

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

Approved
at the meeting of orthodontics department
protocol № 1 by 23.08.2017 y.

Head of department _____ L.V. Smaglyuk

METHODICAL RECOMMENDATION
for independent work of students during the preparation
to practical lessons and the lessons

Academic discipline	Orthodontics
Module №2	Anomalies and deformation of dento-jaw region
The theme of the lesson №11	Vertical malloclusion. Open bite. Etiology, pathogenesis, prorhylaxis. Clinical presentation and diagnostics of open bite.
Course	IV
Faculty	Preparation of foreign students

Poltava 2017

1. The relevance of the topic.

Open bite refers to widespread malocclusions. Treatment is more efficiently during physiological height of occlusion lifting. Treatment in other periods is quite difficult and long. Therefore knowledge of factors that lead to the development of open bite, its pathogenesis, features of diagnostics, clinics, treatment and prevention is important in the training of a dentist orthodontist.

2. Specific objectives:

To describe of bite in vertical plane.

To explain reasons which cause the development of open bite.

To explain pathogenesis of different forms of open bite.

To explain facial, morphological and functional violations at the different forms of open bite.

To interpret algorithm of examination of patients with a open bite.

To classify forms of open bite, their advantages and failings.

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

Name of previous disciplines	Skills
1. Anatomy	To determine the periods of development of the human. Features of a structure of bones of a facial skeleton, bones of a skull. A structure of TMJ in different periods.
2. Rentgenology	To determine cephalometric signs of skeletal and dentaalveolar forms of open bite
3. Prophylaxis of stomatological diseases	To determine the terms, order, sequence of eruption of constant teeth.
4. Propaedeutic of a therapeutic odontology	To determine the biological, dental age of the patient, deviation in development.
5. Orthodontics	To determine the form of the anomaly, the nature of the aesthetic, morphological and functional disorders.

4. Tasks for independent work during preparation to the lesson and 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. The vertical plane	This plane is parallel to the forehead. Is characterized by presents of incisor contact, the depth of overbite
2. Open bite	Malocclusion that characterized by

	presents of vertical gap between the teeth antagonists
3. Myofunctional balance	Equal force between muscles that surround the dental arch (m. buccinator and m. orbicularis oris from outside and tongue muscles – from internal side)
4. Supraocclusion of teeth	Position of teeth, when they are above the occlusion plane
5. Infraocclusion	Position of teeth, when they are below the occlusion plane
6. Height of the bite	Distance between the alveolar crests of upper and lower alveolar process that fixed with antagonist teeth
7. Vertical gap	Space between the teeth antagonists (in mm)

4.2. Theoretical questions to the lesson:

1. What is the symptom of open bite?
2. What open bite classifications do you know?
3. What is the "vertical gap", what manifestation degrees does it have?
4. What is the etiology and pathogenesis of open bite?
5. What facial signs do patients with open bite have?
6. What are the intraoral signs of open bite?
7. What functional disorders take place at open bite?
8. What methods of diagnosing of open bite do you know?
9. What are the features of diagnostics of different forms of open bite?

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

1. To work on the modern stomatological equipment with the use of the proper tool.
2. To apply the rules of medical etiquette and during work with children and their parents.
3. To diagnose the different forms of open bite.
4. To record of dental formula.
5. To description of the morphological state of bite in an ambulatory card.
6. To determination of approximate age of child in obedience to the amount of the cut second teeth through.

The content of the topic:

Open bite is referred to vertical anomalies. According to statistics, from 1.7 to 5.3 % patients have this anomaly. A.D. Mukhina and Z.F. Vasylevska believe that open bite is more often met in older age than in children with temporary occlusion. Open bite is characterized by the presents of the gap between the frontal

or lateral teeth. The gap could be symmetric (between the homonymous teeth) or asymmetric, one-sided or two-side (between the lateral teeth).

Open bite is met in many classifications. Thus, according to **Angle's** classification, open bite is referred to the 1st class, when "occlusion key" is preserved, jaws are located in "mesiodistal harmony", and the pathology is located in the frontal part, and also in individual teeth anomalies: *infraocclusion of frontal teeth and supraocclusion of lateral teeth*.

