

KNMU

*Department of Pediatric Dentistry, Pediatric Maxillofacial
Surgery and Implantology*

Topic of lecture : «Prophylactics of development of dentognathic anomalies».

Plan of lecture:

1. Preventive orthodontics.
2. Preventive measures in orthodontics:
 - A. Caries control
 - B. Parent counseling
 - C. Space maintenance
 - D. Exfoliation of deciduous teeth
 - E. Abnormal frenal attachments
 - F. Treatment of locked permanent first molars
 - G. Abnormal oral musculature and related habits.
3. Muscle Exercises
 - A. System of exercises offered by Rogers
 - B. Exercises of orbicularis and circumoral group of muscles
 - C. Exercises of the tongue.
 - D. Exercises of masseter muscles
 - E. Exercises of pterygoid muscles
 - F. Limitations of muscle exercises
4. Oral habits in children
 - A. Classification of oral habits in children by Okushko (1975)
 - B. Digit sucking habit (thumb/finger- sucking). Effect of digit sucking habit.
Treatment of digit sucking habit
 - C. Tongue thrusting habit. Clinical features effects of tongue thrusting habit on
dento-facial structures. Treatment of tongue thrusting habit
 - D. Lip sucking
 - E. Cheek biting
 - F. Postural habit
5. Dispensary System in Orthodontics.

6. Stages of health examination.

7. Dispensary groups.

Prevention is not only better than cure but more stable and cheaper as well. Begg in 1977 stated that "the proper time to begin treatment is as near the beginning of the variation from the normal, in the process of development of the dental apparatus, as possible". Kesling in 1960 stated that "some cases should be referred as early as 3 or 4 years of age and all cases by the age of 8 or 9 years", thereby, laying the foundation of preventive and interceptive orthodontics.

Graber (1966) has defined *preventive orthodontics as the action taken to preserve the integrity of what appears to be a normal occlusion at a specific time.*

Profitt and Ackermann (1980) has defined it as *prevention of potential interference with occlusal development.*

Preventive orthodontics generally shows results over a period of time. The right time to initiate preventive orthodontics would be ideally during prenatal counseling.

In our society, the deciduous dentition is given the least importance, with the promise that the deciduous teeth have to exfoliate eventually. However, maintaining the integrity of deciduous teeth and occlusion leads to their preservation up to exfoliation, which in turn forms one of the most important steps in preventive orthodontics.

Therefore, this is largely the responsibility of the pedodontist and where such specialists are unavailable, of the general dentist. The general dentist's view of initiating treatment should be as early as possible instead of the now impregnated view that it should be initiated after all the permanent teeth have erupted. There is a fundamental need for a shift in this thought process among the general dentists.

Some of the procedures and concepts of preventive and interceptive orthodontics are common but the time of application pertaining to the stage of dental development are different. These procedures not only prevent or intercept a developing malocclusion, but also allow proper mastication to develop along with speech, which in turn leads to the development of an individual with good esthetics and has a positive psychological effect apart from guiding dental growth and development positively.

PREVENTIVE MEASURES UNDERTAKEN

1. Caries control
2. Parent counseling
3. Space maintenance
4. Exfoliation of deciduous teeth
5. Abnormal frenal attachments
6. Treatment of locked permanent first molars
7. Abnormal oral musculature and related habits.

Caries control. Caries involving the deciduous teeth, especially the proximal caries is the main cause of development of a malocclusion. There has been a sudden spurt in nursing and rampant caries, involving the deciduous and the mixed dentition generally, which has resulted in a sudden demand for preventive and interceptive orthodontics. The importance of maintaining and preserving the deciduous dentition should be counseled to the parents and pediatricians. Most of the parents first seek the opinion of their pediatrician regarding their child's decayed teeth.

In case of proximal decay, the adjacent tooth tends to tilt into the proximally decayed area resulting in the loss of arch length, thereby resulting in lesser space for the succedaneous tooth to erupt in their rightful place and position. Therefore, the proximal decay should be restored accurately at the earliest and much problems may not arise provided arch length loss is equal to or less than the Leeway Space of Nance.

