The Prophylactic Orthodontic Treatment with Removable Appliances in Children

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Childhood and adolescence include periods of growth in which the pediatrician meets multiple challenges in terms of cooperation, compliance with treatment, and the patient's family, thus constituting the pedodontic triangle. The importance of long-term patient monitoring should not be neglected, especially for those in the stage of growth and development of temporary or permanent dentition, when a real cascade of bad events can be triggered. Mobile dental appliances with the indication to be worn both day and night, less during meals and when tooth cleaning is taking place. They are used for a relatively short period as part of a wider treatment plan. The efficiency of an orthodontic appliance is appreciated by the possibilities it offers to reach the desired result in a minimum treatment time, without affecting the biological integrity of the substrate on which it operates. Ortodontic mobilisable devices used to correct dento-maxillary abnormalities, requires plates with orthodontic force, retention and anchoring. If these are used as contention devices, is needed only retention. Study group regards the selection, examination and orthodontic treatment of 46 cases at the Orthodontic Clinic of the University of Medicine and Pharmacy Tîrgu Mureº between 2014-2016.The study deals with the theoretical aspects regarding biomechanics and the principles of orthodontic treatment and at the same time represents a synthetic exposure characteristics of the orthodontic devices, considering the development of new techniques. Orthodontic treatment begins in childhood, around the age of 6 years old or when the child has 4-6 milk teeth, when we already can see problems in growing of jaw and permanent teeth.

Keywords: orthodontic appliances, biomechanics, temporary dentition, correction of anomalies

Dental problems are not only reflected at aesthetic level, but also in the general health of each person. The orthodontics deals with the diagnosis and treatment of dento-maxillary abnormalities, given their consequences on the functioning and the cranio-facial morphology of the child or adult patient.

Childhood is defined as a qualitative, variable ascending from fetal to newborn, reaching adulthood (Maxim A).

The child's attributes and abilities are established and developed on the dispositions of activity, education and instruction, and as a result of social and historical development. The psychic instincts develop as a result of a merging of the elements born with those acquired. Genetic determinism manifests itself more strongly in elementary mental functions and stronger in early stages of child development [1].

Awareness of the individuality of the child will occur only when he/she becomes aware of his/her sex, a phenomenon that is represented in the Oedipal drama, differentiated in girls versus the boys.

The treatment of dento-maxillary abnormalities involves correcting the position of teeth and occlusion as much as is necessary and especially possible. The treatment decision and the treatment plan should take into account the patient's age, the general state of the body, the health status of the oral cavity, the clinical form of the dento-maxillary abnormality, its etiology, the degree of collaboration with the patient and the treatment options. The balance of forces around the dental arches is very complex and can be divided into developmental forces and neighborhood forces, determined by the structures and functions of the dento-maxillary apparatus. Developmental forces influence the position of the teeth and establish occlusal relationships. They are caused by the development of jaws, temporomandibular joints, eruption forces, and muscle mass [2,3].

In the orthodontic treatment, the forces are divided by their nature in artificial or mechanical forces and natural or functional forces: the artificial (mechanical) forces produced by the properties of the materials from which the orthodontic appliances are made (stainless steel for springs, elastic materials - rubber rings, orthodontic screws). The deformation of the elastic component causes a tendency to return to the initial form, triggering a force applied to the tooth which mediate its position; the intensity of the force is regulated periodically by the physician by activating the arcs or by the patient by removing the bolts or changing elastic rings. Natural (functional) forces are generated by the contractions of the oropharyngeal muscles resulting from the modification of the balance of antagonistic muscle groups. The intensity of these forces is regulated by the reflex of periodontal proprioceptors, articulations, the danger of overdosing that forced being reduced [4-6].

From the point of view of the orthodontic force used, three aspects are discussed: the rate of application, the intensity of the force, the resistance of the tissue to which it is applied. From the point of view of the *rhythm of action*, it is very important the balance between action - pause There are three types of forces: *intermittent forces* characterized by alternation of periods of action and pause, being generated by mobile devices, activators, extraoral devices, the apparatus acting only for part of the day; *discontinuous forces* characterized by alternation of periods

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of action with periods the pause that allow the organization of tissues, important during activation, diminishes rapidly from the time of the orthodontic displacement of the tooth; continous forces with approximately constant intensity during tooth movement, do not require *continuous forces*, with approximately constant intensity during tooth movement,do not cause exaggerated compression of the periodontal ligament and tissue hyalinization; allows the most favorable orthodontic shift [7,8].

The efficiency of an orthodontic appliance is appreciated by the possibilities it offers to reach the desired result in a minimum treatment time without affecting the biological integrity of the substrate on which it operates.

In modern orthodontics, light tooth displacement forces are preferred, these beeing forces that do not produce hyalinezing zones that block the movement and furthermore undesirable effects may occur. Orthodontic force behaves like any other vector taking into account laws of composition and decomposition that can be exerted on isolated teeth, dental groups, arches, temporomandibular joints. Regardless of the nature of the orthodontic force (natural, artificial), a force application area (teeth, arcade, jaw) and a support area called anchorage are required to obtain a therapeutic effect. According to the mechanical principles, the force applied to the movement of a tooth or dental group must have at least equal and opposite force for anchorage.

