MASARYK UNIVERSITY

Faculty of Medicine

S T O M A T O L O G Y

FOR STUDENTS OF GENERAL MEDICINE

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1. Introduction to Stomatology

Stomatology is one of the basic medical fields. It studies diagnostics, treatment and prevention of diseases affecting teeth, oral cavity and tissues and organs which are topographically associated with it. Stomatology services are provided mainly in the form of an outpatient care, just a small part of the care is provided by inpatient stomatological facilities.

Today's stomatology is a field that employs exclusively university-educated professionals, i.e. doctors after graduation from five to six years long studies at a university.

A doctor-stomatologist's coworkers are health services staff: a nurse, a dental technician, an X-ray technician, and a dental hygienist.

1.1 Classification of Stomatology

Among the basic stomatological fields there are therapeutic stomatology, orthopedic stomatology, and surgical stomatology. Therapeutic stomatology (protective, conserving stomatology) deals with the diagnostics, treatment and prevention of a dental decay and its complications. Associated with this basic stomatology branch there are: children's stomatology (pedostomatology, pedodontics) that deals with the care of the milk dentition or the developing permanent dentition of youngsters.

Periodontics deals with diseases of the periodontium tissues and the oral cavity mucous membrane diseases.

Orthopedic stomatology (dental prosthetics) deals with the replacement of parts of crowns, individual teeth losses or provides for the total replacement of lost teeth by the production and application of various dental prostheses (crowns, bridges, removable dentures). An individual specialty is orthodontics (othopedics of jaws) that deals with the diagnostics, treatment and prevention of irregularities of the individual teeth, groups of teeth and anomalies of jaws.

Surgical stomatology deals with the surgical treatment of the oral cavity diseases (dentoalveolar surgery) or as a specialty (maxillofacial surgery)

provides for surgical treatment of larger orofacial diseases, mainly in the form of the inpatient care.

A graduate of the stomatology studies is prepared both theoretically and practically for the praxis in prevention and cure in the basic stomatology fields. He or she receives only general knowledge in the specialized disciplines that allow for a responsible decision of a consequent treatment at highly specialized dental offices. As a graduate student he or she can receive a higher degree of qualification after passing necessary examinations and continue to work as a specialist in othodontics or maxillofacial surgery fields.

1.2 Examination of Patients

An examination should be conducted under a proper lighting, with a patient sitting at the chair of the stomatological unit, by examination tools (dental mirror, dental probe, dental forceps). Results of an examination should be entered into a patient's medical record which serves for preparing a treatment plan. The first part of an examination is the anamnesis (case history). This part collects data that are related to a patients current illness and could influence a way of patient's treatment.

Social anamnesis. Some data may indicate professional risks: e.g. higher cariousness at bakers or confectioners. Data about a patient's habits may also be significant (smoking, drinking hard spirits), in relation to pre-cancerous states and malignant tumors.

Family anamnesis collects data on previous illnesses, surgeries and injuries. Data on cardiovascular diseases, metabolic disorders (diabetes, thyropathy), blood or hemocoagulation changes, allergic or paroxysmal states etc. Sometimes it is necessary to request a written report on a patient's condition from a specialist. This report must state a proposed extent of a surgical treatment to be conducted.

Stomatologic anamnesis focuses on previous illnesses, surgeries or injuries of the orofacial area, about previous orthodontic, prosthetic treatments or dental surgeries, and about hygiene habits.

Extra-oral examination uses methods that are common in medicine, e.g. aspection, palpation, and also auscultation in the mandibular joint area.

Careful examination and a qualified evaluation of its results may suggest a lot on the nature of a patient's illness.

During an intra-oral examination, an attention is paid to the whole oral cavity. Not only the teeth should be examined, but also the mucosa of alveolar ridges, the tongue, the oral cavity base and the cheeks. Attention should also be paid to the ducts of large salivary glands and the appearance of saliva. Individual teeth are examined with the aid of the dental mirror and the probe so that all tooth surfaces can be inspected. The teeth of the permanent dentition are labeled with Arabic numbers from 1 to 8, milk dentition teeth are labeled by roman numerals from I to V. At present, the most frequently used numbering is that recommended by the international stomatology organization FDI (Féderation Dentaire Internationale). The quadrants of upper and lower jaws are labeled with numbers both for milk and permanent teeth. The permanent dentition quadrants are labeled as follows:

upper jaw	right side	left side
	1	2
lower jaw	4	3

The milk dentition quadrant labeling is the following:

upper jaw	right side	left side
	5	6
lower jaw	8	7

The quadrant number precedes a number that marks an individual tooth. For instance, the upper right canine tooth of the permanent dentition will be marked as 13, the same tooth of the milk dentition will be marked as 53.

Auxiliary examination methods complement the basic clinical examination. Besides some specialized methods (sonography, thermography), the most important is the X-ray examination. The intra-oral X-ray examination provides for an image of teeth and alveolar ridges, the extra-oral X-ray examination renders an image of the facial skeleton or the mandibular joint. Tomography provides for more detailed data by imaging a pre-selected layer of an object in

a certain depth. Computer tomography (CT) is utilized in surgical dentistry mainly for imaging of the orofacial area tumors or during some injuries of the upper or middle third of the facial skeleton. The panoramic examination on the Status X instrument yields a surveying X-ray of teeth, e.g. when examining for a focal infection. Concurrent imaging of both jaws, nasal and maxillar sinuses and mandibular joints can be achieved by the orthopantomographic examination, e.g. using the AVANTEX instrument (Chirana). An X-ray exam with the use of contrast compounds is also frequently used. These compounds (e.g. iodinated oils - Lipiodol, or the barium suspension) absorb more X-rays than the surrounding tissues thus creating a positive contrast. This means of examination enables to follow morphological and functional manifestations of normal or pathologically altered organs, especially the large salivary glands (sialography), changes of the maxillar sinuses epithelium (antrography), eventually localization of cysts at the orofacial area (cystography).

Results of these examination methods can help significantly with determination of the correct diagnosis of an illness.

1.3 Biological Testing of Dental Materials

In 1978, the working team 5 of the Federation Dentaire International (FDI), the Commission for Dental Materials, Instruments, Tools and Therapeutics (COMIET) - today's The Commission for Dental Products, have agreed upon the document No. 198 which was published in the bulletin No. 204. The bulletin describes recommended tests for evaluation of dental materials. It was published as the "ISO Technical Report". The publication actually represented the first international attempt to set up procedures and rules for evaluation and testing of dental materials and assessment of their harmlessness upon the contact with human tissues. The report has reflected current level of knowledge at that time and showed readiness to modify or improve testing methods with the final goal of transforming this Technical report into an international norm. The report has been accepted internationally, except Australia and South Africa, by national government

authorities as responsible for evaluation of safety of dental materials used on their territories.

The Czechoslovak stomatology has accepted these rules in the modified form in compliance with available laboratory testing methods and technology in 1986. This proposal also recommends standard methods for safety testing of dental materials designed for application into human tissues. This recommendation excludes pharmaceuticals, except those that are applied directly during a preserving or endodontic treatment. Tests of environmental factors effects and dental equipment effects are excluded as well. Recommended procedures include biological, not technical tests of materials. Results of proposed tests will be presented as a part of applications for clinical trials.

Testing concerns the following groups of materials:

I. Materials for preserving stomatology - designed for a tooth reconstruction. Both metal and non-metal materials belong to this group. They are inserted into a tooth as a temporary or permanent fillings. They are in a short-term or permanent contact with tissues and the environment of the oral cavity.
II. Prosthetic materials - designed for the teeth reconstruction. The impression materials will stay for a short time inside the oral cavity, materials for molding of dentures will stay there longer. Implantation materials remain in a tissue permanently.
III. Materials for endodontics. These materials serve as disinfectants and fillings of the tooth pulp cavity. They may penetrate into the periapical ligamentous tissues and the bones via foramen apicis dentis. Compounds for devitalization of the pulp belong here, too.
IV. Materials for periodontics. These materials are used for treatment of the periodontium, come into a temporary contact with the oral mucosa, submucous ligaments and the bone of the alveolar ridge.
V. Materials used in orthodontics. Remain inside the oral cavity for the period of up to several years.
VI. Materials for the oral surgery. Are present temporarily inside the oral cavity as plastic bandages or tissue glues.

VII. Materials for stomatological prevention. These materials enter the oral cavity for a long time. They are utilized for filling of dental fissures as a prevention of dental decay or for teeth cleaning.

General overview and the degree of testing are shown in Table 1.

Table 1.: Degree of biological testing of dental materials.

Initial tests	• Short-term test of systemic toxicity (oral way) • Test of acute systemic toxicity (intravenous way) • Test of toxicity by inhalation • Hemolysis test • Coagulation tests • Ames test of mutagenicity • Clastogenic test • Cellular transformation test • Test of dominant lethality • Cytotoxicity tests
Secondary tests	• Test of subcutaneous implantation • Test of implantation into a bone • Sensitization test • Test of oral mucosa irritation
Application tests	• Test of oral mucosa irritation • The pulp and dentine test • Test of materials used for the pulp overlay and pulpotomy • Endodontic application test • Bone implants application test

Initial tests:

- The short-term test of systemic toxicity (oral way): the test is designed to evaluate toxicity of a material tested during a short-term oral administration.

- Test of acute systemic toxicity (intravenous way): the test is designed to evaluate an acute toxicity during intravenous administration of studied material or extract.
- Test of toxicity by inhalation: the test is designed to evaluate toxicity of materials or ingredients that are highly volatile at room temperature or under conditions of their use.
- Hemolysis test: the test is designed to evaluate an acute, in vitro hemolytic activity of materials designed for a long-term contact with the bone and soft tissues.
- Coagulation tests: the tests should show possible changes that might be evoked by tested samples in the blood coagulation system in vitro. These tests are supplementary.
- Ames mutagenicity test: the test is designed to investigate mutagenic activity of solid or liquid materials, with recommendations for measurement of gases.
- Clastogenic test: : the test is designed to investigate mutagenic activity of studied material on the chromosomal level. It is a supplementary test.
- Test of cellular transformation: the test should determine a potential carcinogenic activity of materials studied.
- Test of dominant lethality: the aim of this test is to measure the dominant lethality or mutagenicity of materials studied.
- Cytotoxicity tests: the tests should check cytotoxicity of materials studied. A variety of modifications are utilized in this test according to possibilities of a laboratory. They may be as follows: the test of dynamic determination of contact cytotoxicity, the combined test of cytotoxicity of cellular morphology and metabolism, macro-contact method of the cytotoxicity test, cytotoxicity test in vitro, the test of tissue culture overlaid with agar, the test of proliferation of cells in culture, the test of dilatation of cells.

Secondary tests:

- Test of subcutaneous implantation: the test is designed to evaluate a toxicity in vivo of tested materials designed for a long-term contact with subcutaneous tissues.
- Test of implantation into a bone: the test is designed to evaluate a toxicity in vivo of tested materials designed for a long-term contact with the bone.
- Sensitization test: the test is designed to evaluate a allergo-toxic potential of materials studied.
- Test of the oral mucosa irritation: the test is designed to evaluate a tissue irritation by a tested material which will be temporarily or permanently adhered to the oral mucosa during its proposed use. This test may be employed as an application one as well.

Application tests:

- Test of the oral mucosa irritation: the test was already described in the paragraph on secondary tests above.
- The pulp and dentine test: the test is designed to study reactions of the pulp and dentine to procedures and filling materials.
- Test of materials used for the pulp capping and pulpotomy: the test is designed for detection of reactions of the pulp and for pulpotomy.
- Application test of an intra-bone implant: the test is designed for evaluation of materials that are mounted in a bone and penetrate partially the oral mucosa inside the oral cavity.

Conclusions:

The above recommendations of the FDI follow a logical sequence, however, they are not a fixed scheme according to which every dental material should be tested biologically. They are rather guidelines of how and in what order a material should be evaluated. Further modifications and developments are possible in concordance with new findings. Manufacturers of a particular dental product or material should obey this system and follow its rules. For this purpose, a network of testing laboratories should be established in praxis, which would provide for a rational, although official biological testing.

2. Basics of Restorative Stomatology

Restorative stomatology deals with causes of the dental caries origin, diseases of the pulp and the apical periodontium. Treatment of the dental caries and complications associated with it belong to the basic practices of the inpatient stomatological care.

2.1 Dental Caries and Associated Issues

The dental caries is the most widespread disease in the population, it affects 80-90% of the population. The most remarkable feature of prehistorical findings of jaws is the teeth abrasion. The dental caries may already be found on teeth dating back to paleolith and mesolith. Until the end of the 17th century, the dental decay occurrence was rather small and its frequency continued to grow until the 18th century. The dental caries incidence is directly related to the food composition and means of preparation.

The origin of caries has not been satisfactorily explained yet. During certain periods the opinions on the dental caries origin reflected contemporary level of knowledge and they possess rather historical value these days. A group of exogenous - localistic - theories deem the cause for caries in external effects. The endogenous - vital - theories explain the origin of caries by the influence of endogenous factors.

Factors influencing appearance of the dental caries.

Occurrence of the dental caries depends on numerous endogenous and exogenous factors:

The saliva. The saliva is a product of both large and small salivary glands. Most of saliva is produced by the glandula submandibularis (40%) and glandula parotis (26%). Composition of the saliva is variable. More than 99% of it is made of water. The saliva contains 0.7% of solid substances, of those 0.5% are organic compounds and 0.2% inorganic compounds. Calcium is present in form phosphates and to the lesser extent as carbonate. The saliva further contains potassium, magnesium, chlorides, sulfate and some other elements, e.g. iodine. The amount of iodine in saliva is 20 to 100 times

higher than in plasma which reflects the thyroid gland function. Carbon dioxide is an important part of the saliva as well, it acts as a buffer to maintain the saliva's pH. Organic compounds of the saliva are represented by mucoids, albumins, globulins and peptides. Urea, uric acid, creatin and ammonia are present in low concentrations in saliva. Among the most important enzymes are amylase, esterase, lipase and peroxidase. Lysozyme is an important component as well. The saliva contains small amounts of erythrocytes, leukocytes from the gingival grooves and lymphocytes from the tonsils. However, phagocytotic ability of leukocytes from saliva is low.

Microorganisms of the oral cavity. A mixed microbial flora, both aerobic and anaerobic inhabits the oral cavity. *Streptococcus mutans* which forms 28 to 96% of the total microbial flora present in the dental microbial plaque, has the closest relationship with the occurrence of a dental caries. This relation is supported by its ability to produce acids and both intracellular and extracellular polysaccharides. Intracellular polysaccharides may be also produced by various strains of staphylococci, diplococci and rods. That is why the microbial flora in general is responsible for the dental caries origin, not just a single strain of microorganism.

Microbial plaque. This coating is one of the most important factors playing a role in the dental caries occurrence having also a relation to the origin and course of parodontopathies. The first stage of its development is the secondary cuticle which is made of salivary glycoproteins and covers teeth, fillings, crowns and dentures. At the early stages the cuticle contains cocci and short rods. The microbial plaque itself is made of the secondary cuticle, microorganisms and an intermicrobial substance. Some bacteria can produce glucanes and fructanes and promote the plaque growth even when no food is being consumed. Besides streptococci, a developed microbial plaque contains also actinomycetes (40-60%). The amount of plaque varies - most of it is present in the morning and after food ingestion. The plaque's formation is linked to places that are habitually non-clean (i.e. places where the process of self-cleaning is restrained) - grooves of premolars and molars, cervical parts of crowns. According to its location, the plaque can be divided into fissural, supragingival, and subgingival. At the surface of the microbial

plaque, there is materia alba that is made of the peeled off epithelium, leukocytes and food residues.

The dental calculus is formed by mineralization of the microbial plaque. It can be found in mouth especially around the large salivary glands ducts.

Food intake, nutrition, hereditary factors. The occurrence of caries is influenced by the presence of low-molecular saccharides from food, time intervals of a food ingestion and its composition. Concentration of sugar in saliva has a great influence, as well as the period of its activity. Food that is long-persistent and sticks to the teeth (honey, chocolate) has a negative effect. The origin of caries is not directly caused by genetic factors, although a predisposition to it is hereditary. Genetic factors are rather manifested by the teeth arrangement at some orthodontic anomalies. These abnormalities create a condition for easier deposition of the microbial plaque, thus causing caries and parodontopathies.

Dental caries and its clinical manifestations.

Dental caries is linked to the hard dental tissues. It starts with the enamel surface's decalcification during which the hydroxyapatite crystals loose its orientation, change their shape and the interprismatic spaces are enlarged. When more rods become affected, a macroscopically detectable defect of the enamel can be observed. After the decay crosses the enamel-dentine boundary, it spreads more rapidly through dentine towards the pulp. The carious focus consists of large cavities on the surface which are filled with numerous microorganisms producing acids and proteolytic enzymes. As the caries process widens, it affects the enamel, dentine, and the cement. The primary caries occurs on those teeth surfaces that have not been treated yet, the secondary caries starts at the close vicinity of fillings. The occurrence of the secondary caries depends on the physical and chemical properties of the filling materials, faults during its preparation, and during a tooth preparation and filling. Profession - related caries are caused by the sugar or flour dust at workers in bakeries and mills. These caries occur mainly as circular forms around the tooth cervix. Ignoring safety rules when working with acids or hydroxides leads to damage of the frontal teeth labial surfaces. According to the extent of damage to teeth, caries can be divided into surface caries

(extending to the enamel), medium caries (extends into dentine) and caries close to the pulp (at the close proximity of the pulp chamber).

Clinical manifestations of the dental caries.

The enamel caries is manifested as a white spot where the enamel looses its gloss. It may be brown colored by deposition of a pigment. It is not painful. A large carious defect, extending to a various depth into dentine, is usually painful when a tooth is irritated directly (mechanical, chemical, thermal effects). Pain is relieved, however, immediately after the causing effect stops. The affected tooth has clinical signs of rough surfaces or sharp-edged cavities which may accumulate food residues.

The caries close to the pulp is a result of further progression of the carious process. Dental pulp defends itself by producing the tertiary and transparent dentine. The tertiary dentine is synthesized as a response of odontoblasts to an irritation and it contains more of the basal substance and less dentine tubules. The transparent dentine is made of mineralized processes of odontoblasts. The pulp does not usually display any signs of inflammation and a patient may not have heavy problems. Pain caused on cold, salty, sweet and sour irritation is often reported, however, this pain is relieved after the causing effect stops.

Caries close to the pulp are treated by the method of indirect pulp capping . This treatment is based on supporting the pulp's resistance by calcium hydroxide (Calxyd brand) that is applied to the pulpal wall of a prepared cavity after soft dentine has been removed. Calxyd has antimicrobial and anti-inflammatory effects and stimulates the pulp's resistance mechanisms. The Ca^{2+} and OH^- ions penetrate the pulp. OH^- ions cause coagulation of protein components of the pulp and neutralize acidic inflammation products. Ca^{2+} ions stimulate phagocytosis, decrease permeability of capillaries and upon reaction with CO_2 form calcium carbonate in the tissue. A layer of Calxyd is covered by the zinc oxide -an eugenol based cement that has good insulation properties, a weak antimicrobial action and stimulates production of the tertiary dentine. This kind of treatment provides for successful results in up to 90% cases. Failures are usually accounted to a false diagnosis, caused by leaving a rather thick layer of

softened dentine, or low resistance abilities of the pulp. In cases when the pulp chamber is exposed either by an injury or by careless preparation of a cavity, the direct pulp capping method is indicated. Here, the most appropriate material is calcium hydroxide (Calxyd) as well. This material is applied directly on the exposed pulp providing a perforation is not too large. By these means, a layer of a coagulation necrosis is formed, and the layer of a connective tissue barrier forms underneath it. Non-differentiated mesenchymal cells produce new odontoblasts that differentiate further. A dentine bridge is gradually formed above the perforation which takes 4 to 6 weeks. The success rate of this method is 80%-90%. Failures may be caused by too large a perforation, by infecting the dental pulp, or decrease of the pulp's immunity.

Materials used for the dental caries treatment.

The underlying principle of the dental caries treatment is a careful removal of carious, softened parts of dentine and providing for sufficient retention and resistance of a filling. Filling materials used in restorative stomatology practice can be divided into two classes: temporary and permanent. To isolate the pulp from thermal and chemical irritation, zinc oxide - phosphate, carboxyl or zinc oxide - eugenol cements are used as bases. Zinc oxide - phosphate cement is used also for root canals filling before a surgery (apicectomy) and for cementing during prosthetic works. Zinc oxide - phosphate cement is often used as a temporary filling material , e.g. as a cavity closure after the pulp necrotizing compounds or disinfecting dressings have been applied.

Permanent fillings are either plastic (that solidify after filling into a prepared cavity) or cast (made in a laboratory according to a previously taken impression). The major requirements for filling materials are their volume, mechanical and chemical stability, they have to be non-irritating, and should provide for an esthetic appearance in the frontal sections of the dentition. Amalgam is the most widely used plastic filling for the lateral sections of the dentition. It is prepared as a mixture of a metal powder (containing various weight parts of silver, zinc and copper) with mercury. Pleasantly looking composite filling materials are used at the frontal sections of the dental arch (Evicrol brand). These materials meet the requirement of a perfect seal of a

prepared cavity, they adhere well directly onto hard dental tissues and they are color stable. Cast fillings are usually made of precious dental metals (gold). Due to its disturbing appearance they are used mainly at the lateral sections of the dentition.

2.1.1 Diseases of the Pulp

Many effects, such as infectious, chemical, physical and combined contribute to origin of the dental pulp diseases. In most cases, a mixed bacterial flora enters the pulp from a carious focus through the dentine tubules. Less frequently, an infection enters the pulp retrogradely via foramen apicale (in case of deep periodontal pockets) or by the blood stream. Silica-phosphate fillings that lack bases and to the lesser extent also composite fillings may cause chemical irritation. The pulp inflammation may occur after an acute trauma or by a chronic traumatic irritation, as well.

Regressive changes of the pulp.

As a reaction of the pulp to either external or internal irritation, the true pulp stones arise from odontoblasts. Their structure is similar to the tertiary dentine. Mock pulp stones are formed by mineralizing deposits surrounding an organic core. Pulp stones may be located freely inside the pulp's interstitium or adhere to the walls of the pulp's chamber or a root canal. The proof of pulp stone presence is done by an X-ray examination. Clinically, pulp stones may be a cause of neuralgic pains.

The pulp hyperemia.

This change is characterized by a short and well localized pain in response to physical or chemical stimuli which diminishes after a causing effect stops. The treatment in this case is an indirect pulp capping.

Acute pulp inflammation (pulpitis acuta).

The inflammation may affect a part of the pulp (pulpitis acuta partialis) or the whole pulp (pulpitis acuta totalis). It may have a serous (pulpitis acuta serosa) or purulent (pulpitis acuta purulenta) forms. The pain at serous

pulpitis is caused by an external irritation at the beginning, later it may be spontaneous. Pain is described by a patient as blunt, radiating and pulsating. At a total pulpitis, the pain is often hard to localize (possesses a neuralgic character). Treatment for a serous pulpitis: pulpotomy or extirpation of the pulp by the vital or mortal methods. The purulent form of pulpitis accompanied by formation of small abscesses inside the pulp chamber has clinical signs similar to those at serous total pulpitis. A significant anamnestic feature is a pain relief by cooling. Treatment for the purulent form: pulpotomy or extirpation of the pulp by the vital method.

Chronic pulp inflammation (pulpitis chronica) takes forms of a closed inflammation of the pulp chamber (pulpitis chronica clausa, granulomatosa, interna) or an open inflammation (pulpitis chronica aperta hypertophica, ulcerosa). Closed pulpitis often has a course without significant clinical manifestations. A diagnosis is based on an objective finding completed by an X-ray examination (e.g. a resorption of the pulp chamber or a root canal - an internal granuloma). Pulpitis chronica aperta is characterized by growing of the pulp through a cavity, its ulceration on the surface, and sometimes by an outgrowth of the granulomatous tissue through a cavity to the oral cavity and formation of the pulpous polyp. Clinical signs are mild, bleeding occurs often as a result of the pulpal tissue injury.

The treatment of the pulp altered by an inflammation is performed by its partial removal (pulpotomy) or total removal (extirpation). The pulp removal may be done under a local or block anesthesia (the vital method) or after a devitalization of the pulp by treatment of various substances (the mortal method). As devitalizers, arsenic trioxide, cobalt paste (arsenic metal), or paraformaldehyde are often utilized. Arsenic trioxide (Arsodent) is a protoplasmic poison that affects blood vessels, cells of the pulp and nerve endings. Its application results in necrosis of the pulp that can be removed painlessly. Arsodent is applied as close to the pulp as possible or directly on an exposed pulp, and a cavity is then sealed hermetically by a temporary filling. Its effect on molars lasts for 48 hours, after that it is necessary to remove the necrotic pulp, to fill the root canal by a root filling material and to make a permanent filling. Arsenic metal has the same effects as Arsodent, although its action is prolonged and is usually applied for a period of 3 to 5

days. The paraformaldehyde paste releases formaldehyde. Anesthetics that are contained in the paste relieve the pain. Since the paste is not very stable, its activity decreases with time. The mortal method is indicated for all kinds of pulp inflammation except the purulent, ulcerous and polypous forms. The use of Arsodent is contraindicated at teeth with incomplete root development. At this method, a patient has to be informed that a pain won't disappear immediately and that a devitalizer has to be removed from a dental cavity on time. For these reasons the vital method of treatment is preferred. Requirements for a good result of the vital method are proper diagnosis of the disease, good anatomical conditions of the root canal and sufficient amount of time for the treatment. The greatest advantage of this method is completion of the whole treatment during one visit.

The consequence of inflammatory and degenerative changes of the pulp is pulp necrosis that may affect just a part or the whole pulp. If there is an infection at a necrotic pulp, the pulp gangrene occurs. A patient with gangrene feels pain during a heat test.

2.1.2 Periodontitis

Periodontitis is characterized by spreading an infection into the periodontium. They are caused mostly by the root canal infection that proceeds into periodontium through foramen apicale or through ramifications in the apical area. Among other causes there may be traumas (both chronic and acute), chemical effects (devitalization or disinfecting agents).

Periodontitis acuta is characterized by dilatation of vessels near the root apex and an edematous infiltration of periapical tissues. According to the extent of inflammatory changes, an acute periodontitis has the following stages:

- at the periodontal phase, the inflammation is located at the apex area
- for the enosseal phase, the serous exudation and formation of a cellular infiltrate with a pus colliquation are characteristic
- at the subperiosteal phase, the inflammatory process spreads under the periosteum of an alveolar ridge

- after the periosteum necrosis the pus containing exudate leaks under a mucosa; the submucosal phase is accompanied by formation of an abscess that sometimes empties spontaneously by an intra-oral fistula.

An acute periodontitis often originates by exacerbation of a chronic periodontitis due to decrease of an organism's immunity or after a treatment of an infected root canal. After examination of the oral cavity, a doctor formulates a diagnosis and makes it more specific after an X-ray examination. A physician can identify an aching tooth and the apical area sensitivity upon percussion. It is also possible to find a submucous tissue infiltration, eventually redness, swelling and fluctuation at a vestibule surrounding the affected tooth. At more developed cases, enlargement of regional lymph nodes occurs and the patient's general condition is altered, often accompanied by a fever. Pain is severe during the early phases of the inflammation. After the submucosal infiltrate or a fistula are formed, an obvious pain relief comes. The aim of the acute periodontitis treatment is to ensure that an exudate may flow away from the periapical area. This may be achieved by a tooth trepanation (at periodontal and enosseal phases) and by making a passage through the root canal. A patient feels a distinct relief after this treatment. At the subperiosteal and submucosal phases, the tooth trepanation has to be complemented by an intra-oral incision. Antibiotics should be prescribed if a patient's general state is altered and an elevated body temperature occurs. After acute problems are relieved, further treatment is applied as in the case of diagnosis of periodontitis chronica.

Periodontitis chronica. The underlying cause of the disease is formation of a granulomatous tissue at the tooth apex area. The course of the disease is either in the form of a non-limited, diffuse process (periodontitis chronica diffusa) or it tends to be localized (periodontitis chronica circumscripta). A focus is then encapsulated by a fibrous membrane, with small abscess cavities or a single continuous abscess cavity inside. Mallaséz's epithelial cells, remnants of the Hertwig's sheath occurring during the tooth development, can often be found. These cells grow as a result of an inflammatory irritation and form clusters of epithelial cells - an epithelial granuloma.

At periodontitis chronica granulomatosa progresiva, the granulomatous tissue spreads into surrounding structures and mucosal, even cutaneous fistulas arise. If the process affects the upper jaw near the antrum, an antral fistula may be formed. Chronic periodontitis usually runs with no clinical difficulties and it is diagnosed by an X-ray examination. An X-ray image shows large or small, diffuse or sharp-edged radiolucency around the tooth apex. A mucosal fistula can be sometimes found next to an affected tooth. A chronic inflammation may also exacerbate acutely, causing obvious difficulties. The treatment for a necrotic, gangrenous pulp and for chronic periodontitis is by conservative or surgico-protective means.

Conservative therapy relies on a mechanical widening of the root canal, treatment of a microbial infection and filling the root canal with a filler that prevents re-infection and allows for healing of periapical tissues.

At the surgico-conservative therapy, the root canal is filled with the zinc oxide - phosphate cement, after a previous root canal treatment. The surgery - tooth apex resection (apicectomy, amputation) - the basis of which is an removal of a treated tooth apex, excochleation of the granulomatous tissue followed by a toilet of the bone wound.

2.2 Focal Dental Infections

The term focus (region of a localized infection or disease) at the orofacial area stands for a local deviation that causes pathological changes of remote organs. It is presumed that caries products of dental foci sensitize and allergize the whole organism. Focal infections may cause a variety of diseases, such as endocarditis, myocarditis, phlebitis, nephritis, pyelonephritis, migraines, subfebrile states, eczemas and rheumatic diseases. As the foci of a dental infection, all teeth with an X-ray detectable periapical finding, devitalized and gangrenous teeth, chronic pulpitis, sinusitis, radices, retained teeth, dental cysts, dentitio difficilis, periodontal pockets and abscesses may be designated.

Detection of a dental focus is based on an anamnesis (the relationship between a basic disease and a pathological state of mouth) and on the clinical and X-ray examinations. Provocation tests are not used in these

cases due to their unreliability. Dental focus therapy relies on a focus removal by conservative or surgical means. The treatment is performed under an antibiotic screen which should decrease the possibility of complications to minimum.

The scheme of antibiotic prophylaxis (Pávek 1989)

A. Patients tolerant to penicillin:
1 hour before surgery 3 grams of amoxycillin administered perorally (Amoclen 6 tablets)

B. Patients allergic to penicillin:
1 hour before surgery 1.5 grams of erythromycin administered perorally (Erythromycin 6 tablets)
plus 0.5 gram (2 tablets) of erythromycin 6 hours after surgery

2.3 Special Aspects of Children's Treatment

Pedostomatology is a complex field that includes all branches of stomatology - restorative, prosthetic, surgical stomatology and periodontology. All these branches possess special approaches for treatment of children which are determined by a somatic and psychological development of a child. A proper treatment should always be based and respect a stage of development of little patients.

Children's age means the period between the birth of child and finishing the elementary school attendance. It can be divided into the following periods: newborn baby (the 1st month of life), nursling (till the end of the 1st year), toddler (1 to 3 years), preschool age (3 to 6 years), school age (6 to 15 years), and youngsters (15 - 18 years). Each age has its specific diseases, and for each age group, an attention has to be paid to the stage of development of the organism, especially to that of jaws and teeth, during the therapy.

