

THE MINISTRY OF HEALTH OF UKRAINE  
THE HIGHER STATE EDUCATIONAL INSTITUTION OF UKRAINE  
"UKRAINIAN MEDICAL STOMATOLOGICAL ACADEMY"

Approved  
at the meeting of orthodontics department  
«\_\_\_\_»\_\_\_\_\_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 №1	Orthodontia. Diagnostic of dento-gnathic anomalies and deformations.
The theme of the lesson № 14	Classification of malocclusion. The principle of their construction, the advantages and disadvantages, and community differences. Classification by E. Angle, Betelman, by Kalvelis, Grigorieva, WHO.
Course	III
Faculty	Preparation of foreign students

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**1. The relevance of the topic.** For the formulation of the diagnosis and recording in the clinical history of the disease, you need to define it in terms of one of the existing classifications of dento-alveolar anomalies and deformities of the bite. It facilitates the cooperation of orthodontists. Therefore, knowledge of the various malocclusion classifications is important in the training of a dentist-orthodontist.

**2. Specific objectives:**

To determine the malocclusion;

To make a diagnosis of the existing malocclusion according to classification by Angle;

To know the advantages and disadvantages of classification by Angle;

To make a diagnosis of the existing malocclusion according to classification by Betel'man;

To know the advantages and disadvantages of classification by Betel'man;

To make a diagnosis of the existing malocclusion according to classification by Kalvelis;

To know the advantages and disadvantages of classification by Kalvelis;

To make a diagnosis of the existing malocclusion according to classification by Grigorieva;

To know the advantages and disadvantages of classification by Grigorieva;

To make a diagnosis of the existing malocclusion according to classification by WHO;

To know the advantages and disadvantages of WHO classification.

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

Name of previous disciplines	Skills
1. Anatomy	To determine the period of the child development, the proportionality of body parts during this period of child development. To determine the places of muscles attachment, their functions, degree of functional disorders.
2. Prevention of dental diseases	To write the dental formula (clinical, anatomical, WHO).
3. Normal physiology	To determine the timing of muscle contractions, coordination of certain muscle groups work.

#### **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. Classification	(lat. classis – class, and facio – acting), the system of distribution of objects into classes according to certain characteristics.
2. Norm	(lat. norma – "rule") is a regulatory rule that specifies the boundaries of its application; corresponds to something typical or usual, that occurs in a natural way and does not cause health problems.
3. Anomaly	(gr. abnormality) abnormality, an aberration from the general pattern.
4. Deformation	(from lat. deformatio "distortion") – change the size and shape of a rigid body under the action of external forces or other effects.

4.2. Theoretical questions to the lesson:

1. The definition of "norm" in orthodontics.
2. The definition of the terms "abnormality" and "deformity".
3. The definition of "classification".
4. Classification of malocclusion by Angle.
5. The advantages and disadvantages of Angle classification.
6. Classification of malocclusion by Betel'man.
7. The advantages and disadvantages of Betel'man classification.
8. Classification of malocclusion by Kalvelis.
9. The advantages and disadvantages of Kalvelis classification.
10. Classification of malocclusion by Grigorieva.
11. The advantages and disadvantages of Grigorieva classification.
12. Classification of malocclusion by WHO.
13. The advantages and disadvantages of WHO classification.

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

1. To make a diagnosis of the existing malocclusion according to classification by Angle;
2. To make a diagnosis of the existing malocclusion according to classification by Betel'man;
3. To make a diagnosis of the existing malocclusion according to classification by Kalvelis;

4. To make a diagnosis of the existing malocclusion according to classification by Grigorieva;
5. To make a diagnosis of the existing malocclusion according to classification by WHO.

### **The content of the topic:**

There exist a lot of anomalies and deformations with similar clinical presentation. In this connection there have been offered numerous different classifications which allow systematizing various types of dento-gnathic anomalies. Anomalies systematization enables to choose a correct approach to their understanding, study etiopathogenic factors of their origination, put a diagnosis and plan the treatment.

All classifications of malocclusions are mainly built on the registration of morphologic deviations, functional disorders, etiologic factors or their combination.