In case of pulpal involvement due to caries, partial pulpectomy or pulpotomy is done followed by the placement of stainless steel crown.

Caries initiation can be prevented by diet counseling, topical fluoride application, pit and fissure sealants and educating parents (prenatal counseling and postnatal counseling).

Parent counseling. Parent counseling though the most neglected, is the most effective way to practice preventive orthodontics.

Parental counseling may be divided into:

- Prenatal counseling
- Postnatal counseling - which in turn can be associated with the clinical examination of the child at:
 - ❖ Six months to 1 year of age

- ❖ Two years of age
- ❖ Three years of age
- ❖ Five to six years of age.

Prenatal Counseling. This is the most effective time to get across to the expecting parents. They are open to ideas and receive the suggestions regarding better welfare of the child's well being. The gynecologists would benefit immensely on having their patients counseled on dental health. Prenatal counseling may involve the following:

- The importance of oral hygiene maintenance by the mother.
- How irregular eating and hunger pangs by the mother can result in her developing decayed teeth, which can be quite painful on pulpal involvement, especially during the third trimester of pregnancy.
- Recent studies have indicated a possible co relationship between the mothers' poor oral hygiene and premature births.
- A mother suffering from pregnancy induced diabetes mellitus, would be more difficult to manage during the pregnancy period especially if her oral hygiene is poor.
- The increased risk of a mother suffering from poor oral hygiene transmitting the strains of caries inducing bacteria to the baby on sharing the same feeding spoon or on tasting the food with the same are high.
- To have natural foods containing calcium and phosphorus, e.g. milk, milk products, egg, etc. especially during the third trimester, as they would allow adequate formation of deciduous teeth crowns.

Postnatal Counseling. Postnatal counseling should be advocated along with the clinical examination of the child. The same can be divided into:

Six months to One-year of Age. This is the most important period of counseling. The parents are made aware of:

- ❖ Teething and the associated irritation, slight loose motions are possible in mildly elevated febrile condition.
- ❖ Most of the parents are appalled on seeing the deciduous teeth erupting in rotated positions. Awareness to be brought about as to how they are in that position and that they would eventually straighten out on erupting fully.

- ❖ No sugar addition to bottle milk, however mothers' milk is preferred and the best for the TMJ development as well as for non- development of tongue thrusting habits.
- ❖ Brushing with the help of a finger brush during bathing should be introduced. Cleaning of the deciduous dentition with a clean, soft cotton cloth dipped in warm saline is also recommended, to prevent the initiation of nursing or rampant caries.
- ❖ Child should be initiated to drinking from a glass by one year of age.

Two years of Age

- Bottle-feeding if previously initiated should never be given during the passage to sleep. Bottle-feeding to be withdrawn completely by 18 to 24 months of age. These would decrease the chances of initiation of decay and the potential for nursing **caries**.
- Brushing to be initiated post-breakfast and post dinner.
- Clinical examination to assess any incipient decay and eruption status of teeth.

Three years of Age

- Clinical examination-generally the full complement of deciduous dentition should have erupted by now. To assess the occlusion, molar and canine relationships and if there is the presence of any discrepancies away from the normal, e.g. unilateral cross bite, supernumerary teeth, missing teeth, fused teeth, etc.
- The child should be on 3 square meals a day.
- Oral habits such as thumb sucking, lip sucking, oral breathing, etc. and their effects on the development of occlusion should be considered. Parents to be informed accordingly. The use of muscle training appliances to be considered.
- To assess clinically for incomplete eruption of deciduous second molars/pericoronal flaps may lead to decay on the same.
- Child to be encouraged to begin brushing on his own at least once a day – preferably post breakfast.

Five to Six years of Age

- Parents to be informed about the initiation of exfoliation of deciduous teeth and that it would go up to 12 to 13 years of age.
- Clinical examination.
- The need for constant review and recall on a regular basis.

- In case of extraction of deciduous teeth due to decay, etc. the need, advantages and importance of space maintainers should be explained.
- Space maintainers in different forms may be required to maintain spaces in case of premature loss of teeth.