Newborn baby age. It is very rare that a dentist meets patients of this age. Typical diseases include developmental anomalies (clefts, cysts, dentes praelactei etc.).

Nursing age. Dentists seldom meet children of this age in their offices as well. Rarely, a decay may occur on freshly erupted incisor teeth. Cariousness at this age is caused by the developmental defect of hard dental tissues composition and by an inappropriate diet (sweet drinks at night, a pacifier with honey).

Toddler age. At this age, dental decay of molars and incisors may already develop more frequently. The most common reasons for visiting a dentist are, however, injuries of the milk dentition.

Preschool age. Dental caries and its complications, as well as teeth injuries are the most frequent problems. Teeth loss due to caries or injuries are treated prosthetically. Of the periodontal diseases, cheilitis or various forms of gingivitis may be encountered. Gingivostomatitis herpetica is a typical disease of this period.

School age. Children of this age already have a mixed dentition. Attention should be paid to the first permanent molars that are very susceptible to decay. Again, the most frequent stomatologic problems of this age is caries and its complications and injuries of the frontal section permanent teeth. Lost teeth are replaced by prosthetic means. The incidence of gingivitis is higher. Some anatomical deviations (attachment of the lip's frenulum) may be corrected surgically. This age period is the most suitable one for the orthodontic therapy. The dentition changes and jaws grow at this age.

Youngsters' age. Stomatologic therapy at this age does not differ from the therapy of adults, just prosthetics and surgical therapy include some special characteristics. Cariousness gets higher incidence rate at this age, as well as inflammation of gums and oral mucous membranes. Gingivostomatitis ulcerosa is a typical disease.

The importance of the temporary teeth.

The main function of the temporary dentition is the food mastication. If the temporary teeth are destroyed, the digestive system suffers and the healthy development of an organism may be affected. Periosteal inflammation and lymph nodes possibly caused by milk teeth may be a life threatening situation for a young person. Untreated caries causes a bad breath. Temporary dentition's periapical changes may damage the

permanent dentition. Premature loss of milk teeth leads to shifts of permanent teeth and often disturbs an occlusion plane, resulting at some orthodontic anomalies. In addition, frequent painful procedures are reflected by a child's mind and form his/her negative relation to dental therapy. Missing teeth affect a proper pronunciation, and an esthetic aspect should not be neglected, too.

2.3.1 Restorative Stomatology

During a treatment of dental caries and its consequences we should consider whether we treat a temporary or permanent tooth and what stage of development the tooth and its root are at. A degree of a root's resorption should be evaluated on X-ray images of temporary teeth. Principles of a cavity preparation are the same for children's temporary and permanent teeth as for adults, except the temporary frontal teeth. The same filling materials are used, just Evicrol should not be used for temporary teeth and permanent teeth with an incomplete root development. Resorbing filling materials should only be used for filling of root canals of temporary teeth. In case of permanent teeth with complete development, methods of treatment and materials for root canals filling are the same as those for adults. Endodontic treatment of teeth with incomplete development is very difficult. If a root is very short, one should not hesitate to perform an extraction, even at frontal region. In case of partial pulp inflammation, a vital pulpotomy of a crown pulp is performed. A typical method of children's stomatology is apification that has been used successfully for the following diagnoses: pulp necrosis, gangrene, and acute periodontitis. The method decreased to a minimum the need for surgico-conservative therapy of teeth with incomplete development (so called filling under visual control). The apification method is based on high biological activity of the tissue at an open root apex (mesenchymal papilla). Teeth with the above described diagnoses are filled repeatedly with Calxyd. The root's closure should occur at 6 to 24 months, although the root may remain shorter. Indeed, it may reach its normal length (so called apigenesis).

Prevention of dental caries.

Dental caries prevention may be either local or systemic.

Systemic prevention may be applied during the period of teeth development only. It consists in sufficient supply of proteins, minerals and vitamins, especially A and D; fat and polysaccharides must not be absent either. An enamel's resistance against decay is significantly influenced by fluorine. For this reason, fluoridation of a drinking water at an optimal dose of 1 mg of a fluorine compound per 1 liter of water is used. Fluorine becomes introduced into hydroxyapatite crystalline structure thus forming hydroxyfluoroapatite that is more resistant to acids. Fluorine also replaces CO_3 ions, binds to the organic matrix of enamel and influences to a certain extent positively formation of the teeth occlusal planes. Fluorine contained in saliva suppresses metabolism of microorganisms that contribute to formation of dental decay. It also influences tonus of capillaries thus improving the gingiva's blood supply. Fluorine's anti-carious properties may only be active when it is supplied to an organism for at least 300 days a year. At places where a drinking water fluoridation does not take place, fluoride tablets are administered to children. High doses of fluorine impair building of an enamel, however. Some brands of mineral water used for dilution of milk baby formulas contain high concentration of fluorine and are not suitable for babies (e.g. Mattoniho kyselka, Praga). On the other hand, "Ida" brand mineral water is suitable, it contains 0.29 mg F per 1 liter.

Local prophylaxis is applied to erupted teeth. It consists in increasing the enamel's resistance and limiting activity of harmful substances. Enamel's resistance is increased upon fluorine treatment of teeth surfaces. Fluorine ions penetrate 100 - 200 μm in depth, their bond is not stable, however, and fluorine supply has to be repeated. Aqueous solutions of sodium fluoride or fluorine aliphatic monoamines (Elmex) in forms of varnishes or gels are mostly used. Some brands of toothpaste contain fluorine as well. It is possible to decrease an action of harmful substances on an enamel by proper diet composition that excludes cariogenous foods, such as saccharose. Our daily diet should be complemented by solid foods with self-cleaning properties (apples, raw vegetables, hard cheese, dark bread). Proper dental hygiene plays an important role in fighting caries. Effective teeth brushing removes dental plaques and reduces number of microbes in oral cavity. Proper oral care has to start at early child's age by learning the right brushing technique,

selection of a good toothbrush and toothpaste. Toothpastes that contain fluorine and have pleasant tastes are recommended (Fluorka, Tuti Fruti, Gabi, Perlička).

2.3.2 Surgical Stomatology

The most common dental surgeries of children's age is tooth extraction. It is performed under a surface or injection anesthesia. Temporary teeth with highly resorbed root may be extracted without an anesthesia. Among frequent surgico-conservative treatment of permanent teeth belongs root canal therapy that is practiced at teeth with radicular cysts or granuloma, eventually in case of the apification method failure. Injuries of temporary and permanent teeth represent a separate topic, described below. In case of temporary dentition, sub-luxations or luxations of teeth are quite often seen. Rather than hard teeth tissues, a tooth socket that is still highly elastic, is affected upon an impact.

Injuries of the temporary dentition periodontal ligament.

The slightest and prognosticativelly most favorable injury of the dental supporting apparatus is contusion. At this injury, a mushy food is recommended and the dental pulp vitality is checked periodically. In case of the pulp necrosis, therapy should be applied according to principles of restorative stomatology with respect to the stage of development of the root. Sub-luxation is a common temporary teeth injury. A slight sub-luxation requires the same therapy as contusion, more severe cases require repositioning of sub-luxated teeth followed by immobilization with a fixed splint. An increased care of the dental hygiene and a pulpy food are recommended. If the pulp of sub-luxated teeth looses its vitality, therapy should be applied according to principles of conserving stomatology. In case that injured teeth has to be extracted, a gap is replaced with a removable denture. Luxated temporary teeth must not be replanted. There is a danger of damaging permanent teeth germs; the younger a child, the higher the danger. A special kind of luxation is repulsion (intrusion, central luxation) which occurs after an impact at a longitudinal tooth axis and causes partial or total immersion of a tooth to the alveolar ridge. Upper incisor teeth are mostly

prone to this type of injury while it is rare for teeth of the lower jaw. This condition does not require any therapy since intruded teeth usually erupt again during 2 - 4 weeks. Teeth should be extracted only if they are intruded into nasal cavity or if they could harm the permanent tooth buds. Resulting gap should be replaced removable dentures (space-maintainers). Fractures of temporary teeth crowns that do not expose the pulp chamber should be treated similarly as a corresponding injury of permanent dentition. If the pulp is exposed by an injury, a therapy is applied with respect to a stage of development of the tooth. Teeth with advanced root resorption should be extracted. In case of a fracture in the middle third of a root, teeth should be fixed by a splint. Fractures of the apical third of a root are mostly treated by grinding that just excludes an affected tooth from articulation.

Consequences of temporary teeth injuries.

A coloration may occur at affected teeth, their vitality may be preserved, however. More often, discoloration is a sign of the dental pulp necrosis. A rare consequence of an injury is the pulp chamber obliteration or internal root resorption. After heavy sub-luxations, an accelerated root resorption, a temporary tooth position change, eventually its delayed exfoliation, may often take place. Long lasting teeth mobility, post-accidental gingivitis, denudation of the cervix or root of a temporary tooth may be further consequences of an injury.

Consequences of permanent dentition injuries.

Bearing in mind that a permanent tooth development takes about ten years, during which formation and mineralization of the enamel, dentine, and cement takes place, a root is formed and teeth gradually erupt, permanent teeth change their positions relative to their temporary predecessors, we can not be surprised by a number of various possible defects of permanent dentition. Mechanism of an injury may lead to a permanent tooth crown fracture, to a tooth germ position change or its complete shattering. Permanent teeth defects are more prominent after their eruption. The crown or the root part of a tooth, its pulp, or sometimes the whole germ may be damaged. Defects of teeth eruption are not all that sporadic. Injuries of permanent teeth with completed root development should be treated the same way as in adult patients. At incompletely developed teeth, we have to

consider a stage of the root development. Luxated teeth should be replanted in all cases where the gap needs to be preserved. If it would be more suitable to compensate for a lost tooth by an orthodontic movement, we do not perform replanting and the sub-luxated teeth should be extracted as well.

2.3.3 Stomatologic Prosthetics

The leading goal of children's age prosthetic therapy is to enable a smooth development of the orofacial system after loss of a dental crown or a whole tooth. Children's prosthetic work has mostly a temporary character. Besides the main purposes, such as rehabilitation of its function, phonation and personal appearance, dentures at children provide for additional functions: enable complete teeth development and growth of alveolar ridges of jaws, thus serving an orthodontically preventive purpose. All kinds of dentures have to be constructed in such a manner that they are easily replaceable when the growth of alveolar ridges requires it. Lost teeth are replaced so that it does not impede the growth of jaws. When reconstructing crowns of temporary or permanent teeth, aspect of a personal visage is not the most important one. The main effort should be put in preserving a tooth vitality. Hard dental tissues defects of temporary and permanent dentition are replaced with crowns made of platinum - gold alloy. Some kinds of nice looking crowns may be used for permanent dentition restoration when articulation is favorable. Finalization of permanent teeth with a composite material is possible only for some defects where a line of fracture allows it. Devitalized permanent teeth may be fitted with a root post and an esthetic crown. At temporary teeth, a denture must not obstruct the root canal and disturb the root resorption. Here, crowns made of dental precious metals are utilized. Missing permanent teeth are replaced with dentures in majority of cases; the orthodontic teeth movement is applied in indicated exceptional cases only. Dentures have to be made so that they restore teeth functions, prevent shifting or tilting of adjacent teeth into the gap, improve a patient's look and enable for a proper pronunciation. As a rule, removable dentures (space-maintainers) are applied until the growth and development of alveolar ridges is finished. Removable dentures must not be fitted with clasps.

Missing temporary teeth (mostly the frontal teeth) is also replaced with dentures without clasps. Lateral teeth are rarely replaced; if they are, a removable denture is used.

2.3.4 Periodontics

Pathological changes affecting the periodontium may occur at temporary, mixed and permanent dentition. Various forms of gingivitis or gingivostomatitis are the most common diseases. Periodontal diseases at children may be divided into three classes.

At the first group of diseases, the periodontium is damaged by a local noxa and this damage is limited to a small area. Permanent teeth are more often affected. Irritation by a incorrectly made filling, a denture, pathological tension of either upper or lower lip frenum, eventually shallow vestibulum oris are among the most typical examples. That is why such an emphasis is put not only to teeth restorative care, but also to a timely frenectomy. Surgical correction of a shallow vestibule should be practiced at the age of 14 and up.

At the second group of diseases, the periodontium is damaged by pathological processes that originate in surrounding tissues, e.g. inflammatory and necrotic states, tumorous growth etc. If the cause is removed successfully, the disease does not spread further.

At the third group there are diffuse alterations of periodontal tissues that result in a premature loss of temporary or permanent teeth. Progress of destructive changes is rapid. A systemic disease or metabolic disorder are usually the cause: Down's syndrome, ectodermal dysplasia, skin diseases, diabetes mellitus.

2.3.5 Treatment of Non-cooperating Patients

At children's dentistry we may encounter patients who do not cooperate well. There may be lots of reasons for this non-cooperative behavior, the most frequent one being a pathologically exaggerated fear. Some of children who have normal intellect can be treated with use of proper medication and well planned psychological approach. High doses of

Oxazepam have been used successfully at our clinic. If a painful treatment has to be performed, a child prepared by medication should be treated under a local anesthesia. Oxazepam has an advantage of a good antianxiety effect and low sedative effect. If this approach does not allow for a child's treatment, general anesthesia should be chosen in collaboration with specialists - anesthesiologists. Treatment under general anesthesia is also indicated in cases of illnesses accompanied with twitches or uncoordinated movements, or in case of low intellect of a child. This kind of treatment should be more radical: not only all carious teeth should be repaired, but extractions and other surgical interventions should be performed as well. If prosthetic treatment is to be used, prepared teeth should be abutted and impressions should be taken. Keep in mind that treatment under general anesthesia is not a common method of therapy. We should select it only after all other attempts failed.

2.3.6 Disorders of Teeth Development

Anomalies exist in number, shape, size, structure, position of teeth, as well as temporal disorders of teeth development and teething.
Orthodontics deals with teeth position anomalies.
Reduction of teeth number is called hypodontia (agenesis). Upper second incisor teeth and wisdom teeth are those teeth that are most often absent. A condition when groups of teeth are not formed is called oligodontia, if the teeth are not formed at all we call it anodontia. Increase in teeth number is called hyperodontia. Extra teeth are most often found between the central incisor teeth (mesiodens). A shape change may affect the crown, the root or the pulp chamber. The most common shape alterations are peg-shaped teeth or teeth with accessory cusps. An interesting anomaly of a crown and root is taurodontism. Proportional reduction in teeth size is called microdontia, enlargement of teeth is macrodontia. Defects of hard dental tissues formation can be divided into two groups:

- the first group encompasses disorders that are caused by non-specific effects on a developing tooth
- the second group includes genetically determined anomalies.

Among non-specific changes belong hypo-mineralization and the enamel hypoplasia. These disorders may be caused by common diseases of upper respiratory tract, otitis, diarrhea, deficiency (especially vitamin deficiency) states or endocrinopathies. Hypomineralization and hypoplasia are also a result of tetracycline antibiotics administration during the enamel formation and mineralization, i.e. from about the 6th week of the intrauterine life up to the 8th year of a child's life. The first few years of life is especially risky since crowns of most permanent teeth are formed and mineralized at this age. Affected teeth have yellow-brownish colored enamel and numerous hypoplastic defects that are prone to decays and fractures. A child's psychology is usually strongly affected by a defect of the cosmetic look. Enamel composition defects occur also as a consequence of erythroblastosis, lues congenita or as a result of fluorine overdosing (fluorosis) as well. Among genetically determined disorders there are dentinogenesis imperfecta hereditaria and amelogenesis imperfecta hereditaria. These disorders affect all teeth of both dentitions.

Teeth development and eruption may be either accelerated or, on the other hand, retarded.

3. Periodontal Diseases

Periodontal diseases (parodontopathies) include an array of conditions ranging from simple to complicated ones, from repairable to irreparable ones. Their diagnostics and therapy is a domain of specialists - periodontists - however, it would be a professional neglect if a doctor of general medicine would have lacked a basic knowledge from the field that is so important for preservation of teeth and thus health of his/her future patient.

The periodontium are tissues surrounding a tooth. These are the following:

1. The gum (gingiva) which may be:
    a) free - forms a kind of rim around a tooth neck. Between the rim and the tooth surface there is a sulcus that may be up to 1 mm in depth.

b) attached - divided from a free gingiva by the paramarginal groove that marks the sulcus' depth from the outside

c) interdental papilla filling the interdental space.

2. Periodontal membrane that lines the periodontal slit.
3. The tooth root surface cement.
4. Compacts of a tooth socket.

A tooth is set in an alveolus in such a way that it may move slightly upon a mastication load. This movement distributes a chewing pressure evenly on the whole bone socket and prevents a momentary localized overloading. The periodontal membrane that fills the space between an alveolus and a tooth root, provides for this function. The main structures of this membrane are bundles of collagenous fibrils arranged into several groups of ligaments. Some fasten a tooth to its socket, others fix a gum to the bone base. Another groups of ligaments project along a tooth to the socket's edge at the interdental space, connect adjacent teeth and their net forms ligamentum circulare at the alveolus edge, that closes a periodontal slit. Ligaments in an alveolar slit lead from lamina dura of an alveolus to the cement of a root's surface. They are S-shaped at rest and straighten, stretch and distribute a tooth load by pulling on the whole socket's walls not until a stress is applied. Two areas are important for good health of the periodontium: attached gingiva and its width, and the place where an epithelium attaches to a tooth neck at the bottom of a sulcus - the attachment.

3.1 Factors Causing Parodontopathies

Factors that cause parodontopathies to occur are both internal and external with mutually overlapping effects.

1. Internal causes:

Age - changes of the periodontium may occur already in childhood and the time factor just enable the disease to evolve.

Heredity - concerns anatomic anomalies only (upper or lower frenulum, shallow vestibule).

Toxic substances - damages by hydantoinates and salts of heavy metals.

Infection - exacerbations and multiple abscesses arise during infectious diseases after stopping a treatment with antibiotics.
Race - does not play a role, differences are caused only by exogenous factors at different races.
Gender - men have higher incidence of parodontopathies. Worse dental hygiene plays certain role at men as well.
Vitamins - vitamin deficiency does not exist in our country, so there are no reasons for a vitamin therapy.
Endogenous factors - high levels of estrogen cause growth of bacteroides melaninogenes in a plaque. Incidence of parodontopathies is significantly higher at liver cirrhosis, chronic alcoholism, juvenile diabetes and Down's syndrome.

2. External causes.
Orthodontic anomalies worsen hygienic conditions of the oral cavity.
Traumatic occlusion worsens an existing damage of the periodontium, although it does not cause a disease by itself.
Anatomical deviations of mucous membranes - lip frenula that have a high attachment and pull the marginal gingiva, makes it to become anemic and chronically irritated. Shallow vestibule causes chronic irritation by an analogous mechanism.
Wrong stomatologic work - overhanging fillings, non-fitting crowns, crowns in supra-occlusion or infra-occlusion, braces of dentures etc.
Tartar - both supra- and sub-gingival that acts as a plaque carrier and is basically a mineralized plaque by itself.
Soft dental coating - the plaque - is the most significant factor of a parodontopathy origin. It is an acquired item and it plays a key role in the occurrence of dental caries. It covers surfaces of teeth and dentures and may be removed by mechanical means only. The plaque undergoes certain maturation during which its microbial flora changes (it is developed in 14 days). At the deepest layers, filamentous bacteria form a palisade layer, the middle part is made of a mesh of the same microorganisms, filled with other microbes. There is materia alba on the surface, a structureless thin layer, removable by a spray. Microbial composition of the plaque varies, although it

seems that the higher the number of gram-negative rods, the more invasive the plaque is. New data are being generated on the plaque's influence on the periodontium and course of immunological reactions inside periodontal tissues. It seems that the plaque produces many antigenic substances that induce B and T lymphocytes sensitization and their increased counts in a gingiva. An immunological reaction in the periodontium neutralizes the plaque antigens. On the other hand, during binding of the complement, the tissue necrosis and lymphokines release take place causing an inflammation.

3.2 Classification of Parodontopathies According to the Czech Nomenclature

Diagnosis		X-ray changes
I. Gingivitis		
a) G. acuta	acute inflammation	0
b) G. chronica	chronic inflammation	0
II. Periodontitis marginalis	gum inflammation, true gingival pockets, prevailing exudative part	bone resorption
III. Parodontosis	slight or no inflammation, prevailing endogenous part, true gingival pockets	bone resorption
IV. Periodontium atrophy	atrophy of periodontal tissues, without gingival pockets	bone atrophy

I. Gingivitis (gum inflammation)

During an acute gingivitis, an erythema, catarrhal, sero-hemorrhagic, purulent, vesiculous, pseudo-membranous or ulcerous inflammation occurs.

At chronic gingivitis, catarrhal, hyperplastic, atrophic or ulcerous inflammation occurs.

I. a) Gingivitis acuta

1. Gingivitis acuta simplex

Etiology - frequently occurs together with respiratory tract diseases, influenza or an infectious exanthema.

Pathologic anatomy - hyperemia, erythema.

Clinical picture - without great difficulties, slight itching may sometimes occur.

Therapy - treatment of the basic disease, improved oral hygiene.

2. Gingivitis acuta catarrhalis

Etiology - exogenous factors or whole-organism diseases.

Pathologic anatomy - a diffuse soaking of the gingival tissue by lymphocytes and polynuclear leukocytes infiltrate.

Clinical picture - both apposing and spontaneous pain. Bleeding caused by touching, or exudation sometimes appear; regional lymph nodes take part in the process.

Therapy - adjusted oral hygiene, removal of exogenous causes, mouth washing with disinfectant and astringent solutions. If not cured, this disease tends to become chronic.

3. Gingivitis acuta during gingivostomatitis herpetica

Etiology - Herpes hominis virus.

Pathologic anatomy - vesicular inflammation.

Clinical picture - mostly child's disease (maximum incidence between 1 and 3 years of age), although it affects adults between 17 and 30 years as well. The disease has an influenza-like prodromal stage marked by headaches, pains of arms and legs, nausea, sore throat. These signs are followed by a fever, sometimes quite high; the disease is rarely afebrile. Herpetic blisters appear inside a mouth. These blisters are round or oval shaped, size ranging from 1 to 10 mm, often with broken tegmens, covered with a fibrin deposit. Blisters sometimes merge into one surface and typical efflorescences can be found on its edges only. An inflammatory rim forms around the lesions. It is preferentially located at the palate gingiva behind the upper incisor teeth and on the hard palate mucosa. It may also appear on the tongue, lips, gingiva or

inside a pharynx. The disease is always accompanied by catarrhal gingivitis. A necrotic decomposition of papillae tips or inflammatory hyperplasia appear as well. The sub-mandibular lymph nodes often react, and a multiple, gray and wet fur covers the tongue. The disease is accompanied by dry mouth and mucous membranes (due to breathing by mouth).

Mucous lesions inside a mouth are very sensitive and children refuse solid food and even to swallow the saliva (virtual hypersalivation). This is probably the reason why this disease is sometimes misdiagnosed by pediatricians as the foot and mouth disease (stomatitis epizootica). This disease has a similar clinical course, although it is very rare at children and a direct contact with infected cattle has to be proven.

Therapy - mouth washes with disinfecting solutions or with a solution of "Framykoin". Small children should have mouth washed with 1-2% solution of methylene blue or gentian violet. At complicated cases, antibiotics are administered to prevent secondary infection. Antipyretics and supportive therapy with vitamins B and C should be added in case of high fever. Currently, drugs that affect the capacity of viruses to grow and live - acyclovirs (Zovirax) and iododeoxyuridine (IDU). These drugs are administered both as a general treatment and locally. Patients' diet should be bland and pulpy.

4. Gingivitis acuta ulcerosa

Etiology - fusiform bacteria, borrelias, anaerobic streptococci, vibrios; accompanied by severe failures of immune reactions.

Pathologic anatomy - ulcerous inflammation.

Clinical picture - the disease appears without prodromes, begins at perfectly healthy persons mostly at their second or third decennium. It is linked to presence of teeth. An organism - weakening disease may be present in an anamnesis. The disease frequently occurs in groups of young people (boarding houses, dormitories, military bases, at students during a pre-exam period etc.), and under situations with increased mental or physical stress. An acutely inflamed gingiva with ulceration at interdental papillae tips that has a destructive character, can be observed. Ulcers appear predominantly at places of increased local irritation, e.g. at wrong fillings, denture braces, cutting wisdom teeth, roots etc. After a careful removal of a necrotic tissue, a

papilla appears to have its tip cut off. The disease acute phase may either take a course with high fever or it may be afebrile. If the disease is not diagnosed and cured on time, it enters a chronic stage that causes irreparable damage of the periodontium.

Therapy - mushy diet. Careful local washes with hydrogen peroxide, administration of vitamins B and C. Penicillin should be used in more serious forms of the disease. At acute phase, all stomatologic, especially stomato-surgical treatments are contraindicated.

Caveat! At every ulcerous gingivitis that after a timely and intense care does not show any recovery or has low inflammatory reaction, it is imperative to examine the blood count for possible white cells disorder. The differential diagnostics should take into account a possibility of infectious mononucleosis that is often accompanied by ulcerous gingivitis.

I. b) Gingivitis chronica

1. Gingivitis chronica catarrhalis

Etiology - mainly external factors.

Pathologic anatomy - hyperemia, slight edema of the gingiva, inflammatory infiltrate, granulous tissue.

Clinical picture - the disease begins as chronic and exacerbates acutely later. An inflammatory rims appear together with formation of a granulous tissue that is not painful spontaneously but is sensitive to pressure. An increased bleeding occurs.

Therapy - removal of irritation factors. Oral hygiene, massages, irrigation and mouth washes with astringent solutions.

2. Gingivitis chronica desquamativa

Etiology - unclear.

Pathologic anatomy - diffusive erythema and an epithelium peeling.

Clinical picture - the gingiva has a dotted or a “map-like” spotted appearance and bright red color. The epithelium smears under a slight pressure. Very high painfulness.

Therapy - a causal therapy does not exist. Corticoids and estrogens are sometimes used with success. Removal of factors causing a local irritation.

3. Gingivitis hyperplastica

a) Gingivitis hyperplastica pubertalis - iuvenilis

Etiology - unknown.

Clinical picture - frequently occurs at girls of pubertal age. Its appearance is favored by bad oral hygiene, orthodontic anomalies, or previous gingivitis. A small, not painful swelling of palatal papillae appears first, that becomes hypertrophied at later stages. After the end of puberty, this disease may either disappear or it is transformed into a chronic form at some subjects.

Therapy - is the same as in case of a chronic gingivitis. Sclerotization of interdental papillae by calcium is sometimes advisable. If a hyperplasia is so large that it causes obstruction during eating, it is possible to perform a gingivectomy.

b) Gingivitis hyperplastica gravidarum

Etiology - occurs at about 50% of pregnant women during the second or third month of pregnancy. After the end of lactation, the disease often disappears. Its appearance is supported by bad hygienic conditions or earlier gingivitis.

Clinical picture - various forms ranging from light hyperplasia of the pale gingiva to heavy edematous soaking and interdental papillae hyperplasia can be found. Papillae may even cover the teeth crowns, they loose its shape, the gums are livid, bleeding and contain granulous tissue. Hyperplasia may sometimes be restricted to a narrow section of dentition. This form is called a gestation tumor - epulis gravidarum.

Therapy - if hyperplasia obstructs during eating, a gingivectomy is indicated.

c) Gingivitis hyperplastica during the vitamin C deficiency

This disease, associated with malnutrition, occurs very rarely in this country. Its signs are hyperplasia and exulceration of gingiva with bleeding.

d) Gingivitis hyperplastica diphenylhydantoinica

Etiology - hyperplasia of the epithelium of a non-inflammatory origin, that is induced by a medication used by epileptics.

Clinical picture - the gingiva is smooth and pale, inflammatory changes may come at later stages. Young individuals are more prone to hyperplasia, this susceptibility decreases after 30 years of age. The disease occurs at 50% of epileptics, often preceded by a chronic gingivitis or bad oral hygiene.
Therapy - oral hygiene improvement, removal of irritating factors, dental massages. If a hyperplasia obstructs mastication (during frequent recurrences), gingivectomy is indicated. A neurologist has to be consulted for a possible change of a medication.

e) Gingivitis hyperplastica during leukemia

Etiology - occurs most often at acute forms of leukemia.
Pathologic anatomy - diffusive infiltration of connective tissues with white blood elements that are characteristic for a particular type of the disease.
Clinical picture - gingival hyperplasias appear at the oral side at first, more often at the frontal section. They are not painful, and inflammatory signs are missing. The surface of a gingiva may exulcerate and bleeding may occur. Gingival bleeding may take place even without the presence of ulcers. Other oral mucous membranes are notably pale.
Therapy - is completely in the hands of a hematologist. A dentist takes care of a patient's oral hygiene and removal of local harmful effects.
Caveat! Any oral surgical interventions are contraindicated. Necessary extractions may be performed after consulting a hematologist only.

II. Periodontitis

Periodontitis is always accompanied by the inflammatory part, the chronic gingivitis. Inflammation proceeds into depth to the alveolar tips. This process results in attachment damage, deepening of a periodontal pocket and impairment of periodontal ligaments. The periodontal slit gradually widens and the bone is being resorbed. Besides chronic gingivitis, true gingival pockets can be found. These pockets are shallow at the beginning, but they get deeper with time and teeth get loose. Loose teeth are noticed first by a dentist during an examination. A patient feels just paresthesias at this period (itching feelings, insecure feelings during occlusion), sometimes even foetor ex ore. Teeth moving or fanned spreading of teeth sometimes appears. In

some cases, gaps between teeth occur as a result of teeth movement. In case of a deep periodontal pocket, a periodontal abscess may appear as a result of a purulent exacerbation. Periodontitis course may change and even take different courses at the upper and lower jaws.

III. Parodontosis.

Parodontosis is a chronic disease of the degenerative nature. It lacks an inflammatory process, which may sometimes occur at the terminal stage. This diseases is regarded as a form of periodontitis at individuals who have reduced immunity against microbes of the plaque. During clinical examination, we can find a pale gingiva with shallow pockets, loose teeth, especially at the molar area, that does not correspond to an X-ray finding. It affects mostly young individuals before age of 30, who practice a good oral hygiene. As the disease progresses, true pockets get deeper and an inflammation appears, so that the finding is the same as for periodontitis.

IV. Atrophy of periodontium.

Etiology of periodontal atrophy is not known, although the alveolar compact matter state plays an important role. Clinically, teeth necks get exposed, inflammatory changes are not present. Teeth remain firm, neither periodontal pockets, nor widened periodontal slits are present.

Therapy for periodontitis, parodontosis and periodontal atrophy is fulfilled according to a plan outlined at the beginning of the treatment. This plan proceeds from simple tasks to more complicated ones. At the first instance, all exogenous harmful effects are removed (plaque, tartar, teeth overload, orthodontic anomalies) including defective dental work. An inflammation should be eliminated by the local use of disinfecting and astringent solutions. Patient's cooperation is essential at this stage, who can significantly influence results of the therapy by a regular care at home (massages, irrigation, oral hygiene). This conservative cure is followed by a surgical therapy that aims at elimination of pockets and their contents, removal of pathological tractions (high attachments of a frenum, transient folds and the shallow vestibule), ensuring sufficiently wide attached gingiva

and restoring a physiological shape of gums and the bone base. If needed, therapy is supplemented with a prosthetic work that provides for functional completion of teeth and its splinting.