The most wide-spread are the classifications built on the basis of morphologic changes. They are grounded on the immovable junction of the facial skeleton, excluding the lower jaw, with other cranial bones. Thus, according to scientists, the facial skeleton does not undergo the harmful influence of internal and external factors and is not exposed to such changes as the dento-gnathic apparatus is exposed to.

The first morphologic classification, based on the principle of dental arches correlation on the whole, was offered by E. Angle in 1889. The classification is grounded on the mesio-distal correlation of the 1-st permanent molars of both jaws, which are defined by the author with the term "occlusion key". Angle considered that the localization of the, upper 6<sup>th</sup> tooth always corresponds to the localization of the crista zygomatica thanks to its eruption in this place only. The author named the 6<sup>th</sup> tooth "punctum fixum" (the fixed point). The permanent localization of the 6<sup>th</sup> tooth, according to the scientist, is determined, first of all, by the immovable junction of the upper jaw with the cranial base, and secondly, by the fact that it always comes out behind the 2<sup>nd</sup> temporary molar. Therefore all atypical correlations of permanent molars arise only at the expense of the irregular position of the lower jaw.

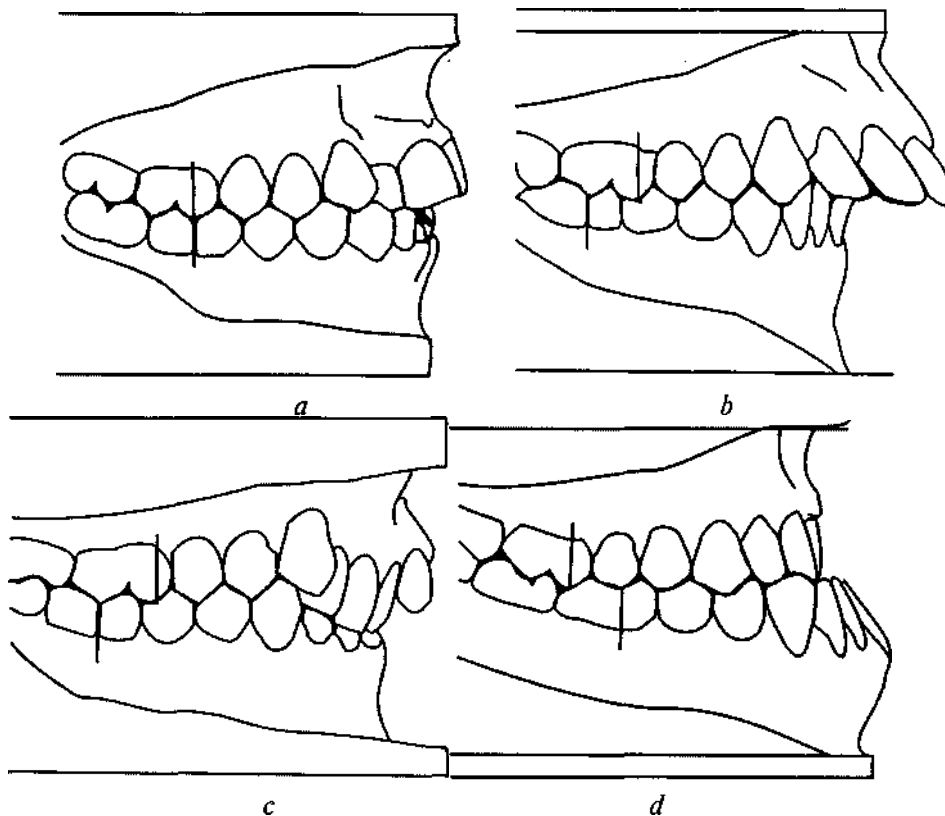
Angle divided occlusion anomalies into three classes.

The 1<sup>st</sup> class – "occlusion key" is not violated: the mesial buccal cusp of the 1<sup>st</sup> upper permanent molar is located in the inter-tubercular sulcus of the lower 1<sup>st</sup> permanent molar. Thus, the pathology is only localized in front of the 1<sup>st</sup> molars and concerns either teeth arrangement or alveolar process and jaws bodies development. Except for the sagittal occlusion anomalies Angle differentiates seven types of individual teeth anomalies:

- 1) labial, or buccal occlusion;
- 2) lingual, or palatine occlusion;
- 3) mesial occlusion;
- 4) distal occlusion;

- 5) tortoocclusion;
- 6) infraocclusion;
- 7) supraocclusion.