EXFOLIATION OF DECIDUOUS TEETH. Generally the deciduous teeth should exfoliate in about 3 months of exfoliation of the one in the contralateral arch. Any delay more than that should be considered with suspicion and the following should be ruled out:

- a. Over-retained deciduous/root stumps.
- b. Fibrous gingivae.
- c. Ankylosed/submerged deciduous teeth to be assessed radiographically.
- d. Restoration overhangs of the adjacent tooth.
- e. Presence of any supernumerary tooth.

ABNORMAL FRENAL ATTACHMENTS. May cause the development of diastemas/excess spacing between the teeth, which in turn may not allow the eruption of succedaneous teeth. Surgical correction of the high frenal attachments is therefore *advised*. The tongue should also be assessed for ankyloglossia/ tongue-tie.

LOCKED PERMANENT FIRST MOLARS. The permanent first molars may get locked distal to the deciduous second molars, at times. Slight distal (proximal) stripping of the deciduous second molar allows the permanent first molar to erupt in their proper place.

ABNORMAL ORAL MUSCULATURE. Abnormal oral musculature can be prevented:

- ❖ Tongue thrusting habits or retained infantile swallow patterns are related to prolonged breastfeeding or bottle feeding by the mother. The same should be withdrawn by 18-24 months of age.
- ❖ Hyperactive mentalis action results in the lingual inclination of mandibular incisors resulting in decreased arch length and an increased chance for the developing anterior crowding. Oral habits such as:
 - Thumb/digit/lip sucking - the child can be distracted from indulging in the same.

- Mouth breathing-the child can be given adequate medical attention, regarding recurrent upper respiratory tract infection. Oral screens and the recently introduced myofunctional appliances such as the pre-orthodontic trainers, train the child to breathe through the nose, thus allowing the proper development of nasal passage, regression of adenoid mass and the development of a shallow, broad palate.

MUSCLE EXERCISES. The normal development of the occlusion depends on the nature of the muscles of the face. If the oramaxillofacial musculature were in a state of balance, a good occlusion would develop and if any of the muscle groups were aberrant it would result in a malocclusion in some form or the other. Muscle exercises allow a clinician to bring such aberrant muscular functions into normal functioning, to create normal health and function, as they are important elements in aiding growth and development of normal occlusion.

USES:

- 1. To guide the development of occlusion.
- 2. To allow optimal growth patterns.
- 3. To provide retention and stability in post-corrective (mechanical) orthodontic cases.

There exist various methods of prophylactic exercises for the treatment of maxillofacial deformations, but the system of exercises offered **by Rogers** has gained the biggest ground. The basic positions of these methods of training underdeveloped and weakly functioning muscles of the maxillofacial skeleton may be worded in the following way:

- Traction is to be carried out with the least amplitude.
- The intensity of such muscles contractions should correspond to their physiological function, it should not be excessive.
- The speed and duration of traction is to be adapted to the peculiarities of this movement; at first they are to be slow, continuous, and conducted regularly.
- There should be a rest pause between two consequent tractions; pause duration must equal the duration of traction itself at least.

- Traction should repeat at every exercise and last till the appearance of light local fatigue sensation. This fatigue determines the limit of exercise duration, which should not be overstepped.

EXERCISES

Exercises of orbicularis and circumoral group of muscles:

- ❖ Upper lip is stretched in the posteroinferior direction by overlapping the lower lip. Such muscular exercises allow the hypotonic lips to form an oral seal labially.
- ❖ Hypotonic lips can also be exercised by holding a piece of paper between the lips.
- ❖ Parents can stretch the lips of the child in the posteroinferior direction at regular intervals.
- ❖ Swishing of water between the lips until they get tired.
- ❖ Massaging of the lips.
- ❖ Playing a reed musical instrument-produces fine lip tonicity.
- ❖ Placement of scotch tape over the lips helps to train them to remain sealed.
- ❖ Use of an oral screen with a holder-to exercise the lips.
- ❖ Button pull exercise a 1 1/2 inch diameter button is taken through which a thread is passed. The patient is asked to place the button behind the lips and pull the thread while the lips try to resist the same.
- ❖ Tug of war exercise-is similar to the button pull exercise, where the difference is that 2 buttons are used and another individual pulls the thread gently while the same movement is resisted, by the patient.

