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"UKRAINIAN MEDICAL STOMATOLOGICAL ACADEMY"

Approved at the meeting of orthodontics
« ____ » _____ 20 ____ y.
protocol № ____ by _____
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METHODICAL RECOMMENDATION
for independent work of students during the preparation
to practical lessons and on the lessons

Academic discipline	Orthodontics
Module № 3	
The theme of the lesson № 5	Traumatic injuries of teeth and jaws in children.
Course	V
Faculty	Preparation of foreign students

Poltava 2017

1. The relevance of the topic. Dental injuries in children are more frequently observed as an independent type of traumas and much less frequently – in association with injuries of other parts of the face. In recent years doctors are encountering this pathology more often. An increase in the number of frontal teeth injuries in children, strangely enough, is connected with improvement in well-being of people, particularly popularization of such kinds of sport as hockey, football and others requiring power play.

2. Specific objectives:

To know the causes that contribute to the development of the dental injuries.

To know the features of the dental injuries.

To know the algorithm for examining patients with the dental injuries.

To know the classification of dental injuries.

To be able to diagnose different clinical forms of the complicated dental injuries.

3. Basic knowledge's, abilities, skills necessary for studying the topic (interdisciplinary integration)

Name of previous disciplines	Skills
1. Anatomy	to know the teeth and jaws structure' features
2. Propaedeutics of orthopedic somatology	to know the classification and features of dentures for separate teeth defects reconstruction.

4. Tasks for independent work during preparation to the lesson and on the lesson

4.1.A list of the main terms, parameters, characteristics that need to learn by the student during the preparation to the lesson:

Terms	Definition
1. Trauma of the teeth	A violation of the anatomical integrity of the tooth and / or its connection with the periodontal tissues, leading to a reversible or irreversible loss of its functional properties. Traumas of the teeth are represented by a bruise, a crack, a fracture of the crown or root, damage to the rudiment of the tooth, dislocation of the tooth.
2. Dislocation of the tooth	Is a permanent, pathological movement of the tooth relative to the alveolus, caused by violent mechanical action, which is accompanied by damage to the periodontal (connective tissue surrounding the tooth) and the neurovascular bundle of the tooth.
3. Fracture of the tooth	A serious mechanical injury of the tooth, leading to a violation of the anatomical integrity of the root of the tooth or its crown.

4.2. Theoretical questions to the lesson:

1. WHO classification of dental traumas.
2. What complications may be caused by an acute trauma of temporary teeth?
3. When is the use a sling-splint indicated?
4. What is dental fracture?
5. What dental cracks are differentiated?
6. What is dental dislocation?
7. What is dental contusion?
8. When is teeth replantation conducted?
9. How can one fix biological bandages on the teeth?
10. Is fracture healing possible in teeth and in what cases?

4.3. Practical works (task) which are executed at the lesson:

Identification of risk factors for development of dental injuries.

Definition of risk groups for development of dental injuries.

Collect anamnesis of the disease of an orthopedic patient with dental injuries.

Describe and classify possible deviations from the norm in the dento-alveolar system with dental injuries.

Correctly put the corresponding previous diagnosis for patient with dental injuries.

The content of the topic:

The prevalence of this pathology has not been thoroughly studied. There are few statistical investigations of this problem. Nevertheless, some data have been published by foreign authors. Thus, R. Gellis, K.W. Davey (1970) conducted an examination of 4251 secondary school pupils, who in 4.2 % cases showed dental crown fractures; M.L. Marcus (1951) found a high prevalence of frontal teeth traumas – 16-20 % of the total number of examined children. The upper incisors are injured the most frequently. The ratio of the number of injured upper and lower incisors makes 3:1. Boys are injured twice as often as girls. It should be noted that in recent years there increased the number of cases of a complicated trauma (odontogenic cysts and inflammatory processes of the frontal part), which not infrequently conditions termination of dental root system formation, and this, in its turn, decreases the functional value of the tooth or a group of injured teeth and, ultimately, leads to their early loss. Such types of complications testify to the fact that many experts know a little about the specific character of treatment for traumatic dental injuries in children. The duration of treatment for dental traumas in children at all stages can make a couple of days or weeks, and can take longer – up to 2-3 years, which is conditioned by trauma severity, the degree of formation of the root system of the injured tooth and the method of its treatment.

On the basis of extensive practical experience and analysis of the results of treatment for this pathology it is expedient to divide the whole period of rehabilitation of a child with a dental trauma into three stages:

- 1st stage – primary visit – from the moment of child's visit to a doctor to expert care provision;

- 2nd stage – expert care – from history taking, finding the cause of trauma, including expert care, to clinical recovery;

- 3rd stage – aftercare and recovery of the functions of injured teeth, case follow-up.

Differentiation of the stages of rehabilitation of children with dental traumas promotes proper rendering of medical care at each stage: from referral to the appropriate expert to care delivery.

At the 1st stage a child with a dental trauma is provided with emergency medical aid in any medical establishment. A child with a dental trauma without involvement of the soft tissues and facial bones and without concussion of the brain must be referred to a dentist.

Since this pathology is mainly treated by a pedodontist, it would be better for a child to get to this doctor directly without appealing to other experts. The sooner the pedodontist provides the child with expert care, the better long-term results of treatment.

If such a child appeals to an orthodontist, a periodontist, a surgeon, or other dental experts, these doctors must render emergency medical aid, which foresees evaluation of the general condition of the child, disease diagnosis, anesthetic management (if it is necessary) or administration of analgesics. A 1-2-day delay in expert care leads to less complications than unskilled aid rendered in haste, which is a frequent cause of severe complications, up to permanent tooth loss.

The 2nd stage of expert care includes:

- proper compiling of medical records;
- history taking;
- clinical investigation (examination, palpation, percussion);
- applying transillumination for investigation;
- radiological examination;
- electroodontometric investigation;
- making a proper diagnosis on the basis of clinical and auxiliary methods of investigation;
- providing expert care.

Anamnesis. During patient interview the doctor is to collect and record in detail answers to the following questions: when the trauma was received, if there was sharp pain, what specialists were visited, if any aid was rendered, what kind of aid was rendered: general medical or stomatological, and also what subjective complaints the patient has. The second group of questions is not important for treatment, and most often concerns the legal aspect of the case (who and with what hit the patient, if the trauma was accidental, at what time exactly it happened). Although these questions do not influence the quality of treatment, they are very important, and the doctor must enter all the data in the case history as thoroughly as possible – this is necessary for compiling insurance documents, and sometimes for investigating authorities. The third group of questions concerns general medical issues. One should determine drug tolerance and evaluate the general condition of the child, particularly one must find if a tooth fragment got into the airway. If the

doctor suspects this, he must urgently conduct a chest X-ray.

Clinical methods of investigation. The clinical presentation of dental trauma is versatile, which may be explained by the type of injury, peculiarities of the age-specific structure of children's teeth (non-formed roots, presence of a growth zone, etc.), presence or absence of occlusion anomaly. Each child with a dental trauma must undergo a number of clinical and auxiliary methods of investigation: examination, palpation, percussion, and also instrumental methods – tooth X-ray, transillumination test with the use of fiber-optic light guides, electroodontometric investigation.

During clinical examination the doctor should determine the level of fracture, tooth displacement, socket fracture, tooth coloration, occlusion violations, adjacent tissue involvement. The tooth may be pink or dark. This happens as a result of neurovascular bundle rupture and penetration of erythrocytes into the dentinal canals, their oxidation; it is also possible in tooth pulp necrosis. Under clinical conditions tooth crown coloration is eliminated by whitening according to a special technique.

Occlusion violation caused by a frontal teeth trauma may develop in case of displacement of one or a couple of teeth, fracture of the alveolar process or jaw.

In dental trauma palpation allows determining mobility of the tooth or its parts, swelling, bulging, which may develop in alveolar process fracture or tooth displacement. The degree of injured teeth mobility is determined with the help of tweezers according to a standard technique:

- first-degree mobility (vestibulooral): as a rule, splinting is not required, but if the roots are non-formed, one resorts to this type of care;
- second-degree mobility (vestibulooral and mesiodistal): most frequently the tooth is to be stabilized with the help of different types of splints;
- third-degree mobility (vestibulooral, mesiodistal and vertical): most frequently urgent splinting is required, and in almost complete dislocation – tooth replantation.

If a trauma is accompanied by a fracture of only one tooth, the doctor must check the adjacent teeth by means of percussion, because they may also be involved.

Vertical percussion shows the degree of periapical tissues affection, for example, partial rupture of the periodontal tissues or incomplete tooth dislocation. Horizontal percussion is conducted especially carefully, it may allow determining periodontal rupture in the vestibulooral direction, pulp bleeding, swelling. Sound percussion is recommended. In periodontal swelling, neurovascular bundle rupture, bleeding behind the dental root apex the percussion sound may vary from clear to dull. Percussion is very often a clinical test determining the result of treatment.

Conducting radiological investigation in children's dental traumas is strictly obligatory. Radiograms help the doctor to determine the dislocation direction, if there is dental impaction, periapical changes, the width of the pulp cavity, the stage of root system formation, the width of the dentin interlayer (in crown fracture) between the fracture line and the dental cavity, condition of the periodontium,

growth zones, and also presence of foreign bodies. Radiological investigation provides comprehensive information on frontal teeth traumas. Proper interpretation of a radiogram, detailed entry in the case history provide successful treatment of the indicated pathology.