3.3 Prevention of Parodontopathies

Prevention of parodontopathies begins already at nursing age, when a care of the proper development of jaws is needed. At older children, a dentist should focus on orthodontic irregularities, anatomic deviations of a mucosa (high attachment of the frenulum, shallow vestibule) and timely diagnostics of the oral mucous membrane inflammations during puberty. It is very important that all disorders listed above are cured and eliminated. Oral hygiene belongs to substantial preventive measures.

Tools and devices for maintaining a proper oral hygiene.

1. Toothbrush, manual or electric. The working part of a toothbrush should be short, fitted with bundles of plastic fibers, rounded at their ends. The optimal strength and softness of fibers should be determined by a dentist according to the state of periodontium. A toothbrush should be replaced at least every three months, otherwise its effectiveness decreases.
2. Toothpaste, completes oral hygiene and makes it more pleasant. The use of a toothpaste shortens time needed for teeth cleaning, but it is not necessary for perfect cleaning. Composition of toothpastes varies. At present, toothpastes with slightly acidic reaction and not too abrasive properties are preferred. Dental powders are not suitable. They may damage teeth enamel due to their high abrasivity. The use of mouthwashing solutions is not too advisable, either. Their use leads away from proper oral hygiene and they damage the mucosa after prolonged use.

Methods of teeth cleaning and their practicing under a supervision of an attending dentist or nurse represent a substantial part of the home dental care. Current stomatologic literature prefers the cleaning technique that is called roll or sweep method. This method is based on a rubbing movement of a toothbrush from gums towards the teeth crowns. A toothbrush is laid on a gingiva under 45 degrees angle and it is moved towards teeth while rotating and rubbing movements are applied. Teeth should be cleaned at least two

times daily (in the morning and at the evening), with duration of minimum of two minutes.

3. Dental floss is used for cleaning of interdental spaces and a sulcus. A floss, stretched at a plastic holder, removes well all that remains after brushing with a toothbrush. This way of cleaning is suitable especially for densely spaced teeth. Gum massages should be practiced by a patient and a dentist, who also selects an appropriate method. Massages can be done with a toothbrush, rubber or plastic stimulators, or cotton-tipped swabs (Q-Tips) wetted in an astringent solution. Massages may as well be done with the use of irrigators (Irigostoma brand name) that utilize a permanent or interrupted stream of water (or medicinal solution) under pressure. The aim of massages is to increase the gums blood supply and its metabolism rate, support keratosis of the epithelium, to remove plaque and a sulcus's content, decrease an edema and to prevent formation of connective tissues.

4. Diseases of Oral Mucosa

Diseases of oral cavity mucous membranes are among the most difficult chapters in stomatology namely because individual morphae (especially blisters) change rapidly due to mastication and wet environment and their typical form lasts very shortly. A physician has to rely on an anamnesis, evaluation of the course of a disease and auxiliary examinations that help to complete a picture of a disease.

4.1 Etiology of Mucous Diseases

Etiology of mucous diseases is a multi-factorial one. Many effects take part for these diseases to occur: mechanical (traumatizing), thermal, chemical, electro-galvanic effects, radiation, etc. Besides these external effects, internal factors, such as nutritional deficiencies, disorders of iron, lipids, saccharides, vitamins, proteins or minerals metabolism, play a role. It is rare that mucous diseases would be restricted to oral mucosa only, usually they are in a close relationship with general changes of an organism, especially with skin diseases. The variability of changes inside a mouth is determined

both by various arrangement of mucosa at different parts of oral cavity, and by saliva composition. Both specific and non-specific immune mechanisms (phagocytic cells and immunoglobulin antibodies) play a role at these processes. The immune system has an important role at oral mucosa diseases and to a large extent determines its resistance against pathologic noxas.

All morphae that are known in dermatology may be found on a sick oral mucosa; except incrustations and scales (squama) that occur at the lips vermilion only. An aphta is typical for oral mucosa only. It begins with a small blister that erodes rapidly and gets covered with fibrin. It is surrounded by a regular inflammatory rim (halo).

4.2 The Selected Disorders of Oral Mucosa

Cheilitis (inflammation of lips) should always be in hands of a specialist - dentist, since it may be transformed into a phlegmon that puts a patient into a serious risk. Thrombophlebitis v. angularis may spread into brain sinuses and cause a suppurative lepto-meningitis.

Anguli infectiosi (stomatitis angularis, painful lip angles) do not possess an immediate danger for a patient, although they usually signal a general illness. This disease is a concomitant sign of hypochromic anemia, ariboflavinosis, iron deficiency, diabetes, and also Sjögren's and Plummer Vinson's syndromes. It also affects people with lowered occlusion (lacking teeth or with a wrongly made denture), often in combination with candidiasis.

Glossitis (inflammation of the tongue) has a colorful etiology. At children, this disease may originate as a result of the tongue traumatization by a persistent coughing (e.g. in case of pertussis - whooping cough - a small ulcer at the tongue frenulum - Rig's disease). Glossitis of an allergic origin (drugs induced) that are associated with formation of vesicles, ulceration an edema, are common. Glossitis often appears during a general sickness, but certain kind of inflammation of the tongue is rarely a pathognomonic sign of a particular disease. The tongue's filiform papillae react in the most sensitive way (usually by atrophic changes) to alterations in an organism. Glossitis atrophica appears frequently during malignant anemia, Faber's anemia,

pellagra, ariboflavinosis and sprue. It is also a part of xerostomy accompanying Sjögren's syndrome, severe diabetes, liver malfunctions and chronic colitis.

Lingua villosa nigra (black hairy tongue) is characterized by hypertrophy and coloration of the filiform papillae. It appears as a result of a long term treatment with antibiotics or oxidants.

Lingua geographica (map-like tongue) is characteristic by bounded smooth areas on the dorsum of the tongue. These areas are divided from those with a physiologic surface by a noticeable white edge. The surface picture changes during the course of the disease. At children, this phenomenon may be inherited and does not require any treatment, in adults it may appear in connection with gastrointestinal tract diseases.

Inflammation of the whole oral mucosa is called stomatitis. If various metals are present at oral cavity, stomatitis electrogalvanica may rise at sensitive individuals. This disorder is accompanied by salivation defects, metal-like bad taste, dynic or neuralgia-forming problems. Erythemas, surface erosions or sclerotization defects appear on the mucosa. Alterations of the oral mucosa may as well originate during general infectious diseases - Koplik's spots during measles, or raspberry colored tongue during the scarlet fever. In other cases, changes inside a mouth are primary and the major symptom of a disease - gingivostomatitis herpetica or ulcerosa.

Bullous (blistery) diseases.

The most serious disease of this group is pemphigus vulgaris. The primary morpha is a vesicle or bulla without an inflammatory rim. Besides large blisters, just disruptions of the epithelium and a livid, dim mucosa are sometimes observed. Crusts appear on the vermilion, the tongue is covered with an uncleanly flaccid fur. Diagnosis is supported by Nikolsky sign - tearing off the mucosa's epithelial cover by pressure applied by fingers. Histological picture shows an intraepithelial blister and acantholysis. The diagnosis is confirmed by a positive result of immunofluorescence. Corticosteroids and even sometimes cytostatics are used for therapy.

Benign pemphigus and bullous pemphigoid are diseases similar to vulgar pemphigus. However, during histological examination, a subepithelial blister can be found. These diseases can be differentiated by immunofluorescence assays as well.

Lichen ruber planus belongs among diseases with an unclear etiology, accompanied by defect of keratinization. It affects the oral mucosa with no skin manifestations in 50% of cases. The basic morpha is a whitish, matte and flat papula. Morphae often aggregate and form porcelain-white, net-like or garland-like structures. Sometimes, morphae fuse together and their typical form can be found only at edges. Therapy is usually accomplished with “Kenalog” in “Orabase”, anti-malaric drugs, hypodermic injections of procaine containing “Kenalog” in cases of localized foci.

Mucous manifestations of drugs intolerance have colorful and variable clinical picture. The predominant part of the clinical picture in case of purely allergic reactions is an acute mucosa inflammation. Erythema, catarrhal inflammation, blistering, pseudo-membranous changes, even erosions and ulcers can be found. The tongue shows a wet, whitish and intensified fur. If toxic effects prevail, these signs are rather localized, with erosions and ulcers. Unaffected mucosa remains pale. Hyperkeratoses or lichenous morphae appear at a chronic intoxication. The tongue has less fur and a smooth surface. Hyperkeratoses occur on its smooth surface. Similar manifestations can be observed at epileptics after treatment with barbiturates or patients suffering with rheumatism after treatment with gold.

During a mixed allergo - toxic mucous reaction, mucous manifestations combine after the initial allergic reaction followed by the toxic and mucous component of the reaction. Tiny hemorrhages, above which the mucosa decomposes thus forming erosions, are among the first clinical signs of this disease. Upon a long-term intoxication, potentially malignant leukoplakias may emerge.

A stomatitis of viral etiology appears usually after an influenza. These diseases are accompanied by redness of mucosa at the soft palate. Some viral diseases, such as variola, varicella, vaccinia, herpes simplex, zoster or herpetic gingivostomatitis, cause appearance of blisters. Red Koplik’s spots appear at molars area during measles; a catarrhal inflammation of mucosa

occurs during rubeola. Exulcerations and tiny hemorrhages can be found in a mouth during infectious mononucleosis.

Viral hepatitis is commonly accompanied with difficulties during opening a mouth and redness at the Stenon's duct. Poliomyelitis acuta anterior shows a similar picture on the tongue as scarlet fever, a triangular pale area around the mouth, whitish spots on the boundary of the soft and hard palates and a triangular exanthema on the hard palate. Dermatophytic mucous inflammations, candidiases, are caused by infection of *Candida (Monilia) albicans.* Small white spots or coatings that can be originally easily wiped off, appear on the mucosa. They grow deeper later on and form tuberous aggregates. The danger of candidosis lays in a possibility of spreading the disease into other organs. Generalization of this disease represents a life threatening situation for a patient. Therapy is mostly local - rubbing of lesions with 2% solution of gentian violet and borax with glycerin. At the same time, high doses of vitamins B and C are administered. At serious cases, anti-mycotic drugs have to be administered generally. It is important to note that moniliasis can be induced by a long-term administration of antibiotics. Some oral mucosa inflammations originate on the basis of immune system disorders. One of them, stomatitis aphtosa recidivans, is currently proposed to be renamed to aphtosis minor. A small blister with an inflammatory rim that breaks soon and gets covered with fibrin, occurs on the mucosa. Before it outbursts, patients report an aura in the form of burning and tension of a particular place at the mucosa. A strong painfulness comes after an erosion appears. Patients usually have several aphtae inside their mouth at all times and undergo just short periods of rest. Aphtae never affect the hard palate mucosa, attached gingiva or lips vermilion.

Therapy: local rubbing with 5-10% solution of silver nitrate and gentian violet. Mouth washes with chamomile and salvia, sometimes with Framykoin, trypsin may be used locally. Good results have been achieved with Škach's combination of three compounds: pyridoxine, folic acid and vitamin B12. Epithelization can be quickened by Solcoseryl.

Periadenititis mucosa necrotisans reccurens (aphtosis maior) is a serious disease characteristic by deep mucous defects around small salivary glands ducts that are painful, persistent and heal with scars. The therapy is identical

with that of aphtae minores, it is much more difficult, however. In some cases, hypos with Kenalog are successful.

Erythema exsudativum multiforme Hebrae is a disease that affects mainly youngsters. Its basis is an immunodeficiency. Up to 50% cases of oral mucosa efflorescence are without dermatologic manifestations. Exanthema, papulae and small blisters appear on the mucosa. The iris form is typical for the skin, it may be found occasionally at the palate. Notable hemorrhagic crusts appear on the lips vermilion. The disease is accompanied by catarrhal gingivitis. The tongue is covered with an intense white fur, erosions or exulcerations may sometimes be found on its edges. The disease appears mainly during spring or fall. It is considered to be benign but it may have a fatal end in some cases. Therapy is tedious - epithelization preparations can be used locally, general anti-inflammatory treatment, corticoids, eventually immunologic treatment.

Aphtous stomatitis in combination with iritis and ulceration of genitalia may be parts of the Bechcet's syndrome. It is a serious disease that may result in blindness due to purulent iritis. Similarly as in case of multiform erythema, the therapy is based on the use of corticoids and antibiotics. Currently, immunosupressants are used.

4.3 Profession-related Changes in the Oral Cavity

These changes originate either by a direct action of a working environment on oral cavity mucous membranes, or they are a manifestation of general chronic intoxication. A variety of pathological states belong to this group, some of which allow patients to be financially compensated for them, since these diseases are classified as work-related according to present regulations.

1. Damages caused by a dusty environment.

Upon the exposure to soft flour or sugar powder, a heavy plaque is formed at teeth necks, circular caries occurs and marginal inflammations of the gingiva arise. Coal, stone or siliceous powders mixed with saliva of mine or quarry workers, form a kind of an abrasive paste that cause abrasion of teeth occlusal planes and edges. Metal powder originating during machining

causes catarrhal and sometimes ulcerous inflammations of gums. Calcitic or cement dust acts both as a mechanical abrasive and chemically: the cheek mucosa coloration, even leukoplakias appear after a long exposure. The chemical or metallurgic industry workers are affected by changes of the hard dental tissues (the tooth enamel gets rough) or by cheek mucosa hyperkeratinosis.

2. Damages caused by general intoxication.

Changes that are a result of a general intoxication with heavy metal salts can also be found inside the oral cavity. Discoloration of the gingiva around teeth necks, caused by lead intoxication, is particularly known to occur at workers in lead foundries and lead paints manufacturing. Intoxication by mercury that is the most commonly used material for fillings in stomatology, appears not only at mercury plants workers but also at people working in dentistry. Mercury penetrates wall plasters and floor chinks at a dentist's office. Mercury intoxication causes vague problems (trembling of arms and legs, headaches, irritability) that are difficult to explain for a long time. Ulcerous mucosa inflammations are often found after intoxication with zinc or chromium. Arsenic which is a part of devitalization preparations may cause local ulcerous changes of the gingiva if not applied properly; or osteitis if it penetrates through the apical foramen of the tooth root (single-root teeth, too long application of arsenic preparation in a carious cavity). Heavy metals intoxications are usually accompanied by an excessive salivation and taste ailments.

4.4 Manifestations of AIDS on the Oral Cavity Mucosa

Infection by the human immunodeficiency virus (HIV) is associated with several pathological changes of the oral cavity mucosa. An early recognition of these changes represents a significant addition for the general diagnosis of this worldwide disease (AIDS - Acquired Immune Deficiency Syndrome). The group of intra-oral pathological changes, associated with the HIV infection, contains the following diseases:

- candidous infections (erythematous, pseudo-membranous or hyperplastic candidiasis)
- hairy leukoplakia of the tongue
- gingivitis and HIV necrotizing gingivitis
- HIV periodontitis
- Kaposi sarcoma with a predominant appearance at the palate and gums
- Non-Hodgkin lymphoma (at the palate and gingiva)

Besides the above stated clinical picture, a diagnosis of these diseases is also based on immuno-serologic examinations.

5. Prosthetic Dentistry

Prosthetic dentistry deals with replacements of lost teeth or their parts, parts of alveolar ridges and soft tissues of the oral cavity or the face.

Artificial dental replacements are called stomatologic prostheses (dentures). Their significance is both medical and social. The medical importance lays in therapy and prevention. The social importance means a possibility for a patient with affected dentition to re-enter his/her career and a social life.

Dentures should meet requirements of functionality, phonation, esthetic look and health. Dentures can be divided into crown prostheses, teeth prostheses, and fixed or removable ones. Depending on a way of the chewing pressure transmission, prostheses may be divided into dental, dento-mucosal, and mucous.

The teeth to which a prosthesis is fixed, are called abutments. According to their biological factor, these teeth can be divided into three classes. The biological factor of teeth depends on teeth shape, cariousness, periodontal diseases, teeth developmental anomalies and alveolar ridges atrophy.

Teeth losses result in defects of dentition that are classified to three classes according to Voldřich:

I. class A gap, up to four adjacent teeth wide, bounded by the first class pillar teeth.

II. class A shortened dental arch. It is replaced by a dento-mucosal denture. The first class teeth is replaced by dental prostheses.

III. class Defects that do not belong to the above two classes. These are usually replaced with dento-mucosal or mucous prostheses.

Dentures are made according to a model that can be obtained by the direct method, i.e. by modeling a pre-made prosthesis directly inside a mouth, or by the indirect method that includes forming pre-made structure on a situation model. Metal dentures or their parts are made by casting into a mold by the “vanished wax” technique. Resin dentures are formed according to a wax model of a prosthesis inside a flask filled with plaster. After the wax model is

melted and drained, a cavity inside the plaster is stuffed with resin paste that polymerizes inside the flask under pressure.

5.1 Types of Dentures: Fixed Dental Prostheses

Fixed dentures transmit chewing pressure by the dental way only. Teeth fitted with those dentures (pillar teeth) are prepared properly, and constructions that attach to these teeth are called pillar constructions. This group contains inlays, crowns, fixed bridges.

Inlays replace a part of a tooth's lost crown or the whole crown. An onlay replaces the whole occlusal part of a crown. An inlay replaces the occlusal part of a crown either totally or partially, plus one or both proximal parts of it.

Root inlay (superstructure) replaces the whole crown part of a tooth and it is attached to a treated root canal by the root pin.

Crowns replace a part or the whole damaged tooth's clinical crown that is covered, partially or completely, by a surface jacket which reaches to, or under the marginal gingiva. Crowns are of the following types:

1. Jacket crowns, made of metal, ceramic or resin.

Metal jacket crowns are made by casting from gold, gold-palladium or silver-palladium alloys. A temporary protective band crown can be made for young patients in exceptional cases. These crowns are made of a metal sheet with cast or sheet occlusal surface (for distal teeth), or as a protective metal sheet crown made of two halves for frontal teeth.

Ceramic crowns are the oldest type of jacket crowns that still fit today's needs well. They are used mostly at the frontal section. The base of ceramic is silicon dioxide, feldspar and kaolin that is being replaced by aluminum oxide these days. Ceramic crowns are much harder than dental tissues or prosthetic metal alloys. For this reason, a pillar tooth periodontium may get damaged by its overloading (a ceramic crown does not abrade), or a non-physiological abrasion of an antagonist tooth may occur.

Resin crowns are the most often used ones for frontal teeth. The material from which these crowns are made is a methylmetacrylate resin. A

disadvantage of these crowns is their low mechanical resistance and bad color stability.

2. Veneer crowns are made of metal by casting, in combination with a resin or ceramic that form a veneer. The metal construction covers by its inner casing a treated tooth's surface. The outer jacket completes the anatomical shape of a tooth from oral and proximal sides, whereas the facet (a part of the outer jacket) completes the crown's shape from the visible vestibular side.

3. Pin crowns replace the whole clinical crown of a pillar tooth. They are fixed to its root by the root pin.
Fixed bridges replace gaps after one to four teeth of the dental arch that are framed by the first class abutments. If a connecting line between the abutments is straight, the bridges are referred to as linear ones. If connecting lines of the abutments enclose a plane, bridges are marked as planar (anchored to a plane). If the pillar teeth number is higher than number of replaced teeth, we call them splinting bridges. A fixed bridge consists of abutment retainers and the pontic, or so called inserts. The pontic fills the area after missing teeth and it is firmly connected abutment retainers. According to the relationship of a pontic to an alveolar ridge, there are inserts that are not in contact with the mucosa (reverse arch cleansable pontic), and contact inserts. Reverse arch cleansable pontics are used at the lower jaw's distal parts for high abutments. The mucous surface of an insert has to be at least 3 mm clear of the alveolar ridge mucosa. Contact pontics sit at the alveolar ridge by a small oval surface that has a major part located at the vestibular slope of the alveolar ridge. The occlusal surfaces of pontics are reduced in size by about one third, so that to prevent an overload of abutments during chewing.

5.2 Removable Prostheses

Defects of dentition can as well be replaced by removable dentures. These are anchored on remaining teeth or lay on an edentulous area. Advantages compared to fixed bridges include the possibility of cleaning outside the

mouth, they are less expensive, abutments need minimum preparation and dentures can be easily repaired. Their disadvantages are low functional performance, the possibility of damage of the remaining teeth and an edentulous area, and long period of acceptance. These removable dentures may be either partial or total.

Partial removable dentures complement for large defects that can not be replaced with a fixed bridge and for shortened dental arches. They consist of the following basic construction elements:

1. Body, the most important part of a removable denture, replaces a missing part of an atrophied alveolar ridge and the teeth. It restores the chewing function, personal visage of a patient and his/her ability of phonation. It consists of a saddle and artificial teeth (made of resin or porcelain). Size of a body is determined by the way of transferring the chewing pressure. Prostheses with the dental transfer of the chewing pressure have their body reduced in size and they are similar to flatly sat inserts of fixed bridges. The chewing pressure is not transmitted to a denture's bedding. Dento-mucosal dentures with a mixed transfer mode have a saddle-shaped body that is greatly extended. Dentures with mucous mode of the chewing pressure transfer have a body that extends into a palatal or lingual plate. The denture's body is made of a resin.

2. Anchoring elements serve for fastening a partially removable denture to the rest of teeth. Braces and telescopic devices belong here. Braces are among the most often used anchoring elements. Their arms are usually made of a flexible steel wire (0.7-0.8 mm in diameter) or cast of chromium-cobalt alloys. Retention braces (two-armed) should only hold a prosthesis to the rest of teeth. Its retention arm is made of wire, it is flexible and it is positioned along the vestibular teeth surfaces. The stabilizing arm (rigid) stretches along the oral teeth surface; it is mostly made by casting. Propping braces transfer the chewing pressure to a pillar tooth in such a way, that the brace's supporting arm rests on an occlusal surface of a braced tooth. Propping braces can be wholly made of an alloy.

Telescopic devices provide for better personal appearance than braces. A principle of retention by telescopic anchoring systems lays in a mutual friction of a pin and a socket that fit into each other. A socket of the telescopic

connection is located at the pillar tooth construction. A pin that is a part of removable denture, inserts into a socket (inner insertional connection). Similarly, a telescopic crown's outer metal casing that is a part of the removable denture's construction, sets onto an inner metal casing, firmly attached to a pillar tooth.

3. Connecting elements connect individual parts of a prosthesis. Main connecting elements form a sort of frame that holds together parts of the prosthesis' body. To this frame, other construction elements of a prosthesis are attached by tiny clamps (secondary connecting elements). Main connecting elements are used in the form of bars, reduced plates, and palatal plates at the upper jaw, or in the form of bodies that push against the oral slope of the lower jaw alveolar ridge. Front palatal bar connects the front edge of one or more bars of metal construction that belong to a partially removable denture, at the area of palatal rugae. Side palatal bar is usually an extension of a front palatal bar at the distal part of the upper jaw where teeth are present. A wider rear palatal bar connects distal parts of a metal construction. It goes along the back edge of the hard palate in parallel with its boundary and does not extend into the non-movable part of the soft palate. Construction elements of both halves of the dental arch are connected at the lower jaw by a sublingual bar. It leads beneath the marginal gingiva at the lingual slope of the alveolar ridge.

Reduced plates are positioned at the center of a palate and hold together bodies of symmetrical defects prosthesis at the upper jaw near flat palates. At the lower jaw, a reduced plate lies by its upper edge to tubercula dentalia of the lower front teeth, eventually to a horizontal maximum convexity of distal teeth. Its lower edge is placed above the oral cavity base.

Palatal plates cover the whole palatal bed of a prosthesis, in case of mucous dentures of the upper jaw. Their rear edge runs along the non-movable part of the soft palate. None of the above listed elements should constrict the marginal gingiva of other teeth, to avoid damages to the periodontium.

4. Stabilizing elements prevent prostheses to rotate along their axes and a denture's body to move away from a prosthetic bed. They also prevent dentures from a swinging movements and abutments from heaving. The basis of a stabilizing element is the stabilizing arm of a brace that runs along

the maximum horizontal convexity of a pillar tooth on its oral side. An extended brace with higher stabilizing effect is formed by extension of an arm to adjacent teeth. If an arm of three-armed braces leads from one end of a group of remaining teeth to another in such a manner that arms conjoin, a continuous brace is thus formed.

Total dentures.

Total denture is a replacement with mucous transfer of the chewing pressure. It replaces a general defect of teeth, except the third molars and atrophied parts of an alveolus in the jawbones. Its sole construction element - a body - is made of a resin base that bears artificial teeth. At the upper jaw, the basis is formed by a palatal plate; at the lower jaw it is a saddle. Both parts sit on a prosthetic bed by the largest possible area. Total dentures possess problems of retention and stability. The principle of total dentures' retention lays in their adhesion to a prosthetic bed, and at a negative barometric pressure (capillary pressure) that occurs when a denture moves away from its prosthetic bed. Retention depends on an environment between a denture and a prosthetic bed, on the state of mucous membranes and the quality of saliva. A prosthesis' stability depends on artificial teeth positions at the body. A correct teeth position is a subject of many articulation theories, although none of them guaranties stability of a denture during its function. Configuration of jawbones and activity of masseters and mimic musculature are important for good stability and retention of a denture. A patient, to whom a total removable prosthesis was given, has to undergo a regular follow-ups and eventual denture sores have to be eliminated by smoothing a denture. If a denture is not fitted well, these denture sores can evolve into mucous rugae - garnuloma fissuratum. These formations not only worsen retention of a total denture but could also result in a neoplasm by chronic traumatization of the tissue. Total prostheses can also be made according to impressions taken before teeth extraction. This so called immediate prosthesis is given to a patient right after extractions are finished. Discrepancies between this denture and a prosthetic bed can be fixed by denture padding - rebasing. After complete healing of extraction wounds (takes about six months) a definite prosthesis should be made. Immediate dentures have an advantage

of quick accustoming (a patient gets used to it easily) and also the fact that they slow down an alveolar resorption.

5.3 Surgical Dentures

Surgical dentures replace large defects of both soft and bone tissues of the oral cavity and the face. Among these are the following types:
Obturators. They serve to close large palatal clefts. Obturators consist of a removable palatal plate that covers a defect and is attached to rest of teeth by regular anchoring elements. Soft palate cleft is covered by a “pelota” plate that is coupled to a palatal plate by a joint.
Resection prosthesis. Replaces defects after resection of jawbones due to neoplasms and supports soft cheek tissues. A palatal plate closes resection cavity and also complements for defects of the dental arch. Edges of a prosthesis can be made of an elastic silicone material.
Epithesis replaces a skeleton and soft parts of the face after large surgeries of neoplasms or after injuries. It is usually combined with resection prostheses. They are made of elastic silicon-based materials. Retention of a prosthesis is improved by an eyeglasses frame with spring wire which press an epithesis against the face. An eye prosthesis is usually a part epithesis.

5.4 Damage of Tissues by Dentures and Its Prevention

Incorrectly made fixed or removable denture may cause many damages to its bearer. It can be mainly damages to abutments periodontium during their functional overloading. Wrongly adhering or unstable total removable dentures may cause decubitus ulcers or chronic inflammatory hyperplasia - granuloma fissuratum - of the prosthesis bed mucosa. Similar etiology exhibits ligamentous transformation of the alveolar ridge which further reduces retention of a prosthesis. Another kind of damage is stomatitis prothetica which occurs mostly on a palate under resin plate of a denture. It is caused by chemical irritation by free resin monomers or it appears as a contact allergy to acrylic compounds. Chronic inflammations of mouth commissures - anguli infectiosi - are a result of low occlusion at patients who

wear old, abraded total replacements. Monilial infections of oral mucosa - candidiasis - is also frequent at people wearing total dentures.
Most of the above described damages can be avoided by technically correct prostheses, regular check-ups and proper oral hygiene.

6. Dental Implantology

Transplantation and implantation methods are being used more often in medicine. The same situation is in dentistry. Despite some terminological discrepancies, the term transplantation means transfer of an organ, a tissue that becomes a part of an organism, not only by its configuration and function, but also gets integrated into a recipient organism by its composition and metabolic processes - it maintains its vitality. The term transplantation also means such a transfer of precisely configured material or artificial organ that fully or partially integrates into an organism's function, it is fully biologically tolerated but it is not vital. During last several decades, such a method - method of implanting - has begun to be more intensely utilized for repairs of a defective, incomplete dentition by means of dental implants. The term dental implant means a construction (part) of various forms or shapes which forms an artificial abutment after being inserted into the upper or lower jaw alveolus. Thus implanted artificial abutments allow for more sophisticated denture to be made in cases where teeth replacement would not otherwise be possible. It enables a person to utilize his/her teeth fully with all its functions - processing food, speech and articulation.

Variety of dental implants have been developed so far, differing in materials used, shapes, forms, ways of implanting them into jawbones and their relation to tissues. As our knowledge increases, periods of greater or smaller utilization or refusal of dental implants at clinical practice alternate.

At present times when high technology is possible and social demands increase, dental implantology is again a hot topic. Many authors have been involved in solving problems related to quite wide area of dental implants. Their opinions and results of their work have been a subject of many discussions and publications. The major problems of both foreign and domestic literature are related to materials, forms and shapes of implants, methods of implanting, availability, including suitable instrumentation, and also a very important question of biological tolerance of dental implants. This question is even more amplified by the specific property of dental implants -

they penetrate the oral mucosa and stretch out freely into the oral cavity (open implants). In 1979, the FDI (Federation Dentaire Internationale) dealt with the question of biological tolerance and issued recommended international norms for dental implants materials. In Czech republic, these norms have been respected since 1986.

During last couple of decades, the worldwide field of dental implants has reached such degree of quality, especially due to scientific achievements, that it occupies a firm place at specialized extended dental care.

6.1 Classification of Implants, Properties of Materials, Biocompatibility

Dental implants can be classified according to various points of view. From the clinical point of view, the classification that is based on the relationship between implants and tissues in which an implant is embedded, is the most often used one. The classification is as follows:

1. Closed, i.e. implants that are not in contact with the oral cavity since they are fully covered by an organism's live tissues, the alveolar bone. Magnets made of a chromium-cobalt alloy and embedded in a tantalum mesh, are an example. A magnet with the opposite polarity is placed inside a removable denture's body. Magnetic force improves retention of a removable prosthetic denture during its function in situ. Other forms of such implants exist, too. Their use is limited, though.
2. Semi-closed implants, also called endodontic, transdental, transradicular, or root. They have a form of long pins, smooth or threaded, made of metal (tantalum, titanium) or non-metallic (sapphire) materials, that create a firm tooth or pillar for fitting a prosthetic denture, by penetrating the root and crown part of a tooth to the bone. This way is not often used, either. Reasons for it are technical or instrumental rather than a usefulness.
3. Open implants: these implants represent the most often used and the most variable group. Their characteristic is that they pass through a mucosa or muco-periosteum freely inside the oral cavity where they form dental pillars. These implants can be further divided according to their relationship to the alveolar tissue:

a) intramucous implants: these implants are based on the “pin and socket” principle. The socket in this case is a well, artificially made in a bone but coated with epithelium. A denture contains metal or ceramic pin that fits into the socket and helps to retain a removable denture. Although, this mode is not very common and can be used rather for temporary solutions.

b) Subperiosteal tooth implants (synonym juxtaosseal): these implants are formed by metal constructions placed on the surface of conditioned alveolar bone, they are covered by the periosteum and artificial pillars protrude from them through periosteal mucosa into the oral cavity. Implants may be also fixed into the bone by screws. This kind of implants have been in use since Twenties. Various metal materials were used, from fine steel to titanium and its alloys used in these days. These implants are widely used today in cases of atrophied alveoli both in the upper and lower jaws. Limiting factors of their use are requirements for great care during implanting and also relatively high (up to 50%) unsuccessfulness rate followed by quite large damages to the bone.

c) enosseal implants: are the most commonly used and perhaps also the most promising group of dental implants. The method of implanting the enosseal dental implants has became a part of dental care in all developed countries. It is used in many forms in the Czech Republic as well. Basically, implants which may vary in their shapes, are inserted enosseally into the spongy bone, their parts penetrate the cortical bone, periosteum, and mucosa into the oral cavity where they form an artificial pillar. Their variability does not concern only shapes, but also materials, surface finish and ways of surgical implanting of a denture anchors. At present, an emphasis is put on the following requirements for enosseal implants: they have to integrate perfectly into the bone and surrounding tissues, i.e. no interstitial layers of ligaments, granulous tissue or groove between the implant and mucosa that would allow for microorganisms to penetrate deeper into tissues, can occur. Besides biocompatibility, biomechanics of dental implants that is determined by their shape and material they are made of, plays an important role. At present, the most suitable materials appear to be pure titanium or tantalum, titanium and vanadium alloys, hydroxylapatite ceramic, aluminum oxide containing monocrystalline and

poly-crystalline ceramic, phosphate-based ceramic, and experimentally also bio-glass and bio-carbon containing ceramic materials. A combination of metal and ceramic implants is used mainly due to the surface finish. Shapes, forms and surface finish of enosseal implants should assure the largest area of contact with a bone, thus making conditions for complete integration of an implant. In concordance with these requirements, including the way of a denture anchoring, tens of enosseal dental implant systems have been developed. Single-phase implants have an endosteal part that verges into a pillar part, as compared to two-phase implants, where the endosteal part is implanted first and the supraconstruction is fixed in the second phase after 3-6 months, when a prosthesis is made, too. The well known brands of dental implants are MTI, Ardent - cylindrical, Impladent, LTI, Precioza, Disal, VNI, Timplant, IMZ, Swiss-made Bonefit, Swedish Branemark, American Cor-vent and tens of others.