The 2<sup>nd</sup> class is characterized by the distal localization of the lower 1<sup>st</sup> permanent molar. At such correlation the mesial buccal cusp of the upper 1<sup>st</sup> permanent molar is in front of the inter-cusp sulcus of the lower 1<sup>st</sup> permanent molar. Either the contact is defined by similar cusps or the mesial-buccal cusp of the upper 1<sup>st</sup> permanent molar is located between the cusp of the 2<sup>nd</sup> premolar and the mesial buccal cusp of the lower 1<sup>st</sup> permanent molar, which depends on the complexity of the deformity. The changes of teeth correlation concern the whole dental arch. The 2<sup>nd</sup> class may have two subclasses of the anomaly: the 2<sup>nd</sup> class, 1<sup>st</sup> subclass – the distal location of the lower jaw, at which the upper frontal teeth are inclined forward and are fanlike allocated, with diastems and tremas. The 2<sup>nd</sup> class, 2<sup>nd</sup> subclass – the upper frontal teeth are inclined in the oral direction, deeply covering the lower ones. In both subclasses the distal correlation in lateral areas may be uni- and bilateral.



Angle's classification was very popular at the end of the 19<sup>th</sup> century as it somehow ordered the diagnostics of malocclusion. This was the first accessible by its simplicity, the only generally accepted occlusion anomalies classification in the world, which is eagerly used by specialists also nowadays.

But in spite of this Angle's classification has a number of drawbacks. Firstly, the upper 1<sup>st</sup> molar does not always have a stable place: at premolars extraction or their adentia the place may change mesially. Besides, the upper jaw may take the front position in the cranium, and then the location of the 1<sup>st</sup> molar changes.

Secondly, it is possible to use the classification only when examining transitional dentition and permanent occlusion.

Thirdly, the classification reflects occlusion anomalies only in the sagittal plane, not taking into account vertical or transversal anomalies.

Fourthly, the classification does not take into account functional and esthetic violations.

**A. I. Betelman's classification (1956)** divides all malocclusions into the anomalies of individual teeth positions and articulation anomalies.

Articulation anomalies are viewed in three directions: sagittal, vertical, and transversal.

Characterizing of pathologic occlusions the author proceeds from morphologic peculiarities of orthognathic occlusion. Deviations in the relations in the sagittal, vertical, and transversal planes at orthognathia lead to the appearance of pathologic forms of occlusion in the same three directions. Therefore, according to A.I. Betelman, there is a necessity to differentiate three groups of pathologic forms of dental occlusion: sagittal, vertical, and transversal occlusion anomalies.

Sagittal occlusion anomalies include deviations from the norm in the mesio-distal correlation of dental arches: distal and mesial occlusions. Distal occlusion is characterized by the distal position of the lower jaw, and also the functional insufficiency of the muscles protruding the lower jaw and the orbicularis oris muscles. Besides, depending on the degree of jaws development A.I. Betelman singles out four forms of distal occlusion:

- the 1<sup>st</sup> form – lower micrognathia;
- the 2<sup>nd</sup> form – upper macrognathia;
- the 3<sup>rd</sup> form – upper macrognathia and lower micrognathia;
- the 4<sup>th</sup> form – maxillary prognathism with constriction in the lateral areas.

At mesial occlusion the lower jaw is located mesially, the protruding muscles are excessively developed, and retractors are insufficiently developed. Mesial occlusion has such forms:

- the 1<sup>st</sup> – upper micrognathia;
- the 2<sup>nd</sup> – lower macrognathia;
- the 3<sup>rd</sup> – upper micrognathia and lower macrognathia.

Vertical anomalies include cases of deviations from orthognathia, from the point of view of the degree of the upper frontal teeth covering the lower ones. The pathology has two forms: deep and open bites.

Deep (overbite) arises at the underdevelopment of the muscles protruding the lower jaw; open – at the underdevelopment of the muscles lifting the lower jaw, and also the orbicularis oris muscles.

