the fracture line. The most commonly used method for mandibular fractures is the use of intermaxillary fixation (IMF). A further example of indirect fixation is the use of external biphasic pin fixation in combination with an external frame.

**Patients often complain of the following:**

- Pain or tenderness is often present at the site of impact with the possibility of a direct fracture, or at a distant site in the case of an indirect fracture.
- Difficulty chewing. Pain could be limiting mandibular function or there may be a malocclusion or mobility at the fracture site.
- Malocclusion. The patient may be able to tell the clinician of an alteration in the bite from normal; however, patients are not always reliable and may claim that the bite feels normal when it is not and vice versa.
- Numbness in the distribution of the inferior alveolar nerve. This usually indicates a displaced fracture in the region of the body or angle of the mandible on the affected side. A nondisplaced fracture often does not give rise to numbness in the distribution of the inferior alveolar nerve.

**Clinical Examination**

The clinical examination should consist of inspection and palpation. It is best to proceed in an orderly fashion and to perform this evaluation as a component part of the entire head and neck examination of the trauma patient. The skin of the face and, in particular, the area around the mandible should be inspected for swelling, hematomas, and lacerations. A common site for a laceration is under the chin, and this should alert the clinician to the possibility of an associated subcondylar or symphysis fracture. Typically, the patient who has suffered a fracture of the mandibular condyle will present with facial asymmetry. This is owing to the loss of the vertical height of the ramus on the side with the fracture, resulting in a shift of the mandible to the ipsilateral side.

The best routine to evaluate facial fractures is to start at the top and work down, assessing the stability of the anatomic structures in a mediolateral fashion. It is best to begin the examination from behind the seated or supine patient. The clinician should palpate the movement of the condyle both over the lateral aspect of the joint and through the external acoustic meatus and observe the movement of the mandible itself. If a unilateral condylar fracture is present, a subjective assessment can then be made between the palpable movement of one side compared with the other. Failure to detect the translation of the condyle, especially when associated with pain on palpation, is highly indicative of a fracture in this area. Palpation will frequently confirm tenderness over the lateral pole of the injured condyle with associated crepitation. However, in the case of fracture dislocations, the condyle may not be palpable.

Any significant deviation on opening may be indicative of subcondylar fracture on the side to which the mandible deviates. To better evaluate this area, the fifth finger is placed in each acoustic meatus and the patient is asked to open and close the
mouth. On opening, the mandible frequently shifts even more toward the side of the fracture as a result of decreased translation of the condyle on the injured side. As mentioned before, in unilateral fractures, there is deviation of the occlusion toward the fractured side, with premature occlusal contact in the posterior region on that side. This results because the lateral pterygoid muscle on the fractured side pulls on the fractured segment and does not have any protruding influence on the mandible. The lateral pterygoid muscle on the contralateral side is unopposed and thus causes deviation to the fractured side. The midlines no longer coincide, and there is an open bite in the body region on the contralateral side. This is often accompanied by fracture of the posterior dentition on the same side as the condylar fracture.

If bilateral condylar fractures are present, the occlusion may not be deviated. The midlines are often coincident, and premature contact is present bilaterally on the posterior dentition with an anterior open bite. The posterior dentition may be fractured on both sides in these situations.

Often the patient with a fracture of the condylar process also has a limited range of motion. This limitation, however, is primarily caused by voluntary restriction as a result of pain. One has to keep in mind that any limitation of mandibular movement may also be a result of reflex muscle spasm, temporomandibular effusion, or mechanical obstruction to the coronoid process resulting from depression of the zygomatic arch. Other less common findings include blood within the external auditory canal and, in the case of fracture dislocation, development of a prominent preauricular depression. Careful otoscopic evaluation of the external auditory canal is of particular importance in patients suspected to have suffered an injury at this level. Occasionally a fracture of the condylar process will produce a tear in the epithelial lining of the anterior wall of the canal, which produces bleeding from the acoustic meatus. It is important to determine that this bleeding is not coming from behind a ruptured tympanic membrane, which may signify a basilar skull fracture.