6.2 Indication, Contraindication

Indication and contraindication to the use of dental implants is closely connected with ways of implanting them to the jawbone. Even though dental implants present a significant and irreplaceable improvement in dental care, they are not a method that could be used under all circumstances, for all patients. It is still considered to be a non-standard treatment which can be chosen only under certain conditions. Several viewpoints are to be considered. The basic characteristic of an implant is creation of an artificial dental pillar at jaw's alveolar tissue which allows for further mounting of a denture assuring full teeth functions. However, dental implants should not be used for the sake of themselves without taking into an account the state of other teeth, implant's expected lifetime, and other local and general medical conditions. Installing dental implants should not lead to premature loss of natural teeth or to decrease in dental care, under any circumstances. Implantation into jawbone's alveolus is a large or small surgical intervention into an organism and has to be respected as such.

Introduction of a dental implant has to be performed *lege artis*, with proper expert erudition, after a special training, with special instrumentation

and equipment. It should be performed under a local or general anesthesia, after appropriate anamnesis and analysis of a patient's general health condition and local conditions as well.

Indications may be as follows:

- single gap in the alveolus after a lost tooth
- large gap at frontal or distal parts of the alveolus where an implant would serve as an inserted pillar either alone or linked to adjacent teeth
- shortened dental arch at which an implant is used as a complementing independent pillar or an end pillar for bridges
- a toothless jaw, where implants are utilized as pillars for a bridge or hybrid removable denture.

In general, blade-like, metal, extension implants are used mainly at narrow alveoli. Cylindrical, screw-like implants find their use at stronger alveoli of toothless jaws.

Contraindications from the local point of view:

- insufficient strength of alveolus
- mucous inflammation or fibrous alterations that do not assure an implant's stability
- unsatisfactory topographical and anatomical dimensions, e.g. position canalis mandibularis, relatively large jaw cavity, extreme alveolus atrophy, anomalous occlusal intermaxillary conditions, defects of jaws, macroglossia.

Contraindications in terms of general health conditions can be either relative or absolute.

Relative contraindications:

- ongoing infectious states
- chronic pathological states of decompensation

Absolute contraindications:

- systemic bone diseases
- endocrinologic diseases
- diseases of the hepatopoietic system
- rheumatoid diseases
- heart conditions

- nephritis or nephrosis
- liver cirrhosis
- allergies
- immune system disorders

Among other important factors are a patient's psychological condition, motivation, ability to cooperate during the implantation preparation phase, as well as further caring of dentures (fixed or removable) carried by dental implants.

Without a perfect anamnesis, local analysis and without meeting all requirements for indication or contraindication, it would not be possible to utilize dental implants successfully for the treatment of dental defects.

7. Orthopedics of Jaws

Orthopedics of jaws (orthodontics) is the dental specialty and practice of preventing, diagnostics and correcting irregularities of the teeth, relationships of dental arches and anomalies of the oro-facial area. Orthodontic care is a part of the dental care provided for the generation of young people. It has a preventive character and contributes to formation of functional and esthetic qualities of the oro-facial system.

7.1 Orthodontic Anomalies

Among orthodontic anomalies belong defects of positions of individual teeth, groups of teeth, defective mutual relationships of dental arches, and defects in the build or growth of the facial skeleton. Cleft disorders form a separate group of anomalies.

The frequency at which orthodontic anomalies occur is high at present times. In our population, more than one half of school-age children are affected by ailments of occlusion. Not every aberration found has to be treated. Therapy of tiny irregularities that do not hamper the teeth functions or personal visage would not be beneficial.

Etiology of orthodontic anomalies. Many factors contribute to appearance of these anomalies. Among general causes of orthodontic anomalies there are heredity, growth rate, physical constitution, diseases, diet, function of endocrine glands. Dental caries, premature loss of teeth, functional defects are the local causes of orthodontic anomalies. From the etiology viewpoint, orthodontic anomalies can be further divided into congenital and acquired ones.

Congenital anomalies can be either hereditary or appear during intrauterine development as a result of harmful influences. These influences can be toxic chemicals (drugs), physical (X-ray irradiation, radioactivity), viral infections (rubeola). Hereditary disorders include anomalies in number, shape and position of the teeth. A primary position of the tooth germ, the shape and size

of jawbones are genetically determined as well. An example of a hereditary dominant disease is progenia.

Acquired anomalies appear after a child's birth by effects of internal and external influences. Internal causes include metabolic disorders, rachitis, endocrine disorders etc. External factors are for example: various bad habits, such as sucking fingers, putting foreign objects inside the mouth, biting of lips, the tongue, cheeks, breathing by mouth etc. These habits are long-term forces that may unfavorably influence position of the teeth, shape of alveolar ridges, mutual relationship of jaws, growth and development of the oro-facial system. Dental decays and premature losses of teeth may lead to formation of orthodontic anomalies, too.

Prevention of orthodontic anomalies.

The basis of prevention of orthodontic anomalies is the care about healthy and harmonic development of children and their oro-facial system. It begins by the mother and child care during pregnancy. Very important is also a mother's healthy lifestyle and environment, as well as avoiding all influences which could negatively affect her pregnancy. Postnatal prevention and prophylaxis are tasks for parents, a pediatrician and later for a pedo-stomatologist. Right diet is highly important for proper development of children's oro-facial system. Breast-feeding is preferred against an artificial feeding at nursing age. At later age, care has to be paid to the food composition and texture. Employing functions of the chewing system has an essential influence on right development of the oro-facial system and prevents from various bad habits to occur. If bad habits still appear, it is mandatory to quit them with aid of simple shielding devices or muscular exercises. An important part of prevention of orthodontic anomalies is avoidance of dental decays and systematic sanative care of the teeth. Premature losses of teeth lead to weakening of the functional fitness of the teeth, shifts of neighboring teeth into gaps and loss of space for cutting of the permanent teeth. This all depends on cooperation of parents, a pediatrician and pedo-stomatologist, as well as proper health education.

7.2 Classification of Orthodontic Anomalies

7.2.1 Anomalies of Teeth Positions

Teeth inclination means tilting of a tooth along its longitudinal axis. Its forms are: mesial, vestibular and oral, distal. Vestibular inclination at the front area is often called protrusion, an oral tilt is called retrusion.

Teeth rotation stands for turning a tooth along its longitudinal axis. It is frequent for single-root teeth (incisors, canine teeth) if there is not enough room at the dental arch, or if teeth are jammed.

Supraocclusion - a tooth overhangs the occlusal plane.

Infraocclusion - a tooth does not reach the occlusal plane.

Shift - a tooth changed its position while maintaining its longitudinal axis direction.

Transposition - two teeth exchange their locations.

Dystopia - a tooth cut out of the dental arch at vestibular or oral side.

Retention - a tooth did not cut during a period of physiological teething. The most often cause of retention is horizontal position of the germ or constriction of the dental arch.

7.2.2 Anomalies of Dental Arches Relationships

These anomalies can be evaluated at sagittal, transversal or vertical directions. At the sagittal plane, the lower dental arch can be positioned by three ways relative to the upper arch: normocclusion - 1st Angle's class, distocclusion - 2nd Angle's class, and mesiocclusion - 3rd Angle's class.

Normocclusion is such relationship of dental arches when at the maximum inter-cuspidation, the mesiobuccal cusp of the first upper molar fits into the inter-cuspate groove of the first lower molar, and the cusp of the upper canine tooth fits between the lower canine tooth and the first premolar.

Distocclusion is characterized by the distal shift of the lower jaw. The first lower molar is shifted relative to the upper molar distally. This group of anomalies can be further divided into the first division - distocclusion is accompanied by protrusion of incisor teeth - and the second division - distocclusion is accompanied by retrusion of incisor teeth.

Mesiocclusion is characterized by the mesial shift of the lower jaw. At this position, the first lower molar is shifted mesially relative to the upper molar. The ventral position of the lower jaw is often accompanied by a reverse bite at the frontal section.

At the transversal plane, the buccal cusps of upper side teeth overlap those of lower teeth, at the maximum inter-cuspidation. A discrepancy between the width of upper and lower dental arches results in anomalies of the bite, designated as buccal nonocclusion, crossed bite, or palatine non-occlusion.

At the vertical plane, mutual position of jaws can be hindered by a deep or an open bite. The deep bite is such a bearing when upper incisor teeth overlap by more than two thirds of the labial surface of lower incisor teeth. The open bite is such an anomaly, where a vertical gap appears between groups of two or more adjacent teeth and their antagonists, at the maximum inter-cuspidation of the teeth. This anomaly may occur at the frontal or lateral sections of the teeth.

7.2.3 Disorders of the Facial Skeleton Structure and Growth

Some of the dental arches mutual position anomalies are determined by deviations in size, position and bearing of the jawbones. These anomalies are often hereditary, although they may be caused by external factors as well. Prognathia maxillaris is characterized by an excessive growth of the upper jaw in forward direction, while the lower jaw has normal shape and size. The upper frontal teeth do not touch their lower antagonists and protrude out of the mouth, in majority of cases. Chewing of food is difficult, sometimes impossible. The shortened upper lip does not overlap the upper frontal teeth, the lower lip gets inserted between rows of teeth.

Progenia mandibularis is characterized by a large lower jaw, while the upper jaw's size is at normal range. It is one of the most prominent jaw anomalies and appears at the rate of more than 1% in our population. Hereditary factors play a role at its etiology; although acquired progeniae occur as well, for instance during endocrine glands malfunctions (acromegaly). Increased occlusion and enlarged lower jaw's body, resulting in the horizontal overlap,

are typical for a progenia. Mastication functions of the teeth and speech ability are usually hampered. An altered configuration of the face - enlarged lower third and emphasized chin - does not look nice. That is why this anomaly is often corrected by a surgery after the growth of jaws is completed.
Pseudoprogenia is characterized by a small upper jaw, while the lower jaw's size is at normal range. This anomaly can be most frequently seen in cases of clefts, that are results of a combination of hereditary causes (insufficient development of the premaxilla) and external factors (consequences of operation scars). It is accompanied by the inverted bite.
Microgenia originates as a result of small lower jaw and is accompanied by distocclusion. The chin projection is absent and the chin changes over to the neck's upper part almost imperceptibly. The nose and the upper lip, that overlaps the lower lip, protrude from face profile. This disorder may be of hereditary origin, more often it appears after an injury or inflammation of the jaw joint during childhood.
Laterogenia is caused by an increase or reduction in size of one half of the lower jaw, less often by skewing the whole jaw from its normal position. It occurs with the face asymmetry.

7.3 Therapy of Orthodontic Anomalies

The orthodontic therapy is based on the assumption that bone tissues adjust themselves to gradual changes of their functional load. The field can be divided into two basic branches:
1. Conservative orthodontics, that uses effects of forces (orthodontic instruments, functions) and often also the oro-facial system's growth. Changes in shape of dental arches are initiated by reconstruction of the jaw bone tissue.
2. Surgical orthodontics changes the oro-facial system appearance by surgical operations.

The best time at which the orthodontic therapy should start is the period of mixed teeth, when cutting teeth can be lead to a correct position at the dental arch and when the growth of jaws may affect the teeth development in a positive manner. At the period of temporary dentition, a

preventive and prophylactic treatment prevails. Its goal is to enable a natural development of the teeth. A treatment that begins after the dentition change, can be regarded as late therapy, since the main growth of the oro-facial system is over and the dentition development is finished. The period after the growth is finished is suitable for surgical correction of anomalies that require changing the size, the shape, or eventually positions of jawbones (progeniae, prognathiae, open bite). Orthodontic therapy is carried out by several means. Orthodontic instruments, orthodontic extractions, auxiliary surgeries and myotherapy are among the most often used ones.

Orthodontic therapy with the aid of instruments

Fixed appliances are wire arches of various shapes that are connected to the teeth with cemented rings or glued locks. They consist of various springs, elastic tensions and devices that influence the teeth by an external force. Removable appliances can be divided according to the acting forces into active appliances (acting mechanically), whose elementary example is a plate fitted with active elements (screws, springs etc.), passive and combined appliances. Passive appliances (functional) use muscular functions for correction of an anomaly, they direct the growth and reconstruction of bones. Combined appliances act both mechanically during the therapy - using active elements - and through a muscular function. Treatment with the aid of orthodontic instruments is an exacting one, requiring cooperation of a patient and his/her parents in maintaining the therapeutic regime and oral hygiene.

Surgical therapy

The basic element of surgical orthodontics are orthodontic extractions that have become a routine part of therapeutic processes today. They enable for faster and more stable incorporation of teeth into the dental arch in case of tightness and lack of space. In case of unequal numbers of teeth at the upper and lower jaws, this method can provide for the correct inter-cuspidation of the teeth. Another reason for extraction may be unfavorable positions of teeth or a tooth’s germ, dental arches asymmetry etc. Extractions also find its application at orthodontic prophylaxis, since well planned extractions of temporary and permanent teeth achieve the correct teeth evolvement.

Surgical therapy of orthodontic anomalies is used mainly for correcting of congenital anomalies of jaws where the orthodontic therapy alone is not sufficient. Surgeries of jawbones are performed after their growth is completed, i.e. around 18 years of age. Until this age, attempts to adjust the teeth positions, height of the bite and mutual positions of jaws should be carried out, so that the best possible conditions for a surgery are achieved. Surgical therapy is most frequently applied in cases of mandibular progenia, open bite, maxillar prognathia, microgenia and laterogenia. A number of surgical techniques have been developed for correction of particular types of anomalies. These are always serious surgical interventions, requiring a patient's hospitalization.

Myotherapy

Myotherapy serves for exercising of particular groups of muscles. It is not very demanding method that should create a proper muscular tonus. Favorable conditions for normal development of the teeth are created by increasing the tonus of flaccid muscles or by releasing a hypertonia.

7.4 Cleft Disorders

Cleft disorders originate as a malfunction during the embryonic development of the middle part of the face. Endogenous causes, mainly the heredity at about 10-25% of cases, play a role at their etiology. Among exogenous factors there are mother's infectious diseases (rubeola, influenza), hormonal preparations, mechanical and chemical influences, lack of vitamin B, excess of vitamin A, various drugs, irradiation, alcohol, nicotine, eventually other teratogenic compounds that act during the period of the face development (5.-12. week of intrauterine life). The most common are clefts of the lips and the palate. Their incidence rate increases during last several decades - there is one cleft disorder per 400-500 of births at present. The cleft disorders classification stems from the process of embryonic development of the oro-facial system. It can be divided into three groups, according to Kernahan and Stark:

1. Primary palate clefts, i.e. clefts of the lip, vestibule and the upper jaw alveolar ridge, up to foramen incissivum. The primary palate is formed during

the 5^{th} - 8^{th} week of gestation by connection of the maxillar projection of the first gill slit and the medial nasal projection. The cleft may be either sub-mucous or total. It sometimes affects the lip's red only, or the whole lip and the alveolar ridge. In case of the alveolar ridge affection, irregularities in the teeth position, number and shape occur as well. If the cleft reaches the nose bottom part, it causes its deformation. In case of the total one-sided cleft of the lip and alveolar ridge up to foramen incissivum, the larger segment together with the premaxilla are tilted forwards, the smaller segment is reduced at all dimensions. In case of a double-sided cleft, the premaxilla is connected to the vomer and often skewed in forward and upward directions. Defects of the nose are present to a various extent.

2. Secondary palate clefts originate at the 8^{th}-12^{th} week of gestation. During this period, the tongue which had filled the combined oral and nasal cavities so far, got lowered and lateral palatal projections get connected thus dividing the nasal cavity from the oral cavity at the area behind the primary palate. If the connection does not take place, the isolated palatal cleft occurs. It can range from an isolated cleft of the uvula, through the cleft or shortening of the soft palate, to the total palatal cleft up to foramen incissivum. The sub-mucous palatal cleft distorts the continuity of muscles or even the bone, the mucous cover is preserved, though. The alveolar ridges and the dental arch is formed normally.

3. Primary and secondary palates clefts affect the lips, the alveolar ridge, the hard palate, the soft palate and the uvula. They may be either single-sided or bilateral. A single-sided, complete cleft divides the above listed formations into two unequal parts: the bigger part containing the inter-maxilla and connected to the vomer and septum nasi; the smaller part is formed by the remains of lips, the alveolar ridge and the palate. The mutual bearing of the segments is usually damaged. In cases of bilateral total clefts, the premaxilla is joined to the vomer and the septum nasi form an independent part that protrudes at the anterior direction in front of side segments, or it is interlaced between them at the oral direction. Parts of hard and soft palates are not connected at the middle line.

4. Facial clefts are rarely occurring disorders which originate during the embryonic development, too. Middle clefts affect the nose, upper and lower

lips, eventually the lower jaw. Oblique clefts go from a nose wing to the inner eye corner. Cross clefts are localized at the oral fissure area and manifestate as macrostoma.

Functional defects at cleft disorders.

Functions of the oro-facial system are hampered to the greatest extent at clefts of the third group. Due to oro-nasal communication, the nursing, swallowing and breathing are affected. Nasal mucosa, airways and the middle ear often suffer from inflammations. Children of later ages have speech problems.

Cleft disorders therapy.

Children affected with cleft disorders have to be under a follow-up care from the birth to adult age. Therapy is very demanding and takes place at centers for cleft disorders that are being established at plastic surgery clinics. Therapy is conducted by a team of experts who determine an individual plan of cure and a schedule for individual phases of therapy. Since it is necessary to ensure feeding at nurslings, the oro-nasal communication is closed by the palatal plate. The ventral shift of inter-maxilla is corrected by an elastic band, connected to a cap. Clefts of the first group undergo a surgery at the age of 5-8 months. Reconstruction of a lip, vestibule and the nose bottom takes place during this surgery. The hard and soft palates closure is performed at the age of 3-4 years, i.e. the period when the temporary dentition is completely cut. The aim of the palatal plastic surgery is dividing the oral cavity from the nasal cavity. The goal is that operation scars do not slow down the jaws' growth too much and that the growth centers can be employed as much as possible. A patient undergoes the orthodontic therapy from his/her birth to the completion of the permanent teeth development. The aim of this cure is to support the growth and development of jaws of an affected individual. It also creates conditions for an optimal surgical treatment of clefts, reduces adverse effects of scars on the skeleton growth at the period after a surgery with help of an active therapy, shielding therapy, or myotherapy. Positive conditions are also formed by correction of the teeth position, shapes of the dental arches and alignment of the jaws, that serve for a definite sanation of the teeth at later age. The prosthetic therapy should guarantee a functional and esthetic rehabilitation of the teeth at these patients.

8. Basics of Dento-alveolar Surgery

Dento-alveolar surgery deals with prevention, diagnostics and therapy of pathological states of the teeth, alveolar ridges of the jaws, and the mouth soft tissues mainly by surgical methods. Besides exemptions of high-risk patients (endocrinopathies, cardiopathies, hemocoagulation disorders), these surgeries are performed in the inpatient form. They include the following stomatological surgeries:

a) teeth extractions
b) treatment of difficulties with cutting of the third lower molars
c) surgical treatment of chronic peri-apical periodontitis (apicectomy)
d) surgical treatment of dental cysts and developmental cysts
e) treatment of post-extraction complications (alveolitis sicca)
f) excision of small benign tumors
g) small pre-prosthetic adjustments of alveolar ridges, hypertrophied mucous folds
h) treatment of dental-related inflammations at the area of alveolar ridge

During a dental and surgical examination of the oral cavity, a surgeon should also focus on screening for pre-cancerous stages and early stages of the oral cavity tumors.

8.1 Teeth Extraction

The tooth extraction is a surgical event which is based on a tooth removal from the dental socket by extraction instruments (forceps, levers). The integrity of both soft and hard tissues of the oral cavity gets damaged thus opening a way for infection which may complicate healing of the extraction wound. The work under aseptic conditions is thus a mandatory rule of all dental surgeries.

Indication, contraindication and the extraction technique.

<u>Indication for extractions.</u>

The reasons for teeth extractions at dentistry practice are the following:

a) teeth greatly damaged by decays or injuries

b) teeth at which an endodontic treatment or a preserving surgery cannot be done
c) teeth with advanced destruction of the periodontium (loose teeth)
d) retained teeth and teeth positioned out of the dental arch
e) teeth obstructing a prosthetic treatment
f) devitalized teeth at the jaw's fracture line
g) teeth causing inflammations around jaws
h) devitalized teeth at areas where a radiotherapy is expected

Contraindications of extractions.

Reasons for an absolute contraindication are acute leukemia, agranulocytosis, stomatitis ulceronecrotisans. Relative contraindications are de-compensated heart diseases, diabetes mellitus, coagulopathy, and pregnancy between the second and the third, and the seventh and the eighth months, respectively. Relative contraindications are reasons for a delay of extractions, where possible. Extractions should be performed after consulting a specialist who should determine a suitable ways of a patient's preparation.

The extraction technique.

An extraction is conducted at several consequent steps:

a) release of the gingivo-dental rim at the tooth's neck area by a lever
b) putting the beaks of forceps onto the tooth's neck area at its longitudinal axis
c) executing of luxating movements, changing from vestibular to oral directions. This interrupts a periodontal ligaments which form a supportive apparatus and enable for dislocation of a tooth from the alveolus.

8.2 Anesthesia at Dentistry

Painful feelings that are associated with most of dental surgeries can be dealt with relatively well by an anesthesia. Anesthetics are chemicals of various structure and properties that interrupt reversibly the conductance of sensory neural fibrils. According to chemical composition, these chemicals can be divided into:

a) procaine - related anesthetics: Procain, Tetracain

b) lidocaine - related anesthetics: Lidocain, Neolidocaton, Mesocain D, Ultracain D-S, Supracain.

An irreplaceable part of anesthetics are vasoconstrictive substances. These substances slow down the absorption of an anesthetic into the blood circulation thus reducing its toxicity, prolonging its effect, simplifying the overview of an operation field and reducing the duration of a surgery itself. Vasoconstrictive substances in use are synthetically made, although most of them are made by an organism under physiological conditions. They include adrenaline (epinephrine) - a hormone secreted by the adrenal medulla, noradrenaline (norepinephrine) that is secreted both by the adrenal medulla and the postganglional fibers of the sympathetic nerves, vasopressin, a hormone of the neurohypophysis (the drugs POR 8, Octapressin).
The local anesthetics can be applied by various ways:

a) Surface anesthesia (mucous, contact). Anesthetics are applied to the dried oral mucosa in a form of sprays, solutions, creams or gels. By this way, a short-term anesthesia is achieved which is used for particular indications, such as for desensitization of injection anesthesia, removal of tartar, incision of submucosal abscesses, at children and sensitive patients.
b) Terminal, infiltration anesthesia. Disposable syringes and needles are used for this kind of anesthesia. Subcutaneous anesthesia is used in cases of outer incisions or extirpations of small tumors; submucous anesthesia is used at the oral cavity for teeth extractions, for vital extirpations of the pulp, for grinding of vital teeth in order to fit it under prosthetic dentures etc. The effect of an anesthetic is based on a sufficient penetration of a solution through the periosteum and the compact bone to sensitive nerves of the upper and lower jaws. Intraosseal anesthesia (intra-spongious) may be applied at young individuals; an anesthetic is applied into the spongy part of the interdental septum.
c) Regional anesthesia. An anesthetic is applied by instillation to bone canals and apertures through which the sensitive nerve fibers enter the upper or lower jaws. At the upper jaw, this kind of anesthesia is used on tuber maxillae, foramen infraorbitale, foramen incisivum, and foramen

palatinum majus. At clinical praxis it is sufficient to employ the infiltration anesthesia by depositing an anesthetic at the level of the root apexes. Regional anesthesia is more often used at the lower jaw, where a thick cortical part at the molars area prevents diffusion of a solution to sensitive nerves. Anesthesia should be applied at foramen mandibulae and foramen mentale.

d) Trunk anesthesia. An anesthetic is applied directly to exits of the trigeminus branches from the ganglion semilunare. Upon instillation at the foramen rotundum area, anesthesia is achieved for the second branch innervation area, after application at foramen ovale, anesthesia is achieved for the third branch area. The trunk anesthesia is rarely used in common praxis. It is devoted to neurosurgeries in cases of the trigeminus neuralgias.

Complications that may occur during anesthesia may be either local or general.

Local complications.

a) breaking an injection needle at a patient's sudden move
b) misplacement of an injection solution
c) introduction of infection deeply into a tissue, or infecting a hematoma resulting from a break in a blood vessel
d) damage of the periosteum or neural branch followed by pain, after a deep puncture
e) ischemic necrosis of a tissue after application of a large amount of an anesthetic and a vasoconstrictive substance
f) muscle contraction after anesthesia at foramen mandibulae. It may be caused by a muscle injury, hematoma infection or toxic effects of the anesthetic.

General complications.

a) Toxic reaction in case of exceeding a maximum dose of an anesthetic. It can occur by a cumulative effect of two different anesthetics - absolute overdosing - or by an accidental intravasation - relative overdosing.
b) Allergic reaction is quite frequent after application of procaine-like anesthetics. Allergic reactions include hives with exanthema, angio-

neurotic edema, oral mucosa erythema etc. The most serious condition is the anaphylactic shock with a sharp onset of the heart and respiratory insufficiency (accelerated, later weakening breathing, heart arrhythmia or even heart arrest). Therapy of general reactions to anesthetics should be carried out according to general rules of reanimation, which every physician should be familiar with. Relatively frequent reaction, which sometimes occurs even before an anesthetic is applied, is fainting (peripheral collapse). It results from a sudden failure of blood circulation into the brain, caused by a decrease of the peripheral resistance of blood vessels due to vasodilatation. Numerous other factors play a role here, such as mental stress, fear from a treatment, hypotonicity and hypoglycemia caused by hunger, lack of sleep or fatigue. A patient turns pale, gets nausea and loses his/her consciousness temporarily. These states can usually be managed without a medication. A doctor should keep talking to a patient and try to calm him/her down. A deep leaning over, with head close to the knees sometimes works well, due to pressing of the splanchnic area together with a low position of the head which increases blood circulation of the brain tissues. In all cases, a patient's clothing should be released and fresh air should be supplied. A patient may as well be laid at the dentist's chair, with his/her legs raised.

General anesthesia is indicated for large surgeries at the oro-facial area that are performed in the form of the inpatient care. A short-term intravenous general anesthesia is used in the ambulatory praxis (Sombrevin) for non-cooperating patients (children, neurotic patients, mentally affected individuals). It requires a patient's general preoperative examination, ensuring his/her escorting and a home care at the day of a surgery.
Analgesia deadens sensing of painful stimuli while maintaining a patient's full consciousness. Various forms, such as pharmacological, hypnotic or reflexive (acupuncture or transcutaneous electroneurostimulation - TENS) are used.

8.3 Complications of Teeth Extractions

Complications during an extraction.

Even a simple extraction may get complicated for various reasons. Among these reasons there are anatomical influences (retention, a tooth's bent, anomalous number of roots, hypercementosis of roots), uneasiness of a patient, unsatisfactory equipment of a dentist's office etc. The most frequent complications are the following:

a) Breaking of a tooth's crown, breaking an alveolus wall.
b) Luxation or sub-luxation of an adjacent tooth.
c) Opening of the maxillar sinus during extractions of premolars or molars in the upper jaw.
d) Injury of the mandibular nerve during difficult extractions of deeply positioned lower molars, eventually breaking the lower jawbone.

Breakage of an extracted tooth is quite common complication that requires finishing the extraction by surgical means. A surgical extraction starts by cutting the mucosa and the periosteum, and continues by forming so called mucoperiosteal flap. A cortical part covering the broken tooth's root is removed by bone surgery instruments (chisel, hammer, milling cutter). The root is pulled up by extraction levers and after trimming the bone wound, edges of the mucosa are joined by a stitch.

Complications after an extraction.

Impaired healing of an extraction wound. Under physiological conditions, healing of an extraction wound is made by formation of a blood clot that fills an alveolus after a tooth has been pulled out. The coagulum changes into a granulating tissue that becomes ligamentous tissue in 3 to 4 weeks. Complete healing of a bone tissue takes around six months or more. This healing process may be hampered by absence of a blood clot at hemocoagulation disorders, or by washing off a coagulum during extensive mouth rinsing after an extraction, or by infection of a coagulum followed by its decay. This leads to the post-extraction syndrome , causing prolonged healing of an extraction wound. This syndrome has two forms:

Alveolitis sicca (dry socket) is caused by traumatization of tissues after a difficult extraction or by a tissue ischemia after the use of excessive amounts of an anesthetic. A sharp pain which shoots to temples, ears and cheeks, occurs the second or third day after an extraction. The alveolar socket is covered with a gray coat and its surroundings are red and painful.

Alveolitis purulenta (purulent alveolitis) is caused by infection and subsequent decay of a blood coagulum. It is characterized by a large general alteration, fevers, foetor ex ore and reaction of local lymph nodes. Therapy of an alveolitis tries to restore the physiological filling of the tooth's bed by a blood clot after former wound excochleation. Rinsing the alveolus with solutions of a disinfectant (1‰ Rivanol) are used. For local therapy, drugs with analgesic effects (Pharodoran, Apernyl) or physical therapy (Solux lamp) are used. Currently, a biostimulating and analgesic effects of a laser have been used successfully. For general therapy, analgesic and antipyretic medications are administered. Antibiotics should be used only if there is a danger of spreading the alveolitis further (a possibility of osteomyelitis or jaws inflammation).

Bleeding after an extraction.

Bleeding from an extraction wound stops in 5-10 minutes under physiological conditions and the wound gets filled with a blood coagulum. Prolonged bleeding may be caused by local or general factors:

Local causes of bleeding can be numerous. It may be a granulous tissue inside en extraction wound, a root or its fragment after an unfinished extraction, foreign objects (pieces of metal fillings) in a wound, bruised mucous edges. Bleeding can also be provoked by irritation of the wound's edges by tongue, excessive rinsing or sucking. More serious bleeding may occur in cases of angioma in the oral cavity or by damaging blood vessel branches by cutting, e.g. during incision of abscesses.