Electroodontometric diagnostics (EOD) ranks second among auxiliary investigation methods. During the first visit to the dentist EOD results may appear inaccurate, which decreases their diagnostic value, but later on they become very important because EOD is the only method of determining pulp viability. If the roots of children's permanent teeth are not formed, such investigation is hampered because the nerve fibers of the pulp are not formed (O.D. Dzhafarova, 1969). Besides, during the first visit, if there is a swelling of the pulp, periodontium, concussion of the neurovascular bundle, EOD findings may decrease sharply. In this case one should not hurry and during the first couple of days not conduct active medical interventions if they have no urgent indications.

In recent years at the chair of pediatric dentistry of Central Order of Lenin Continuing Medical Education Institute during diagnostics and treatment of children's dental traumas doctors successfully use a new type of investigation — transillumination method with the use of elastic fiber-optic light guides. The method of illumination allows easily determining even minor disorders in the structure of the hard dental tissues (fissures, fractures), i.e. all the changes, which are hard to determine visually.

This type of investigation is especially important in crown-root longitudinal fractures.

If there are many fissures, one sometimes has to change the opinion concerning preservation of injured tooth pulp and apply other methods of treatment.

The doctor makes diagnosis on the basis of anamnesis, clinical, radiological, and physical methods of investigation. Lower there is given the WHO classification of traumas of children's permanent teeth. It is based, first of all, on age-related peculiarities of injuries. The classification is aimed at the correct choice of treatment method depending on age-related tooth structure. This WHO classification is standardized in such a way that the name of diagnosis contains information on the type of trauma; it is organized according to the principle “from simple cases to complicated cases”).

Classification of Permanent Teeth Traumas in Children (WHO)

Class I. Dental injury with minor structural damages (enamel cracks).

Class II. Simple tooth crown fracture.

Class III. Complicated tooth crown fracture.

Class IV. Complete tooth crown fracture.

Class V. Crown-root longitudinal fracture.

Class VI. Tooth crown fracture.

Class VII. Tooth dislocation (incomplete).

Class VIII. Complete tooth dislocation.

Traumatic injuries of temporary teeth are considered separately due to

versatility of diagnostic criteria and different treatment approaches. Since in each class of injuries there may be a couple of injury varieties, and injuries may take place in different age periods, i.e. in different degrees of root system formation, each class of traumas is considered subject to the degree of root system formation, damage of the tooth crown and root, and also damage of the neuromuscular bundle. In classes VII and VIII one should also evaluate the integrity of adjacent tissues in the region of the injured tooth. For this purpose in some classes 2—3 types of traumas have been differentiated:

- type 1 — trauma of teeth with unfinished root formation;
- type 2 — trauma of teeth with incompletely formed root apex;
- type 3 — trauma of teeth with completely formed root apex.

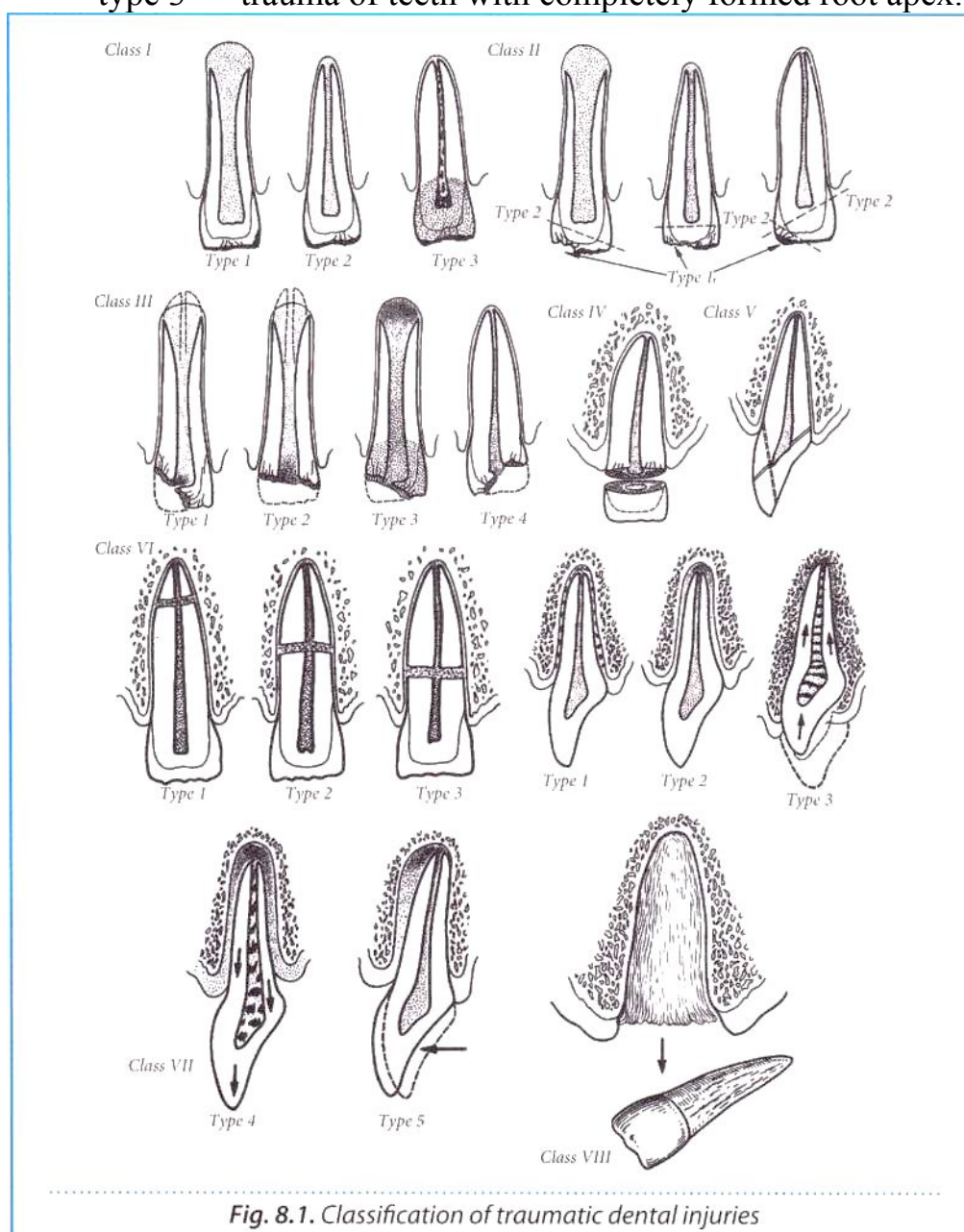


Fig. 8.1. Classification of traumatic dental injuries

Such division promotes not only proper diagnostics of the indicated pathology, but also optimal choice of treatment approach in a frontal teeth trauma in children.

The primary aim of clinical classification, except for knowledge

systematization, is helping the doctor to make a diagnosis, plan treatment, prognose results. Analysis of available classifications shows two tendencies in their compilation: the first – to describe all the varieties of traumas, condition of the pulp, periodontium, possible complications, the second – to simplify classification by including the most widespread injuries into it.

A disadvantage of the classification offered by Bulgarian scholars S. Davydov and Z. Peniova (1964) is its section “Traumatic Periodontitis”, which does not correspond to generally accepted periodontitis classification: it differentiates acute, chronic periodontitis and chronic periodontitis at the stage of exacerbation. The term “traumatic” only indicates the cause of periodontitis, and not its course. The authors introduced the clinical entities “loosening of teeth without dislocation”, “neuromuscular bundle rupture without loosening of teeth”, which are not types of dental trauma, but its consequences.

Besides, enumeration of teeth dislocations is not provided with necessary details: description of the possible direction of injured tooth displacement, which is very important for the choice of treatment method and complications prevention. The knowledge of root displacement direction in temporary teeth injury allows prognosing damages of the permanent teeth germs, like in case of vestibular displacement of a temporary tooth crown in impacted dislocation. This point is considered in N.M. Chuprynina’s classification (1985) and is absent in many classifications offered by foreign authors.

N.M. Chuprynina’s classification includes the condition of the neuromuscular bundle and pulp. Practice shows that during the first visit it is impossible to determine the degree of neurovascular bundle affection and judge with certainty about the condition of the pulp. It can be determined only on the basis of dynamic observation. Thus, this specification complicates classification structure. There is also no need to single out tooth cervix fracture and specify its level relative to the bottom of the dentogingival pocket, which is very difficult to determine even in transverse fracture of the tooth root.

V.F. Vasilevskaya’s classification (1970) does not indicate the direction of teeth displacement in incomplete dislocation. It does not single out types of crown fractures in the zone of enamel and dentin according to pulp translucence, which, according to the authors, is rather conditional considering identical treatment of this pathology.

Practical application of classifications developed by H.M. Ivashchenko (1963) and A.M. Konstantinov (1985) is very difficult because of non-systematic and incomplete enumeration of clinical entities. Thus, H.M. Ivashchenko did not include into the working classification determination of the type and level of the tooth fracture line, which is vital to know for treatment planning. A.M. Konstantinov uses not clinical, but metric assessment of injuries: breaking off of 1/3 or 2/3 of the crown, which is rather difficult to determine because of varying sizes, forms and localization of the part that broke off; besides, these data are useless in treatment planning. The authors believe that it is unacceptable to differentiate complicated and simple root fractures, because it foresees association

of the trauma with its consequences.

The classification developed by Jacobsen (1981) is simple and understandable for practicing physicians. Its disadvantage is the absence of description of teeth displacement direction in dislocation; differential diagnostics of the injured site and subluxation is also hampered.