**Anatomic Location:**

- **Dentoalveolar fracture:** Any fracture that is limited to the tooth-bearing area of the mandible without disruption of continuity of the underlying osseous structure
- **Symphysis fracture:** Any fracture in the region of the incisors that runs from the alveolar process through the inferior border of the mandible in a vertical or almost vertical direction
- **Parasymphyisis fracture:** A fracture that occurs between the mental foramen and the distal aspect of the lateral mandibular incisor extending from the alveolar process through the inferior border
- **Body fracture:** Any fracture that occurs in the region between the mental foramen and the distal portion of the second molar and extends from the alveolar process through the inferior border
- **Angle fracture:** Any fracture distal to the second molar, extending from any point on the curve formed by the junction of the body and ramus in the retromolar area to any point on the curve formed by the inferior border of the body and posterior border of the ramus of the mandible
• Ascending ramus fracture: A fracture in which the fracture line extends horizontally through both the anterior and posterior borders of the ramus or that runs vertically from the sigmoid notch to the inferior border of the mandible.

• Condylar process fracture: A fracture that runs from the sigmoid notch to the posterior border of the ramus of the mandible along the superior aspect of the ramus; fractures involving the condylar area can be classified as extracapsular or intracapsular, depending on the relation of the fracture to the capsular attachment.

**Goals of treatment:**
1. Obtain stable occlusion.
2. Restore interincisal opening and mandibular excursive movements.
3. Establish a full range of mandibular excursive movements.
4. Minimize deviation of the mandible.
5. Produce a pain-free articular apparatus at rest and during function.
6. Avoid internal derangement of the temporomandibular joint on the injured or the contralateral side.
7. Avoid the long-term complication of growth disturbance.

**Comprehensive control:**
1. Classification of traumatic injuries of the jaw bones.
2. Peculiarities of the examination of children with trauma of the jaw bones.
3. Clinic and diagnostic of the fractures of upper and lower jaws in children.
5. Types of splints.
6. Dispanserization, rehabilitation of the patients with fractures of the jaws.

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**Practical class 16**

Clinic of the short-cut frenum of the tongue (tongue-tie), upper and lower lips.

Clinic, operation in outpatient department

**Teaching objective:** to familiarize students with clinical course and treatment the short-cut frenum.

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<td>1</td>
<td>Introduction</td>
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<td>2</td>
<td>Inquiry of the students</td>
<td>20</td>
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<tr>
<td>3</td>
<td>Practical training</td>
<td>60</td>
<td>Tables.</td>
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<td>4</td>
<td>Summarizing of the class</td>
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**Pre-study questions:**
1. Anatomy of the oral cavity.
2. The depth of the vestibulum oris, its definition.

**Content of the class:**

**Tongue tie**, ‘**Ankyloglossia**’ or ‘short frenum’ are the terms used when the lingual frenum is short and restricts the mobility of the tongue. Tongue tie can be defined as a structural abnormality of the lingual frenum. When the frenum is normal, it is elastic and does not interfere with the movements of the tongue in sucking, eating, clearing food off the teeth in preparation for swallowing and, of course, in speech. When it is short, thick, tight or broad it has an adverse effect on oromuscular function, feeding and speech.

They can be thin and membranous, thick and white, short, long or wide, extending from the margin of the tongue all the way to the lower front teeth, or so short and tight that they make a web connecting the tongue to the floor of the mouth.

When they extend to the margin of the tongue, they cause a heart-shaped look at the front of the tongue and no tongue tip can be seen. When they extend across the floor of the mouth they cause pain when the tongue is elevated. They can cause separation or inward tilting of the incisors.

**Diagnostics:**
- Appearance of the tongue and its movements.
- Maternal factors including pain, nipple injury, blocked ducts or mastitis during breastfeeding.
- Infant factors including low weight, vomiting and gagging.
- Lack of lingual mobility which affects speed and accuracy of tongue movements.
- Eating difficulties caused by poor coordination of oral musculature.
- Dribbling - which is prolonged.
- Dental problems which are severe and wide ranging.
- Speech which is unclear due to several aspects, especially coordination.

**Intervention.** Early intervention is ideal since it avoids habit formation and the negative effects of failure: whether it is due to messy or slow eating, funny looking teeth or speech problems. When there are no strong habits to eradicate there is a better chance of success in correcting the difficulties that poor tongue mobility has caused.

**Comprehensive control:**
1. What type of abnormalities of the tongue and lip frenum do you know?
2. Influence of the tongue and lip frenum abnormalities on the development of pathological condition in the mouth cavity.
3. What types of functional changes are possible in the presence of the shortcut frenum of the tongue?
5. What types of functional changes are possible in the presence of the shortcut frenum of the upper and lower lip?
6. How to define the depth of the vestibulum oris in children in different periods of age.
7. Influence of the small vestibulum oris on the development of different pathological conditions in the mouth cavity.
8. Treatment of the shortcut frenum of upper lip.
10. Surgical treatment of the shortcut frenum of the upper lip in the different periods of age.

Practical class 17
Summary lesson.