General causes of bleeding. Heavy bleeding may appear at patient with hypertension, respiratory tract diseases with a fever, when a permeability of blood vessel walls is increased due to infection. Diabetic angiopathies cause heavy bleeding at patients with diabetes. Menstruation tends to increase bleeding, so surgeries are not usually planned for this period. Bleeding disorders (coagulopathias such as hemophilia A, B, thrombopathia and purpuras of blood vessel types), anticoagulation therapy at patients after myocardial infarction, heart surgeries and thromboembolic diseases, belong to severe causes of post-extraction bleeding. As one can see from the above listed causes of post-extraction bleeding, a detailed anamnesis before a surgery itself is very important. In cases of general illnesses, a specialist's opinion and recommended preparation of a patient are required. Bleeding

disorders are an indication for a surgery in the inpatient care. In case an unexpected bleeding of unclear origin occurs after an extraction, a local wound dressing has to be made. It should start with a local anesthesia that enables for good overview of a bleeding wound and its painless revision. Remains of a granulous tissue, fragments of teeth and other foreign objects are removed from the alveolar socket by excochleation and bruised edges of a wound should be trimmed (the wound toilet). Sharp edges of the alveolus should be smoothened by a milling cutter providing a good cooling is ensured. Mucous margins are brought together by a stitch (“mattress stitch”). An absorbable hemo-styptic drug Traumacel in the powder form (Traumacel P) or dental suppositories have been used with good results. If bleeding does not stop upon this treatment, it is necessary to identify its cause and hospitalize a patient at a specialized department.

8.2 Diseases of the Mandibular Joint

The mandibular joint is a complicated structure of the oro-facial area and that is why diagnostics and therapy of its diseases are difficult. Several factors with potentially additive effects play a role at the origin of problems. Causes of joint difficulties are occasional or chronic traumas, recurring luxations, lowering of the vertical mutual position of jaws, psychogenic factors resulting in bruxism (grinding and clenching of the teeth) and muscular spasms, infectious diseases (acute rheumatic disease), degenerative processes (osteoarthritis), congenital disorders (joint head hyperplasia) and others. Among the clinical manifestations, the pain (arthralgia) at the mandibular joint area is on the first place. It is mostly localized directly inside the joint, it is either one-sided or double-sided and increases upon its function. Sometimes the pain gets transferred into a temple, ear or lower jaw. The joint sound effects - cracking and screeching during its movements - are very disturbing. These sounds can be often heard at a close distance from a patient. Another sign is a restricted mobility of the joint, associated with muscular spasms and tenderness of some of the chewing muscles (especially pterygoid muscles). This painful tension of chewing muscles is mostly felt by patients in the morning after waking up and it gradually decreases later during a day. If one observes a slow mouth opening movement at these patients, deviation from the center or S-like movement of the lower jaw can be noticed. Clinical examination should be completed by an X-ray exam of the mandibular joint. The described symptoms are typical for the syndrome of mandibular joint dysfunction and pain. This syndrome occurs preferably at young age (between 20 and 40 years), more often at women. A characteristic feature for its identification is a negative X-ray finding at bone structures of the mandibular joint. Therapy of the above problems is tedious and needs a patience. The basis of therapy is adjustment of articulation and occlusal malfunctions by an occlusion splint made of resin and 3-6 mm thick. After the difficulties diminish, the increase in height of the occlusion can be maintained by prosthetic treatment. Supplemental therapy includes symptomatic influencing of particular problems. It includes ionophoresis with Mesocain,

Solux lamp, diadynamic currents, 1% Mesocaine shots in the area around the mandibular joint, transcutaneous neurostimulation (Analgonik).

Acute inflammations (arthritis) that appear during an acute rheumatic disease, general infectious diseases or by transfer of infection from adjacent areas undergo therapy according to general rules with use of antibiotics, analgesic and antiphlogistic drugs. A temporary immobilization of jaws is made with the aim of reducing pain at the time of movements. A puncture of the joint exudate is less common.

Osteoarthritis of the mandibular joint is a degenerative disease, even though it may originate from chronic traumatization of the joint structures at habitual or recurring luxations. Besides the corticoid therapy (Kenalog), a surgical extirpation of a threaded joint meniscus or the condylar process is performed in some cases.

8.5 Contracture of Jaw Muscles

At the maximum mouth opening, the distance between incisal edges of the middle incisor teeth should be about 3.5 to 4 cm. This distance varies individually, although if a patient cannot open his/her mouth to the distance of at least 3 cm, it can be felt as an unpleasant functional restriction. A restricted ability of the lower jaw to move is designated as contracture which has several forms:

Inflammatory contracture has its origin at an inflammation around the mandibular elevators (mainly the m. pterygoideus medialis).

Muscular contracture appears by damage of the above mentioned muscle during mandibular anesthesia.

Arthrogenous contracture is caused by inflammations of the mandibular joint or by a chronic traumatization of the joint at occlusion defects.

Fibrous contracture is determined by fibrous changes at the mandibular joint area after traumas or burns.

Neurogenic contracture (trismus) appears at tetanus.

Therapy of restricted mouth opening should focus on elimination of underlying causes. In cases of an inflammation at the mandibular joint area, a temporary loose immobilization of jaws by a wire bonding has its place,

besides the anti-inflammatory therapy. At other kinds of contractures, physical therapy (red Solux lamp), active and passive exercises and laser therapy are often used. Fibrous contractures need to be released surgically in some cases.

A total immobility of the mandibular joint is called ankylosis. It is a coalescence of the lower jaw articular process with the temporal bone. Its cause is usually the mandibular joint purulent inflammation associated with otitis or osteomyelitis during childhood, or an intra-articular fracture or contusion with the joint hematoma. It results at a significant restriction of mobility of the mandible. A diagnosis is confirmed by an X-ray examination at Schüller's projection, or a computer tomography examination. Ankylosis is treated surgically - arthro-plastic surgery - that includes cutting out the bone bridge followed by insertion of other material (fascia, cartilage) into the neo-formed glenoid.

8.6 Inflammations Around the Jaws

Inflammatory illnesses of the oro-facial area are very common. They can be divided into two groups:

1. Non-specific inflammations that are caused by a bacterial flora inhabiting and growing saprophytically inside the oral cavity under aerobic or anaerobic conditions.
2. Specific inflammations, caused by a particular infectious agent, such as actinomycosis, tuberculosis and lues.

Non-specific inflammations are mostly of an odontogenous origin. They arise from an acutely exacerbating chronic periodontitis that appears during dentitio difficilis of the lower third molar as a result of an infected alveolar socket after an extraction. Other causes include infected dental cysts, penetrating injuries, skin inflammation (furuncles), periodontal cysts, inflammation of salivary glands or lymphatic nodes. An inflammation has usually a course of an interstitial process; either a delineated abscess or diffusely spreading phlegmona originates depending on a causative bacterial agent's virulence and an organism's immunity. An inflammation spreads per continuitatem at

different rates through the bone tissues at the root's tip underneath the periosteum (sub-periosteal abscess) and further into submucous tissues (parulis). At better cases, the abscess fluid gets emptied through the alveolar ridge mucosa to the mouth vestibule or by the oral way, thus creating an inner draining fistula. At more serious cases, the infection spreads by pre-formed paths, along muscles, their attachments and fasciae in such manner that it affects areas around the jaws. Inflammations around the jaws occur, affecting usually more than one area. Inflammatory processes diagnostics should focus on both overall and local signs that indicate harms of a particular area around the jaws. General signs include the rate of onset of problems, fever, the shivers and previous treatment. Of local signs, one should register swelling, palpation sensitivity of an affected region, skin color, fluctuation, chewing muscles contracture. During inflammations that originate at the upper jaw, a large swelling of eye lids and cheeks occurs, however the extent of swelling does not have to be related to an inflammation severity. Inflammations that take place around the lower jaw, a progressing contracture of chewing muscles and difficulties during swallowing occur, as well as submandibular infiltrate and swelling which move towards the neck area.

Therapy of these inflammatory processes is surgical only. It is based on draining a puss from the abscess cavity by a wide enough intra-oral or extra-oral incision. A purulent exudate is collected into a sterile sample tube for microbiological examinations and determination of a bacterial flora's sensitivity to antibiotics. A wound is then drained by a sufficiently long rubber or plastic drain, flat or tubular. The aim of drainage is enabling the purulent exudate to flow out freely and prevention of reconnection of wound edges. After an acute inflammation phase diminishes, extraction of the causative tooth is performed. Extraction can be also done during an abscess incision, under an antibiotic screen.

According to anatomical localization, inflammations around the jaws can be divided into the following groups:

1. Retro-maxillar abscess. An infection penetrates the retro-maxillar space from gangrenous upper molars, infected cysts, sometimes by infection of a hematoma after an injection anesthesia at tuber maxillae (puncture of plexus venosus pterygoideus).

2. Abscess of the pterygo-palatal, infratemporal or temporal regions. Originates by broadening of a retro-maxillar abscess into its surroundings. Besides a high fever of septic character and changes of a patient's general condition, infiltration of the temporal area, swelling both above and below the zygomatic arch, orbital signs (edema of eye lids, protrusion of eyeballs), and contracture occur. There is a para-pharyngeal swelling and redness inside the oral cavity.
3. Submental and submandibular abscess. These inflammations are mainly caused by gangrenous teeth of the lower arch: the frontal teeth in case of a submental abscess, molars in case of a submandibular abscess. Clinical picture shows primarily an increasing swelling of submental or submandibular areas, reddish and warm skin. Fevers and difficulties during swallowing occur, even contracture of chewing muscles. The submandibular area has a fundamental importance for surgical therapy of inflammations around the jaws, since from there it is possible to drain all regions around the mandible, including the para-pharyngeal space, after an external incision.
4. Pterygomandibular and para-pharyngeal abscess. These inflammations are often caused by difficult eruption of the third lower molar. A contracture, high fevers, overall condition changes, difficulties to swallow are common signs. Expansion of a para-pharyngeal abscess into the mediastinum and formation of purulent mediastinitis is a very serious condition and despite combined surgical and antibiotic therapy, it may be lethal.
5. Abscesses of the tongue and sub-lingual region. These abscesses originate mainly after injuring the tongue by biting or by a foreign object. They can be found on the surface under the mucosa, or interstitially at the tongue's base. A sub-lingual abscess can be a result of gangrenous molars or premolars whose roots are positioned at the level of the attachment m. mylohyoideus. Infection may as well be transferred from the submandibular areas. The tongue's movements are restricted, speech is altered, swallowing and mouth opening are painful and restrained.

Specific inflammations. These are chronic inflammations caused by a specific etiologic agent, accompanied by formation of granulous tissue (actinomycoma, tubercle, gumma). They should be considered if an acute inflammation process does not recede after a treatment and changes into a chronic state. This is true especially in case of actinomycosis whose cervico-facial form is far more frequent than abdominal and pulmonary forms. The cause of the disease is the anaerobic Actinomyces israeli or Nocardia asteroides that inhabit the oral cavity of healthy people. The clinical picture is dominated by a tough, inflammatory infiltrate at an affected area, abscesses and external fistulas are formed, from which leaks a thin purulent exudate with yellowish druses of actinomycetes. In addition to surgeries, therapy also includes high doses of penicillin (mega-doses). Tuberculosis of the oral mucosa may appear at patients suffering from the open form of lung tuberculosis. Upon a microscopic examination, the subepithelial connective tissue contains epithelial nodes with multi-nuclear cells of Langhans type. Manifestations of syphilis at the oral cavity can be found during all three phases of the disease. A specific granulomatous inflammation (gumma) is a sign of the third stage of the disease which affects mainly the nose septum, palate and tongue. Therapy is conducted by specialists - a phthisiologist or a venereologist.

8.7 Osteitis and Osteomyelitis of the Jawbones

Although there is a little difference between these two forms of the bony tissue inflammations from the pathological anatomy point of view, for the clinical classification the term osteitis means a localized, delineated inflammation of bone, while the term osteomyelitis (inflammation of the bone marrow) is used to describe a diffuse extension of an inflammatory process to a large extent.

Osteitis originates by transfer of infection from a gangrenous tooth root into a bony tissue around the tooth apex, after an extraction or an alveolar socket inflammation. Clinical signs are identical to those of an acute periostitis or subperiosteal abscess of the alveolar ridge. It is a painful disease, alveolar

mucosa around the affected tooth is swollen, a purulent discharge appears and an internal fistula is formed.

Osteomyelitis of the upper jaw is usually restricted to the alveolar ridge and its course is similar to an extensive osteitis. It is accompanied by high fevers with shivering, pronounced edema of cheeks, upper lip and lower eye lids. The danger of this disease lies at a possibility of the inflammation transfer to veins of the face and possible infection of orbits and intracranial infection of sinus cavernosus.

Osteomyelitis of the lower jaw affects adults more often than osteomyelitis of the upper jaw. An acute inflammation extends rapidly into surrounding soft tissues. High fevers with shivering, teeth loosening at an affected area and puss discharge from alveolar sockets. A diagnosis is confirmed by hypesthesia or anesthesia of the lower lip (Vincent's sign). An X-ray examination of the lower jaw does not show any significant changes during the early stage (up to 10 days). Only after this period, an irregular dense and light areas of the bony tissue (spotted bone) and a gradual necrotization of bone together with sequestra appear. Therapy includes a combination of surgeries (incision of abscesses, sequestrectomy) and high doses of antibiotics (Lincomycin). An immobilization of jaws is employed in cases of large damage of a jaw in order to prevent a pathological fracture.

Osteomyelitis of child's age.

This disease has usually odontogenous causes (streptococcal or staphylococcal infections). Hematogenous infections or general infectious diseases are other etiological factors. Serious complications of this disease are disorders of jaws development that can result from an inflammatory process near the growth centers. Lateral deviation of jaws, microgenia, pseudoprogenia or ankylosis of the mandibular joint can occur. Osteomyelitis of either upper or lower jawbone at infants can be caused by a tooth's germ, infected by injured oral mucosa or by a hematogenous way. During this very serious disease, a child suffers from high fevers and refuses food. If a therapy is not started on time, the disease could be lethal in several days.

Inflammations around the jaws belong to serious stomatologic diseases. They are treated preferentially by a surgery supported by a

targeted antibiotic therapy. Prevention of these diseases is based on regular and specialized stomatological examinations and treatment.

9. Diseases of Salivary Glands

9.1 Salivary Glands Functions

Salivary glands of the oral cavity are the large paired salivary glands (parotid glands, submandibular glands, and sublingual glands) and small non-paired salivary glands, scattered at the submucosal connective tissue. According to their location, they are designated as lip, cheek, palatal, lingual and gum glands. The product of salivary glands is saliva which has numerous functions, such as:

a) ensuring a moist and smooth surface of the oral mucosa, thus enabling transport of masticated food from the mouth to the digestive tract through the esophagus,
b) saliva is the primary digestive fluid which activates digestion of starches by the enzyme amylase,
c) participates on neutralization of acidic environment in the mouth,
d) takes part in maintaining an integrity of the oral mucosa by producing glycoproteins and mucoids that reduce penetration of irritant substances from food, drinks, tobacco smoke etc.

Under physiological conditions, a man produces about 1.5 liters of saliva in 24 hours. This secretion is made by the parotid glands by 26% (serous saliva), submandibular glands by 69% (sero-mucinous saliva), and the sublingual salivary gland by roughly 5%. Salivation is controlled by vegetative nerves in such manner that parasympathetic neurons induce secretion of rather thin serous saliva, in contrary to the sympathetic neurons which induce production of viscous, mucinous salivation. The vegetative neurons come to salivary gland either along blood supply vessels (especially sympathetic nerves), or by means of large nerve fibers (for instance in case of gl. parotis by means of n. auriculotemporalis).

9.2 Examinations of Sialopathies

A diagnosis of sialopathies is based on a meaningful combination of data obtained from a patient's anamnesis and clinical examinations of a salivary

gland by palpation and aspection. X-ray examination of the salivary glands area helps in diagnostics of sialolithiasis (a simple X-ray picture, e.g. at occlusal projection onto the mouth base).

Examination by sialography that uses injection of an X-ray contrast substance (Lipiodol Ultrafluid) into salivary gland ducts, shows not only changes at the ducts (obstructions of filling), but also parenchymatous modifications (e.g. in cases of chronic inflammatory states or tumors). It also informs about the functional ability of a salivary gland to extrude a contrast filling under 60 minutes.

For diagnostics of salivary glands tumors it is possible to utilize a resolution power of the computer tomography (CT), radiometric examination (scintigraphy by technetium Tc 99m), ultrasonography, thermography (contact crystal or infrared thermography).

In cases of suspect tumorous lesions, a puncture biopsy or per-operational histological examination of cryosections is performed. Sialometry (the Škach's method) provides objective data on salivary secretion and helps to distinguish hypo-, normo- and hyper-salivation. The lower limit of a normal, physiological secretion of saliva is 10 ml in 30 minutes.

9.3 Inflammations of Salivary Glands

Inflammations of salivary glands can be either primary, during whose the first disease modification is the inflammation of a salivary gland's parenchyma; or secondary, where an inflammation is caused by a pathological process inside the gland's duct or its surroundings. Among the latter, there are concretions of gland ducts, post-inflammatory strictures of ducts or obturation of ducts by a tumorous process. All these ailments result in decreasing the rate of secretion and flow of the saliva including a possibility of an ascendant gland's infection. In cases of general infectious diseases, a salivary gland may become descendably infected by hematogenous or lymphogenous ways. Penetrating injuries of salivary glands or their neighboring areas can also cause their direct infection. Bacterial, viral and mycological infections, as well as aseptic inflammations play a role at the etiology of sialadenitis.

The major signs of salivary glands inflammations are swelling of a corresponding area, red and sometimes also stretched skin. Retention of saliva, pressure of an exudate and irritation of sensitive nerves by toxic products of microorganisms cause pain. A sharp, very intense pain that shoots into the teeth and tongue (salivary colic) is a result of sialolithiasis caused by a sudden duct's entanglement and closure by a stone. Chronic inflammations of salivary glands cause less severe pain which can be induced by a deep palpation. An important diagnostic feature of salivary glands inflammations is redness of duct's opening, absence of saliva production even after massaging, or milky colored saliva containing flakes of puss.

Inflammation of the parotid gland (Parotitis acuta or p. chronica). The inflammation is characteristic by swelling of the parotido-masseteric region in front of the ear, below and behind it, and by a typical elevation of the ear lobe. Swelling may be rigid, together with redness of skin, sometimes the skin is stretched and glossy. At the purulent form (parotitis purulenta), except parotids of infants, a fluctuation is not palpable since the parotid gland has a thick fibrous capsule. Both spontaneous and palpational pain is present, the Stenton's duct opening is reddish, saliva is cloudy or purulent, its secretion is reduced or absent.

Therapy is based on administration of broad-range antibiotics and analgesic medications. Purulent forms are treated by the extra-oral incision and wide opening of the gland's fibrous capsule followed by drainage.

Parotitis epidemica (mumps) although affecting mainly children of pre-school and school age, can appear at adults, too. The causative agent of the disease is Paramyxovirus parotitidis. The incubation period is 21 days. Swelling occurs at one side first and in about 60% of cases extends to the other side. It slowly diminishes after 2-3 days. Overall problems do not have to be too serious, fever lasts several days and may reach 38-39^{o}C. Salivation is reduced and a patient has difficulties with opening the mouth. The disease induces a lifelong immunity. A substantial diagnostic tool is positive serological reaction with the V-antigen. Amylase concentrations are elevated in blood and urine. At adults the disease may be accompanied by complications, such as meningoencephalitis, pancreatitis, orchitis or mastitis, with permanent consequences (malfunctions). The disease is subject to

mandatory reporting. It requires isolation of a patient and rest at home. Therapy is symptomatic and uses analgesic drugs and application of wet compressions. A sufficient supply of liquids and oral hygiene are other major parts of a therapy regimen. An inpatient care is required only if complications occur.

Recurrent child's parotitis (morbus Payen) is a microbial infection of the salivary gland which appears at children several times a year. Antibiotics are used for therapy; in cases of repeated inflammations and a large damage of the gland's parenchyma, the gland's function elimination can be indicated by tying off the duct. The disease has a typical sialographic picture.

Parotitis of newborns (parotitis neonatorum) can occur already few hours after the birth after infection of mixed microbial flora. It represents a serious purulent inflammation of the gland that originates by a hematogenous way, characteristic by early fluctuation (in contrast to adults disease). Therapy is surgical and radical in order to prevent spreading the disease to the mandibular joint (and jaws deformation by damages of the growth center).

Parotitis postoperativa (postanesthetica) is an inflammation of the ascendant origin that appears at dehydrated, hypovolaemic or decrepit patients as a result of reduced salivation or bad oral hygiene. It may complicate serious abdominal or gynecologic surgeries and neurosurgeries. Its origin is facilitated by metabolic disorders. Therapy is based on administration of broad-spectrum antibiotics, supplying a patient with liquids, eventually a surgery (incision) in case of purulent forms. Prevention by consistent pre-operative preparation and good oral hygiene are important.

Odontogenous inflammation of the parotid gland (parotitis odontogenes) is a rare complication of inflammation around the jaws, it appears per continuitatem and it is extremely painful. After an incision, a malodorous pus comes out, similarly as in cases of odontogenous abscesses.

Sialadenitis submandibularis is a microbial inflammation originating ascendentally at sialolithiasis. It is manifested by swelling of the submandibular area and a reddish and stretched skin. A characteristic swelling of the mouth base mucosa around the Wharton's duct opening and reduced production of saliva upon massaging are important for diagnostic differentiation of this disease from a submandibular lymphonoditis appearing

at acute inflammations around the jaws. There are no X-ray findings on the lower jaw's teeth roots. Therapy is directed towards removal of a sialolith, after which the pathological condition disappears.

Sialoadenitis sublingualis (acuta) appears during purulent processes at the mouth floor. Plica sublingualis is swollen, the mucosa is reddish. The condition is relieved after inflammatory changes inside the mouth are eliminated.

Acute inflammation of tiny salivary glands appears rarely as a single disease. A chronic inflammation may affect the lower lip glands - cheilitis glandularis simplex (morbus Puente Acevedo), or cheilitis suppurativa superficialis (Volkmann's disease). The lower lip is swollen and its mucosa contains small papulae with grayish tips - gland ducts. Cryotherapy is used with success in treatment of this disease.

Specific inflammations of the salivary glands.

Tuberculosis affects the parotid glands more often (70%), than the submandibular glands (27%). An infection passes into the gland via hematogenous or lymphogenous ways. This disease occurs both in the disseminated (infiltrative) and delimited (nodular) forms. The latter form is characterized by formation of delimited lymphomas that can be found by palpation at various parts of the salivary gland. Reduction in saliva secretion may lead to a secondary gland super-infection of an ascendant origin, which obscures a diagnosis. Therapy lies in curing the basic tuberculosis disease.

Syphilis (lues) may affect salivary gland at its 2nd stage causing diffuse swelling at both sides, or at its 3rd stage when a single-sided gumma may occur in addition to double-sided damage of a salivary gland by infiltration. Diagnosis is confirmed serologically and finding of Treponema pallidum in saliva, at some cases. Therapy focuses on treatment of the basic illness. The disease is relatively rare, however, due to current increase of newly reported cases it is necessary to take into account also the luetic damage of salivary glands.

Actinomycosis affects preferably the parotid salivary gland either primarily or secondary (by penetration from adjacent areas in case of cervico-facial actinomycosis). Diagnosis is supported by finding of a rigid, slab-like infiltrate at the parotido-massetheric region, accompanied by formation of numerous

fistulas, from which a pus containing yellowish druses of actinomycetes flows out. Therapy is based on a combined antibiotic and surgical treatments, similar to those used for therapy of specific inflammations of the oro-facial region.

9.4 Sialoses

Sialoses are a group of diseases characterized by recurring or chronic swelling of large salivary glands (especially the parotid gland - parotidomegaly). Chronic changes affect also small lip glands in about 80% of cases. Sialoses can be divided according to their etiology into the following types:

sialoses of mostly allergic origin (Sjögren-Gougerot-Houwers' syndrome, Mikulicz's disease, Mikulicz's syndrome, Heerford's syndrome),

sialoses of a hormonal origin (swelling of salivary glands during diabetes mellitus - Charvát's sign)

neurogenous sialoses (originating from a damage to n. auriculotemporalis during an injury of the parotid gland or after parotitis abscedens)

deficiency sialoses (after a long-term vitamin deficiency during a starvation, so called Terezin sign, Kwashiorkor's syndrome).

A histological picture is characterized by atrophy of the gland's acini and huge lymphocytic infiltrates. Upon reduction of the functional parenchyma of a salivary gland, secretion of saliva is lowered (hyposialia or even xerostomia) which allows for an ascendental infection of the gland. Sialoses are marked by a chronic course, local and overall signs and a typical sialographic findings.

Sjögren's syndrome is marked by various extents of hyposialia as well as reduction of secretion of lacrimal glands and nasal mucosa glands, decreased secretion of synovial fluid, and glands of the alimentary tract mucosa. Patients report dry mouth, difficulties to swallow, pain in joints, digestion problems and dry conjunctivas. Etiology emphasizes an immunopathological origin and hormonal imbalance, since this disease appears at women during a menopause. Therapy is symptomatic and not very successful due to chronic nature and progression of the disorder. Salivary secretion is enhanced by application of pilocarpine and syntostigmine. Lacrysin (methylcellulose) eye

drops are recommended at a dry conjunctivitis. It is also recommended to drink the “Karlovarský Mlýnský pramen” mineral water, half a liter a day or more.

Mikulicz’s disease is manifested, similarly as the above described condition, by gradual swelling of the parotid, submaxillar and small salivary glands, and also enlargement of lacrimal glands. The swelling is semi-rigid, not painful, and can extend into a large size. Histological finding shows primarily lymphocytic infiltration and formation of follicles (the benign lymphocytic lymphoma). If the salivary secretion is reduced, the disease may get complicated by an ascendant inflammation of a salivary gland. Therapy by an X-ray irradiation or ligation of a salivary gland ducts show positive results.

Mikulicz’s syndrome has the same clinical picture as the above disease, but the etiology is known. The causes of swelling of salivary or lacrimal glands may be lymphatic system disorders, such as lymphatic leukemia, lymphogranuloma, lymphosarcoma, benign lymphogranuloma, tuberculosis or metastases of a carcinoma.

Heerford’s syndrome is characterized by a non-painful swelling of the parotids, affliction of the uveal tract (uveitis, iridocyclitis), sometimes fevers (febris uveoparotidea) and paralysis of the facial nerve. The disease has a good prognosis. Therapy should be conducted by an ophthalmologist, since ocular complications may arise (synechia at the uveal tract, glaucoma).

9.5 Sialolithiasis

Sialolithiasis is a disease during which concrements (sialoliths) are formed inside the ducts or parenchyma of salivary glands thus slowing down or disabling flow of saliva. The disease affects the submandibular salivary gland (about 90% of cases) more often than the parotids or sublingual gland. Salivary stones originate from changed mucin of the saliva, by precipitation of salts around a core formed in the duct by a foreign object, cluster of epithelial cells and leukocytes, at the time of salivary glands inflammations. Stones may have rounded or spindled shapes. Clinical manifestations of sialolithiasis are repeated swelling of the gland area which appear especially before a meal when salivation increases and a stone prevents the saliva to pass freely inside

the mouth. The saliva retention may result in an ascendant transfer of infection and occurrence of a secondary sialodenitis.

Upon long-term illnesses and repeated infections, the gland may become fibrously modified (sialodenitis fibroproductiva). Sialolithiasis therapy is surgical and lies at a salivary stone removal from the duct after discission of its wall. If a stone is positioned intra-parenchymatously at the submandibular salivary gland, an extirpation of the whole gland from the extra-oral side is indicated.

9.6 Tumors of Salivary Glands

Salivary gland tumors may appear at any age, however, they occur mainly during the fourth to sixth decennium. Clinical manifestations include a slow, non-painful growth and gradual deformations of the face. Tumors can be found most often in the parotid gland (90%), submandibular gland (about 9%) and rarely in the sublingual salivary gland or small salivary glands.

Classification of salivary glands tumors

1. Epithelial tumors
    - a) Adenomas
        - i) Pleomorphic adenoma
        - ii) Monomorphic adenoma
            - a) Adenolymphoma
            - b) Oxyphil adenoma
            - c) Other types
    - b) Mucoepidermoid tumor
    - c) Acinocellular tumor
    - d) Carcinomas
        - i) Adenoid cystic carcinoma
        - ii) Adenocarcinoma
        - iii) Epidermoid carcinoma
        - iv) Non-differentiated carcinoma
        - v) Carcinom in the pleomorphic adenoma
2. Non-epithelial tumors
3. Non-classified tumors

4. Tumor-like states
    i) Benign lymphoepithelial lesion
    ii) Sialoses
    iii) Oncocytoses

According to the old classification, tumors can be divided into the following classes:

A. Sialomas: true tumors that originate from epithelial cells of acini or ducts. Here belong all types of adenomas, mucoepidermoid and acinocellular tumors and carcinomas.
B. Synsialomas: originate from the salivary glands interstitial tissue. This class includes non-epithelial and some of non-classified tumors.
C. Parasialomas: all types of tumors of epithelial and mesenchymal types that grow in the proximity of salivary glands.

Therapy for salivary gland tumors is mainly surgical in cases of benign neoplasms. In cases of malignant tumors, a combined therapy including surgery, radiotherapy and chemotherapy is indicated. The submandibular salivary gland containing a tumor is extirpated as a whole. The extent of a surgery at the parotid gland is determined by a pre-operational histological examination. The surgery includes either partial or total parotidectomy, while the maximum effort is paid to preserving the facial nerve. A diagnostic excision of a tumor for pre-operational examinations is not recommended in cases of salivary gland tumors due to possibility of a tumor dispersal.

9.7 Cysts of Salivary Glands

Retention cysts of salivary glands originate from widening of a duct either inside a gland or outside of it. The cause may be a post-inflammatory or after-injury stricture that gradually closes a gland's duct. Saliva accumulates before a barrier and widens the duct by pressure (ductocele). Among retention cysts of the sublingual salivary gland, there is ranula, a cyst that appears on the floor of the mouth on the side of the tongue frenulum. It can grow into a size that obstructs the tongue's movements. In some cases it

may break open and get emptied spontaneously. This cyst often reappears if it was not removed surgically.

Retention cysts of small mucinous glands (mucocele) appear on the mucosa of the lower lip, cheeks, palate or tongue. These cysts on the lower lip of children can be traumatized by biting, causing them to break open. If even a small amount of mucinous saliva penetrates the lower lip tissue, a painful inflammation occurs - mucophagous granuloma.

Cystic widening of the parotid gland Stenon's duct or Wharton's duct of the submandibular gland appear scarcely, called ductocele and sialodochocele, respectively. It is presumed that these cysts are caused by an inborn atony of a salivary gland duct's wall followed by dilatation. A causative factors include increased pressure inside the mouth of musicians playing brass instruments, or glass blowers.

9.8 Injuries of Salivary Glands

Traumatic injuries of the parotido-masseteric area cause affection of salivary gland more often than it is recorded. These injuries may be of various extent and severity. A frequent injury is bruise - contusion of a parotid gland caused by blunt blows at the gland area. It is manifested by bloody saliva at the Stenon's duct opening only, and gets obscured by other more pronounced signs (pain, swelling, eventually fractures of the lower jawbone).