Exercises of the Tongue. Exercises of the tongue are done to correct any aberrant tongue swallow patterns:

- ❖ One elastic swallow. An orthodontic elastic, usually 5/16th of an inch, is placed on the tip of the tongue and the patient is asked to raise the same to rugae area and swallow.
- ❖ Two elastic swallow. 25/16th inch elastics are used and one is placed on the tip of the tongue whereas the other is placed on the dorsum of the tongue in the midline and asked to swallow.
- ❖ Tongue hold exercise. A 5/16th inch elastic is used and the patient is asked to place the same on a designated spot over a definite period of time with the lips

closed. The patient is asked to swallow with the elastic in the designated position and lips apart.

- ❖ Hold pull exercise. The tip of the tongue is made to contact the palate in the midline and the mandible is gradually opened. This allows the stretching of the frenulum to relieve a mild tongue-tie.

Exercises of Masseter Muscles

- ❖ At times it is advised to strengthen the masseter muscles. The patient is asked to clench his teeth, count up to 10 in his mind and then relax them. This has to be repeated over a period of time, until the masseter muscles feel tired.

Exercises of Pterygoid Muscles

- ❖ In case of disto-occlusion cases the patient is asked to protrude the mandible as much as possible and then retracted. Repeat the exercises until the muscles feel tired. The ability to keep the mandible in correct position gradually improves.

Limitations of Muscle Exercises

- ❖ 1. Exercises are not known to drastically alter any bone growth pattern.
- ❖ 2. They are not a substitute for corrective orthodontic treatment.
- ❖ 3. Patient compliance is extremely important.
- ❖ 4. If not done correctly, can be counter productive.

Oral habits in children

Oral habits in children are a prime concern for the dentist, be it an orthodontist, pedodontist or a general practitioner. The neonate uses its mouth as a primary device for exploring the environment and his survival depends on instinctive sucking when his lips and tongue are stimulated. By random movements, infants discover their hands and toes, and use these to continue stimulation of the mouth and related structures. Normal habits grow out of these early developmental stages smoothly. Occasionally, a retained infantile pattern can cause an evident oral habit.

Finn says that habits cause concern because they **cause**:

- *Oral structural changes.* Harmful, unbalanced pressures bear upon the immature, highly malleable alveolar ridges and bring about potential changes in position of teeth and occlusion.
- *Behavioral problems.*

- *Socially unacceptable act.*

Okushko (1975)

Functions are divided into incorrect type of the function and unnecessary correct type of the function.

- I. Oral habits of sucking (fixed reaction for movement):
 1. Finger sucking;
 2. Lips/cheeks/object (pen, dummy) sucking and biting;
 3. Tongue sucking and biting.
- II. Pathologic function (fixed function which is incorrect):
 1. Incorrect mastication (unilateral mastication, lazy mastication);
 2. Incorrect swallowing and tongue thrusting;
 3. Mouth breathing;
 4. Incorrect articulate (speech).
- III. Fixed postural and tonic reflexes, which determine incorrect position of parts of the body in the rest:
 1. Incorrect position of the body and incorrect posture;
 2. Incorrect position of the mandibulare and tongue in the rest.

DIGIT-SUCKING HABIT. (THUMB/FINGER-SUCKING).

Gellin: Defines digit-sucking as placement of thumb or one or more fingers in varying depths into the mouth. Moyers: Repeated and forceful sucking of thumb with associated strong buccal and lip contractions. Practically all children take up this habit, but eventually discontinue it spontaneously with age and maturation, as growth unfolds

EFFECT OF DIGIT-SUCKING. Dentofacial changes associated with NNS can affect:

- Maxilla
 - 1. Proclination of maxillary incisors: When a child places a thumb/finger between the teeth, it is usually positioned at an angle so that it presses against the lingual palatal surface of the upper incisors and the lingual surface of the lower incisors. This direct pressure causes displacement of incisors.
 - 2. Increased arch length.