Transversal anomalies include two forms of transversal occlusion: the first form – on one side teeth articulate as at orthognathic occlusion, and on the other side – the upper jaw is narrowed and the lower teeth cover the upper ones; the second form – the whole lower jaw is displaced to one side and because of this on one side the palatine surfaces of the upper lateral teeth cover the buccal surfaces of the lower ones, and on the other side – the lingual surfaces of the lower lateral

teeth cover the buccal surfaces of the upper ones, i.e. the teeth join not with mastication cusps but with smooth lateral surfaces.

This state arises as a result of the functional insufficiency of one of protruding muscles, left or right, depending on the side, to which the lower jaw is displaced. The first is named the unilateral transversal occlusion, the second – bilateral.

A.I. Betelman's classification of individual teeth position anomalies presupposes 9 types of their position:

- 1) oral position;
- 2) vestibular position;
- 3) supraocclusion;
- 4) infraocclusion;
- 5) mesial position;
- 6) distal position;
- 7) tortoocclusion;
- 8) diastems;
- 9) crowding.

The advantage of A.I. Betelman's classification lies in the facilitation of conducting the differential diagnostics in orthodontics. General notions "distal" and "mesial" occlusions, divided into forms, allow clarifying the differential diagnosis. The classification gives not only morphologic but also functional characteristics of deformations.

Drawbacks of the classification lie in insufficient representation of malocclusions etiology.

**D.A. Kalvelis (1957)** considers that classification should be based on the morphologic changes of teeth, dental arches, and occlusion on the whole taking into accounts the etiology and value of these derangements for function and esthetics.

Dento-gnathic anomalies and deformations are classified in the view of work convenience of a practicing orthodontist and have three groups:

- 1) anomalies of individual teeth;
- 2) anomalies of dental arches;
- 3) anomalies of occlusion.

D.A. Kalvelis' classification:

I. Anomalies of individual teeth.

1. Anomalies of the number of teeth:

- adentia – partial and full hypodontia;
- supernumerary teeth (hyperdontia).

2. Anomalies of size and shape of teeth:

- gigantic teeth;
- acanthoid teeth;
- distorted forms of teeth;
- Hutchinson's, Fournier's teeth.

3. Anomalies of hard tooth tissues structure:

- hypoplasia of the tooth crown.

4. Disorder of the process of eruption:

- premature eruption of teeth;
- delayed eruption of teeth.

II. Anomalies of dental arches.

1. Anomalies of dental arches formation:

A). Anomalous position of individual teeth:

- labiobuccal eruption of teeth;
- palatine-lingual eruption of teeth;
- mesial eruption of teeth;
- distal eruption of teeth;
- low position (infraocclusion);
- high position (supraocclusion);
- tooth torsion (tortocclusion);
- teeth transposition;
- dystopia of upper canine teeth.

B). Crowding position of teeth.

C). Space between teeth (diastemas).

2. Anomalies of the shape of dental arches:

- narrowed dental arch;
- saddle-shaped dental arch;
- V-shaped dental arch;
- quadrangular dental arch;
- asymmetric dental arch.

3. Anomalies of occlusion.

1. Sagittal anomalies of occlusion:

- prognathia;
- progenia: false and true.

2. Transversal anomalies of occlusion:

- narrowed dental arches;
- inadequacy of the width of the upper and lower dental arches: - disorder of the correlation of lateral teeth on one side (transversal or unilateral cross bite).

3. Vertical anomalies of occlusion:

A). deep (overbite):

- covering occlusion;
- combined occlusion with prognathia (roof-shaped);

B). open bite:

- true open bite (rachitic);
- traumatic open bite (caused by bad habits).

The disadvantage of the classification is insufficient attention paid to the functional disorders of the dento-gnathic apparatus.

**In 1984 L.P. Grigoryeva** proposed to divide all bites type to physiological, abnormal and pathological.



To physiological types of bite according to this classification refers those ones which respond to third norms: morphological, functional, and aesthetic. Abnormal or disgnathic, is considered to be such bite types, when slight morphological deviations from normal bite structure lead mainly to aesthetic disorders. While abnormal bite types the condition of first permanent molars (neutral) remains; i.e. that corresponds to Angle I class. To pathological refers such types of bite, when hard morphological disorders lead to significant functional and aesthetic changes.