One of the latest classifications was developed by V.V. Rohinskyi (1987). According to the author, there is no need to complicate the classification with indication of the degree of injured tooth root formation, one should not also consider dental concussion to be a clinical entity because it is not possible to determine it on the basis of signs offered by V.V. Rohinskyi. Pulp necrosis singled out by the author (class I-II, type 3) is a consequence of a trauma and not a clinical entity.

We have mentioned the WHO classification, which differentiates 8 classes of dental traumas:

Class I. Dental injury with minor structural damages.

Class II. Simple tooth crown fracture.

Class III. Complicated tooth crown fracture.

Class IV. Complete tooth crown fracture.

Class V. Crown-root longitudinal fracture.

Class VI. Tooth crown fracture.

Class VII. Tooth dislocation (incomplete).

Class VIII. Complete tooth dislocation.

This classification does not include enamel cracks, types of incomplete dislocation, germ injuries.

Taking into account the disadvantages of the mentioned classifications, including our own one, we should amend N.M. Chuprynina's classification. In our classification an emphasis was made on the clinical signs of dental traumas observed by the doctor during patient examination.

Classification of acute dental traumas (N.M. Chuprynina, 1985):

1. Injury.

2. Dislocation.

2.1. Incomplete dislocation:

a) without tooth displacement;

b) with displacement in the direction of the adjacent tooth;

c) with tooth displacement around the longitudinal axis;

d) with crown displacement in the vestibular direction;

e) with crown displacement in the oral direction;

f) with displacement in the occlusal direction.

2.2. Impacted dislocation.

2.3. Complete dislocation.

3. Crack.

4. Fracture (transverse, oblique, longitudinal).

4.1. Of a crown in the zone of enamel.

4.2. Of a crown in the zone of enamel and dentin without dental cavity

opening.

- 4.3. Of a crown in the zone of enamel and dentin with dental cavity opening.
- 4.4. Of a tooth in the zone of enamel, dentin, and cement.
- 4.5. Of a root in the cervical, middle, and apical thirds.
5. Associated (combined) traumas.
6. Germ trauma.

PECULIARITIES OF PATIENT EXAMINATION AFTER ACUTE DENTAL TRAUMA

Examination of a dental trauma patient is conducted by a dental therapist. He is the one to treat the patient and involve a surgeon, an orthodontist, or an orthopedist when it is necessary. Examination includes collecting complaints of the victim, questioning, determination of the general patient's condition and condition of the periodontium in the region of the injured tooth, analysis of the obtained data, making a diagnosis and planning treatment.

Scheme of examination:

1. Patient's complaints.
2. Life history:
 - a) allergic reactions to medicines, impaired blood coagulation;
 - b) if there have been traumas before and where they were treated.
3. Case history:
 - a) date of trauma;
 - b) place of trauma;
 - c) conditions of trauma (who, with what and where hit the victim);
 - d) time that has passed from the moment of trauma;
 - e) when, where and who rendered first aid, its type and extent.
4. External examination:
 - a) presence of face asymmetry, its causes (soft tissues defect or swelling, facial bones defect, etc.);
 - b) skin discoloration, violation of its integrity (cuts, ruptures), the degree of wound surface contamination, presence of foreign bodies.
5. Oral cavity examination:
 - a) oral mucosa discoloration, violation of its integrity;
 - b) dental formula (in children one indicates temporary and permanent teeth, carious, filled teeth, etc.);
 - c) presence of occlusion violations or tooth crown displacement relative to adjacent teeth;
 - d) condition of the injured tooth: size, form of the crown, enamel color, presence of cracks, tooth mobility degree, reaction to horizontal and vertical percussion, depth of the dentogingival groove.
6. Auxiliary investigations:
 - a) X-ray diagnostics;
 - b) electro-thermo-odontodiagnostics;
 - c) transillumination with the use of fiber-optic light guides.

According to this scheme one also examines the teeth located close to the

injured one, and also its antagonist.

On the basis of obtained information one makes a diagnosis, plans treatment, chooses the method of treatment, and determines prognosis (possible results).

We have studied numerous trauma case histories and most of them contained no clear description of the general condition of the victim after the trauma, indication of the time, place and conditions of the trauma, complete description of the findings of injured tooth examination. Most frequently an unspecified diagnosis was made: dental trauma or dislocation without indication of crown displacement direction; fracture without description of its localization, direction, fragments arrangement. Inaccurate description affords ground for challenging the correctness of investigation, diagnosis, and consequently, of the chosen method of treatment, which is proved by numerous complications. This makes the scheme given above highly appropriate.

The doctor must attentively listen to patient's complaints, asking additional questions to get more precise information. Child's relatives must be present during questioning. The type of complaints allows suspecting an injury of the periodontium, tooth pulp, bone of the alveolar process, or body of the jaw. In the end of questioning one finds out the type, extent, and place of first aid rendering, clearly recording the obtained information in the case history. Knowledge of the time of the trauma is needed to determine the period which has passed from the moment of injury to the time of visiting a doctor, which determines the extent and methods of investigation, and above all – treatment method and often prognosis.

During examination one is to determine the patient's condition, paying special attention to finding symptoms of central nervous system affection. If there is the least suspicion of the presence of such injuries, one should provide urgent consultation of a neuropathologist and a psychoneurologist, hospitalize the victim if it is necessary.

Antitetanus serum must be introduced because of possible wound contamination (it is usually conducted in the district polyclinic).

At the beginning of examination one should pay attention to the presence of such signs of traumas as soft tissue defects, face asymmetry caused by an edema, skin discoloration. During patient examination one should remember about the possibility of reflected injury, i.e. injury of teeth on the side of the jaw opposite to the trauma. A blow into the mental area may condition breaking off of a part of second molar crowns in temporary occlusion and of first molar crowns – in permanent occlusion.

In temporary teeth injury the direction of the blow allows assuming the possibility of permanent teeth germs affection. Mucosa bulging may testify to a fracture of the alveolar process, jaw or tooth displacement. Palpation helps to determine the type of swelling, its painfulness, teeth mobility.

The knowledge of incident circumstances (where the injury was received, when, by whom and with what it was caused) is important from the legal point of view for compiling and issuing a medical certificate and insurance documents, and

also for investigating authorities during case administration and pretrial examination, therefore the mentioned data are to be clearly entered into the case history.

Prognosis is influenced by the type of medical aid: specialized or nonspecialized.

Of big importance is the specialist who rendered aid: a therapist, a surgeon, an orthopedist or a doctor of another specialty. A 1-2-day delay in expert care rendering mainly conditions less complications than urgent but unskilled treatment.

Occlusion violation develops in dislocation of the lower teeth in the vestibular direction, of the upper teeth – in the palatine direction, of teeth of the lower or upper jaw – in the occlusal direction, in breaking off of the alveolar process, jaw fracture.

After external examination one inspects the oral cavity, and the side opposite to the injury is the reference one. During oral cavity examination one should first of all evaluate the condition of the mucosa to find abrasions, ruptures, edemas. After this one is to describe the dental formula. Teeth examination is conducted according to the traditional scheme, i.e. beginning from the right side of the upper jaw and ending with the last tooth of the lower jaw on the left.

The injured tooth is examined the most thoroughly paying attention to its form and crown color, position and direction of its displacement, mobility degree; one detects painfulness during vertical and horizontal percussion and palpation, pain during probing of the surface of fracture. One finds pathology of the dento-gingival pockets, fistulas, discharge from them. Palpation of the region of injured tooth root projection allows finding displacement of the root or its fracture.

When one determines crown color, he pays attention to its palatine surface because due to a thin layer of enamel it is colored sooner, especially in the cervical area. Crown discoloration may be observed right after a trauma or in some time, which should be specific.

One conducts palpation of the soft tissues of the oral cavity and regional lymph nodes. Tooth palpation allows determining its mobility and painfulness, finding root displacement, which is observed in crown dislocation in the vestibular or palatine direction; sometimes in tooth injury one finds a displaced root apex. The place of root fracture is very rarely found.

Percussion is conducted in the horizontal and vertical directions. Percussion must always be comparative. The pain observed in vertical percussion testifies to apical pathological process, horizontal – to marginal.

One can determine tooth mobility not only by means of palpation, but also with the help of tweezers. One must specify if the whole tooth is mobile or only its part, if the mobility is caused by temporary tooth root resorption. Determination of mobility degree is helpful when one decides if splinting is necessary and chooses immobilization method.

Probing is necessary to determine the depth of the dento-gingival pocket from all sides of the tooth, to find vertical crown fracture and a deep crack. If a part

of the crown breaks off, one resorts to probing to determine junction of the defect with the dental cavity and the degree of painfulness of the exposed pulp.

Radiological investigation is obligatory in any dental trauma. It begins with intraoral X-ray images in standard projection. In this case one examines the injured tooth together with the adjacent and opposing ones. According to indications one resorts to panoramic exposure or orthopantomogram because the region of affection must be reflected in one image. Sometimes one image is not enough and it must be retaken in another projection in order to find details, determine mistakes during radiogram analysis and make a proper diagnosis. Thus, an additional image in tangent projection may help to determine the position of the dislocated tooth and find an injury of a permanent tooth in an impacted dislocation of a temporary one.

At first one is to determine the quality of a radiogram: contrast, sharpness, projection distortions (teeth lengthening and shortening). The image should be interpreted subject to these data, otherwise the doctor takes another image avoiding previous mistakes.