D.A. Kalvelis viewed open bite as a vertical anomaly and divided it into:

- **true open bite (rachitic)**: because of bony tissue disease muscles development advances the process of mineralization and resists self-regulation;
- **traumatic** (caused by pernicious habits).

By **Bateman's classification** this form of the bite is named the open bite with the underdevelopment of the elevator muscle of lower jaw and the orbicular muscle of the mouth.

V.Y. Kurliandskiy refers open bite to individual teeth position anomalies - infraocclusion and vertical jaw underdevelopment.

Z.F. Vasylevska singles out three forms of open bite:

- 1) all frontal teeth or a part of frontal teeth do not articulate;
- 2) frontal teeth and premolars do not articulate;
- 3) frontal teeth, premolars and the 1st molars do not articulate.

F.Y. Khoroshilkina classifies open bite by the size of the vertical gap:

- the 1st stage - less than 5 mm;
- the 2nd stage - less than 9 mm;
- the 3rd stage - more than 9 mm.

The author also differentiates gnathic and dentoalveolar open bite by cephalometric image.

K. Lebreil and I. Fischer-Brandes view open bite as:

1. frontal open bite;
2. lateral open bite:
 - a) unilateral;
 - b) bilateral.

By WHO' classification the open bite is considered to the anomalies of the dental arches.

By Grygorjeva's classification the open bite is pathological bite, could be frontal or lateral, also neutral, mesial and distal regarding to the lateral teeth relationship.

Determinative factors, which caused the development of the open bite:

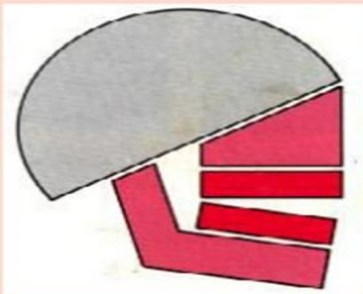
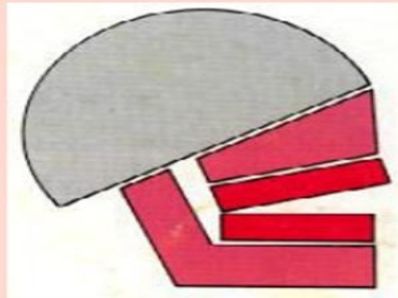
1. Heredity.
2. Children diseases with the impairment jaw-bone mineralization (rachitis).
3. The bad habits (finger sucking, suck the (baby's) dummy, lips, cheek and the outside things.
4. Oral breathing as a result of bad habit or adenoid vegetations.
5. Pathologic function of tongue (passing between the lips).

6. Congenital cleft of lip, alveolar process and palate, which caused the underdevelopment of the frontal part of the upper jaw.
7. Excess vertical growth of the lower jaw.
8. Atypical position of the dental germs of the second teeth
9. Macro glossia.
10. Palatopharyngeal tonsils enlargement promotes forward tongue displacement, its irregular location.
11. Swallowing dysfunction (irregular swallowing with laying the tongue between the dental arches); infantile type of swallowing, when the child pushes the tongue tip off closed lips and draws the lips into the oral cavity;
12. Speech disturbance (irregular articulation of the tongue with surrounding tissues) promotes incomplete teeth eruption and open bite formation in the anterior part of the dental arches.
13. Irregular position during sleep (the head thrown back).
14. Individual teeth adentia, macrodontia on one of the jaws.
15. Violation of the sequence of upper and lower temporary teeth transitional dentition or of the terms of permanent teeth eruption.
16. Shortened tongue frenulum hampers its movements, leading to irregular position of the tongue apex, most often — between incisors. Not infrequently at such position children bite lateral tongue parts, which causes bilateral open bite development.