The diagnosis is built based on disorders determination in three directions (sagittal, vertical, transversal) and frontal and lateral teeth correlation (see table).

<b>Teeth/Plane</b>	<b>Sagittal</b>	<b>Vertical</b>	<b>Lateral</b>
<b>Frontal</b>	Prognathic Progenic Biprognathic Opisthognathic	Open Deep	Cross bite
<b>Lateral</b>	Neutral Distal Mesial	Open	Cross laterogenic Cross laterognathic

Specified in the table data about frontal and lateral teeth correlation changes may be the following:

1. One and two sided.
2. Occurs against the background of narrowing or dilatation of dental arches.
3. Macrognathia of upper and micrognathia of lower jaws.
4. Teeth development abnormalities.
5. Jaws development malformation.
6. Dentition defects (inborned and acquired adentia).

The main principle of clinical diagnosis forming with usage of classification is in follows:

1. At first correlation of frontal teeth in sagittal, vertical and lateral planes is determined.
2. Then correlation of lateral teeth in the same planes is determined. Please find below the example of bite's type determination in one plane taking into consideration the correlation of frontal and lateral teeth in sagittal plane:

- Prognathic neutral occlusion,
- Prognathic distal occlusion,
- Biprognathic neutral occlusion,
- Biprognathic distal occlusion,
- Progenic neutral occlusion,
- Progenic mesial occlusion.

In vertical plane:

- Open frontal bite,
- Open lateral bite,
- Deep bite.

In lateral plane:

- cross laterogenic bite,
- cross laterognathic bite.

The examples of clinical diagnosis forming taking into considerations the disorders in several planes:

- Abnormal neutral bite, vestibular position of 13, supraposition with lack of space for 1/3 of crown's size;
- Prognathic distal deep bite;
- Progenic mesial bite with equal narrowing of upper jaw in lateral parts;
- Deep distal bite.

**F.Y. Khoroshilkina (1976)** on the basis of cephalometric investigation data singles out dento-alveolar and gnathic peculiarities, macro-, normo-, or micrognathia, anterior, medial, or posterior location of jaws and their inclination relative to the cranium. According to studied lateral cephalometric of head and characteristic signs the author divides occlusion anomalies into three basic forms: dento-alveolar, gnathic, and mixed. This anomalies classification allows exact indication of pathology localization and choosing an efficient method of treatment.

**World Health Organization (WHO, 1968)** recommends the following classification of malocclusions.

#### **I. Anomalies of jaws sizes:**

Macrognathia of the upper jaw (synonym – maxillary hyperplasia).

Macrognathia of the lower jaw (synonym – mandibular hyperplasia).

Macrognathia of both jaws.

Micrognathia of the upper jaw (synonym – maxillary hypoplasia).

Micrognathia of the lower jaw (synonym – mandibular hypoplasia).

Micrognathia of both.

#### **II. Anomalies of jaws positions relative to the cranium base:**

Asymmetry (except of hemifacial atrophy or hypertrophy, unilateral condylar hyperplasia).

Mandibular prognathism.

Maxillary prognathism.

Mandibular retrognathism.

Maxillary retrognathism.

#### **III. Anomalies of dental arches correlation:**

Posterior occlusion.

Mesial occlusion.

Excessive overbite (synonym – horizontal overbite).

Excessive overjet (synonym – vertical overbite).

Open bite.

Cross bite of lateral teeth.

Lingvoocclusion of lateral teeth.

#### **IV. Anomalies of teeth position:**

1. Crowding (including imbricate overbite).

2. Transfer.

3. Rotation.
4. Spaces between teeth.
5. Transpositions.

## **V. Unspecified bite's abnormalities**

### **Materials for self-control:**

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

1. To draw the types of malocclusion according to classification by Angle.
2. To draw the types of abnormal teeth positions according to classification by Angle.
3. To draw the tables of pathological types of the bite according to classification by Grigoryeva.