Tooth shadow analysis is obligatory. One pays attention to the outline of the tooth crown and root, presence of a cavity or a filling in the crown, its defects (overhanging edges, loose attachment to the cavity walls). During image interpretation one determines the size, form, location of the dental cavity, presence of a denticle or intrapulpal granuloma in it, location and size of the canal orifices: canal length, form, contours and width, the size of the canal orifice characterizing the degree of root formation and allowing to determine its physiological or pathological resorption. One should pay attention to the condition of the periodontal fissure, its width, uniformity and integrity, assess the condition of the bony tissue surrounding the tooth, outline of inter-alveolar septa tips, their correlation with the cement-enamel junction, spongy substance pattern, the condition of the cortical plate: integrity violation, thinning or thickening in any area, pathological changes – destruction or osteosclerosis – determining the localization, size and form of the pathological focus, the type of its contours.

The radiological method is used not only during primary examination for making a diagnosis. Repeated identical radiograms obtained at different intervals are necessary for dynamic observation of reparative processes.

Thermal odontodiagnostics is a test of pulp sensitivity by means of heating (heated gutta-percha) and cooling (ethyl chloride, dry ice, ether) – it is more frequently indicated in children during examination of temporary and permanent teeth with nonformed roots, because it is easier for a child to determine the sensation of cold and heat than the senses arising during electroodontometry. One should apply cold and heat first on a healthy tooth and then on the injured one to find differences in reaction.

In most medical establishments EOD is conducted during examination of permanent teeth with formed roots. It should be first performed on an unaffected tooth, and then – on the affected one. A.D. Dzhafarova (f 969) believes that one should not determine electroexcitability in teeth with non-formed roots: in this case the method appears ineffective because their pulp reacts to more considerable

irritation with electrical current, which testifies to immaturity of nerve endings. Jacobsen (1981) explains this phenomenon by the fact that the impulse goes through the wide apical orifice.

Low indices of electroexcitability of the pulp of teeth with non-formed roots may be compared with the indices in pulpitis of formed teeth. Nevertheless, according to the authors of the book, EOD of injured non-formed teeth should be carried out with different intervals of time: the dynamics of changes will testify to the presence or absence of reparative processes in the pulp.

CLINICAL PRESENTATION AND TREATMENT OF DENTAL CONTUSION IN TEMPORARY, TRANSITIONAL, AND PERMANENT OCCLUSION

Contusion is a closed mechanical injury of organs and soft tissues without violation of their anatomical integrity in case of blow, which is connected with the influence of force insufficient to cause visible damage of the dental tissues. Only having conducted tooth crown examination by means of transillumination method V.V. Rohinskyi (1987) found in half of victims transversal or longitudinal cracks, mainly localized in the enamel of the cutting edge of the injured tooth, sometimes going throughout the whole crown or its most part. As a rule, cracks are found in the surface layers of the enamel. However, injuring force is transferred to the periodontium, usually the apical part of the root, that is why in case of a blow the periodontium is injured first as a result of squeezing: there appear ischemic phenomena, some periodontal fibers tear or rupture, mostly in its apical part. Despite described damages contusion is considered the slightest type of trauma.

H. Taats (1961) studied radiological and histological changes of the dental tissues in children after a trauma causing “shock” state of odontoblasts, as a rule, reversible: in some time cells start producing normal dentin.

Condition of the pulp after contusion depends on the changes that took place in it. The pulp can die as a result of alimentionation termination, which is observed in case of complete rupture of the neurovascular bundle close to the place of its entry into the apical orifice; in incomplete rupture there is observed pulp bleeding and erythrocytes penetration.

Jacobsen (1981) considers that a blow can compress or inconsiderably damage the veins in the apical orifice without artery affection, due to this there is observed no significant violation of arterial blood flow. According to Jacobsen, the venous system may be restored if root formation is finished. Sometimes there is observed inconsiderable pulp damage, and all the processes violated in it normalize quickly.

In contusion of non-formed teeth the neurovascular bundle is much less frequently ruptured close to its entry into the wide apical orifice if compared to formed teeth. This is explained by less displacement amplitude of the root apex of a non-formed tooth compared to a formed one, a larger space, in which the root pulp is located, and its varying structure. Tire root pulp and the growth zone in non-formed teeth are reprsented by less differentiated cells, which are less viable.

Since there are no external signs of a trauma and the pain disappears quickly

after the teeth are hit, the victims have no deep anxiety, therefore they, as a rule, rarely visit a doctor. Patients come to a polyclinic only if they have a more serious trauma of the adjacent teeth (dislocation, fracture), and only during examination of a considerably damaged tooth (though not always) doctors examine the adjacent teeth determining their contusion. In such a way the authors of the textbook explain insignificant incidence of contusions of both temporary (2.19 %) and permanent (1.41 %) teeth, established during analysis of case histories of persons who experienced such a trauma. Real incidence of this trauma is much higher. Sometimes doctors get to know the history of contusions when much time has passed after a trauma (a couple of months or years), because complications develop. However, some patients with dental contusion, with the pulp uninvolved, remain unrecorded.

During the first hours after a trauma the patient notes dull pain in the tooth when it is pressed. It seems to the victim that the injured tooth became longer than the adjacent ones, though it cannot be determined visually. This sensation appears when a tooth protrudes from the socket due to a posttraumatic swelling of the periapical tissues.

Examination of the contused tooth shows that its crown preserves its form and previous location in the dental arch. The patient feels pain during percussion: more in the vertical direction, less in the horizontal one. Slight tooth mobility is determined.

Radiological investigation shows no damage of the tooth and adjacent tissues. In some victims the tooth crown acquires pink coloring after contusion, which is explained by pulp hemorrhage caused by a rupture of its vessel and penetration of the blood into the dentin via dentinal tubules. The intensity of crown coloring gradually decreases and disappears completely if the pulp preserves its viability.

A diagnosis “dental contusion” is made on the basis of clinico-radiological findings. Despite the fact that in “fresh” dental contusion there are revealed no radiological changes, one still has to carry out radiographic investigation to exclude tooth root fracture, which sometimes has the same clinical presentation as contusion. Besides, an X-ray image taken right after a trauma will be needed to determine pathological changes that developed with different time intervals after a trauma in the periapical tissues, which is important to solve the question of treatment necessity.

Dental contusion should be differentiated from incomplete dislocation, in which tooth displacement is not determined clinically. Contusion differs from this type of dislocation by lower tooth mobility, absence of an extended periodontal fissure in a radiogram. Dental contusion should also be differentiated from tooth root fracture, in its minimal mobility or in its absence. In tooth root fracture a radiogram shows violation of the integrity of tooth contours and a light line dividing the root into two parts; there are no such changes in contusion.

Pink coloration of the crown after a blow caused by pulp bleeding should be differentiated from similar tooth coloration caused by granulation tissue of intra-

pulpar granuloma, which is localized in the crown part of the dental cavity. It is visible through the hard dental tissues made thinner by the pathological process. In contusion the whole crown or its cervical part is colored. In intra-pulpar granuloma there appears a pink spot of varying size on the vestibular or oral surface of the tooth crown, and sometimes on both surfaces. In the latter case there is noted their identical localization on these surfaces. In an X-ray image in accordance with spot location there is projected an oval or rounded lucent focus with even, less frequently scalloped, edges according to the area of hard tissue resorption. One can easily establish the cause of discoloration because there is a filling in a treated tooth and the material, which fills the dental cavity and/or canals, is projected onto the X-ray image.

To determine the state of the pulp after a trauma one uses thermo-odontodiagnostics (TOD) or EOD. It is more expedient to check pulp electroexcitability in permanent teeth with formed roots. One should remember that neither negative nor positive result of investigation of the pulp after a trauma is conclusive. During the first visit to a doctor there is most often found desensitization of the pulp of the damaged tooth.

Absence of pulp electroexcitability or a decrease of its reaction not always testifies to a considerable damage of the neurovascular bundle. They may be caused by pulp concussion or a hematoma, or ensue from traumatic neuritis. In the latter cases pulp electroexcitability may be restored in a month at the earliest, and often it happens even later. Preserved normal EOD indices observed during the first visit to a doctor do not exclude inflammation and pulp death at later stages. Thus, positive and negative results of the research conducted during the first visit are used to compare with the indices obtained in the course of case monitoring and testify: in increased pulp electroexcitability – to reparative processes, in decreased – to its death.

Single check-up of pulp electroexcitability is insufficient because even normal electroexcitability, its decrease or complete absence due to the mentioned reasons may be temporary. The data obtained during the first visit are recorded in the case history, and the patient is registered for periodical survey. If EOD results remain normal during 3 months, the victim is taken off the books. After signs of normalization are found, EOD is conducted every 3 months until the pulp does not react to 5-6 microampere electrical current. If the first test shows no signs of pulp electroexcitability recovery, the tooth crown darkens and there appears a fistula on the gum, this testifies to irreversible changes in the pulp and in this case the tooth requires treatment.

EOD is less effective in examination of permanent non-formed teeth because the nervous elements of the pulp are still at the stage of formation and respond to current irritation not like formed teeth. However, EOD is still indicated in non-formed teeth and its results can be used later on for comparison: electroexcitability of the living pulp gradually increases when the root is formed. Therefore the obtained results are to be recorded in the case history.