Pathogenesis of the open bite is caused by disturbance of jaw growth in unfavorable heredity, mothers' diseases during pregnancy, calcium changing's transgressions as a result of **rachitis**, endocrine diseases. Agapov, Iljina-Markosjan, Korkhaus devoted the much considerable deformed effect of the masticatory muscles on pathologically modified bone tissue. Consequently the lower jaw bends up in molar region under the action of jaw-erector muscles (masticator muscles, temporal and inner pterygoid muscles). In chin region the lower jaw bends down as a result of the traction of lower jaw- depressor muscles (digastric, mylohyoid and geniohyoid muscle). At that the upper jaw deforms in the lateral part with lengthening of the frontal part. The deformation of the upper jaw is descended under the action of muscles which fasten to temporal bone, maxillary tuber, pterygoid process of sphenoid bone and pull down a zygomatic arch, alveolar process and surrounding tissues. The compression of the lateral part of the upper jaw evokes the dental arch modification – saddle-shaped and V-shaped forms. As a result of early rachitis trapezoid form with constriction in frontal part may be observed; as a result of late rachitis the lower molars bend forward to the tongue under the action of mylohyoid muscles.

Mostly in consequence of the bad habits the open bite develops with others anomalies of the bite in transversal and sagittal planes. The development of sucking mechanism begins from 18 week of pre-natal growth. When the temporary teeth are erupted, the sucking function fades away and the mastication function develops. But in special situation the sucking reflex is remained, the child sucks a

finger, a lip and a tongue. As a result of such bad habits the open frontal bite develops. When the child sucks or bites the cheek, open lateral bite develops.

DIFFERENCE BETWEEN SKELETAL AND DENTAL OPENBITE	
Skeletal Openbite	Dental Openbite
It is a result of increased downward and backward inclination of the mandible. The mandibular angle is increased.	It is a result of underdevelopment anteriorly of the maxillary and mandibular alveolar processes.
	

The dysfunction of the nasal breathing also stimulates the development of the open bite. The child respires with the open mouth and the deformation of the hard palate arises from the buccal muscle's exertion with forming the "Gothic palate".

So as to make easier the breathing, the child displaces the lower jaw in back position, and this relation between the jaws contributes the development of the distal bite. Under the action of masticatory muscles the upper jaw narrows in the lateral part; the fore-part of the upper dental arch becomes longer as a result of the disturbed lips' closing.

The mechanism of the swallowing also changes after a number of years. When the temporary bite forms, the physiological "infantile" type of the swallowing is replaced by the somatic type. The conserved "infantile" type of the swallowing is caused the development of the open bite.

Congenital cleft of the lip, the alveolar process and the palate are caused the underdevelopment of the frontal part of the upper jaw with forming of the asymmetric open bite.

In rare instances the open bite develops as a result of damage of the jaws and temporo-mandibular joint, the atypical position of the germs of the second teeth, excessive growth of the lower jaw.

The clinical systematization of the open bite' forms (Holovko)

I. Causes of the development.

II. Aesthetic disturbances (the facial signs).

- 1) feebly marked facial signs
- 2) well-marked facial signs of anomaly
 - a) the lengthening of the lower facial part;
 - b) the open mouth;
 - c) the intensive lips closing;
 - d) the flatness of the labiomental and nasolabial fold;

e) the increasing of the mandibular angle.

The evidence of the aesthetic disturbances depends on the child's age, the degree of the morphologic and functional signs of the bite' deformation with the pathology of the bite in the lateral and sagittal planes.

The facial configuration depends on the vertical gap – the more one's the better aesthetic disturbances. The symptom of “lemon –peel or thimble” appears as a result of the disturbed lips closing.

The anomaly is diagnosed on the grounds of:

- clinical examination;
- photometric face investigation;
- study of diagnostic jaws models;
- jaw orthopantomograms;
- lateral teleroentgenograms of head

III. Morphologic signs

1) By the localization:

- a) the open frontal bite(symmetric and asymmetric);
- b) the open lateral bite(one-sided and two-side);

2) By the relation of the first permanent molars:

- a) the neutral bite;
- b) the mesial bite;
- c) the distal bite.

3) Variants of dento-alveolar form:

- a) the dento-alveolar contraction in the frontal part of the upper jaw;
- b) the dento-alveolar contraction in the frontal part of the lower jaw;
- c) the dento-alveolar contraction in the frontal part of the both jaws;
- d) the dento-alveolar lengthening in the lateral part of the jaws;
- e) the dento-alveolar contraction in the frontal part of the upper jaw and the dento-alveolar lengthening in the lateral part the jaws;
- f) the dento-alveolar contraction in the frontal part of the lower jaw and the dento-alveolar lengthening in the lateral part of the jaws;
- g) the dento-alveolar contraction in the frontal part of both jaws and the dento-alveolar lengthening in the lateral part of the jaws.