#### **B. Tasks for self-control:**

1. The bite is:
  - the relation of dentition in the position of central occlusion
  - the relation of dentition in the position of habitual occlusion
  - the relation of dentition in position of anterior occlusion
  - the relation of dentition in the position of the right lateral occlusion
  - the relation of dentition in the position of the left lateral occlusion
2. To anomalies of the dentition according to the WHO classification include:
  - crowding, displacement, rotation, transposition and spacing between the teeth
  - crowding, the vestibular position of canine, mesial and distal displacement
  - congestion, tortoposition, transposition
  - congestion, supra- and infraposition, torto and transposition
  - overcrowding, dystopia upper canine and supra- and infraposition
3. Pathology of dentition by classification E. Angle defined in this direction:
  - mesio-distally
  - mesio-horisontal
  - mesio-vertical
  - mesio-frontal
  - mesio-lateral
4. The relation of dentition in E. Angle is determined by the relation of such teeth:
  - first permanent molars
  - second permanent molars
  - permanent second premolar
  - permanent canines
  - first permanent premolars

5. The relation of first permanent molars by E. Angle called:  
the key of occlusion  
sagittal key  
the permanent key  
alternating key  
the correct key

6. According to classification by E. Angle distinguish between these classes of anomalies:

I, II, III classes  
anomalies of relationship of the jaws  
sagittal, transversely, horizontal malocclusions  
anomalies of individual teeth, dentition and occlusion  
anomalies of the jaws relative to the plane of the base of the skull

7. Classification E. Angle – a classification of malocclusion in a plane:  
sagittal  
vertical  
horizontal  
occlusion  
Frankfurt

8. The term "labial occlusion" corresponds to such position of the teeth:  
lip inclination  
panama inclination  
tongue inclination  
mesial shift  
reverse inclination

9. The term "tortooocclusion" corresponds to such position of the teeth:  
rotation around the axis  
below the occlusal plane  
above the occlusal plane  
lingual inclination  
panama inclination

10. I class of malocclusion by Angle is characterized by:  
neutral relation of first permanent molars  
distal harmony of first permanent molars  
mesial relation first permanent molars  
distal relation of second permanent molars  
mesial relation of second permanent molars

11. Mesio-distally harmony by Angle is characterized in:  
mesial buccal tubercle of upper first permanent molar is within groove of the lower first permanent molar  
mesial buccal tubercle of upper first permanent molar is located between mesial tubercle of the lower first permanent molar and the second premolar  
mesial buccal tubercle of upper first permanent molar is ahead of grooves of the lower first permanent molar  
mesial buccal tubercle of upper first permanent molar is located at groove of the lower first permanent molar  
mesio-distally harmony of the first permanent molars

12. The disadvantages of classification E. Angle consider:  
characteristics of the malocclusion only in the sagittal plane  
characteristics of the malocclusion only in the vertical plane  
characteristics of the malocclusion only in the transversal plane  
display only functional disorders  
mapping the etiological factors of disease

13. For E. Angle, "punctum fixum" is:  
location of the first permanent molars of the upper jaw  
the position of the first permanent mandibular molar  
permanent canines of the upper jaw  
permanent canine of the lower jaw  
zygomaticus counterforce

14. Classification E. Engle cannot be used in case of:  
temporary occlusion, permanent and mixed bite with extracted first permanent molars  
lateral displacement of the lower jaw  
correct answer is absent  
presence of pathology in the transversal plane  
presence of pathology in a vertical plane

15. The term "supraocclusion" is characterizes the position of the teeth:  
above the occlusal plane  
palatal occlusion  
below the occlusal plane  
rotation around the axis  
buccal-lip

16. The term "infraocclusion" is characterizes the position of the teeth:  
below the occlusal plane  
above the occlusal plane  
around the axis of Rotation

palatal occlusion  
buccal-lip

17. The term "oral occlusion" corresponds to such position of the teeth:  
lingual and palatal position  
lip inclination  
buccal inclination  
frontal inclination  
distal inclination

18. The term "mesial occlusion" according to the classification of E. Engle is:  
anterior displacement of teeth  
lip inclination  
buccal inclination  
lingual and palatal position  
distal displacement of the teeth