- 3. Increased anterior placement of apical base of maxilla: Maxillary teeth experience a labial and apical force resulting in flared and labially inclined anteriors with or without a diastema.
- 4. Increase in SNA angle.
- 5. Increased clinical crown length of maxillary incisors.
- 6. Increased counter clockwise rotation of occlusal plane.
- 7. Decreased width of palate. Left/right side of anterior maxillary arch is usually deformed with deformation related to whether the right or left thumb is sucked.
- 8. Atypical root resorption of primary central incisors.
- 9. Trauma to maxillary central incisors (Primarily due to their prominence).
- Mandible
 - 1. Proclination of mandibular incisors.
 - 2. Increased mandibular inter-molar width.
 - 3. More distal position of point B: Mandible is more distally placed relative to the maxilla.
 - 4. Mandibular incisors experience a lingual and apical force.
- Inter-arch relationship
 - Decreased inter-incisal angle
 - 2. Increased overjet
 - 3. Decreased overbite
 - 4. Posterior cross-bite. If the thumb is placed between the upper and lower teeth, tongue is lowered, which decreases the pressure exerted by the tongue against the lingual aspect of upper posterior teeth, at the same time, cheek pressure against these teeth is increased as buccinator contracts during sucking. Cheek pressures are greatest at the corner of the mouth, therefore, maxillary arch tends to become V-shaped with more constriction across the canines than molars. Hence, the maxillary arch becomes narrower than the mandibular arch.
 - 5. Anterior open-bite. Arises by a combination of interference to normal eruption of incisors and excessive eruption of posterior teeth. When a thumb or a finger is placed between the jaws the mandible must be positioned

downward to accommodate it. The interposed thumb directly impedes incisor eruption. With the separation of jaws, there is an alteration in the vertical equilibrium, which causes more eruption of posterior teeth; about 1 mm supraeruption posteriorly, opens the bite about 2 mm anteriorly resulting in an open bite.

- 6. Narrow nasal floor and high palatal vault results from loss of equilibrium in the force system in and around the maxillary complex, it is possible for the nasal floor to drop down vertically from its expected position during growth. These are commonly seen and is dependent on the position and pressure exerted by the digit during sucking.
- Lip placement and function
 - 1. Lip incompetence
 - 2. Hypotonic upper lip
 - 3. Hyperactive lower lip: Since it must be elevated by contractions of orbicularis oris and mentalis muscle to a position between malposed incisors during swallowing.
- EFFECT ON TONGUE PLACEMENT AND FUNCTION
 - 1. Tongue thrust
 - 2. Lip to-tongue rest position
 - 3. Lower tongue position: Tongue is displaced inferiorly towards the floor of mouth and laterally between posterior teeth.
- Other Effects
 - 1. Affects psychological health
 - 2. Risk of malpositioning of the teeth and jaws
 - 3. Deformation of digits
 - 4. Speech defects (lispings).

TREATMENT OF DIGIT SUCKING

Chemical Approach to Habit Control. Recommends the use of hot flavored, bitter tasting or foul smelling preparations, placed on the thumb or fingers that are sucked. The chemical therapy uses cayenne (red) pepper dissolved in a volatile liquid medium. Quinine and Asafoetida, which have a bitter taste and an offensive odour respectively,

also may be used. This should be done only when the patient has a positive attitude and wants treatment to break the habit.

Corrective therapy Appliances are indicated only. When the child wants to discontinue habit and needs only a reminder.

Classification of appliances for thumb-sucking

1. Removable appliances. These are passive appliances which are retained in the oral cavity by means of clasps and usually have one of the following additional components:

- a. Tongue spikes
- b. Tongue guard
- c. Spurs/rake.

TONGUE THRUSTING HABIT

Tongue thrusting is the most controversial of all oral habits. Considerable attention has been paid at various times to the tongue and tongue habits as possible factors in malocclusion.

CLINICAL FEATURES| EFFECTS OF TONGUE THRUST ON DENTO-FACIAL STRUCTURES

- 1. Open-bite-anterior and posterior (lateral tongue thrust)
- 2. Proclination of upper anterior teeth.
- 3. Protrusion of anterior segments of both arches with spaces between incisors and canines.
- 4. Narrow and constricted maxillary arch-posterior cross-bite.