4) By the size of the rift:

The horizontal sizes

- a) the absence of the contact in the incisor part(I degree);
- b) the absence of the contact from incisors to canines(II degree);;
- c) the absence of the contact from incisors to premolars(III degree);;
- d) only molars contacts(IV degree);.

The vertical sizes

- a) the rift to 5 mm;
- b) the rift from 5 mm to 9 mm;
- c) the rift more than 9 mm.

IV. The functional disturbances

- 1) disturbances of the mastication (by Agapov in %);
- 2) disturbances of the swallowing;
- 3) disturbances of the pronunciation of single sound;
- 4) disturbances of the lips closing.

If we represent graphically the height of the alveolar process and the dentition in the frontal and the lateral part in the open bite, the curve, concaving in frontal part and convexing in lateral parts, is formed (in one or both jaws).

Frequently in the open bite the constriction of the upper jaw in the lateral part and anomalous placing of the frontal teeth (the overcrowding) may be observed.

Rarely the lower jaw is constricted. The open bite, especially one's which is evolved from the disturbance of the calcium metabolism, is accompanied by the carious lesion of the frontal teeth, first permanent molars, rarely – the premolars. The tongue in most cases is increased with the strongly pronounced transversal and sagittal plane, smoothed papillae; the chronic catarrhal gingivitis may be developed.

According to the lateral cephalometric Khoroshilkina considered the dento-alveolar, gnathic and combined forms of the open bite.

The traumatic open bite of the dento-alveolar form develops as a result of the bad habits. At that the upper incisors swerve in the vestibular direction, the angle of inclination of their axis is decreased regarding the plane of the basis of the upper jaw. The growth of the frontal part of the upper jaw is delayed. The distance $\underline{1}$ – SpP is smaller than $\underline{6}$ – SpP i.e. the alveolar process in the part of the first permanent teeth higher than in the incisor's part. The prognosis of the treatment of such anomaly is favorable.

The open bite which develops as a result of a rachitic rarely has a gnathic form.

The differences of the gnathic form:

- The change of the mandible' body – considerable deepening its lower edge before the fastening of the proper masticatory muscles;
- The enlarged length of the lower part of the face;
- The enlarged basal angle and mandible' angles;
- The dento-alveolar height is smaller in the frontal part and larger in the lateral part;
- The decreasing of the incisors' angle.

The concluding diagnosis is established on the basis of the clinical examination, biometrics of jaws' models, anthropometry, photometry and the lateral cephalometric.

Materials for self-control:

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

1. To draw in albums dentoalveolar forms of open bite.

2. To draw in albums the Spee curve in open bite.

B. Tasks for self-control:

1. Open bite is pathology in a plane?
 - a) vertical
 - b) sagittal
 - c) transversal
 - d) frankfurt
 - e) spinal cord

2. Vertical plane is characterized by?
 - a) depth of overbite, the presence or absence of incisor contact
 - b) correlation of the canines
 - c) correlation of the first permanent molars
 - d) correct or reverse incisive overlap
 - e) correlation of the molars

3. The degree of open bite is determined by the following features?
 - a) horizontal and vertical dimensions of the gap
 - b) correlation of the first permanent molars
 - c) correlation of the canines
 - d) localization of the gap
 - e) midline shift

4. According to localization open bite has the following forms?
 - a) frontal and lateral
 - b) mesial and distal
 - c) lateral and distal
 - d) true and traumatic
 - e) superior and inferior

5. If vertical gap size up to 5 mm what stage open bite is it?
 - a) 1
 - b) 2
 - c) 3
 - d) 4
 - e) 5

6. If vertical gap size up to 9 mm what stage open bite is it?
 - a) 2
 - b) 1
 - c) 3
 - d) 4
 - e) 5

7. If vertical gap size more than 9 mm what stage open bite is it?
 - a) 3
 - b) 2
 - c) 1
 - d) 4
 - e) 5

8. The second degree of open bite depending on the length of the gap is?
 - a) not articulate anterior teeth and premolars
 - b) not articulate premolars and first molars on one side
 - c) not articulate the front teeth, premolars and first molars on both sides
 - d) not articulate incisors and canines
 - e) not articulate incisors