Pulp death in a non-formed tooth sometimes leads to growth zone death

conditioning cessation of root formation. Described changes are found by means of occasional radiological examination. Clinical presentation is peculiar in this case. Sensation of “discomfort” in the tooth is typical. Soon there appears indistinct painful sensation in the tooth during mastication of solid food, sometimes pain appears when temperature changes or the crown is pressed. Examination may show that the tooth is intact, which baffles the doctor. EOD facilitates diagnosis specification. In such a tooth electroexcitability test shows its decrease on the tubercle corresponding to the location of the canal with damaged pulp. Radiogram shows no changes right after a trauma and in the short run. When a long period of time passes after a trauma, pulp death is testified to by changes in the periapical tissues of the root.

A patient with dental contusion begins to worry after tooth crown discoloration and fistula formation on the gum or skin, which is a sign of chronic periodontium inflammation or an acute inflammatory process in the region of an impacted tooth. This makes the victim visit a doctor. Sometimes the doctor gets to know about contusion because of changes in one of the roots or periapical tissues shown in an X-ray image made during neighboring teeth examination. The following contusion results are possible:

1. Pulp function recovery.
2. Gradual change of pink coloration of the crown (if it was pink) to gray coloration, which testifies to pulp death. Crown darkening may be primary, without preceding pink coloration, which is a sign of pulp necrosis. Most frequently not the whole crown but one third of it is colored, the cervical part, especially from the palatine side.
3. Canal obliteration.
4. Death of the pulp of a temporary tooth, which causes periodontitis development, not infrequently with a permanent tooth germ involved in the inflammatory process. Granulating process in the periodontium of a temporary tooth accelerates the process of its tooth resorption. A radicular cyst may form, which ceases resorption of the root directed into its cavity and leads to repositioning of the corresponding permanent tooth or its retention.
5. Development of some form of chronic periodontitis or radicular cyst caused by the death of the pulp of a permanent tooth.
6. Cessation of root development caused by the death of the pulp of any non-formed tooth.

Treatment. After dental contusion rest must be provided until pain ceases to appear when the tooth is pressed. In small children this is achieved by temporary exclusion of solid food from the diet. One can exclude contact of the temporary tooth with its antagonist by grinding a part of the crown of the latter. As a rule, the child is administered anti-inflammatory treatment.

If pulp necrosis is determined, there is indicated crown trepanation and further endodontic treatment of chronic inflammatory process in the tooth apex. There are no vital differences in the treatment of single-rooted temporary and permanent teeth. Treatment of developing teeth is somewhat different from

treatment of formed teeth because of peculiarities of their structure, notably: a shorter canal, wider canal and canal orifice, a thin layer of hard tissues with wide dentinal tubules, presence of predentin on the walls of the root canal, and presence of granulation tissue in the root socket.

Ossification of the pathological focus near the root of a permanent tooth is observed from the 3rd to 18th month even in considerable destruction of the bony tissue; in children it is quicker than in adults. When a canal of a temporary tooth is filled up to the apex and beyond its borders, the bony tissue is restored only in the teeth without a process of physiological root resorption. The absence of bone regeneration in the zone of resorption is connected with bone rearrangement in the period of teeth change, when resorption processes prevail over osteogenesis. If even a small area of the bony tissue limiting a follicle is destroyed, it will never restore because in such a case the temporary tooth cannot be treated.

After dental contusion children must be registered with the aim of dynamic observation of the condition of the pulp and periapical tissues, and after endodontic treatment, if it was indicated, – of reparative processes in the bony tissue in destruction foci until complete elimination of the pathological process. If the tooth was being formed at the moment of trauma, such a child must be observed during the whole period of its development. In the process of dynamic observation one conducts examination in 1 week, 1, 3, 6 months after contusion, and then once a year until the root is formed.

CLINICAL PRESENTATION AND TREATMENT OF DENTAL DISLOCATION IN TEMPORARY, TRANSITIONAL, AND PERMANENT OCCLUSION

Dental dislocation is caused by a hit into the tooth crown, due to which the tooth is displaced in this or that direction, more frequently partially, less frequently completely, moving beyond the limits of the socket. Thus, dislocation is characterized by a change of spatial relations of a tooth and its socket. Sometimes displacement cannot be determined clinically, but a radiogram shows periodontal fissure dilatation.

One differentiates incomplete, complete and impacted dislocations. The type of dislocation depends on the direction of the effective force and the place of its application, and the degree of tooth displacement – on blow force, age-related peculiarities of the structure of the tooth and bony tissue.

Clinically, one diagnoses dislocation with displacement on the basis of a change of tooth crown location in the dental arch or tooth crown absence, gingival hemorrhage caused by a rupture of the round ligament of the tooth, pathological changes of the periodontal tissues and affection of the bony tissue of the alveolar process, formation of a pathological dento-gingival pocket.

Diagnosis is specified during radiological investigation. A radiogram helps to specify the type of dislocation and direction of tooth displacement from its socket, determine the width of the periodontal fissure, condition of the cortical plate of the socket wall, integrity of the spongy bone of the alveolar process, and sometimes – of the jaw body. In dislocation of a temporary tooth radiological

investigation allows determining the relations of the root of this tooth with the permanent tooth germ, condition of the cortical plate of the follicle of the same germ.

Incomplete dental dislocation is sometimes characterized by a change of its crown position in the dental arch and displacement of the root relative to the socket walls in the absence of visible displacement which, nevertheless, is shown by a radiogram. In incomplete dislocation depending on the direction and the place of application of the force, which acts in one stage, the tooth may be displaced bodily from the occlusal surface of the adjacent tooth in the labial or oral direction or turn round the longitudinal axis violating the form of the dental arch. But most frequently the crown of a dislocated tooth is displaced relative to the crowns of the adjacent teeth to the side of the oral cavity, vestibularly or to the side of the adjacent tooth, and the root is displaced in the opposite direction, which leads to a change of spatial relations between it and the socket walls. It is especially important to specify the direction of temporary tooth root displacement to determine the possibility of damage of the corresponding permanent tooth germ. There may be observed combined dislocations, i.e. displacement of a tooth simultaneously in two, less frequently – three directions. The degree of dislocation depends on the force of the blow and age-related peculiarities of tooth and bony tissue structure.

One should clearly differentiate types of dislocations because each type determines doctor's approach to tooth reposition. Dislocation may be associated with breaking off of a part of the tooth crown, dental fracture, crack or complete breaking off of the alveolar process or, which is observed more frequently, its part.

In any incomplete dislocation during the first hours after a trauma patients are bothered by aching pain when the tooth is touched. Most patients complain of tooth mobility, its crown changes location relative to the dental arch, it is difficult to bite off food and sometimes impossible to bite or close the mouth.

Not infrequently examination shows an edematous lip, a hematoma, an abrasion or a wound of the soft tissues, changed location in the dental arch. The patient cannot occlude the teeth in the position of central occlusion, especially if the tooth is displaced in the direction of the occlusal plane or the crown of a lower tooth is displaced vestibularly, and the crown of an upper tooth – palatally. In such cases the lower jaw takes a forced position. There is no tooth mobility if the root apex breaks through the socket wall and the root is stuck in the thickness of the bone. Tooth mobility is pronounced if it is displaced to the side of the alveolar edge or its dislocation is associated with alveolar process fracture.

In dislocation palpation and percussion, both vertical and horizontal, are painful.

The gums are edematous, hyperemic, sometimes bleeding. Hemorrhage from the dento-gingival fissure testifies to damage of the periodontal vessels and fibers.

The type of dislocation is determined during clinical examination by crown position in the dental arch and specified with the help of radiological investigation. Each type of dislocation is characterized by certain clinical and radiological

presentation, determined by a change of crown location relative to the adjacent teeth, and a change of root location – relative to the socket walls, a change of the periodontal fissure width (narrowing or dilatation), sometimes shortening of the root projection in the radiogram.

If a crown is not or hardly visible during examination, one should carry out radiological investigation to confirm the diagnosis, specify the direction and degree of tooth displacement from the socket, determine the degree of root formation, and in a temporary tooth – also its resorption. A radiogram shows the condition of the periodontal fissure and periapical tissues, continuity of the cortical plate surrounding the permanent tooth follicle, and the possibility of injuring it. It is also necessary to exclude a fracture of the root, alveolar process, and sometimes body of the jaw.

In incomplete dislocation there is always damaged the tooth pulp, periodontium and bony tissue of the socket wall. The pulp does not necessarily die, it is especially stable in a non-formed tooth. This is explained by the fact that the displacement amplitude of the root apex of a formed tooth is much higher than of a longer non-formed one (in case of such a tooth crown displacement). Besides, in a tooth with non-formed roots the pulp occupies a larger volume and has a specific structure (the growth zone is represented by poorly differentiated cells). The growth zone may remain vital if most of the root pulp dies. As the root is being formed, the probability of neurovascular bundle rupture close to the apical orifice in dental dislocation increases.

Unlike complete dislocation, in incomplete dislocation the fibrous structure of the periodontium is partially damaged to a greater or lesser extent. Some fibers stretch, tear, or completely rupture. The localization and volume of the changes taking place depend on the type of dislocation and the degree of tooth displacement. In other areas connection of the tooth with the socket is preserved.

Violation of the socket walls integrity in most cases is observed in one area and is not always shown by a radiogram because the tooth root projection overlaps it. Alveolar process fracture, which accompanies dislocation, is most often found in children younger than 2 years, more frequently on the upper jaw. A fragment of the alveolar edge may be displaced; in this case a radiogram shows a violation of the integrity of the cortical plate surrounding the periodontal fissure, and a light stripe in the spongy layer of the jaw.