TREATMENT OF COMPLEX TONGUE-THRUST

1. Treat the occlusion first.
2. When orthodontic treatment is in its retentive stages, careful occlusal equilibration is completed
3. The muscle training is begun similar to simple tongue-thrust with minor modifications.

LIP-SUCKING

In many instances, lip-sucking is a compensatory activity that results from an excessive overjet and the relative difficulty of closing the lips properly during

deglutition. It is easy for the child to cushion the lip to the lingual side of maxillary incisors. To achieve this position, mentalis muscle extends the lower lip upwards.

The patient may exhibit the following features:

- When the habit has become pernicious, a marked flattening and crowding of lower anterior segment occurs.
- Retraction of teeth occurs which depends upon whether the upper or lower lip is sucked.
- Maxillary incisors may be forced upward and forward into a protrusive relationship in lower lip-sucking.

CHEEK BITING

Biting the cheeks, if unchecked may contribute to ulceration, pain, discomfort or malignancy.

ETIOLOGY

- Buccalversion of erupting third molar
- Flabby cheeks
- Lack of proper coverage of lower teeth by upper teeth buccally.
- Atrophy of muscles seen in paralysis.

TREATMENT

- Identify the cause
- Analgesics
- Appliance therapy - oral screen
- Oral screen.

POSTURAL HABIT

CHIN-PROPPING HABIT. It is an extrinsic pressure, unintentional habit which causes a deep anterior closed bite. It may cause retraction of mandible.

FACE LEANING. Lateral pressure from face leaning which is an unintentional, extrinsic pressure habit, may cause lingual movement of maxillary teeth on that side. The mandible is less affected as it does not have a rigid attachment and can slide away from the pressure.

ABNORMAL PILLOWING/HABITUAL SLEEPING ON RIGHT OR LEFT SIDE OF FACE. Normally children do not lie in one position during sleep. The

movements are largely involuntary and are produced by nervous reflexes in order to prevent pressure interferences with circulation. Pillowing habits may cause flattening of the skull, facial asymmetry in infants.

Dispensary System in Orthodontics. Dispensary system is the system of Ukrainian treatment-and-prophylactic institutions work, which provides diseases prevention, their early detection and treatment at systematic observation of patients. Health examinations are conducted by local children's stomatological polyclinics and orthodontists in particular, who have a prophylactic day a week. It is conducted in children's institutions and consists of several stages.

- *The first stage* — registration of all children. Age, sex, and general state of health are taken into consideration.
- *The second stage* — specialized examination of every child.
- *The third stage* — their distribution into groups.
- *The fourth stage* — observation of patients, oral cavity sanitation, conducting lessons of hygiene and other mass prophylactic measures.
- *The fifth stage* — studying the effectiveness of orthodontic health examination.

A complex of treatment-and-prophylactic measures, outlined at the examination of a child, is registered in the card of health examination, after what children are distributed into dispensary groups. Osadchyi has singled out 4 dispensary groups:

To the *Ist* group are included children with correct lips closure, normal functioning of the dentognathic apparatus and regular occlusion. These are practically healthy children examined once a year.

The 2nd group includes children with risk factors, i.e. with functional disorders of breathing, swallowing, speech, mastication, mimicry, pernicious habits, with shortened frenula of lips, shallow vestibule of oral cavity. In such children the reasons for disorders should be eliminated and favorable conditions for the normal growth of jaws and occlusion formation should be created. Oral cavity sanitation is conducted, methods of pernicious habits control and curative myogymnastics are recommended, specialists' (otorhinolaryngologist, orthopedist, pediatrician, and others) consultations are recommended; such children should be watched by parents, teachers, medical staff of the children's institution. Orthodontist's examination is carried twice a year.

The 3^d group includes children with not full-blown morphologic changes and anomalies of teeth or their groups position, changes of dental arches shape, occlusion deviations, caused by functional changes. To help such patients measures are taken aimed at the elimination of reasons for disorders development, including orthodontic appliances usage. After treatment examination is carried out once a year.

To *the 4th dispensary group* are included children with evident changes in the dentognathic apparatus: derangements of the functions of breathing, swallowing, speech, biting and chewing food. Such children require specialized help and complex treatment measures which fix the function of the dentognathic apparatus and the organism on the whole.