A gland may get damaged during open injuries of the parotido-massetheric region caused by traffic accidents or gunshot wounds. Injuries of this kind usually interrupt the facial nerve as well, followed by ailment of the mimic muscles function. Salivary fistulas can be formed upon an injury of the gland's parenchyma, which require a surgical correction. The principle of a surgical treatment of the salivary skin fistulas is replacement of a fistula's opening into the oral cavity and its suturing into the buccal mucosa.

10. Traumatology of the Facial Skeleton and the Teeth

Stomatology with all its branches covers a large area of medical sciences. In the field of maxillofacial surgery it deals with a complex area of the facial and oral traumatology. The face is a highly significant bodily part for everyone and correction of its damages restores mechanical functions that regulate physiological processes of breathing, alimentary tract, fonation, sensorial functions, as well as personal appearance which is important for a man's communication with his environment. Efforts should therefore be put into returning life values and happiness to injured patients by means of qualified care.

10.1 Statistical Analysis of Causes of Facial Injuries

Numerous statistical analyses of facial injuries show both causes of these injuries and their locations.

- the majority of injured people are males (86%)
- the majority of patients are between 20 and 29 years old
- the most common causes of isolated injuries of the lower jaw are criminal acts (batteries and fights), more than 40% of cases
- the most common causes of isolated injuries of the middle facial third are traffic accidents (more than 49%)
- the highest injury increase rate of all transportation vehicles was at bicycles (more than 24%)
- the lower jaw gets hurt more frequently than the middle facial third during isolated injuries(2:1)
- poly-traumatic injuries show the opposite ratio, the middle facial third gets injured more frequently
- the lower jawbone's body and angles get broken most often (64%)
- for the middle facial third, the most common is a fracture of the zygomaticomaxillary complex (53%)
- luxation or subluxation affects mostly the teeth of the upper jaw (72%)

- soft tissues of the chin and cheeks get injured most often, followed by tissues of the upper lip and nose.

X-ray examination.

An X-ray examination belongs to the basic methods in diagnostics of fractures. It is employed at all cases. Both extra-oral imaging of the skull and intra-oral images are used to diagnose injuries of jawbones (the alveolar ridge) and the teeth. It is advantageous to use a panoramic imaging and ortho-pantomograms.

Native images of the skull are taken at the basic projections (anteroposterior, lateral and semiaxial) with the aim of clarifying the nature of an injury from more projections, perpendicular if possible.

To elucidate some types of injuries (hydraulic fractures of orbits), tomograms or other special projections onto the temporo-mandibular joint, zygomatic arch, orbits etc. are utilized.

For detailed observation of fracture lines at fractures of the middle third of the face and craniomaxillar fractures, the CT examination under various projections is often used, as well as a special 3D software.

Documentation and administrative activities.

A documentation has to be filed for all cases of injuries using obligatory forms (case history, daily records, the card of an outpatient treatment). Attention has to be paid to confession of a patient or an accompanying person about the causes of injury. It may influence both legal and expert examinations as well as patient's compensation at later times. Injuries caused by other person(s) have to be announced to legal bodies and to health insurance companies. An eventual influence of alcohol should be recorded and the alcohol blood test should be performed upon request of competent organs.

10.2 First Aid During Facial Injuries

The basic goal of the first aid is to save life of an injured person. First aid can be either technical which removes causes of an injury (rescue work, elimination of physical or chemical influences), or medical. The effectiveness

of first aid depends on abilities and equipment of persons who perform it. Delivering the first aid to persons with facial injuries has to follow general rules supplemented with a specific procedure as follows:

- Freeing airways from foreign objects, blood and vomits; placing a person at the stabilized position, i.e. lying at his/her side with the head turned aside, or lying on his/her belly with the head bolstered (prevents choking and aspiration of saliva, blood etc.)
- Bleeding is stopped with a bandage; bleeding from an artery is stopped by pressing the artery against a bone. Tamponing can be used to stop bleeding from nose or open wound..
- Transport of a patient to the nearest medical facility or directly to a specialized clinic.

Injuries of the lower jaw.

The lower jaw with its U-shaped bone is an exposed edge part of the facial skeleton.

The lower jawbone is covered with a compact bone tissue of various thickness. It is the thickest at the chin area outside of the third molars and at the bottom ridge. At the lower part of the jawbone's branch and its body, there is the mandibular canal that appears as a lighter band inside the spongy tissue on X-ray images.

The knowledge about the canal's route and position is important for placement of osteo-synthetic materials. The alveolar ridge is seated on the jawbone's body. The alveolar ridge gets atrophied upon the teeth loss at old age. The mandible is attached to the skull by ligaments and mandibular joints.

Muscles that are attached to the lower jaw play a basic role in shifting pieces of broken bone. A group of depressors attach to the front part of the lower jawbone (m. mylohyoideus, geniohyoideus, genioglossus and the front belly of m. digastricus). These muscles draw the lower jaw downwards and backwards while resting against the hyoid bone positioned opposite to the mandible caudally and dorsally and fixed by draw of muscles downwards.

Pieces of bone are drawn by these muscles generally downwards and to the front.

The group of elevators that attach to the back part of the lower jawbone (m. pterygoideus med., m. masseter, m. temporalis) draw pieces of bone upwards and more to the front.

Blood supply to the lower jawbone is ensured by two systems. The central system stems from a. alveolaris inf., and the peripheral system from the periosteum. Heavy bleeding does not occur during fractures of the lower jawbone.

10.3 Mandibular Fractures

Blunt impacts of moderate intensity cause just bruises and tearing of the periosteum or formation of subperiosteal hematoma. Providing the intensity of a hit does not cause complete interruption of a bone integrity, dislocation of bone fragments does not happen. Resulting defect thus does not affect the whole width of a bone. A fracture with no dislocation of fragments has its fracture line extended clearly along the whole bone's width, no shifting or deformation is apparent on its edges (this has to be evaluated from two perpendicular projections). Breakage is narrow, sharp and has no interspersed fragments. Even during a complete bone interruption at children, parts of the bone may remain entangled and unshifted due to a strong and flexible periosteum which stays unharmed ("green stick" fracture). Fractures with fragments dislocation have their edges visibly shifted, the breakage is widened and often contains a tooth root or a retained tooth. Fragments are mutually shifted to sides - ad latus, in angles - ad axim, the bone may also be extended or shortened.

According to the number of fracture lines, fractures can be divided into single, double, triple and multiple. The breakages character may be either multiple or comminuted. If a bone tissue is lost (such as gunshot wounds), a defective fractures occur.

<u>Mechanism of wounds.</u>

The lower jaw's prominent position makes it a body part exposed to traumas. The most frequent causes of a trauma are direct impacts of objects onto parts

of the lower jaw ridge or body (a hit by fist, kick, moving objects etc.). Other causes include an impact of moving head to a solid obstacle (falling, hitting a steering wheel at road accidents etc.). During impacts onto the chin area or sides of the lower mandibular, an indirect fracture of one or both articular processes occurs by transferring an impact force onto them. Parts of the lower jawbone that have reduced thickness due to deposition of retained teeth (wisdom teeth) or by the length of a canine tooth's root are predisposed locations for fractures.

Classification of the mandibular fractures.

For a practical use, fractures of the lower jaw can be divided into the following classes:

Fractures of the alveolar ridge

Most often, a fracture appears at the front section. There are usually more fracture lines that descend through the teeth sockets vertically, and a horizontal line divides the ridge from the body at the apex area. Dislocation by an impact appears at the direction towards the tongue. Simple reposition is possible under a good anesthesia, however, teeth roots sometimes prevent from placing a bone fragment into its proper position. Affection of the alveolar ridge is often associated with damages of the teeth.

Fractures of the mandible toothed section

At the middle part of the jawbone, fractures usually do not run perfectly vertically along the symphysis, but rather sideways. In cases of double-sided fractures at the canine teeth area, a fragment of the chin may be pulled backwards by tension of the front depressors. Support of the tongue is thus damaged, causing the tongue to get stuck in the throat followed by suffocation.

Lateral fractures result either from a direct impact at a place of its effect or on the other side of the jawbone by transferring its force there. Muscle tension is ultimate for dislocation of fragments. In general, a short fragment is pulled upwards, especially when the dental arch is shortened on the affected side and an interdigitation of antagonists is not present. Lateral fractures use to be double, i.e. on both sides of the jawbone. Although the presence of teeth at

this part of the lower jaw may cause complications (teeth damage or its presence at fracture line), these fractures can be cured easily and successfully by conservative means, i.e. by a firm intermaxillary fixation for 4 weeks.

Fractures behind rows of teeth

At the teethless distal sections (a retained third molar is often placed here), the bone's thickness is reduced and its fracture can occur after hitting with a fist (on the left side after a blow of a right-handed person who stands opposite to a victim). If a fracture line runs below the attachments of the strong masseter which encompasses both fragments, a dislocation is not apparent. However, if pulling upwards prevails and if there is a retained tooth present at the fracture line, surgical treatment including the tooth extraction followed by osteosynthesis, is the only correct way of treatment.

Fractures of mandibular rami are less common. Most often they arise from a direct impact. Dislocation is usually not significant, these fractures do not require surgical treatment, and an intermaxillar fixation is sufficient for healing.

Fractures of the articular process

These indirect fractures appear frequently. The lower jawbone is very thin at its neck area which can be regarded as a kind of protective mechanism. This part prevents by its breakage the joint head from penetration into the middle cranial space. A direct fracture of the joint process can result for instance from a gunshot wound. These fractures can be either extracapsular or intracapsular. A fracture with no significant dislocation should be treated by resting for 3 weeks followed by rehabilitation of the mouth opening. Luxation fractures belong to those rare injuries of the articular process that require surgical repositioning and fixation.

Fractures of the muscular process

These fractures are very rare injuries. If the coronoid process under the zygomatic arch blocks opening of mouth, it should be removed from intra-oral access. No fixation of fractures is required, however, an immediate rehabilitation of mouth opening is necessary.

Fractures of a edentulous or sparsely toothed jawbone

After reposition of fragments, it is not possible to make any immobilization with dental splints or intermaxillar fixation. Fixation with the aid of resin occlusal humps, interconnected inside the mouth and reinforced from the outside by “headstall” bandages, is rather symbolical than functional. For this reason, this kind of fractures is often treated surgically, currently using mini-splints or functionally stabilizing bone splints and screws.

Defective fractures

Are characterized by a bone loss during a gunshot wounding or an explosion. Reconstruction is made by a combined treatment including the transfer of a bone transplant and fixation of the fracture (autotransplants from the illiac crest or a rib).

Symptoms of fractures

Characteristic signs of the lower jawbone fractures are the following:

Pain

Appears in the forms of spontaneous, functional or pressure pain. At the moment of an injury, an affected person feels a blunt or sharp pounding pain. Pain is later sensed during movements of jaws, opening, closing and biting. It is mostly located at the wounded area. In cases of non-dislocated fractures, this pain can be initiated by pulling the jaw forward by a finger hooked in it, thus identification a broken site.

Deformation of the face

Deformation of the lower jaw’s shape can be observed at highly dislocated fractures only. An injured place gets swollen or a subcutaneous hematoma appears shortly after an injury.

Occlusal defects

Impairment of chewing is always present at fractures of the alveolar ridge or teeth - containing parts of the jaw. Teeth do not touch each other (do not articulate) and the food mastication function is hampered. Mouth opening and closing is restricted mainly while jaw’s branches and articular processes are broken. Swallowing function is restrained mostly by pain which may make

difficult even swallowing of the saliva that ooze from the mouth. In cases of bilateral fracture at the canine teeth areas, the tongue gets stuck and breathing problems appear.

Pathological motion and crepitation of fragments

A pathological motion that can be induced upon a patient's examination is a doubtless evidence of a bone fracture. During friction of ragged bone fragments onto each other, it is possible to hear and feel their crepitation under examining fingers.

Therapy of the lower jaw fractures

Conservative therapy

Only absolutely non-dislocated fractures with sufficiently firm entanglement of fragments at their normal anatomical positions do not require any repositioning. Simple fractures of teeth-containing jawbones undergo a single manual reposition into a correct mutual position, after needed anesthesia. A gradual, slow repositioning by pulling with rubber hitches or orthodontic appliances is also feasible. In order to keep the resulting position of fragments, fixation by a dental splint is then used. A dental splint is made of a semiround or flat wire, either directly inside a patient's mouth or indirectly on a dental model. It is necessary to apply a splint to as many firm teeth as possible, to which a splint is attached by wire ligatures (a steel wire 0.4 mm in diameter). A splint provides for fixation of fractures of the alveolar ridge or toothed parts of the jaw body. Sauer's splint is the most commonly used type at present. Cast metal splints are very firm and functionally suitable, as well.

Mono-fixation.

If an applied splint is reinforced by a fast-hardening resin, it may itself provide for sufficient fixation of simple fractures of the body or alveolar ridge.

Intermaxillary fixation.

A firm intermaxillary fixation ensures a necessary rest needed for healing of fractures of jaws. Such rest can be achieved with the aid of dental splints, applied to both jaws and fitted with wire loops or hooking pins that connect them. Opening of the mouth is thus prevented, jaws are fixed together at an

optimal occlusion. This way of fixing possesses a danger of aspiration of blood, vomits or food, however.

Feeding the patients.

During application of fixtures, the food has to be liquid - blended, supplied more often than a regular food, and substituting it sufficiently by its composition and nutritional values. A patient is fed by means of a glass tube or by drinking. Food can be swallowed normally after passing through retromolar spaces, even if a full number of teeth is present. In serious cases, especially at defective fractures of jaws, a patient receives food by a naso-gastric tube inserted through the nasopharynx. An intermaxillary fixation does not allow a patient to speak, it possesses a social handicap and requires a home stay in majority of cases.

Fixation of edentulous jaws by a mono-block.

If jaws are edentulous and dental splints cannot be used, immobilization of fragments is achieved by laboratory made resin blocks, that are interconnected inside the mouth thus forming a mono-block. Fixation has to be supplemented by an outside by “headstall” bandages - a rubber band or an elastic bandage.

Duration of immobilization.

Immobilization of jaw movements in cases of non-complicated fractures of the body, angle, alveolar ridge or ramus should be for 4 weeks (28 days). Fractures of the articular process should be immobilized for 3 weeks. For children, immobilization times shorter by one week are used. Duration of fixation by the dental splint itself should be determined by a fracture location, its nature and course of healing.

Rehabilitation.

After releasing the intermaxillar fixation, it is necessary to reestablish the mouth opening by chewing muscles exercises and movements of the mandibular joint. Heat effects (“Solux” lamp) and various mechanical mouth props are used.

Oral hygiene.
Wire attachments, splints and intermaxillar fixtures hamper self-cleaning abilities of the teeth and gums and urge a patient or medical personnel to do the teeth cleaning 6 to 8 times a day. A toothbrush and toothpaste are used regularly, an irrigation can be used if there is no injury to soft tissues. Patients who are immobilized or unconscious have to have their teeth cleaned chemically (Chlorhexidin).

Surgical therapy.
The aim of current therapy methods is exposing and release of bone fragments, repositioning them followed by fixation at a proper position, performed under a visual control.

Osteosynthesis.
Osteosynthesis means connecting fragments by means of artificial, mostly metal, materials. Connecting elements can be wires, bone splints, screws, clinches and other parts.

Osteo-sutures.
Bone fragments are most often joined together directly by bone wire stitches (a soft steel wire 0.3-0.4 mm in diameter). Stitches can be single, double, cross-like etc. They are inserted into apertures made at bone fragments edges. They should hold these fragments together in a mutual contact (adaptive osteosynthesis). Connection of bone fragments cannot be made firm enough to ensure keeping fragments together without dental splints or intermaxillary fixation.

Rigid osteosynthesis.
Bone splints that are fixed by screws ensure a firm connection so that no other supporting immobilization of jaws by intermaxillary fixation is needed. A danger of aspiration of foreign objects is thus eliminated and allow for suction from airways of unconscious patients or an intubation for general anesthesia, as well as better communication with a patient and good oral hygiene.

A.O. splints.
At the end of the sixties, efforts of Swiss orthopedists and engineers resulted in design of instruments for firm connections of broken bones with help of bone splints and screws fastened into screwed holes with sharp threads. This is the only way of preserving the “live” bony tissue around screws and maintaining a long-term stability of fixation. Splints and screws had been made of austenitic (stainless) steels originally. Today, they are made of almost pure titanium. Splints and screws are absolutely biologically inert for tissues. Due to their massiveness, they had to be removed from an organism after a fracture has healed.

Mono-cortical minisplints and screws.
Attempts to minimize bone splints and screws in use has led the authors to design of the miniplate fixation system (Champy, Pape and others) and to determine the most appropriate placement of splints at different types of the lower jaw fractures. Muscle attachments and draw effects of strong chewing muscles are limiting factors for placement, shape and number of splints. A splint is then fixed to a bone with screws, anchored in the compact tissue. Also these splints and screws are removed after a bone heals (4-5 months).

Other means of osteosynthesis.
If a fracture line slit runs oblique, e.g. at the body of a edentulous jaw, it is possible to perform osteosynthesis by a wire sleeve (circlage). It is also possible to connect fragments by a clinch or a nail (Kirschner’s wire) whose one end sticks out from the skin during healing period and facilitates its removal.

10.4 Luxation of the Lower Jaw

The mandibular joint facilitates complex movements of the lower jaw. It consists of the lower and upper parts, divided by the articular disc (discus articularis). The pit is located at fossa mandibularis near divergence of processus zygomaticus ossis temporalis. The head is a part of processus articularis of the lower jawbone. A ligamentous cartilage equilibrates

incongruence of the joint surfaces which are covered with a cartilage as well. During the initial phase of mouth opening process, the head turns at the lower part of the joint at the disc pit; then during a continuing movement of the jaw the head shifts together with the disc to the upper part of the joint - from fossa mandibularis along the planum tuberculum forward to tuberculum articulare - which makes a solid obstacle to further movement out of the pit. The articular capsule together with ligaments complete the whole structure of the joint.

Mechanism of luxation.

If the head leaves the pit by shifting in front of tuberculum articulare, the lower jaw luxation appears. Luxation without a bone damage happens at excessive mouth opening (yawning, screaming, cramps, vomiting), or during a forceful passive mouth opening (medical treatments: intubation, insertion of probe etc.). Recurring luxations appear at predisposed individuals (shallow tuberculum, loose articular capsule). Traumatic luxations happen upon forceful effects on the lower jaw's edge (a hit, rarely after falling).

Classification of luxations.

- acute luxations at the ventral direction (with no bone damage)
- recurring luxations at the ventral direction (habitual luxations)
- traumatic central luxations, happen by penetration of the mandibular condyle through damaged glenoid fossa into the middle cranial space (intracranial hemorrhage)
- traumatic luxations at medial or lateral directions (extremely rare, mostly appear as luxation fractures of processus articularis mandibulae)

Manifestations and examination.

The basic sign is a patient's mouth open that cannot be closed. Pain and tension are felt in chewing muscles and the mandibular joint. Saliva may leak from the mouth, since swallowing is difficult. During attempts to close the mouth, a resistance of tight chewing muscles can be felt. An empty pit of the mandibular joint can be felt upon palpation through the auditory canal. X-ray images show the head's position in front of tuberculum articulare.

Therapy for the lower jaw luxations.

Timely repositioning of luxated lower jaw is crucial for a feasibility to use a simple maneuver. Soon, a spasm of chewing muscles causes a very strong resistance that can be surpassed under general anesthesia and after muscular relaxation only.

Repositioning can be commonly made by the Hippocratus grip: fingers of both hands embrace the lower jaw body with thumbs laid on the lower molars. By pushing thumbs downwards, the chewing muscles resistance is overridden and by pushing against the chin by rest of fingers, the head is placed into the fovea.

After a successful repositioning the jaw should be fixed by an external sling bandage or a simple wire intermaxillar bond for several days. A patient has to receive soft foods and be aware of wide mouth opening.

Opening of the mouth is then slowly rehabilitated; a physical therapy or muscular spasmolytics can be used. Recurring or habitual luxations require a surgical treatment that adjusts the joint path and removes obstacles (ablation of tuberculum articulare).

10.5 Injuries of the Middle Third of the Face

The middle third of the face is at its upper part divided from the neurocranial part of the skull by a line that connects both zygomatic-frontal sutures with front-maxillar sutures and naso-frontal sutures. On sides, it is bordered by lines running from the zygomatic-frontal towards the zygomatic-temporal suture and further back to tuber maxillae and pterygoid process of the sphenoid bone. The bottom boundary is formed by the occlusal plane of the upper teeth.

The basic structure of this part of face is body of the upper jaw. The upper jaw together with the hard palate span above the oral cavity and form the bottom of nasal and orbital cavities. Similar to the lower jaw that determines shapes of chin and lower lip, the upper jaw influences formation of the mouth, upper lip, nose and position and size of orbits.

Extension of an injury to the skull’s base.

The boundary between the middle and upper thirds of face, formed by the frontal, sphenoid and ethmoid bones that moreover encompass the pneumatic system of secondary nasal sinuses, enables for fractures affecting the middle third to extend to the skull's base (craniomaxillar fractures) with all consequences of such an injury (liquorrhea, infection of brain meninges, pneumo-cephalus etc.).

Fractures of the middle facial third.

Fractures of the middle third of face differ from fractures of the lower jaw. Reasons include both different anatomical layout of this area and composition of bones. The lower jawbone is a movable bone with a thick cortical bone tissue and well developed spongy tissue. Skeleton of the facial middle third is firmly connected to the skull and it is formed by thin bony lamellas reinforced at certain places by bony trabeculae. Except the maxilla and palatal processes of the upper jaw, there is no developed compact bone. At this region, it is very rare to find isolated injuries of particular bones (except the nasal skeleton), more often groups of bony structures (complexes) are damaged, that break up as a whole unit. Fractures are often of a comminuted character. The presence of the nasal cavity and secondary nasal sinuses whose epithelium can easily be damaged during fractures, make all injuries of the facial middle third to be open fractures with a risk of infection. A honeycomb structure of bones of the middle face with its large periosteum make all healing processes to proceed very rapidly. Dislocated fragments may get fixed at wrong positions that makes later reposition difficult. Serious functional and cosmetic malformations appear as a result.

Anatomical notes.

Skeleton of the facial middle third is composed of many bones (the upper maxilla, palatal bone, nasal bones, lachrymal bone, vomer, ethmoidal bone, upper, middle and lower ethmoturbinal conchae, zygomatic bone, sphenoid bone, zygomatic arches). Bones are held together by sutures to form one unit, with bony lamellae closing various cavities. The skeleton of the facial middle third protects important sensorial organs (vision, hearing, olfaction) and it is a place where airways and alimentary tract begin.

Mechanisms of injuries.

The upper jaw is exposed to shocks from the lower jaw during chewing. The upper jaw's teeth absorb shocks from occlusal teeth and distribute them along the skull's base. Pillars that are made by thicker and stronger lamellae at walls of cavities are positioned in such a way to allow for this absorption. The core and hub of pressures at the middle third is the sphenoid bone that transfers shocks and distributes them to all lamellae, processes and cavities. The bone itself participates at formation of walls of all cavities of this facial region. The middle third skeleton is very resistant to forceful hits at direction from the bottom upwards but it is less resistant to hits coming from the front and sides. Majority of fractures are caused by impacts at horizontal direction. A direction and strength of an impact that causes fractures influence character of fractures and dislocation of fragments. A muscle tonus does not play a role. A reason that participates at fragments dislocation is their own weight. In case of the whole middle third breaking off the neurocranium it may drop down and cause breathing problems by airways closure and dislocation backwards at the direction of causative force. The face then obtains a shape of inverted dish or bowl (a dish face). Most frequent causes of injuries are impacts of moving head onto a barrier. An extent and location of injury are determined by the head position (turn) at the moment of impact and the size of area onto which a force acts. With increased kinetic energy of an impact the extent and comminuted character of injuries of bony structures magnify. An impact of a moving object to the face has a similar effect. A force of a hit by fist directed at the nasal or cheek bones areas already causes an extensive destruction of bones.

10.5.1 Classification of Fractures of the Middle Facial Third

At the beginning of the 20th century, anatomist who lived in Paris, René Le Fort described and classified 3 basic types of fractures of the maxilla , based on experimental studies on heads of corpses. As technology progressed and speed of transportation increased, kinetic energy of moving persons or objects become higher. Placement of fracture lines has changed as well.

Despite that, the classical division is still in use and has its own firm place among systems of classification of fractures of the facial middle part.
The facial middle third can be divided into central and lateral (side) parts. The division line goes from the nasofrontal suture along the inner edge of orbit towards the foramen infraorbitale, and towards the connecting point of a zygomatic bone with the maxilla 's body (this is the fracture line Le Fort type II.). Injuries of the central part are often accompanied by serious complications.

1. Fractures of the central part.
    a) lower (suborbital) layer: fractures do not affect orbits, they are located underneath them.
        i) fractures of the alveolar ridge
        ii) fractures Le Fort type I, lower sub-zygomatic fracture
        iii) sagittal fracture of palatal bones and maxilla s
    b) upper (sub-basal) layer: fractures affect orbits, as well as the ethmoidal bone at the inter-orbital area.
        i) isolated fracture of nasal bones
        ii) fracture of the naso-maxillar complex
        iii) fracture Le Fort type II., upper sub-zygomatic fracture
2. Fractures of the lateral part.
        i) zygomatic arch fracture
        ii) fracture of the zygomatic-maxillar complex
3. Combined fractures of central and lateral parts.
        i) fracture Le Fort type III., supra-zygomatic fracture.

Fractures of the alveolar ridge.
The incisal edge of the upper incisor teeth protrudes forward when head is at upright position. That is why this area is exposed to injuries to a greater extent. If a great force is applied to a large area, the alveolar ridge breaks off together with the teeth which remain mostly undamaged. Vertical fracture lines run between tooth sockets and a horizontal line goes at the level of tooth apexes or just above it. If a force acts towards a single tooth, its isolated damage occurs (subluxation, luxation, breakage of tooth parts). A fragment is

usually dislocated at the palatal direction, or downwards by its own weight, in case it is completely detached.

Fracture Le Fort type I. (lower sub-zygomatic fracture).
If a force acts against a large area of a lower part of the middle facial third, a breaking off appears, whose fracture line runs above the teeth root tips and begins at the lateral edge of apertura piriformis nasi. The breakage descends into the fossa canina and declines backwards under the thickened part of the maxilla ’s processus zygomaticus, it crosses the lateral wall of the maxillary sinus and continues to the back edge of the maxilla . At this place, it usually goes down to tuber maxillae, or goes further towards the pterygoid process of the sphenoid bone. It thus runs above the palatal plate at base of the maxillary sinus. If the lateral wall of nasal cavity is broken as well, and if the cartilaginous septum is detached from the vomer, movability of the whole complex can be clinically proven easily by pulling on the upper incisor teeth.

Sagittal fractures of maxilla s and palatal bones.
Isolated injuries of these bone structures is very rare, they are usually combined with other fractures of this facial part. A fracture line runs in most cases through the suture connecting palatinal processes of both maxilla s and horizontal lamellae of palatal bones. At the front part, it runs through foramen incisivum and between alveoli of the upper middle incisor teeth. Widening of the palatal suture causes the periosteum, that is firmly attached to bones, to break off thus creating an oro-nasal connection.
A sagittal fracture occurs most often upon a force acting from below to the lower jaw and by transfer of impact to the upper teeth that causes the aforementioned breakage at the palatal suture.

Nasal bones fractures.
A position of the nose skeleton at the face predisposes it to frequent injuries. An isolated damage may occur, however, adjacent bones are often damaged as well or the whole bone complexes are broken off.
Nasal bones get detached from the frontal processes of the maxilla s, or a frontal process is broken on one side and nasal bones are heaved at medial

direction. If such an injury appears on both sides, nasal bones form a roof-like overlap. At the same time, nasal cartilaginous structures may be damaged, too.

An upper subzygomatic fracture Le Fort II.
If a force acts from the front, from upper rims of orbits down to alveolar ridges, a possibility arises that maxilla s and nasal bones will be broken off on both sides. Dislocation backwards appears and a decline downwards may be present. An X-ray image taken at postero-anterior projection shows an apparent lengthening of craniocaudal distance of orbits entrances. A fracture line affects nasal bones at their thinnest parts - under nasofrontal sutures. The maxillary frontal process and lacrimal bone are often damaged as well. The fracture line reaches towards fissura orbitalis inferior parallel to canalis infraorbitalis. Around the canal's exit on the front surface of the maxilla it crosses the lower orbital edge at the point where maxilla and a zygomatic bone are jointed, and runs downwards to the lateral wall of the maxillary sinus. From here, it proceeds backwards - similarly to a Le Fort type I fracture - to tuber maxillae or onto the sphenoid bone.

Fractures of the zygomatic arch.
Rarely appear as isolated fractures, occur together with fractures of the zygomatic-maxillar complex. Its causes include a direct impact (or falling onto a sharp edged or rod-like barrier) to the arch area. The arch, due to its shape is affected by breaking off a part of its curvature (two breakages) thus forming a middle fragment that gets heaved at medial direction, towards the temporal bone.

Fractures of the zygomatic-maxillar complex.
These are far the most common fractures of the facial middle third. A characteristic configuration of the face is formed by prominence of zygomatic bones at the latero-ventral direction. A side impact onto this area causes not only an isolated damage of a zygomatic bone (very rarely), but it gets also broken off the surrounding bone structures due to its rigidity. Those structures get damaged as well thanks to their anatomical forms. Fracture

lines thus often run across bone structures. A cranial loosening appears at the zygomatic-frontal suture, from where a line runs on the outer surface of an orbit along the connection of zygomatic bones with large alae of the sphenoid bone towards fissura orbitalis inferior. A breakage crosses from here to the connection of zygomatic bones with orbital parts of the maxilla. Around the lower orbit's edge it runs at the site of zygomatic-maxillar suture nearby foramen infraorbitale from the front surface of maxillary sinus to its lateral wall where several fracture lines are formed. The wall is shattered into many fragments, and the zygomatic-alveolar crista is damaged, too. This crista makes a lateral reinforcement of the facial middle third and transfers a mastication pressure upwards. The fracture line proceeds on the lateral side upwards to fissura orbitalis inferior again. The malar arch is usually broken as well. The most frequent causes include a direct impact of head turned aside to a barrier or hitting by an object (fist) on a zygomatic bone's body. Dislocations at various directions occur, depending on intensity of a causal force. If the whole bone complex gets broken off, backwards and downwards dislocations are mostly found.

Supra-zygomatic fracture Le Fort type III.

While the above described fractures have fracture lines that run below the zygomatic bones which stay firm, a combined fracture of the central and lateral parts exhibits the whole middle part of the skull detached from the skull's base. A fracture line runs below nasofrontal sutures and further through frontal processes of the maxilla and proceeds above and behind the lacrimal bones to the orbital part of the ethmoid bone, from where it descends laterally towards the lower orbital fissure. It further proceeds to pterygoid processes of the sphenoid bone that get interrupted. A second fracture line runs from the lower orbital fissure laterally towards the link of the zygomatic bone orbital part with large pterygoid processes, it crosses the temporal wall of an orbit and divides the zygomatic bone from the frontal bone near the suture zygomatic-frontal. From this suture, a fracture line declines downwards onto the sphenoid bone infratemporal surface at the pterygoid processes base. The malar arch is also broken near the zygomatic-temporal suture. Dislocation backwards occurs, as well as downwards due to the

whole part's weight. It results in articulation of distal molars only and an unclosing bite at the front part occurs.

Signs of fractures.
An injured patient's examination should always begin with a careful anamnesis. A description of events during an injury can help to elucidate its extent and location, providing a patient can recall it.