9. According to the Kalvelis' classification open bite has the following forms?
 - a) rachitic and traumatic
 - b) neutral, mesial and neutral
 - c) frontal and lateral
 - d) one - and two-sided
 - e) symmetric and asymmetric

10. Cephalometric studies help to determine the following forms of open bite?
 - a) gnathic, dentoalveolar
 - b) frontal, lateral
 - c) one-and two-sided
 - d) cranial, combined
 - e) habitual

11. Parents of a 9-year-old boy complain about permanently open mouth of the child. External examination revealed elongation of the lower face part, non-closure of lips. Examination of the oral cavity revealed early mixed dentition. Relationship of the first permanent molars is neutral, vertical space is 5 mm. What is the most likely diagnosis?
 - a) open bite
 - b) distal occlusion
 - c) mesial occlusion
 - d) deep overbite
 - e) cross bite

12. Analysis of a 10-year-old boy's jaw models revealed that occlusal plane of the frontal maxillary teeth was of concave form, its lateral parts were convex. Form of the alveolar process also represents

deformation of dental arches. The upper jaw is of saddle-like form with abrupt narrowing in the region of premolar teeth. What type of bite is it?

- a) open
- b) distal
- c) deep
- d) mesial
- e) cross

13. Parents of a 6,5-year-old boy consulted an orthodontist about no contact between the front teeth. The child has a bad habit of sucking his tongue. Objectively: there is a symptom of lemon crest on his chin when the lips are closed, speech disturbance, between the front teeth there is a vertical gap up to 8 mm. Specify the occlusion anomaly?

- a) open bite
- b) cross-bite
- c) distal occlusion
- d) mesial bite
- e) overbite

14. What clinical symptoms are not typical for open bite?

- a) the deepening of supramental fold
- b) a surprised facial expression, a tight closing of the lips
- c) increase height of the lower third of the face
- d) naso-labial folds are smoothed, the mouth slightly open, upper lip shortened
- e) vertical gap

15. The fourth stage of physiological height bite increasing occurs when erupted?

- a) third permanent molars
- b) the first permanent molars
- c) second permanent molars
- d) permanent canines
- e) permanent incisors

16. The anomalies of dentition in the vertical position includes?

- a) supraocclusion, infraocclusion
- b) vestibular, distal position
- c) vertical, oral position
- d) medial, distal position
- e) supraocclusion, infraocclusion, medial position.

17. When patient has the shortened tongue frenulum, what treatment is indicated in this case?
- combined treatment (orthodontic combined with surgical)
 - myogymnastics treatment
 - physiotherapeutic treatment
 - frenulum plastic surgery
 - prophylactic appliances treatment
18. A 9-year-old child complains of defect of the face proportion. During extraoral examination revealed distal lengthening, muscle tension. In the oral cavity - alternating occlusion between incisors of the upper and lower jaws - the vertical gap size is 4 mm. To what plane of anomaly belongs?
- frontal
 - sagittal
 - horizontal
 - transversal
 - vertical
19. A 6-year-old child revealed the habit of sucking the thumb. What pathology of occlusion may occur as a result of this habit?
- open bite in the frontal area
 - deep bite
 - open bite in the lateral area
 - mesial bite
 - retrusion of frontal area of the upper jaw
20. A 9-year-old child comes to a doctor. The doctor found deviations characteristic of open bite. Which of these factors cannot be the cause of this disease?
- habit of sleeping with his fist under his cheek
 - infantile type of swallowing
 - sucking of tongue, lips, cheeks, tongue laying between teeth
 - violation of nasal breathing
 - bad habit
21. A 5-year-old boy complains of deformation of the face. On examination revealed smoothing of nasolabial folds and a chin, closing lips with stress. In the oral cavity there is no front group of teeth. Type of swallowing - infantile. What pathological bite can develop in the child in the future?
- open bite
 - retrusion of the front teeth
 - deep bite

- d) vestibular position of the canines
- e) abnormalities in the formation of dental arch

22. A 5-year-old child's parents complain of the habit to keep pencils and pens in lateral teeth. Which pathological bite will cause this habit?