To determine the condition of the pulp one should check its electroexcitability: first during the first days after a trauma, and then in 2-4 weeks, and if there are indications – even later. The criteria of pulp condition assessment include the onset of new clinical signs and radiography findings. An increase of the inflammatory process in 2–3 days after the trauma or its development after a longer period testifies to pulp death. Pulp death is also indicated by crown darkening, fistula formation on the gum, or a chronic inflammatory process in the periapical tissues, which is shown by a radiogram. If clinical presentation is favorable, one can assess tooth pulp condition by the absence of changes in the state of the root and periapical tissues, which is determined by means of comparing repetitive

radiograms taken annually after the trauma. Pulp necrosis is testified to by cessation of root formation, destruction of the cortical plate and spongy substance of the bony tissue near the tooth root apex.

In temporary teeth the pulp overcomes affection quicker due to peculiarities of its structure: abundant blood supply, good outflow of exudate during inflammation.

Treatment for incomplete dislocation. In incomplete dislocation teeth are preserved, except for temporary ones with incipient root resorption, and also in chronic periodontitis, which spreads onto the permanent tooth germ.

Treatment plan: 1) anesthesia; 2) tooth reposition; 3) radiography aimed to check reposition correctness; 4) tooth immobilization (according to indications); 5) antitetanus serum introduction (according to indications); 6) case follow-up.

In whole, the treatment plan is implemented by a dental therapist, who involves a surgeon, an orthodontist, or an orthopedist when necessary. Medical assistance provided in full volume during the first visit to a doctor guarantees favorable outcome of the trauma. The choice of treatment method should be based on the type of dislocation, concomitant injuries, general condition of the patient, his age, condition of the pulp, periodontium, and the time of visit to the doctor.

An important stage is the return of the tooth to its previous site (reposition) after anesthetization. Involuntary reposition is observed rather rarely, mainly in temporary teeth, and in permanent ones – in case of tooth displacement in the palatine direction. Most frequently reposition is performed by a therapist, less frequently – by a surgeon or an orthodontist.

One differentiates single-stage and prolonged reposition. The doctor resorts to single-stage reposition if the victim appeals for medical aid during the first hours after the trauma. If the victim visits a doctor after a longer time and the tooth has settled in the new position, it is displaced gradually with the help of orthodontic equipment.

Single-stage reposition must be preceded by anesthetization. One should remember that in young children conduction and infiltration anesthesia is carried out with 0.25-0.5 % novocaine solution, adrenaline may be added only in children older than 5 years. When signs of anesthesia appear, single-stage reposition is conducted with fingers or with the help of dental extraction forceps. If one conducts reposition with fingers, they are to be placed on the alveolar process, the doctor exerts pressure not only on the injured tooth, but also on the adjacent ones. Pressure only on the injured tooth may lead to its dislocation in the reverse direction. One should reset the tooth slowly not to damage the neurovascular bundle by the entry to its apical foramen, and in a non-formed tooth – also the growth zone, which might be unaffected by the trauma.

A validation criterion for correct reposition is the absence of antagonist thrusts during closure of teeth in the position of central occlusion. If a thrust can be felt, one should grind a part of the antagonist's crown or exclude the tooth from occlusion, disjoining it in the frontal part. This is achieved by means of fixing orthodontic crowns on children's temporary molars, if the latter are missing — one

the first permanent molars.

If the treatment procedure is delayed by more than 48 hours, the tooth is usually fixed in the new position and will resist return to its previous site. The stability of the tooth in its new position is promoted by the presence of blood clots, and later – granulations, which develop between the tooth root and socket walls, in case of tooth displacement in the palatine or vestibular direction, and wedging of the root apex between fragments of its wall. Due to this, prior to reposition one should cause dental luxation and later carry out reposition as described above. If a victim visits a doctor in a couple of weeks or months after a trauma, when the tooth is stably fixed in the new position, its reposition is conducted with the help of orthodontic appliances of different constructions.

A repositioned tooth should be fixed, otherwise it can return to the previous position. For this purpose one uses different splints. One should remember that splinting is hampered in little children. The younger children, the more complicated fixation.

Difficulties are conditioned by the small size of the crowns of temporary teeth and of permanent teeth in the period of their eruption, when the crown has not completely come out of the gum, there are physiological tremas and diastems, absence of certain teeth in the period of their replacement, mobility of temporary teeth caused by physiological resorption of their roots, and also by the fact that children cannot endure prolonged and not always painless manipulations.

Impacted dislocation (intrusion, or intrusive luxation) is partial or complete immersion of the tooth crown into the socket, and of the root into the jaw bone along the longitudinal axis of the tooth. This type of dislocation is observed when the cutting edge of a tooth is hit, it is always accompanied by stretching, tearing or complete rupture of the periodontal tissues, squeezing or fracture of the bony tissue of the socket walls, because the broad part of the tooth goes into the narrower part of the socket. A tooth may completely move beyond the borders of the socket destroying the spongy substance of the jaw body. Dental impaction is sometimes associated with its displacement in the palatine or vestibular direction or its dislocation around the longitudinal axis.

Impacted dislocation cannot be referred to incomplete dislocations. It would be more correct to single it out as an independent nosologic unit because it has clinicalradiological signs of both incomplete and complete dislocation, and also its typical features (complete disappearance of the periodontal fissure, injuries throughout the socket walls, complete destruction of its bottom).

The victim complains of insignificant pain in the tooth, shortening of the tooth crown or its disappearance from the dental arch, difficulties during food intake, bleeding from the gums if they are touched. During examination, depending on the degree of tooth impaction, a part of tooth crown is determined above the surface of the gums (sometimes only its cutting edge), or it cannot be seen at all. In the latter case the crown is found within the socket during probing, and sometimes it is not found.

The part of the tooth crown projecting above the gum is immobile. Its

percussion is hardly painful. During palpation of the nasal cavity floor one can determine the root apex of the upper incisor if its impaction was significant. The gums near the impacted tooth are swollen, which sometimes hampers examination, and, consequently, making a diagnosis without preliminary radiological investigation.

In case of deep impaction one finds a blood clot in the free part of the socket. The location, degree of impaction, and condition of the tooth, and also its position relative to the adjacent teeth are determined during radiological investigation. In a radiogram, the cutting edge of the crown of an impacted tooth on the upper jaw is usually located above (on the lower jaw – below) the level of the adjacent teeth crowns, sometimes – at the level of the alveolar edge, less frequently – in some part of the socket, and very rarely – beyond its borders. The root apex of an impacted tooth on the upper jaw is located higher, and on the lower jaw – lower than the root apex of the homonymous unaffected tooth. The periodontal fissure is missing in most cases, which is explained by the fact that a wider part of the root goes into a narrower part of the socket. Projection and contrast range of the cortical plate depend directly on the degree of tooth impaction into the socket.

If a tooth is beyond the borders of the socket, it may be located in the body of the jaw close to the floor of the nasal fossa, part of the wing of nose, maxillary sinus, in the soft tissues. In this case the empty socket with a destroyed floor is projected. An impacted tooth has the same length as a homonymous uninjured tooth.

If an impacted dislocation is associated with an incomplete one (crown displacement in the vestibular or palatine direction), the tooth seems shortened in the radiogram because of inclination as compared to a homonymous uninjured tooth. If dislocation of a non-formed tooth takes place, its growth zone is projected in decreased form or cannot be determined.

In impacted dislocation of a temporary tooth examination should determine if the follicle of the corresponding temporary tooth has been injured. For this purpose one should make sure that the cortical plate limiting the follicle is continuous. Assessment of the condition of the compact bone in this area is hampered by overlapping of the images of the permanent tooth follicle and temporary tooth root. Taking X-ray images in different projections helps to solve this problem.

A radiogram taken in a year after the trauma or later sometimes shows violations of permanent tooth crown formation before the beginning of its eruption. It is possible in the cases when the root of a temporary tooth is considerably resorbed and the most part of the permanent tooth crown has formed. This is testified to by a change of the form of the tooth crown, an increase or a decrease of its transparency in this or that area. Final diagnosis is made after tooth eruption.

Thus, diagnosis specification allows finding typical clinical and radiological signs of impacted dislocation and conducting differential diagnostics. Impacted dislocations should be differentiated from complete dislocations, root fracture with

a complete dislocation of a fragment, two types of incomplete dislocation – crown displacement in the vestibular and palatine directions and repositioned supplemental tooth. It is differentiated from complete dislocation in the cases when an impacted tooth is beyond the borders of the socket, in this case, as well as in complete dislocation, the socket free from the tooth is projected in the radiogram. Diagnosis specification is promoted by determination of tooth location and condition of the cortical plate of the socket walls and floor. In complete dislocation the cortical plate is thin and visible on the socket floor, and sometimes throughout its walls, and in impacted dislocation it is often absent.

Treatment for impacted dislocation of temporary and permanent teeth. This question is still being discussed. Opinions vary concerning doctor's approach in this case: 1) waiting (this point of view is supported by the fact that with time impacted teeth can involuntarily return to the initial position); 2) single-stage reposition with obligatory fixation of the repositioned tooth; 3) pulling-out of the impacted tooth with the help of orthodontic appliances; 4) extraction of the tooth followed by its replantation; 5) extraction of the impacted tooth without subsequent replantation (defect elimination according to indications by means of prosthetics).