Soft tissues swelling, changes of physiognomy.
An apparent sign of the middle skull skeleton injuries during the palpation are notably large swollen soft tissues. It appears very shortly after an injury, sometimes the whole face gets swollen (the face resembles a soccer ball). At another cases, such as flattening of a prominent cheek area during zygomatic-maxillar complex fractures, swelling of soft tissues masks a facial area deformation. If the whole middle third gets dislocated downwards and the face gets elongated which can be observed at the nose and the inner eye corners that are limp. During injuries at the nose base or orbital area with breakage of lig. canthus med., the distance between eyes widens (post - injury hypertelorism).

Bite and occlusion maladies.
Damaged occlusion or bite occur after dislocation of fragments. A patient can bite together at the distal molars only and an unclosing, frontally open bite is the result. In case of one-sided injury, a decrease occurs resulting in a traumatic bite on an affected side. If the lower jaw pushes up forcefully, the deformation disappears, but only until the mouth is opened again. In such cases, it is important to examine the hard palate inside the mouth, since an oro-nasal communication may be formed that is a sign of a sagittal fracture of palatal bones.

Bleeding and hemorrhages.
Soft tissue and bony structures damages are accompanied by bleeding. A direct bleeding from the nasal cavity is most frequent, although blood can partially accumulate at secondary nasal sinuses forming blood clots that show

up as an obscured maxillar sinus at an X-ray image (at semi-axial projection). Hematomas form at soft tissues. Hematomas of lower or upper eye lids, conjunctiva or the face skin often help to locate affected parts. Hematomas of eye lids are very common, they can close the eye and hamper vision. An "eyeglasses-like" hematoma can develop as a sign of the skull's base fracture (it has to be confirmed on an X-ray exam).

Bony structures deformation.

Palpation with gentle and careful touching can revise bony structures shape and location, providing a developed tissue edema or hematoma allows it. At typical places where bone fractures often appear, a physician can sense irregularity, a step or a bone is missing completely as a result of breaking off and shifting away (a dislocated fragment). Places suitable for such examination by palpation are the following: lower and lateral edges of orbits, nose base, hard palate, lateral edge of maxillary sinus (zygomatic-alveolar crista). In cases of widened fractures, these are: the upper edges of orbits, frontal area. A typical sign of fractures in these areas is a subcutaneous emphysema, resulting from air being blown under pressure into the subcutis from secondary nasal sinuses through broken bone walls.

Pathological mobility of fragments or parts of the middle facial third.

During a palpation examination, a movability of bony parts can already be felt, initiated by a slight pressure onto a fragment. It can be used for determination of an injury type and presence or absence of a fracture.

Impairment of vision, mobility of eyeballs or eye-lids.

Vision impairment, hampered eyeballs and eye-lids movability may occur at injuries to bone structures of orbits. Position of both eyeballs can be readily observed by eyes (aspection). An eyeball can be dislocated at different types of injuries ventrally, dorsally, or caudally (dorsally and caudally in cases of breakage of the orbit's base which happens during isolated hydraulic fractures of orbits). Traumatic enophthalmus occurs as well. On the contrary, an exophthalmus occurs at ventral dislocation. In cases of fractures of an orbital base, an eyeball moves downwards, the eye optical axes shift and double vision - diplopia - appears.

Double vision may occur in cases of trapping an eye moving muscle into a fracture line. For this reason, movability of eyeballs should be examined at all directions in order to identify, at what direction the movement is impaired. If a fracture line runs over the upper orbital fissure, impairment of functions at regions innervated by one of the head nerves (n. oculomotorius, trochlearis and abducens) that are located at these areas may happen.

10.5.2 Therapy of Fractures of the Middle Facial Third

Conservative ways.

Non-dislocated fractures or parts of bone complexes that break off incompletely do not require any fixation, just protection from further impacts, lying head at unhurt side, eating mushy food and anti-inflammatory treatments. The following fractures can be fixed by mono-fixation (a splint at injured jawbone) or by inter-maxillar immobilization: fractures of the alveolar ridge, one-sided fractures Le Fort I., sagittal fractures of maxilla s. The above described dental splints (Sauer's splint) or wire fixtures reinforced by resin or composite materials, are used for those purposes. At some cases, fixation is preceded by a simple repositioning that puts fragments firmly together.

Surgical ways of therapy.

Osteosutures:

Surgical ways of repositioning and fixation are used more often at injuries of the middle facial third than those of the lower jawbone. Most often, a direct bone suture is applied. Osteosuture is performed either from the outside (skin) approach, often through soft tissue wounds, or from intra-oral side, to the front surface of maxilla, zygomatic-alveolar crista, hard palate or alveolar ridge. Surgical ways of therapy offer an advantage of repositioning of fragments under direct visual control, achieving their perfect toilet and correction, repositioning into proper positions and fixating them with sufficient firmness. An adaptive osteosuture serves the purpose of getting fragments close to each other and hold them at proper positions, not connecting them rigidly. Rigid connection is achieved with aid of bone splints and screws.

Maxillary Slings:

Loose parts of the middle facial third or whole level descend downwards by their weight and get dislocated backwards by an impact. The aim of therapy is to connect them back to the firm upper third (neurocranium) by a wire sling that ensures a good contact of broken surfaces and long-term rest which is not disturbed by chewing movements of the lower jaw. A hinge has to be selected and positioned in such a way so that it does not cause inconvenience to a patient, i.e. not on the outside, but rather underneath the skin or tissues. These requirements are met by the Adams' hinges (1942). A high sling is placed at the zygomatic process of the frontal bone above zygomatic-frontal suture. Low slings are fit at undamaged zygomatic arches or the lower edge of nasal base (apertura piriformis nasi). With the aid of Kostečka's needle or other inserting tools, wires are drawn into the oral cavity and fixated to the upper or lower dental splints. By fastening the wires, required fixation is achieved. The fixture stays at place for 7 weeks and is removed after that.

A rigid fixation:

At the middle facial third, only bone mini- or microsplints and corresponding screws of various lengths should be used. Gracile splints are rigid enough and inert for an organism (made of pure titanium). Besides high requirements on technical parameters of splints utilized, it is mandatory that a splint is positioned at the right place and fitted beforehand.

The traditional Le Fort's classification of fractures determines also the most common placement of bone splints. They are positioned above particular breakages at fractures of nose, as well as the palate fractures.

Fractures of the zygomatic-maxillar complex are fixed by splints positioned at lateral edges of orbits at the zygomatic-frontal suture area and inside the oral cavity to the zygomatic-alveolar crista. If a lower orbit's edge gets significantly dislocated, a well fitted splint has to be placed at this area as well.

Suprazygomatic fractures (Le Fort III.) have to be fixed on both sides at lateral edges of orbits and at the nose root.

Repositioning and fixation of zygomatic-maxillar complex fractures:

These most frequent fractures of the middle facial third are successfully treated shortly after a dislocated injury (1 week after an injury) by one-time transcutaneous repositioning using a sharp hook, introduced beneath the zygomatic bone body through a cheek. Pulling out and entanglement of fragments can be checked by straightening of a step-like deformation on the orbit's lower edge. Fragments fit into each other and no further fixation is required. Highly dislocated fractures, comminuted fractures and those fractures found long time after an injury cannot be repositioned by a bone hook alone. If the orbit's lateral edge got damaged at the place of zygomatic-frontal suture followed by shifting of fragments, an osteosuture or fixation by a bone splint are applied. Repositioning of the zygomatic bone body is performed through the oral cavity -trans-antrally- by an elevator and fixation at a proper position is achieved by an acrylic column pushed against the firm wall of the antrum medial wall. If an acrylic column is fitted in the middle with an orthodontic screw, its length can be adjusted by turning it thus improving support and fixation. The screw can be later (after 7 weeks) removed easily after shortening it by turning and replacement the support from beneath the zygomatic bone body.

10.6 Healing of Fractures

Healing of fractures takes place by inflammatory and regeneration processes leading to reparation of bony tissue. Healing of bones is dependent on activity of osteoblasts, similarly to bone growth at young individuals or bone reconstruction at adults. The sources of osteoblasts are probably non-differentiated perivascular cells, capillary endothelia, monocytes and most likely also reticulous cells of bone marrow. A healing process begins with formation of hematoma at a breakage crevice and around it from broken vessels. Blood coagulum is the first bandage that joins a fracture. It is followed by formation of fibrin fibers network that is a basis for leading of growing bands of granulous tissue from the periosteum and the bone marrow, as well as Haver's canals. A fracture provokes an aseptic inflammation of surrounding tissues accompanied by an edema and accumulation of cell elements. The amount of granulous tissue gradually increases which

replaces hematoma between fragments. A capillary network is formed and growing fibroblasts create bands of ligamentous tissue strengthened by collagen fibers thus creating a primary fixing ligamentous callus.
According to course of healing process, two types of bone healing may be distinguished:
Primary bone healing
If bone fragments are left still and osteosynthesis is stable, bones heal by a contact way or by slit means, if a slit is present. It is a direct healing with absence of ligamentous callus. A fixation callus function is replaced by a rigid fixation by a splint. Contact healing takes place upon a close contact of both fragments which prevents growth of blood vessels from nearby areas, necrotic ends of fragments do not get resorbed and elimination and formation of a new bone take part simultaneously. Bone regeneration is provided by osteons growing at the rate of 0.1 mm per day thus making a bridge across a fracture line. At the osteon's tip, osteoclasts form a resorption canal with a blood vessel, around which a bone is formed by osteoblasts.
Secondary bone healing
An indirect, secondary bone healing is typical for conservative therapy and surgical adaptive osteosuture that holds fragments together. Healing proceeds in two phases:

- first, the above described primary fixation callus is formed which ensures a mechanical rest for healing
- the callus is reconstructed and remodeled at the second phase: osteoblasts form an osteoid along blood vessels at the callus; this osteoid is gradually calcified and ligamentous fibers are built up at the bone.
- Remodeling is the last phase of healing, during which periosteal and endosteal calluses are resorbed and bone marrow is remade.

A tooth present at a fracture line.
With regards to healing of fractures of the jawbones, a question of teeth presence at a fracture line is often discussed. At those parts of jawbones

which contain teeth, a fracture line runs always across the alveolus of one of the teeth. The teeth itself may get damaged during an injury at the same time (subluxations, fractures of roots). As a rule, teeth that had been proven as devitalized or with a peri-apical finding before an injury has happened, should be removed from fracture lines. Retained or semi-retained teeth should be removed as well, providing that fragments moved or a gingival cover integrity was damaged thus increasing risk of infection. Damaged teeth are extracted from a fracture line, unless they can be treated according to rules for therapy of damaged teeth. Teeth germs in cases of fractures at children should be approached as retained teeth during a surgical treatment. They are usually removed from a fracture line.

Pseudoarthrosis

Occurrence of a mock joint is one of the most serious complications of healing. It is a state during which fragments are not joined firmly by a bony callus. A fracture heals only by a primary ligamentous callus and pathological movability remains at the broken site. This kind of complication may happen at fractures of the lower jawbones. There are three types of pseudoarthrosis:

⇒ syndesmosis (the bones are joined by a ligamentous tissue)

⇒ synchondrosis (fragments fused by a cartilage)

⇒ neoarthrosis (a mock joint is formed together with a joint slit)

These healing complications require surgical ways of treatment, often even transfer of a bone transplant (commonly from ala ilii or a rib) and a long-term fixation.

Ankylosis

Ankylosis appears most frequently at an injured mandibular joint, fractures of a joint head, fractures of comminuted character, overlooked fractures at children or newborn babies. Ankylosis may also result from inflammatory complications (osteomyelitis) at the mandibular joint area. The basis for ankylosis is elimination of a joint slit and bony consolidation from the movable lower jaw onto the skull’s base or zygomatic arches that results in immobility of the lower jaw and inability to open the mouth. Therapy is always surgical -

wide interruption of pathologically fused bones and insertion of a material (fascia, muscle) between edges of formed breakage in order to prevent coalescence. An intense rehabilitation of the mouth opening is necessary.

Traumatic osteomyelitis

An inflammatory complication at the site of fracture can spread onto a surrounding bony tissue, causing osteitis or osteomyelitis. The causative agent is most often *Staphylococcus aureus* or a mixed non-specific infection. Specific actinomycotic osteomyelitis of the lower jawbone have been described, resulting from a bone injury. Therapy is analogous to that of inflammatory non-traumatic states, it is a long-term one, and an affected bone deformation may persist.

10.7 Injuries of the Teeth

Either an individual tooth or the whole groups of teeth may be subject to an injury. The frontal teeth of the upper jaw are affected in most cases due to their prominence at the upper jaw. Teeth damage is often associated with injuries of bones and soft tissues.

Tooth subluxation

Subluxation appears as a result of damage to supporting apparatus of a tooth causing a tooth to move at its alveolus, but without leaving it. A fracture of the alveolus may occur at the same time. Clinically, a tooth protrudes out, it is sensitive to percussion and loose to a various degree. The vicinity of marginal gingiva is usually bruised and sometimes even torn. Therapy requires a good anesthesia that enables for pushing a tooth back to its bed and for fixing it at this position by a resin splint made by molding at a prosthetic laboratory according to an impression, or more often, from a free hand made of a fast polymerizing resin. Wire fixtures or splints do not provide for good results since they rather pull a tooth out from its socket by wire loops. Required period of fixation is usually 3-4 weeks, eating soft foods and increased oral hygiene are a must. An antibiotic therapy is not necessary at isolated injuries of the teeth.

Tooth luxation

Luxation results from breakage of the supporting apparatus of a tooth, that leaves its socket completely. The alveolus edge does not have to be necessarily damaged. Especially teeth with incomplete root development are prone to luxation. It is necessary to replant a tooth as soon as possible (only at young individuals providing the bony tooth socket is not damaged). A tooth should be kept at moist environment before replanting. Excochleation and rinsing of the tooth socket should be performed under a local anesthesia followed by replanting of a tooth washed at sterile physiological solution (remnants of the periodontium at the root must not be removed). Fixation is the same as in case of subluxation, duration of fixation should be longer - 4 to 5 weeks. It is desirable to use an antibiotic screen. After a fixture is removed, a tooth vitality should be followed, and an eventual resorption assessed on X-ray images.

Fractures of the Teeth

Teeth breakages can affect their crowns (treatment described at the chapter on restorative stomatology), or its root. In case of a longitudinal root fracture, extraction of such a damaged tooth is unequivocally indicated. In case of a fracture across a root at its half, such breakage can be treated by intra-dental fixation (by a titanium pin inserted through the fracture line and the apex into the peri-apical bone, so called trans-dental implant). A degree of the root's development is crucial for this kind of treatment since it is necessary to dress and close hermetically the root canal. A dental splint (resin or metal molded) is left at place for at least 5 to 8 weeks. If the root development is incomplete, it is possible to use a conservative approach, i.e. to fix a tooth by a splint for a long period of time, thus allowing for formation of a ligamentous fusing band on the root, or rarely joining by the secondary cement and dentine. If a root is broken at its apical part, removal of the split apex has to be made followed by filling the root canal, excochleation and egalization of the root fragment. Fixation is not needed.

10.8 Injuries of Soft Tissues

A wound is a damage of integrity of the skin or mucous tissue. A harm may be either on the surface (bruises) or deep. At simple wounds, the skin or mucosa together with subcutaneous or submucosal ligaments are damaged, respectively. Deep tissues and structures (muscles, bones, vessels, nerves and others) get impaired in cases of complicated wounds. Wounds get always infected.

They can be divided into the following types:

Incised wounds

These wounds posses sharp and smooth edges which can be easily sutured and heal well. If too deep, these cuts bleed extensively due to broken blood vessels.

Blunt wounds

Occur as a result of injury by a blunt object or by falling onto blunt edges or rims. Broken tissues have irregular jagged edges, often bruised. Only obviously necrotic parts should be removed due to a good healing ability of the face. Suturing is more difficult and healing takes longer time, administration of antibiotics is necessary. Stiff scars often appear, requiring later correction.

Punctured and cut wounds

These wounds are caused by a sharp object and are usually deep, often associated with damages to important organs (eyes, salivary glands etc.).

Defective wounds

result from a gunshot or explosion. Large wounds cannot be corrected by a primary closure, rather by “inwreathing” wound edges . A defective wound may also be caused by biting.

Burns

Burns are serious injuries that can be divided into four stages. The most important action is to start “icing” immediately after burning. Icy water or ice cubes are put into a clean container and compressions are applied onto an

affected area and replaced frequently. This treatment should continue in a hospital, although under aseptic conditions.

10.9 Brain Damage

Injuries of the maxillo-facial region are often combined with brain damages (up to 80% at poly-traumas).
Closed brain damages are classified according to the classical Petit's division (1773):

Concussion of the brain - commotio cerebri
It is a functional damage associated with a short or longer unconsciousness without a topical brain tissue damage. Patients suffer from nausea and vomiting. An amnesia about the injury can occur. Therapy consists of resting in bed and exclusion of eventual more serious brain damages. This injury does not leave any persisting effects.

Contusion of the brain - contussio cerebri
It is the brain tissue focal damage of a various degree, location and extent. It may be either single or multiple. Microscopic lesions, mainly small bleeding occur chiefly at the white brain matter. These lesions appear both at the place of a direct impact and on the opposite side - "par contre coup".
Signs are as follows:

- unconsciousness, usually longer than half an hour
- focal neuro-topical signs according to the contusion site (hemiparesis, aphasia, failures of brain nerves)
- psycho-organic syndromes, retrograde pre-traumatic and post-traumatic amnesia
- hormonal disorders (diabetes incipidus)
- subarachnoid bleeding
- epileptic paroxysms

Compression of the brain - compressio cerebri

The major symptoms of the brain compression are lacks of consciousness. An injured person regains consciousness after an initial period of unconsciousness at the time of an accident, but after some time (free interval, lucid period) looses his/her consciousness again. During periods of consciousness, a subdural hematoma is gradually formed as a result of mixed arterial and venous bleeding from wounded brain vessels or bridging veins and venous sinuses. It appears mainly at frontal and temporal areas. Less frequently, an epidural hematoma is caused by rupture of a. meningica media or its branches. It is an arterial bleeding causing a hematoma very soon followed by unconsciousness resulting from brain oppression. The lesion needs to be treated neuro-surgically by the skull trephining, draining the hematoma and stopping bleeding. Brain compression may also result from a brain edema as a result of vasomotor damage and increased permeability of capillaries that cause accumulation of fluid at peri-cellular and peri-vascular spaces. The danger of brain edema lies at so called “cone” (brain cone), when the brain matter is pressed by an edema through tentorium and by its shifting, the mesencephalon or the cerebellum are pushed against the bony shell. In the latter case, the cerebellum is pushed into the spinal cord canal through the foramen occipitalae magnum resulting at oppression of the center of breathing.

Brain damages of enclosed types can be best diagnosed by a CT examination. This kind of examination can reveal serious injuries. It is followed by consultation with a neurologist, functional examination by EEG and tranquilization by medication. Prevention of an edema and a strict rest in bed are imperative. State of consciousness should be checked periodically by waking up the patient, as well as fluctuations of blood pressure, pulse and breathing.

Damages of brain nerves

These damages also occur with serious head injuries. These are mainly damages to oculomotor nerves attributable to lesions of the IIIrd , IVth, and VIth brain nerves (the upper - cerebral, orbital fissure syndrome). A divergent strabismus of one eye indicates a damage to the oculomotor nerve (IIIrd) on the same side, occurring with paralysis of muscles innervated by this nerve.

Musculus rectus lateralis, which is innervated by the n. abducens (VIth) then pulls the eyeball to the side. On the other hand, the opposite - convergent - strabismus indicates damages of the abducens nerve. A total paralysis of the oculomotor nerve (IIIrd) is manifested by a divergent strabismus, mydriasis of the pupil and ptosis of an upper eye-lid. Turning of both eyeballs is an important indication of a serious damage to the brain stem or cortex. Pinching or interruption of the optical nerve (n. opticus) may happen inside the bony canal. It results at impaired vision of the particular eye and abnormal reactions of pupils. The facial nerves (VIIth) gets hurt quite often during large injuries; its branches are damaged more often rather than the central lesion. Other head nerves get damaged scarcely (the auditory and vestibular nerves, as well as the glossopharyngeal nerve, vagus nerve, hypoglossal nerve, and n. accessorius).

10.10 A Traumatic Shock

It is well known from a long-time praxis that isolated injuries of the facial skeleton, the teeth and soft tissues do not usually evoke a traumatic shock. This complication may appear, however, with combined injuries or poly-traumas.

The definition

The term shock designates a severe, general hemodynamic and metabolic disorder caused by insufficient blood supplies. Three basic parts of the blood circulation are affected during the shock:

- loss of circulation
- defects in permeability of vessels
- heart output decrease

The result is a decrease of the nutritional blood supply to the vital tissues and hypoxia. Insufficient removal of metabolites from tissues causes an acidosis. Irreversible damages to important organs originate from a developing shock: “shock kidneys”, “shock lungs”.

Causes of a shock

Hypovolaemic shock:

- hemorrhagic: blood losses, low damage of tissues
- traumatic: large damage of tissues
- burns related: losses of plasma
- dehydration related: losses of water (diarrhea, vomiting)

Other types of shocks: cardiogenic, septic, anaphylactic.

Stages of a shock

The first stage - compensation

Independently of a shock causes, the volume of circulating blood changes (macrocirculation), as well as specific shock-related changes of circulation inside blood vessels (microcirculation). At the first stage, the organism protects itself by a sympathetic-adrenergic reaction, releasing of catecholamines and excitation of adrenal cortex, in order to maintain homeostasis. Excitation of alpha-receptors of sympathetic nerves leads to closure of pre- and post-capillary sphincters which causes decrease of blood supply to organs depending on the degree of their alpha-adrenergic innervation (splanchnic organs, kidneys, liver, skin). On the other hand, coronary and brain circulations remain unaffected - *centralization of circulation.* The vital organs continue to be supplied with nutrients.

The second stage - decentralization of circulation

After the first stage, a shock deepens and without a compensation, serious metabolic malfunctions occur, tissue hypoxia and acidosis (lactate, ketoacids) increase, damages of cell membranes are caused by failure of the sodium-potassium pump (retention of Na^+ and losses of K^+). *Decentralization of circulation* appears, blood flows into the interstices after an initial peripheral spasm. Microcirculation specific changes also happen, characteristic by hemo-concentration, platelets sticking together, increasing blood viscosity,

formation of thrombi, defects of DIC (disseminated intravascular coagulation) and appearance of consumptive coagulopathies.
A decompensated shock originates at this stage!

Therapy of a shock

A sudden loss of blood requires an adequate replacement. During the first stage, the blood volume is compensated for by replacement solutions, expanders, full blood, infusions, sugars, or salts. It is imperative to prevent any further blood losses (stop bleeding). A sufficient breathing and/or artificial ventilation of lungs (including also intubation) has to be ensured.
Therapy by medication: pain relief, vegetative blockers, corticoids, cardiotonics, prophylaxis of kidneys failure, occasionally a dialysis. A specific therapy is applied for particular types of shocks.

10.11 Polytraumas

A polytrauma is a clinical unit that means a short equivalent for the term “multiple injuries with an immediate damage to a vital organ, followed by failures of vital functions”.
The term “polytrauma” has to be understood as an accidental injury of several anatomic systems of an organism, the general state of organism, not a simple addition of individual wounds of various seriousness and extent. The course of an illness depends not only on the degree of damage to individual organs, but also on significant participation of systems, whose anatomical damages would be totally diminutive. Moreover, the injury influences pathologically also systems that are not directly affected by a trauma. The prototypes of polytraumas have become road accidents. By their nature, polytraumas do not allow for an immediate treatment of all injured parts. The dominant nature of injuries to vital organs require other wounds to wait for attention. Statistical analyses show occurrence of serious injuries of maxillo-facial area with a consequent affection of the middle facial third, in cases of polytraumas. Such injuries are combined with brain damages of various degree (88%), defects of lower (25%) and upper limbs (24%). Chest injuries occur at 15% of cases, damages of the spinal chord, abdomen and pelvis happen less frequently.

The treatment strategy is based on a five-step therapeutic plan:

1. reanimation
2. the first surgical phase (life-saving activities)
3. phase of an active awaiting - to stabilize a patient's condition
4. the second surgical phase (final treatment)
5. recovery and rehabilitation phase

Treatment of combined injuries of the facial area should assure the following: At first, all attention has to be paid to making the airways free (releasing of stuck tongue, foreign object inside the mouth, mucous scraps and coagula). If the airways cannot be freed, breathing has to be enabled by tracheotomy or by a long-term intubation.

The second phase consists of treatments directed towards bleeding control and suturing situationally soft tissues. In cases of defective wounds, these are sutured by "enwreathing". No long-term actions may be undertaken (such as osteosynthesis), bone fragments are fixed temporarily mainly by fixtures and dental splints.

The phase of stabilization of the general patient's condition does not mean a period of a physician's inactivity. A definite therapy and further treatments should be planned. An inter-disciplinary collaboration helps to specify a diagnosis and get all technical tools ready. A sufficient fixation of bone fragments has to be provided during the awaiting phase. Care should be also taken about the oral cavity, damaged soft tissues and patient's diet.

A rigid inter-maxillary fixation with the aid of dental splints belongs among the basic methods of treatment of maxillo-facial injuries. In cases of polytraumas is the firm intermaxillary fixation undesirable for the following reasons: it does not allow for intubation by mouth, draining from airways is difficult, lung ventilation is worsened, food intake, introduction of a stomach probe and the oral hygiene are troublesome. During the final treatment of fractures of jawbones, it is necessary to use such methods of osteosynthesis that do not require intermaxillary fixation (such as minisplints). Besides taking care of injuries at the last phase of therapy, a complex stomatological treatment should be done. An active rehabilitation is very important as well. Secondary surgeries take place during this phase, as well as necessary corrections in

order to achieve optimal results of the treatment and to minimize permanent consequences of an injury.

11. Tumors of the Head and the Neck

Malignant tumors of the head and neck represent about 10% of all statistically recorded tumors of malignant nature. At least 40% of them appear inside the oral cavity and on the lips. Oral cavity tumors are located on the mucous membrane of cheeks and the alveolar ridge, on the movable portion of the tongue (two frontal thirds), on the oral base and on the palate. Anatomical relationship of such tumors to the oropharynx (the tongue base, soft palate, palatal arches and tonsils) is very tight. Contribution of stomatology, oral, maxillar, and facial surgery to diagnostics and therapy of this group of tumors is thus more than obvious. The majority of orofacial tumors are epidermoid carcinomas derived from the mucous membrane of the mouth and oropharynx, as well as tumors originating from the lymphoid tissue of the Waldeyer's ring. Lymphatic supply of these areas is achieved via the neck lymphatic system, consisting of regional submental and submandibular nodes, and nodes jugular, paravertebral and supraclavicular. Nearly one half of carcinomas of the oral cavity and oropharynx exhibit a presence of local metastases already at the time of diagnosis. This fact tells us about late recognition of the head and neck tumors. Non-characteristic initial signs, underestimation of the condition by a patient or even a physician, contribute to late diagnoses. Timely diagnosis of oral and oropharyngeal tumors plays an essential role for a prognosis. The presence of metastases decreases chances of patient's survival for the next five years down to mere 25-30%.

11.1 Epidemiology

The oral cavity is a gateway to the upper airway-digestive tract. It comes into a close contact with carcinogens received in food and products of smoking and exhalations. The most significant risk factors for origination of oral carcinomas are tobacco and alcohol, whose carcinogenic potentiation effects have been proven. Currently, the peroral use of drugs, especially marihuana, is considered as an etiological factor.

Oral precancerous conditions (pre-neoplasias) cannot be overlooked here. The most characteristic among those are leukoplakia and erythroplakia

of oral and lip mucosas. Leukoplakia may have either a benign form, with a typical parakeratosis or even acanthosis, and a malignant form with apparent signs of dysplasia or already as a carcinoma in situ. The origin of a malignant process may also be benign epithelial tumors of mucous papilloma type, if they get permanently irritated chemically or mechanically. During each examination of the mouth, especially by a dentist, it is reasonable to consider possibilities of chronic irritation or traumatization of mucosa by dental materials and fault intra-oral prosthetic constructions. An early elimination of carcinogenic causes is the most efficient prevention of a malignant process initiation (a secondary prevention). Every suspicious skin lesion that persists longer than 3 weeks has to be evaluated by a specialist. Histology testing of an excised tissue sample is then usually indicated.

Pathology

Absolute majority (up to 9/10) of oral and peri-oral tumors are epidermoid carcinomas at various stages of differentiation. Carcinomas of the lips, the tongue base and palate are usually well differentiated. Carcinomas of the oral base are partially differentiated, and carcinomas of the movable part of tongue are not very well differentiated at most cases. Low degree of differentiation has been proven to influence a disease prognosis unfavorably. Other tumors of non-epidermal origin occur at salivary glands (mixed tumors, adenoid cystic carcinomas), at the maxillary sinus (adenocarcinomas). Sarcomas penetrate the mouth mostly from jawbones and maxillary sinuses. Lymphomas affect lymphatic components of the Waldeyer's circle - nodes at the upper part of the neck (a regional lymphatic system).

11.2 Diagnosis and Staging

The majority of head and neck tumors affects men older than 50 years. Although, the lower age boundary has shifted to earlier decades which supports again theories on participation of genetic and immunologic basis in the process of carcinogenesis. Patients with early stages of a carcinoma at the oral cavity sense vague, non-characteristic symptoms of discomfort inside the mouth; and a physical findings are usually not very convincing, either. It is

this phase of a malignant disease development that has to be immediately predicted and carefully dealt with by dentists, general physicians and oral surgeons. General signs of the oral cavity carcinoma are a local pain, non-healing mucous ulcerations and changes in position and adhesion of dentures. Oropharyngeal tumors manifest themselves later and that is why they get diagnosed only at progressive stages. Later phases of tumors of the above discussed locations exhibit more distinct symptomatology. It includes an increasing pain, contracture of jaws, difficulties to swallow, restricted movability of the tongue and its base, formation of inner and outer fistulas and cervical node reaction. Failures of a neurologic sensitivity and motility of facial areas are also significant (branches of n. trigemini, n. facialis).

Oncologically oriented examination of the mouth and upper parts of neck should be a routine part of every periodical check at a dentist's or a general physician's office. Besides a careful aspection of visible parts of mucosa it is necessary to palpate bimanually the oral base, the whole tongue and the neck lymphatic nodes. Suspicious areas and the above mentioned precancerous states have to be clarified by biopsies. A diagnostic excision is the most exact diagnostic method of a malignant process and the most weighty foundation for determination of a course of therapy.

A clinical check should be complemented with sonography and modern methods of X-ray examinations. Computer tomography (CT) and magnetic resonance (MR) specify an extent and nature of a tumor and determine its relationship to surrounding organs (bones, blood vessels, nerves), as well as these methods point out at an infiltration of regional nodes. The classification system TNM (tumor, nodi lymphatici, metastases) integrates all clinical information according to the international rules (UICC) for purposes of staging (determination of a stage) of a malignant disease.

The following classification scheme is valid for carcinomas of the lips and oral cavity:

T1	=	2 cm
T2		2 - 4 cm
T3		4 cm
T4		infiltration of adjacent structures (the bone)

N1	ipsilateral solitary = 3 cm
N2	ipsilateral solitary 3 - 6 cm
	ipsilateral solitary 6 cm
	bilateral, contralateral = 6 cm
N3	6 cm
M0	remote nodes negative
M1	remote nodes positive

The 1st to the 4th stages of a malignant disease (staging) are determined by combination of the above elements of classification. Staging is a respected groundwork for choosing an optimum therapy and a guideline for a disease prognosis.