- a) lateral open bite
- b) distal occlusion
- c) frontal open bite
- d) cross bite
- e) deep bite

23. Which of the following methods allows to differentiate a form of open bite?

- a) cephalometry
- b) spirometry
- c) measurement of models
- d) electromyography
- e) panoramix

24. What are the changes on cephalometric image most typical for open bite?

- a) increase of the basal angle B
- b) increase of the profile angle T
- c) increase of facial angle F
- d) increase of the angle of the mandible
- e) decrease of the basal angle B

25. The third degree of open bite depending on the length of the gap is?

- a) not articulate the front teeth, premolars and first molars on both sides
- b) not articulate premolars and first molars on one side
- c) not articulate anterior teeth and premolars
- d) not articulate incisors and canines
- e) not articulate incisors

26. The first degree of open bite depending on the length of the gap is?

- a) not articulate incisors and canines
- b) not articulate premolars and first molars on one side
- c) not articulate anterior teeth and premolars
- d) not articulate the front teeth, premolars and first molars on both sides
- e) not articulate incisors

27. What is the reason of traumatic open bite?

- a) bad habits
- b) heredity

- c) early loss of milk fangs
- d) small advance of the oral cavity
- e) fluorosis

28. What signs are not peculiar for open bite?

- a) dentoalveolar elongation in the anterior, dentoalveolar shortening in the lateral section in a vertical plane
- b) dentoalveolar shortening in the anterior, dentoalveolar elongation in the lateral area in a vertical plane
- c) hypoplasia of dental crowns in lateral area
- d) concave dental arch of the upper jaw in frontal part
- e) supraocclusion of upper frontal teeth

29. 8-year-old child complains of : adenoid growths second degree. The child adenoid type face, in the mouth - narrowing and shortening of the lower jaw, narrow upper jaw, gothic palate, between frontal teeth vertical gap 3 mm. What is the main cause of such symptoms?

- a) mouth breathing
- b) sucking of the lower lip
- c) heredity
- d) sucking of the finger
- e) laying of the tongue between tooth rows in the frontal area

30. A 7-year-old child. In the oral cavity - an early mixed bite, incisors inclined vestibular, the existing vertical gap between the incisors is 3 mm, II class by Angle. From history we know that a child sucks his thumb. Put the right diagnosis?

- a) open distal occlusion
- b) open bite
- c) protrusion of the upper front teeth
- d) distal occlusion
- e) open mesial bite

31. What appliances do not used to treat open bite in the period of temporary occlusion?

- a) Katz crowns
- b) Frenckel I type
- c) Klamt's open activator
- d) Schonher's appliances
- e) Krau's

32. Clinical diagnostic sign of malocclusion is?

- a) vertical gap
- b) reverse incisor overlap

- c) protrusion of the upper and lower teeth
- d) sagittal gap
- e) retrusion of upper and lower teeth

33. Facial signs of open bite are the following?

- a) elongation of the lower third of the face
- b) shortening of the lower third of the face
- c) facial asymmetry
- d) elongation of the upper third of face
- e) shortening of the upper third of the face

34. The second period of physiological height bite increasing is?

- a) permanent first molars eruption
- b) temporary first molars eruption
- c) temporary second molars eruption
- d) permanent second molars eruption
- e) permanent canines eruption

35. The third period of physiological height bite increasing is?

- a) permanent second molars, canines and premolars eruption
- b) temporary first molars eruption
- c) temporary second molars eruption
- d) permanent first molars eruption
- e) permanent canines eruption

Literature

Main:

1. Flis P.S. "Orthodontics". -Kyiv, MEDICINE, 2008, - 308-318 p.

Additional:

1. Pubmed. – Режим доступу: <http://www.ncbi.nlm.nih.gov/pubmed/>
2. Google Scholar – Режим доступу: <https://scholar.google.com.ua/>
3. BASE. – Режим доступу: <https://www.base-search.net/>
4. European Journal of Orthodontics. – Mode of access: <https://academic.oup.com/ejo>
5. Angle Orthodontist. – Mode of access: <http://www.angle.org/?code=angf-site>