19. The term "distal occlusion" according to the classification of E. Engle says:  
lip inclination  
buccal inclination  
lingual and palatal position  
distal displacement of the teeth  
distal displacement of the teeth

20. By Khoroshilkina (chronologically) classification of Angle refers to that period of the malocclusion classifications development:  
Angle period  
before angle  
Simon period  
Bonn  
Shwartz

21. In the classification by Betel'man is reflected:  
malocclusions and functional disorders of maxillofacial region muscles  
anomalies of occlusion, functional and aesthetic violations  
malocclusions and their causes  
anomalies of individual teeth, dentition and occlusion  
malocclusions and esthetic violation

22. Sagittal malocclusions according to classification by Betel'man include:  
distal and mesial  
prognathic and progeny

deep and open  
prognathism and progeny  
cross-one and -bilateral

23. The distal occlusion according to classification by Betel'man is accompanied by dysfunction of the muscles:

protractors of lower jaw and orbicularis oris  
lifts the lower jaw and orbicularis oris  
mandibular put down and orbicularis oris  
moved the mandible to the right and orbicularis oris  
moved the mandible to the left and orbicularis oris

24. Class III malocclusion according to classification by Betel'man is accompanied by dysfunction of the muscles:

retractors and protractors of lower jaw  
moved the mandible to the right  
moved the mandible to the left  
moved the mandible to the right and put down  
moved the mandible to the left and put down

25. Vertical malocclusions according to classification by Betel'man include such types of occlusion:

deep and open  
prognathism and progeny  
mesial and distal  
cross-single or double-sided  
laterognatic and laterogenic

26. Transversally malocclusions according to classification by Betel'man include such types of occlusion:

cross  
lingually  
laterognatic  
laterogenic  
bukal

27. Deep bite according to classification by Betel'man is accompanied by dysfunction of the muscles:

protractors of lower jaw  
moved the mandible to the right  
moved the mandible to the left  
moved the mandible to the right and put down  
moved the mandible to the left and put down

28. Open bite according to the classification by Betel'man is accompanied by dysfunction of the muscles:

- lifts the lower jaw and orbicularis oris
- moved the mandible to the right
- moved the mandible to the left
- moved the mandible to the right and put down
- moved the mandible to the left and put down

29. Cross bite according to classification by Betel'man is accompanied by dysfunction of the muscles:

- one of the muscles-protractors of lower jaw
- lifts the lower jaw and orbicularis oris
- mandibular put down and orbicularis oris
- moved the mandible to the right and orbicularis oris
- moved the mandible to the left and orbicularis oris

30. Malocclusions in the sagittal plane according to classification by Kalvelis are:

- prognathia and progenia
- opistognathic and byprognathic
- distal and mesial
- open and deep
- distal and deep

31. Malocclusions in the vertical plane according to classification by Kalvelis are:

- deep (overlap and combined with prognathia) and open (rachitic and as a result of harmful habits)
- deep (frontal and lateral) and open (overlap and combined with prognathia)
- deep (overlap and combined with prognathia) and open neutral
- deep (rachitic and due to bad habits) and an open mesial
- deep (rachitic and due to bad habits) and an open overlapping distal

32. According to classification by Kalvelis what forms of open bite:

- rachitic and traumatic
- front and side
- symmetric and asymmetric
- muscle and joint
- distal and mesial

33. The guidelines describe the occlusion in a sagittal plane are:

- the relation of canines and first permanent molars
- the relation of buccal cusps of molars
- the depth of incisal overlap



the size of the vertical gap  
the presence of the vertical gap

34. The guidelines describe the occlusion in the transversal plane are:  
the relation of the buccal cusps of the lateral teeth, the relation of the median lines  
the relation of the canines and first permanent molars  
the presence of sagittal gap  
the relation of first permanent molars  
the presence and size of a vertical gap

35. The guidelines describe of the occlusion in the vertical plane is:  
the depth of incisal overlap, the presence and size of the vertical gap  
the relation of the canines and first permanent molars  
the presence of sagittal gap  
the relation of first permanent molars  
the size of the lower jaw displacement

## **Literature**

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