11.3 Oncological Prevention in Stomatology

The future of medical sciences and stomatology as its undoubted part, is more and more directed towards a general prevention of origin and development of diseases, unraveling causes of disease processes of organ systems of the human body. Despite enormous efforts and sources dedicated to basic and applied oncology research, a clinically useful method for identification of the initial transformation event (the time and place) of a normal cell into a tumor cell, has not yet been found. Malignant tumors are therefore diagnosed only on the basis of their typical or non-specific local, regional or remote symptoms. These tumors become symptomatic, although, when there are about 10^9 (roughly one milliard) tumor cells present. To achieve this amount (1 gram or 1 cm^3), 30-fold mitotoic division of the actual number of initially transformed cells is required. The critical lethal limit of the order of magnitude 10^{12} tumor cells (1 billion cells, 1000 grams or 1 dm^3) needs theoretically only another 10 divisions of the existing cell mass. From a simplified analysis of the tumor growth kinetics, it may be concluded that at the time of diagnosis, a tumor (10^9 cells) has already spent most (about three quarters) of its biological existence in an affected organ. Due to the fact that the doubling period of cellular division is about 30-60 days for human solid

tumors, it is apparent that a prognosis and future of a patient depends on every month or even day during which a malignant tumor is present. The oncological prevention and timely diagnosis are thus crucial parameters of success of the oncological therapy and oncologic care in general.

From the dynamics and chronology of tumor processes point of view, the oncological prevention contains three steps.

The primary prevention has a general impact. It is based on the finding that 70 to 90% of malignant tumors are caused by exogenous factors. Only a small part is determined by genetic or unexplained etiologic factors. According to the World Health Organization, the tobacco, concentrated alcohol, high fat , high protein and high calories diet with shortage of vitamins (A, E and C), occupational conditions and environment (chemicals, dyes, asbestos), polluted environment (industrial products and exhalations, traffic), medications (cytostatic drugs, hormones) and medical techniques (diagnostic and therapeutic irradiation), solar and ultraviolet rays, and finally infections (viral, mycotic, bad hygiene) are proven carcinogenic factors. The oral, nasal and pharyngeal cavities, that form a common gateway of the airway-digestive tract, have therefore to be viewed as an area of high oncological risk due to the primary contact with external carcinogens.

Many external factors responsible for appearance of malignant tumors either cannot be influenced (climatic, geographical or geological conditions), or can be changed by an aimed policy of a government (air and water pollution, energy sources, traffic systems, health care and social security strategies). A collaboration and positive approach is also required by an individual person in creation of personal microenvironment. It concerns especially changing health risk habits, such as smoking, alcoholism, drug abuse, and a positive orientation towards the healthy diet and hygiene (oral hygiene). The health care system has to revise and reduce unreasonable use of risky diagnostic and therapeutic methods (radiodiagnostics, radiotherapy, pharmaceuticals with toxic and mutagenic effects). Providing the primary oncological prevention together with a positive individual approach towards “fighting cancer” would utilize controlled coordination of ecological, health and social policies, it is reasonable to believe that oncological mortality would show a statistically significant decrease already by the year 2000.

The secondary prevention represents an early recognition of a malignant tumor process already at the pre-clinical stage. It is the phase that precedes infiltration of a tumor into deep tissues and its propagation into adjacent structures and regional lymph nodes. In praxis, the term secondary prevention correlates to the oncological screening and also an early diagnostics. The secondary oncological prevention focuses on a particular anatomical area, a particular organ or organ system. The scope of this prevention is the search for particular, sometimes specific signs and lesions that mark a possibility of formation or presence of a malignant process. One of the lawful duties of a dentist it is to perform an oncological checking of the oral cavity and the whole orofacial area at each patient. This area also includes the oropharynx, salivary glands, upper and lower jaws including the mandibular joint, and the regional lymphatic system. A complete examination of the oral mucosa by aspection has to be completed by palpation, bimanual in the case of the mouth base and salivary glands. Attention has to be paid also to peri-oral tissues (lips, skin of the face, cheek muscles). All deviations of appearance, color and coherent mucous cover have to be recorded. The same applies to areas of palpation resistance on jaws and to suspect regions on the vermilion and skin of the face. All suspect lesions, especially chronic mucous ulcerations have to be checked again by a physician in 14 to 21 days. If the lesion does not disappear or heal clearly, one has to consider its malignant etiology and to arrange its immediate verification at a specialized department (dept. of oral and maxillo-facial surgery). Verification is usually performed by a biopsy. If positive, it requires an instantaneous oncological therapy. Incompliance with the above rules of oncological prevention is a serious violation of professional responsibility and medical ethics, and as such it may be the reason for expert evaluation of an eventual negligence of a mandatory care resulting in an injury to a patient.

Finding and treatment of mucous lesions that may be starting points of a malignant transformation belong to a dentist's duties in the frame of the secondary prevention. Among these lesions there are chronic inflammations of the oral mucosa and the tongue (namely those of viral and mycotic origin), chronic traumatization of mucosa (untreated radices, frangible teeth crowns, wrong teeth fillings and dentures, electro-chemical irritation). Overall bad oral

hygiene creates also a predisposition for malignant processes, especially if combined with alcohol and tobacco abuse. All these dental ailments have to be cured properly in order to prevent a possible malignancy.

A dentist has to be educated about the group of precancerous states (pre-neoplasias). An example of obligatory precancerous diseases (regularly leading to a malignancy) is xeroderma pigmentosum of the facial skin and keratosis of the vermilion. Among facultative precancerous conditions (potentially leading to a malignancy) there are leukoplakias of verrucous or erosive types, erythroplakias that in the form of Bowen's disease represent already a form of intra-epithelial carcinomas (a carcinoma in situ). Glossitis rhombica mediana and the oral melanosis which may be an etiological basis of the malignant melanoma, belong to the group of facultative pre-neoplasias. Odontogenous cysts (mainly the kerato-cysts) and indeed all benign, epithelial and mesenchymal tumors have to be considered as potential pre-neoplasias. All these formations should be surgically removed in a radical and timely manner. Syndromes with an intra-oral symptomatology are also worth mentioning. Those are for instance, the Sjögren's syndrome that has a possibility of formation of an atrophic oral mucosa carcinoma, or the Plummer-Vinson's syndrome that indicates a possible carcinoma of the esophagus and the cardia. Under the secondary prevention, all precancerous conditions (pre-neoplasias) have to be consulted with an expert who specializes at orofacial oncology and filed at an oncological register.

The dentist's role at the secondary oncological prevention is demanding and important. His/her diagnostic opinion and expertise is frequently crucial for therapy of an oncological disorder. On the other hand, a hesitant or alibiing behavior may bring problems not only to a patient, but to an undependable physician as well.

The tertiary prevention includes measures and procedures of the secondary prevention transferred into a post-therapeutical follow-up care. It is aimed at checking the area of the primary malignant process and the lymphatic system of this area. The prevention is carried out under the mandatory oncological follow-up. Since the majority of orofacial tumors reappear during the first two years after therapy, the following time schedule for follow-up checks is recommended: a patient is examined every month during the first six months,

and in two-months intervals during the second semester. During the second year, a patient undergoes a follow-up examination at least every 3 months. If a detailed examination at the end of the second year is negative, an oncological checking is then required once every half a year. A malignant process is regarded as cured after 5 years of non-symptomatic course since a therapy had stopped. Nevertheless, follow-up examinations should continue with the frequency at least once a year, practically in a permanent manner. The reasons for that can be both late recurring tumors from hidden focuses and statistically proven increased appearance of new (secondary) tumors induced by previous intense therapy by cytostatics or radiation. These tumors may appear at locations which have no anatomical association with the primary tumor. Increased attention has to be paid to timely identification of regional and sometimes also remote metastases. These metastases can cause therapy to be unsuccessful at the end, rather than local recurrences. At this phase of care about oncological patients, special diagnostic methods such as computer tomography, nuclear magnetic resonance, sonography and measuring levels of tumor markers (carcino-embryonic antigen - CEA) are widely used.

The systematic tertiary prevention has high importance for a definite prognosis of a malignant disease. Timely identification of a recurrence or a residuum that has not been affected by a therapy enables for successful treatment and leads often to a final cure of a malignant disease.

Oncological prevention combines a diagnostic awareness of a practical stomatologist with functions of a specialist for oncological surgery in the field of therapy of orofacial tumors. Primarily such a coordinated collaboration can help to meet strategies of the WHO in increasing the anti-tumor therapy up to 65% from today's 50% by the end of the second millennium. The stomatology field has to contribute to this goal, too.

11.4 General Rules of Tumor Therapy

Elaboration of a therapy plan for tumors of the oro-facial system has to be made in an interdisciplinary collaboration (maxillofacial surgeon, radiotherapeutist, chemotherapeutist, oral prosthetist, anesteziologist). The

following main factors have to be considered for selection of modes of therapy and their combinations:

1. Tumor disease staging (classification of a tumor)
2. Primary tumor grading (tumor biology, differentiation)
3. General condition and age of a patient
4. Additional general and other illnesses
5. Patient's social situation and profession
6. Perspectives of a psychosomatic rehabilitation

The fundamental pillars of therapy of the orofacial area malignant tumors are surgery and radiotherapy. Over the last two decades, the cytostatic chemotherapy has been also utilized. Combination of the three methods represents so called integrated oncotherapy which is radical enough as a whole while still respecting a quality of life after the therapy as well as re-socialization of a patient.

Surgery employs many procedures of various radicality. Among these belong: extirpation of small restricted tumors (salivary glands, skin and subcutis), excisions with a safety rim (lips, buccal and palatal mucous membranes), partial resection (the tongue, oral base), subtotal resection (maxilla), hemiglossectomy (half of the tongue), hemimandibulectomy (half of the lower jaw). The nodal system can be extirpated (a solitary lymph node), exenterated (submandibular area, supra-hyoid block resection), or dissected (radical one-sided or double-sided neck dissections). Soft tissue defects are replaced with pedicle flaps from adjacent tissues or by transfer of free or stemmed grafts from the temporal or chest areas. Extensive supra-radical resections are being abandoned at present due to functional and esthetic degradation of the face. Supra-radical surgery is being replaced by an aggressive combined oncotherapy which includes radio-chemotherapy. In spite of that, surgery remains the basic and primary therapeutic method of oncological therapy.

Radiotherapy is either independent or combined onco-therapeutic method. It can be applied before an operation as a preparation for the surgery (restriction of metastasizing components of a tumor, control of sub-clinical foci around a tumor, reduction of the tumor mass) or after the surgery

for suppression of residual malignant disease at the tumor peripheral area and regional lymph glands. Both modifications utilize irradiation of tumor by the dose of 54 to 60 Gy (Gray) delivered over the period of 6 weeks. If the irradiation is divided into two doses of 30 Gy before and after a surgery, it is called the “sandwich” technique. At indicated cases, e.g. tumors T1 of the lips, radiation therapy is applied as a mono-therapy (without a surgery).

Chemotherapy got promoted from its original position of a supplementary therapy into a valuable method of a therapeutic stock of techniques. At the oro-facial area is applied mainly in the form of a regional intra-arterial infusion of selected cytostatics. During an intra-arterial application, the tumor area is washed via its supplying artery by a several-fold (minimum of four-fold) higher concentration of cytostatic and anti-mitotic (oncolytical) substances than it would be during a systemic administration per venam or per os. The input supplying artery is arteria carotis externa and its branches which supply all organs and areas of the oro-facial region. The mostly used cytostatic drugs are antimetabolites Methotrexat and Fluorouracil, the cytostatic antibiotic Bleomycin, the anti-mitotic drug Vincristin, anthracyclin Epirubicin and the cis-platinum derivatives. These drugs are usually administered in combinations, out of which the program VBM (vincristin, bleomycin, methotrexat) has been proven to be the most successful. The aims of chemotherapy are down-staging (reduction in size or macroscopic disappearance of a tumor) and down-grading (reduction of the biological aggressivity of a tumor). It creates objectively better initial situation for subsequent surgical intervention and radiotherapy. A chemotherapy which is designed in such a way is called chemo-induction.

The following schemes depict rational therapeutic procedures for primarily operable tumors (T2) and non-operable tumors (T3) which require a pre-operational preparation. The three-phase program is suitable for operable (resectable) tumors:

a) chemotherapy (local and systemic effects)
b) surgical resection (local effects)
c) radiotherapy (regional effects)

In case of an uncertain operability of a primary tumor, the four-phase program is appropriate:

a) chemotherapy (local and systemic effects)
b) pre-operational radiotherapy (30-40 Gy)
c) surgical resection (local and regional effects)
d) post-operational radiotherapy (30-40 Gy)

Follow-up checking

Even a primarily successful strategy of curing the head and neck tumors suffers from relatively frequent failures. Reasons may be early (up to 2 years) and late (up to 5 years) local recurrences as well as regional and remote metastases. In order to achieve a definite success of therapeutic efforts, it is very important to follow patients in a long term after an oncological therapy has ended. The purpose is prevention and timely identification of eventual recurrence of a secondary tumor. An early recurrence can be dealt with if cured on time and in a rational way. A patient with a malignant disease should be followed up for the rest of his/her life. The follow-up examinations should take place once every month during the first six months, once every two months during the second half a year, once every three months up to 2 years, and every 6 months from 2 to 5 years. After the fifth year, a patient undergoes a follow-up examination once every year and receives specific instructions how to proceed in case of eventual changes of a local finding or a general condition. These follow-up visits are executed at specialized clinics in close collaboration with a personal care physician or a dentist. The first recurrence has to be viewed the same way as a primary tumor and the course of action towards its elimination has to be as persuasive as at the first contact with a tumor.

Perspective

Studies on large sets of patients have shown that the five-years survival is reached by about 50% of patients who had suffered tumors at the oro-facial area. Since an efficient cure for cancer has yet to be discovered, it is necessary to focus on a more effective organization of the oncological care,

especially in the field of early diagnosis of primary tumors and more complete interdisciplinary cooperation of specialists. At present, this is the way of reaching the goal, set by the World Health Organization for oncology - to increase the rate of cured oncological diseases from today's 50% up to 65% by the year 2000. Reaching this goal indeed requires a great deal of medical morale. A patient suffering a malignant disease is the patient "sui generis" and that is why his/her physician has to be equipped with an extraordinary ability of empathy with a patient's psychological state and social situation. A personal physician should never abandon a patient since he/she is the solid point for him, which is said to have a capacity to move the universe.

11.5 Oro-facial Precancerous States

The term precancer was used for the first time by dermatologist Dubreuilh in 1896. He derived the term from a clinical experience on some skin lesions that regularly transform into malignant forms. The term precancers designates states and lesions that may transform into a carcinoma. There are also pre-sarcomatoses giving a rise to sarcomas and pre-melanomatoses from which a malignant melanoma originates. All these conditions are generally named as pre-blastomas or pre-neoplasias. At the general medical knowledge, the term precancer is used (not entirely accurately) to describe all pathological lesions that can be a basis for malignant tumorous growth.

Due to the fact that tumors of the oro-facial and stomatological areas are carcinomas in 90% of all cases, it would not be such a mistake to use the common term precancer for pre-neoplastic conditions and lesions at the above described anatomical area. It would be apt to remind here that the term precancer is not definite but relative one, since not all precancers get malignant and not all malignant tumors are derived from precancers. Such relativity by no means decreases the significance of precancerous conditions for etiology and pathogenesis of malignant neoplasias and the oncological prevention (the secondary prevention). For these reasons, clinical oncologists, in concordance with onco-pathologists, recommend to divide the precancerous conditions into those of the narrowest and widest sense of the term.

Precancers in the wide sense are termed as precancerous conditions or facultative precancers. Basically, they are initial affections of the skin of the face and the oral cavity mucosa that are predetermined with a statistically high probability for transformation into a precancer (in the narrowest sense) itself. The list of facultative precancers includes chronic contact dermatoses and mucosidoses (e.g. tar or nicotine induced), electrochemical mucosidoses and glossitises, chronic radiodermatosis, inflammatory and atrophic damages by irradiation with light rays (cheilitis of sailors and agricultural workers) and initial forms of xeroderma pigmentosum. Some forms of simple leukoplakias (transitory, exogenously induced) can be mentioned at this group, as well as the Sjögren's syndrome which can give rise to a lymphoma with malignant properties, upon chronic non-bacterial sialadenitis (sialosis). We should not overlook odontogenous cysts whose epithelium is also prone to malignant changes and last, benign tumors of the skin and skin adnexa (especially pigmented ones) of the face and the oral mucosa(papillomas).

The above mentioned conditions manifest themselves as clinical units and their facultative transformation into an obvious precancer can be proven upon histo-pathological examination only. It is a matter of experience and predictability, if and when these altered tissues should be verified bioptically. Less experienced physician should consult such cases with a specialist.

Precancers in the narrow sense are termed as precancerous lesions or obligatory precancers. They are often (but not always) derived from corresponding initial forms of facultative precancers. In order to diagnose obligatory precancers, it is necessary to perform cytological and histological verification of markers, characteristic for precancers. Skin and mucous precancers originate on the etiological basis of both endogenous and external factors. Endogenous (disposition) factors are genetic, race- and constitution-related, and immunological. Exogenous (exposition) factors are both physical effects (mainly radiation) and chemical (carcinogenic compounds). An individually specific constellation of both disposition and exposition factors may result in formation of favorable conditions for initialization of precancerous states (in the widest sense).

Obligatory precancers include the following skin and mucous lesions: keratoses (solar-induced and actinic), xeroderma pigmentosum, morbus Bowen, erythroplasia Queyrat, cheilitis abrasiva praecancerosa, lentigo maligna and leukoplakias.

Keratoses are probably the most frequent epidermal precancers. They appear at elderly people on the face skin and mucosa of the lips, exposed to light rays or radiation. Keratoses have an appearance of multiple dry and adhering flakes, sometimes forming a cutaneous horn (cornu cutaneum). Histology reveals a dominant hyperkeratosis and nuclear abnormalities at the epidermal cells. Keratinoses of an actinitic origin have a 25% chance to be transformed into a flat-cell carcinoma.

Morbus Bowen is manifested as an isolated, flaky focus of psoriatic look which appears independently of the exposure to solar or other kinds of irradiation. Some pathologists consider it as a carcinoma in situ (intraepithelial carcinoma that does not overlap the mucosa basal membrane). A histological picture shows cellular polymorphism, nuclear abnormalities, atypical mitoses and other signs of malignant transformation of this lesion. Morbus Bowen may also appear on the mouth mucosa, namely at the retro-molar area and gingiva. The stage of development of this precancer is determined by an actual degree of proliferation activity (number and quality of mitoses) which can be assessed only histologically.

Xeroderma pigmentosum is characterized by focal hyperpigmentation of the skin of the face, flaking, atrophy and inflammation of the skin stroma. An inflammatory hyperplastic stage is followed by a proliferative process in the skin. Epidermal, as well as mesenchymal malignant tumors may develop from these foci. Again, a diagnosis can be clarified by histological examination only.

Erythroplasia Queyrat is characterized by red colored area located mostly at the border of the skin and lip mucosa, although it may be found on the oral mucosa as well. It is a network of capillaries that can be seen underneath a thin, pigment-lacking layer of horny cells. Based on degenerative and atrophic processes, a precancer with high proliferative tendency may develop. For this reason, the erythroplakia is already considered as a carcinoma in situ. A histological verification only can provide for conclusive results.

Cheilitis abrasiva praecancerosa, as an obligatory precancer, is commonly derived from a facultative actinitic cheilitis. It affects large sections or even the whole vermilion of the lower lip. At the stage of confluent erosion it already possesses signs of a carcinoma in situ. The precancer may be obscured by a clinical picture of inflammation and escape from identification for a long time.

Lentigo maligna (melanosis circumscripta praeblastomatosa) forms dotted pigmentation and indistinctly bordered foci on the face skin exposed to the solar radiation. It may also appear on the oral mucosa of lips, gingiva and palate. Histological picture shows hyperpigmentation of basal melanocytes at early stages, which can later form clusters of melanocytes. This proliferation of the population of melanocytes determines atrophy of the epidermis, under which a strong inflammation of the stroma is apparent.

Early diagnosis of lentigo maligna and its differentiation from benign melanoses (pigmented nevi) is crucial, a timely excision guarantees almost 100% success of therapy. Otherwise almost 50% of lentigo maligna cases get transformed into a malignant melanoma.

Leukoplakia is, according to the WHO (World Health Organization), literally a clinical term describing a “white, non-effaceable region of a mucous membrane that cannot be associated with any defined disease”. Different usages and interpretation of the term leukoplakia caused many misunderstandings mainly because the term has been used at clinical and patho-morphological literature most definitely for precancerous lesions. In clinical praxis, one has to consider that differentiation among a benign symptomatic mucous diseased patch (a white patch), a precancer, and a carcinoma in situ can be made only according to the cytological and patho-histological criteria. At present, classification of leukoplakias according to the degree of dysplasia is preferred which means studying mainly polymorphism of cells and cell nuclei, number and irregularities of mitoses, disappearance or damage of a regular arrangement of mucous layers and continuity (sharpness) of the basal membrane, by means of bioptic sampling. Classification of precancers (and all pre-neoplasias in general) in pathology has a non-disputable importance for a prognosis of the disease. For leukoplakias, a crucial criterion for determination of degree of malignity is the

absence or presence of a dysplasia. Leukoplakias without signs of a dysplasia have a benign character and classify in the group of precancers at the widest sense (a facultative precancer). A leukoplakia with an apparent dysplasia of the moderate or high degree is already a precancer in the narrowest sense (an obligatory precancer) or even an early stage of a carcinoma (a carcinoma in situ). This brief and simplified description of pathological classification of leukoplakias can be concluded with a fact that the higher the degree of dysplasia, the higher the frequency of transformation of a leukoplakia into a mucous carcinoma.

Two more notes are worth mentioning from the clinical point of view: The first note provides a closer look on quantitative relationships of individual types of leukoplakia, classified according to the degree of dysplasia. Among all types of leukoplakia, forms with no signs of dysplasia or with very low degree of dysplasia represent 74%, forms with moderate dysplasia 17%, and with high degree of dysplasia 6%. Remaining 3% can already be classified as carcinomas in situ (Seifert and Burghardt). The second note concerns over-growth of Candida albicans at the site of a leukoplakia related infection and its vicinity. Such an infection always presents a risk factor and signals weakening of the cellular immune system. A thrush is observed at as much as 35% cases of leukoplakias with high degree of dysplasia. The oral cavity leukoplakia occurs most frequently during the fifth decennium and its occurrence rate increases with age. Men suffer from it more often than women. Not only age, but also a location are important for prognosis. Leukoplakias on the palate and alveolar mucosa have a minimum tendency to malignant transformation and they almost never recur. On the other hand, leukoplakias of the mouth base possess the least optimistic prognosis due to their tendency to a malignant growth.

From clinical and macroscopical perspectives, these diseases include leukoplakia plana, verrucosa and errosiva. Microscopic pictures correspond to this division, identifying the flat form (plana), papillary-endophytic form, and papillomatous-exophytic form. The flat form of leukoplakia presents about 70% of all cases and appears most often on the mucosa of lips, cheeks and tongue. The papillary-endophytic form of leukoplakia presents about 22% and it is mostly diagnosed on the mouth base and the alveolar ridge. The

papillomatous-exophytic form is the least common form (3% of incidence) and appears mostly at the palate and the alveolar ridge. While the simple flat form of leukoplakia rarely turns into a precancer, the verrucous form (grooved patch with wartlike projections) and especially the erosive form (de-epithelized ulcerous patch) possess clearly higher trend towards a malignant transformation into a carcinoma (up to 38% in case of erosive forms, Seifert). These two forms should always rise a clinician's doubt about a precancer of an obligatory type or even an initial form of a carcinoma. This leads to an important observation that every clinician, including those from the field, get involved in the process of an early diagnostics and therapy just upon a slightest suspicion of a malignant tendency. A clinician has to make sure that these services are delivered. In practice it means that a suspicious lesion is subjected to analysis by a specialist which is in patient's own interest. A specialist determines the degree of a leukoplakia lesion by the diagnostic excision and organizes further therapy based on its results. The issue of precancers is predominant especially in the stomatologic field since malignant processes at the oro-facial area can be recognized at early stages. This puts a great deal of oncological responsibility onto all stomatologists. Awareness of this responsibility should result at a close and active collaboration of a local clinic with a specialized department capable of dealing with problems of stomatological oncology.

11.6 Survey of the Oro-facial Tumors

Benign tumors.

Benign tumors of the oro-facial area grow from soft and hard tissues, including odontogenous tissues. They can be by no means underestimated since they may transform into malignant tumors or destroy the original organ and its vicinity by an expansive growth. Vascular tumors posses a danger of excessive bleeding. Based on the tissue of origin, these tumors can be divided into epithelial, mesenchymal and odontogenous.

1. Benign epithelial tumors grow from the mouth or salivary glands epithelium. Most often, a papilloma occurs as exophytically growing, sometimes pedicled structure on the mucous membranes of the cheeks,

tongue and palate. Multiple papillomatosis of the palate or cheeks may occur as well. The verruca (a wart) on the face skin belongs to the same group. Therapy of these tumors is surgical. An adenoma grows from the epithelium of salivary glands. Based on their histological composition, they are mostly mixed tumors - pleomorphic adenomas, or there can be monomorphic adenomas composed of cells of one type (adenolymphoma, oxyphillic adenoma). Also for these tumors, the only appropriate therapy is the surgical removal.

2. Benign mesenchymal tumors originate from various tissues of the facial area. Based on histological composition, they classify as fibromas, lipomas, myomas, angiomas, lymphangiomas, osteomas, and tumors of neurogenic origin. They manifest commonly as bordered structures of various texture, growing slowly inside the oral cavity. If they grow inside the bony tissue, they result in deformation of the jawbones (osteomas, intra-osseal fibromas). A formation that sits on an alveolar ridge near a tooth appears quite frequently inside the mouth - epulis. It has to be removed surgically, followed sometimes by extraction of a tooth in which vicinity it grows. Hemangiomas (capillary or cavernous forms) grow slowly inside the oral cavity; they may be wounded by a hard food which results in bleeding. Hemangiomas appear also on the skin of face together with the inherited vascular anomaly - naevus flammeus. In case of haemangiomatosis faciei, large angiomas penetrate into the jawbones from soft tissues, making a surgery complicated. For therapy of small hemangiomas of the oral mucosa, a cryo-destruction, sclerotization (injection of Aethoxysklerol) and surgical extirpation are often used with a good success. In cases of extensive facial angiomatoses, a pre-operational selective micro-embolization of supplying vessels by small plastic spirals or globules is used. The subsequent surgery then results in smaller blood losses.
3. Odontogenous tumors originate from the primitive dental epithelial strip which is the basis of dental tissues during development. Based on contribution of a particular component, tumors are categorized as epithelial, mesenchymal and mixed. One of the most prominent epithelial odontogenous tumors is the ameloblastoma (adamantinoma, multi-locular

cystoma). It appears mainly at the lower jawbone around the angle, it has mostly a cystic form and it deforms the mandible and makes it thinner by its expansive growth. An X-ray examination reveals a picture of a multi-ocular cyst with thin partitions. However, solid forms exist, too. Therapeutic surgery has to be radical since when not removed completely, this tumor recurs and tends to become malignant (malignant ameloblastoma). Out of all mesenchymal odontogenous tumors, the cementoma has to be mentioned. It is created by proliferation of cementoblasts of the periodontal membrane. On an X-ray image it appears as homogenous, surrounded shadow around a tooth's root. The soft odontomas, odontoblastomas and hard odontomas belong among the mixed odontogenous tumors. All these odontogenous tumors should be removed surgically.

Malignant tumors.

Malignant tumors of the oro-facial area are marked by an invasive and destructive growth, formation of metastases and cachectization of patients.

1. Malignant epithelial tumors originate from the covering epithelium of the skin, oral mucosa or salivary glands mucosa. Among the most frequently occurring carcinomas of the oro-facial area is the lip carcinoma, which appears on the lower lip of men in 95% of cases. It is a spinous cellular carcinoma which appears in two forms. The surface form grows exophytically. It begins in most cases as a small focus of peeling hyperkeratosis on the lip vermilion, grows gradually, it develops the form of verruca and finally gets ulcerous. Resulting ulcer possesses a stiff base, infiltrated edges and is painless. On the mucous side, the ulcer is covered often with a leukoplakia-like altered mucosa. The deep, endophytic form begins by a primary lip infiltration. A crater-like ulcer with reddish edges appears soon. Metastases into regional lymph nodes appear rarely at late stages. Surgical therapy - the quadratic excision - has a very good prognosis at early stages. On the other hand, the tongue carcinoma has much worse prognosis. It appears mainly in young men. It begins on the tongue's edge, around the base, and sometimes on the underside of the tongue. An initial rough infiltrate quickly assumes an ulcerous form and

tumor grows into the oral cavity. It often forms metastases at the deep lymph nodes of the neck. Therapy of carcinomas of the tongue is very tedious and requires utilization of all components of the complex, integrated treatment. The carcinoma of the maxillary sinus that originates from the mucosa of epithelial lining of the antrum, causes diagnostic difficulties. Due to its location, it can remain hidden for a long time (crypto-carcinoma) with vague signs that resemble rather a chronic sinusitis. The first signs are feeling of stuffy nose, loosening of the teeth, eventually a prolapse of neoplastic tissue from the extracted tooth alveolus at the upper jaw. At late stages, the tumor spreads through the bone walls of antrum into adjacent areas and outgrows into cheeks and orbits. A prognosis depends on the stage at which the tumor is identified. The carcinoma of the buccal mucosa originates mostly from a proliferating leukoplakia around the occlusal line and the mouth corners. It is characterized by cauliflower-like projections of tumor tissue, formation of ulcers and infiltration into adjacent tissues. The carcinoma of the lower jaw manifests as an ulcerous structure of the alveolar mucosa which grows into the bone, the oral base and soft tissues. A central form of carcinoma occurs rarely, originating from remaining epithelial Malassez's cells. If osteolysis of jawbones is found on X-ray images, it is necessary to consider metastasizing tumors of remote organs into jawbones, e.g. carcinomas of the thyroid gland, mammary glands, lungs or seminomas.

2. Malignant mesenchymal tumors.

According to the place of origin, these tumors can be identified as sarcomas of soft tissues and jawbones.

Soft tissue sarcomas arise from submucosal ligaments, fascial connective tissues and lympho-reticular tissue. On the basis of prevalent types of cells they can be divided further as sarcomas with round cells, spindle cells and polymorphic cells. Compared to malignant epithelial tumors, sarcomas affect younger population and children with a bad prognosis. Metastases are spread by the bloodstream. Tumors grow rapidly and infiltrate adjacent structures. Somewhat better prognosis have partially differentiated sarcomas - fibrosarcomas and myxosarcomas.

Sarcomas of the bones (osteogenous) metastase into the lungs shortly. The osteolytic form causes rapid destruction of the jawbones and outgrowths into surrounding tissues. The osteoplastic form (sclerotic) grows at slower pace and often reaches a considerable size. Areas of diffusive clear patches and condensed bony tissue can be seen on X-ray images, with radially arranged spikes on the bone edges (spikula). Sarcomas that arise from the lympho-reticular tissue, namely hemo-blastomas and myelosarcomas, form a separate group. Diagnostics and therapy of these tumors belong to the scope of specialists. A skilled stomatologist can identify some of these tumors based on a clinical picture of changes inside the oral cavity (hyperplastic ulcerous gingivitis associated with leukemia etc.).