Complete dislocation is characterized by falling of a tooth out of the socket under the influence of a heavy blow. In this case the blow is most often directed to the side of the occlusal plane. The tooth falls out of the socket after complete rupture of the periodontal tissues and round ligament.

Dislocation is predominantly observed in the frontal teeth of the upper jaw, less frequently – in the teeth of the lower jaw. The central incisors are affected most often, lateral incisors – less frequently, sometimes four incisors are dislocated simultaneously. Canine teeth are dislocated very seldom.

Sometimes children bring fallen teeth home, and adults usually appeal to a doctor for medical aid. In some cases teeth cannot be found.

In complete dislocation the patient complains of the absence of a tooth in the dental arch, pain in the region of the socket, and also of cosmetic and phonetic defects.

Oral cavity examination shows a missing tooth in the dental arch and a socket without a tooth, which may be bleeding and quite often is filled with a blood clot.

Diagnostics of complete dislocation is not complicated if the victim brings the tooth to the doctor, and the latter makes sure that the tooth belongs to the patient. During tooth examination one should check if all its parts are preserved, if there is a carious cavity. In complete dislocation radiogram shows a projecting socket without the tooth. The socket has clear contours, its length and form correspond to the root of the fallen tooth. The socket walls are usually limited with a continuous cortical plate, less clearly defined along the alveolar edge. Nevertheless, one can observe violation of the integrity of the compact bone and even spongy substance in some part of the socket or of its edge, which testifies to the force and direction of the blow. If a multi-rooted tooth is dislocated, one can see the outline of the inter-radicular septum with a pronounced cortical plate,

which limits it.

Everything mentioned above makes it clear that loss of a tooth leads to anatomical, functional, cosmetic, and phonetic defects. Urgent treatment helps to avoid them.

Treatment for complete dislocation consists in dental arch restoration by means of: 1) replantation of the dislocated tooth (return of the tooth to its socket); 2) tooth transplantation (displacement of another tooth into the socket); 3) displacing teeth by turn to the side of the space; 4) prosthetics.

If there are options, in permanent teeth dislocation one should prefer replantation irrespective of the condition of the fallen tooth crown (whether it is intact, carious, a part of it has broken off, if there is a malformation), and even chronic inflammation of the periapical tissues, which developed before the trauma.

Replantation is return of the tooth to its socket. Expediency of replantation is conditioned by many factors. Tooth replantation restores dental arch integrity, and consequently, its function, eliminates cosmetic defects, restores phonetics; in children there are created physiological conditions for further formation of the dental and alveolar arches and jaw in whole.

Cases subject to replantation: 1) teeth extracted by mistake; 2) teeth, which fell out due to an acute injury; 3) extracted deeply impacted teeth (when they cannot be pulled out involuntarily or by means of orthodontic appliances); 4) teeth with root fracture or crown fragment dislocation.

One cannot replant a temporary tooth if the follicle wall was damaged during trauma because the inflammatory process induced by replantation may spread onto the follicle and disturb its development.

Replantation of a temporary tooth with chronic inflammation of the periapical tissues, which developed before the trauma, is contraindicated.

Contraindications for permanent teeth replantation: 1) the interdental space can still be closed by means of displacement of the adjacent teeth (atypical location of the affected tooth); 2) considerable destruction of the socket walls and major inflammatory process in a part of the socket of the fallen tooth; 3) considerable destruction of the dental implant; 4) evident pathology of the periodontium, especially periodontolysis; 5) acute somatic disease or exacerbation of a chronic disease in case of trauma.

CLINICAL PRESENTATION AND TREATMENT OF DENTAL FRACTURE DEPENDING ON PATIENT'S AGE, TRAUMA TYPE AND PRESCRIPTION

Dental fracture is complete isolation of one of dental hard tissues from the tooth. It may take place in any part of the tooth, therefore one differentiates such fracture varieties: breaking off of a part of the crown, breaking off of the whole crown, root fracture, and crown-root fracture. Incomplete fracture can also take place – a crack (infracture).

The fracture line depending on fracture localization goes through the enamel, enamel and dentin, dentin and cement, or enamel, dentin and cement simultaneously.

A crack (infracture) is incomplete dental fracture without abruption of tooth fragment. One differentiates: 1) an enamel crack, which goes above the enamel-dentin junction; 2) a crack, which reaches the enamel-dentin junction; 3) a crack, which goes through the enamel and dentin; 4) a crack, which goes through all the dental tissues (enamel, dentin, pulp and cement).

Treatment of enamel cracks and superficial parts of the dentin is not indicated. If there are deep cracks in the region of the tooth root, it is extracted.

Tooth crown fractures are observed predominantly in permanent teeth and rarely in temporary ones in the form of: 1) breaking off of a part of enamel; 2) breaking off of a part of the crown within dentin at a varying distance from the cavity and pulp (the doctor opens the dental cavity and does not expose the pulp); 3) breaking off of the whole crown. Such classification is expedient because the line of fracture goes through different dental tissues.

Treatment. If the crown is broken close to the pulp, one is recommended to cover the pulp indirectly with a treatment paste, better based on calcium hydroxide, which has an analgetic and bactericidal action and promotes quicker depositing of replacing dentin. In order to fix the treatment paste and restore the missing part of the tooth one should cover the injured tooth with a cap or a temporary crown for 8-12 months, and sometimes for a longer period of time (odontotropic paste may be used for permanent restoration of the tooth form). For such cases the clinic should be provided with readymade crowns and caps of different sizes. If one cannot choose an orthodontic crown or make it quickly, the odontotropic paste may be covered with phosphate cement for 1-2 days. When the crown is ready, one should fit it and cut a semicircular window on its palatine surface, which is needed to conduct EOD, and fix it on the tooth with cement.

Tooth root fracture is possible at any level: near the tooth cervix, in the middle of the root, at the border of the middle and apical thirds of the root, or close to the apex; and direction of the fracture line may be different: transversal, oblique, longitudinal.

Depending on the direction and number of fracture lines there are differentiated transversal, oblique, longitudinal, and fragmented fractures. The fracture line goes through the cement, dentin and pulp of the tooth.

Depending on the number of fracture lines there is a different number of fragments: one line – two fragments, two lines – three fragments, etc. If there is more than one fracture line and they have different directions, such a fracture is called fragmented.

In permanent incisors fracture is most frequently localized in the region between the middle and apical thirds of the root (69 %), the least frequently – close to the root apex (2 %), in other two regions (near the cervix and in the middle of the root) it is equally common (more than 14.5 %); the region between the middle and apical thirds of the root is the most frequent localization of incisor fracture in temporary teeth.

Root fracture, especially in temporary teeth, is often associated with crown fragment dislocation. The root is often displaced in the occlusal, palatine, or

vestibular direction, or falls out of the socket – it depends on the direction and force of the blow. Complete dislocation of a crown fragment is most frequently observed in temporary root fracture, the apical fragment almost never changes its position right after the trauma. Displacement may take place later when there develops an inflammatory process in the region of the fracture on conditions that root fracture was accompanied by pulp rupture.

During the first hours after a trauma the victim may complain of insignificant dull pain, it is painful to bite with the injured tooth. Different patients have varying intensity of pain. The patient is sometimes bothered by stronger or weaker tooth mobility, less frequently – by crown position change.

Treatment is provided according to the following plan: 1) apposition of fragments if they are displaced; 2) splinting by means of a cap; 3) trepanation of the pulp cavity; 4) extraction of a fragment from the canal and its medicamental treatment; 5) obturation of the apical foramen with the filling material in granulating and granulomatous periodontitis; 6) selection of a pin followed by its fixation with cement.

Patients with root fractures should be monitored – the doctor observes condition of the tooth (change of color, location in the dental arch, mobility), pulp, periodontium, fragments reparation, bone regeneration and fragments union.

Repeated examinations are conducted in 1, and then 2 weeks, 1, 3 and 6 months, 1 year. The patient is notified about the necessity of visiting the doctor if there develops an inflammatory process or any changes in the tooth.

Root fracture completion: 1) crown fragment falling; 2) crown fragment displacement; 3) pulp death in a crown fragment; 4) resorption of the fracture surfaces of both fragments, which increases the distance between them that is filled with the bony tissue. A periodontal fissure forms near the surface where a fragment broke off; 5) development of chronic periodontitis in the region of fracture with further fistula formation and apical fragment displacement; 6) intrapulpar granuloma formation; 7) development of periodontitis, sometimes with alveolar crest resorption.

Materials for self-control:

A. Tasks for self-control (tables, diagrams, drawings, graphs):

- to sketch in the album the drawings with classification of dental injuries.

B. Tasks for self-control:

1. According to Chuprinina and Anikienko classification traumatic damages include:

dislocation of the tooth

fractures of the jaws

fractures of the maxilla alveolar process

fracture of the mandible alveolar process

fracture of the zygomatic bone

2. According to Chuprinina and Anikienko classification traumatic damages include:

- tooth damage
- partial loss of the alveolar bone
- complete loss of maxilla body
- fractures of the jaws
- partial loss of teeth

3. According to Chuprinina and Anikienko classification traumatic damages include:

- fracture of the tooth crown
- fractures of the jaws
- fractures of the mandible alveolar process
- complete loss of maxilla body
- fracture of the maxilla alveolar process

4. According to Chuprinina and Anikienko classification traumatic damages include:

- fracture of the tooth root
- complete loss of the alveolar bone
- fractures of the jaw
- fracture of the alveolar process
- partial loss of teeth

5. According to Chuprinina and Anikienko classification traumatic damages include:

- fracture of the neck of the tooth
- complete loss of the alveolar bone
- fractures of the jaw
- partial loss of the alveolar bone
- partial loss of teeth

6. According to Chuprinina and Anikienko classification root fracture of the tooth happens:

- horizontal
- combined
- difficult
- comminuted
- multycomminuted

7. According to Chuprinina and Anikienko classification a tooth luxation can be:

- longitudinal
- cross
- oblique

combined
incomplete

8. According to Chuprinina and Anikienko classification a tooth luxation can be:
full

comminuted
longitudinal
cross
oblique

9. According to Chuprinina and Anikienko classification a tooth luxation can be:
impacted

oblique
longitudinal
cross
comminuted

10. By level of the frontal teeth damage are distinguished:

five degrees
two degrees
four degrees
three degrees
the six degrees

11. By level of frontal teeth impaction the I degree of tooth crown shortening is:

1 mm
6 mm
3 mm
4 mm
5 mm

12. By level of frontal teeth impaction the III degree of tooth crown shortening is:

3 mm
1 mm
6 mm
4 mm
5 mm

13. The child is 11 years old. Complaints traumatic broke off of the 11 tooth crown.
What pin tooth design most rational to eliminate this defect?

by Ilyina - Markosyan
by Richmond
by Katz
by Parshina

by Davis

14. To the hospital asked parents with a child of 4 years old with complaints of aesthetic defect. According to mother the child fell while walking on the street. Objectively: in the sagittal and vertical planes the change is not detected, the upper right central incisor is mobile and in infraposition state is 2 mm relative to the tooth on the opposite side. On the radiograph the root and the crown is undamaged. Diagnosis of traumatic damage according to the WHO:

- tooth luxation incomplete
- uncomplicated fracture of the crown
- fracture of the tooth crown
- minor structural damage
- complete luxation of the tooth

15. To the hospital asked parents with a child of 4 years old with complaints of aesthetic defect. According to mother the child fell while walking on the street. Objectively: in the sagittal and vertical planes the change is not detected, the upper right central incisor is mobile and in infraposition state is 2 mm relative to the tooth on the opposite side. On the radiograph the root and the crown is undamaged. Choose the treatment tactics in this case:

- peace and observation by tooth state
- pulling to the dental arch
- the extraction of a tooth
- endodontic treatment
- to use the retentive kappa

16. Celluloid caps at the crown tooth part trauma in the enamel-dentine side is used for:

- restoration
- splinting
- fixing a biological dressing
- whitening
- bite increasing

17. What is the term for a fixed kappa with an incomplete permanent tooth luxation:

- for 1 month
- for 2 months
- for 2 weeks
- do not conduct splinting
- for 6 months

18. At fracture of a tooth enamel-dentine area with a pulp opening needs:

- pulp extirpation

pulp amputation
biological method of treatment
using a biological dressing and composite restoration
inlay making

19. In acute trauma of temporary teeth in most cases happens:
fracture of the crown on the gingiva level
tooth luxation
root fracture
teeth are not damaged
the breaking away of the alveolar process

20. Electroodontirritability at the trauma can be defined:
in the permanent teeth with the formed root
in the permanent teeth with unformed root
temporary teeth with the formed root
it is impossible to determine in the children
temporal teeth with the unformed root

21. What is a bruised tooth?
closed mechanical teeth and soft tissues damage without violation of their anatomic integrity
open mechanical teeth and soft tissues damage without violation of their anatomic integrity
damages as a result of which the tooth is displaced in the direction partially or fully extends beyond the hole
damage, where the tooth does not move, but only damaged it with a soft tissues
break off the tooth crown at a different level

22. What is a luxation of the tooth?
damage, in which the tooth is displaced in the direction partially or entirely extends beyond the hole
a closed mechanical damage to the teeth and soft tissues without violation of their anatomic integrity
open mechanical teeth and soft tissues damage without violation of their anatomic integrity
a complete separation of a tooth from hole
partial separation of the tooth from hole

23. What is the fracture of a tooth?
it is a complete separation of the hard tissues of the tooth
this is an incomplete fracture of a tooth without departing parts
partial separation of the tooth from hole

open mechanical teeth and soft tissues damage without violation of their anatomic integrity

closed mechanical teeth and soft tissues damage without violation of their anatomic integrity

24. What is a cracked tooth?

incomplete fracture of a tooth without departing parts

closed mechanical teeth and soft tissues damage without violation of their anatomic integrity

damages as a result of which the tooth is displaced in the direction partially or entirely extends beyond the hole

damages for which the tooth does not move, only the soft tissue of the tooth

it is a complete separation of the hard tissues of the tooth

25. To the hospital asked parents with a child of 5 years old with complaints of aesthetic defect. According to mother the child fell while walking on the street. Objectively: in the sagittal and vertical planes the change is not detected, the upper right central incisor is mobile and infraposition state is 2 mm relative to the tooth on the opposite side. On the radiograph the root and the crown is undamaged. Choose the treatment tactics in this case:

peace and observation by tooth state

pulling to the dental arch

the extraction of a tooth

endodontic treatment

to use the retentive kappa

26. The patient 10 years after a transport accident. On clinical examination installed: crowns 11 and 21 teeth is shortened in relation to the adjacent teeth 2 mm on the radiograph the roots of the incisors are formed of roots located outside the hole. The diagnosis of traumatic injury

impacted luxation

fracture of the teeth

tooth injury

complete luxation of the teeth

crack teeth

27. The patient 10 years after a transport accident. On clinical examination installed: crowns 11 and 21 teeth is shortened in relation to the adjacent teeth 2 mm on the radiograph the roots of the incisors are formed of roots located outside the hole. To determine the degree of shortening of the teeth crowns.

2 degree

1 degree

3 degree

4 degree

5 degree

28. To the hospital asked parents with a child of 8 years old with complaints of aesthetic defect. According to mother the child fell while walking on the street. Objectively determined broke off of the cutting edge 22 tooth without pulp exposure. On the radiograph root without damage. The diagnosis of traumatic injury:

- uncomplicated fracture of the crown
- incomplete dislocation of the tooth
- fracture of the tooth crown
- bruise with minor structural damage
- complete tooth luxation

29. To the hospital asked parents with a child of 8 years with complaints of aesthetic defect. According to mother the child fell while walking on the street. Objectively determined broke off of the cutting edge 22 of the tooth without pulp exposure. On the radiograph root without damage. To determine the tactics of treatment:

- restoration
- remineralization therapy
- clinical supervision
- the protective crowns making
- splinting of the tooth 22

30. The patient 9 years after suffering a transport accident. On clinical examination installed: broke off crowns of 11 and 12 teeth with pulp exposure, a radiograph the roots of the incisors are in the stage of the unformed apex. The diagnosis of traumatic injury by Chuprinina and Anikienko:

- fracture of the tooth crown in the area of enamel and dentin with the opening of the tooth cavity
- fracture of the crown in the area of the enamel
- fracture of the tooth crown in the area of enamel and dentin without opening the cavity of the tooth
- bruise with minor structural damage
- uncomplicated fracture of the crown

31. The patient 9 years after suffering a transport accident. On clinical examination installed: broke off crowns of 11 and 12 teeth with pulp exposure, a radiograph the roots of the incisors are in the stage of the unformed apex. To determine the tactics of treatment.

- endodontic treatment
- pulling in the dental arch
- the extraction of a tooth
- peace and observation by tooth

the use of retentive splint

32. To the hospital asked parents with a child 10 years old complaining of spontaneous pain in the tooth on the upper jaw. According to mother the child fell while walking on the street. Objectively: the upper left central incisor is slightly movable, the reaction to thermal stimuli is positive, the pulp sensitivity to electric current is reduced. On the radiograph the root and the crown is undamaged. The diagnosis of traumatic injury.

bruise with minor structural damage

fracture of the crown in the enamel area

fracture of the tooth crown in the enamel and dentin area without opening the cavity of the tooth

fracture of the tooth crown in the enamel and dentin area with the opening of the tooth cavity

uncomplicated fracture of the crown

33. To the hospital asked parents with a child 10 years old complaining of spontaneous pain in the tooth on the upper jaw. According to mother the child fell while walking on the street. Objectively: the upper left Central incisor is slightly movable, the reaction to thermal stimuli is positive, the pulp sensitivity to electric current is reduced. On the radiograph the root and the crown is undamaged. To determine the tactics of patient's management:

peace and observation by tooth

endodontic treatment

pulling in the dental arch

the extraction of a tooth

the use of retentive splint

34. For a consultation with the orthodontist asked parents with a child 9 years with complaints of aesthetic defect. According to the parents the child was in a car accident. The examination found a large traumatic injury of teeth on the upper and lower jaws on the right – broke off crowns of teeth without pulp exposures from the canine to the first permanent molar damages. The diagnosis of traumatic injury. fracture of the tooth crown in the enamel and dentin area without opening the cavity of the tooth

fracture of the crown in the enamel area

bruise with minor structural damage

fracture of the tooth crown in the enamel and dentin area with the opening of the tooth cavity

uncomplicated fracture of the crown

35. For a consultation with the orthodontist asked parents with a child 9 years with complaints of aesthetic defect. According to the parents the child was in a car accident. The examination found a large traumatic injury of teeth on the upper and

lower jaws on the right – broke off crowns of teeth without pulp exposures from the canine to the first permanent molar. To determine the treatment tactics.
restoration
remineralization therapy
clinical supervision
the protective crowns making
splinting of the tooth 22

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