If the force does not act on the tooth resistance center, it will not produce a pure translation, but a tooth rotation due to the force of the defense by applying force away from the center of resistance. The closer the force direction is to the center of resistance, the movement will be predominant by translation, while a larger spacing will generate a larger rotation and a lesser translation. The ratio between the force and the moment created can only be controlled by fixed dental appliances and it depends on the type of tooth movement.

Tooth movement can be done by frictional and non-frictional systems. Ortodontic displacements are: swinging, translation, intrusion, extrusion, derotion, and torque movement. All dental movements can be described by rotational and translational movement, which only refers to the initial, limited displacements occurring in the periodontal space. Larger, long-term shifts are the result of a succession of such smaller displacements, depending on the type of alveolar bone remodeling.

Basculation is the most common orthodontic displacement resulting from the application of a point-like force at the level of the dental crown and consists of tipping the tooth around the center of rotation, and is also called a version. Translation is a movement in which both the crown and the apex are moving in the same direction and on the same distance; is favorable as long as the force strength does not exceed a certain limit. Derotation is a pivotal movement around the large root axis requiring a torque of forces; the orthodontic forces suitable for dental derotations are similar to those for tipping. Extrusion or displacement of the tooth in the vertical direction to the occlusion plan ideally induces only tension zones in the periodontal ligament, not pressure zones, the extrusion forces should have approximately the same intensity as the tipping forces. The intrusion has long been impossible to achieve. It requires careful force control, so that only low intensity forces will be applied because the compression zones will be concentrated on a small area at the apex level. In young people, a continuous, light force is beneficial for intrusion. In cases where the alveolar bone is located closer to the apex, the risk of root resorption increases at the apical level.

The torque movement is a more radicular movement, vestibuloorally, the crown being less shifted or even held in place. The force is distributed over the entire root surface. It requires force pairs whose result is a rotation around a point located to the parcel [4,9,10]. . After the resorption of the mediumsized bone tissue, the root apex gradually begins to compress the adjacent periodontal fibers, thus establishing a high pressure area. Regarding the aggregation mode of dental arches there are fixed, mobile and mixed devices [11].

Movable devices can be removed from the oral cavity and may be of two types: mobilizable devices, represented by palatal and lingual plates, which have hooks or appliances as anchoring elements; fully mobile devices, maintained in the oral cavity due to the contractions of the oropharynx muscles, having no other anchoring element. This category includes functional orthodontic appliances[12,13].

The mobilizable orthodontic appliances are anchored to the dental arches by means of retention such as hooks or bolts. They are palatal plates and lingual plates having the following main characteristics: they can be applied and removed at any time from the oral cavity by the doctor and the patient; the triggering of the orthodontic forces is achieved by deforming the elastic component (the spring) or the action of some mechanical elements (screws); the devices have a firm aggregation in the arches so as to allow the dento-maxillary apparatus to perform the functions of the dental apparatus and the dental movements for orthodontic purposes; if used to correct dento-maxillary abnormalities, the plates need orthodontic force, retention and anchorage. If used as contenders, only retention is needed. The mobilisable devices allow the addition of functional elements, extending the area of the therapeutic indications, rests on teeth and periodontium, the danger of overworking of teeth is reduced, the labor is simple and involves a low cost price, prefabricated elements can also be used; Adaptation in the oral cavity is easy and fast; removing from the arcade odontal or periodontal treatments are possible; in the case of hyperactivity of some elements instability of the device occurs; some items can be activated by the child or the parent; can be repaired in the office and laboratory [14,15].

The baropolymerizable and photopolymerizable acrylic resins used in the foundation of the orthodontic plates have completely modernized the technology of making orthodontic appliances. The anchoring elements and the active elements of the plates are made of wool wire with a diameter of 0.1-2 mm, round, rectangular or oval into section and with a different degree of elasticity (soft wires for ligatures, hard wires for contentious devices and elastic wires for making active and anchoring elements).

The orthodontic plates consist of: the base, made of acrylic resins; the biomechanical (arch, screw) or functional elements; anchorages elements (hooks).

The base of acrylate of the orthodontic plates is the mucosal support area of the apparatus. At its level are fixed the other components of the plates: screw, springs, hooks.

Under the action of the active element (orthodontic screw, wire, spring), the base of the plate exerts forces on both the surface of the teeth and the surface of the alveolar processus area through the soft parts (the maxillary field lining). These forces determine changes in the position of the teeth and bone structure, (remodeling bone processes comprising bone resorption and application phases).

The base of the upper plate covers the palat, faithfully following the palatal surfaces of the superior teeth, and penetrates into the interdental triangles below the contact

points in the form of acrylic extensions to maintain the apparatus.

The base of the lower plate is in intimate contact with the alveolar rebord following the gingival festoon to the last molar on the arch. The acrylic base of the mobilizable orthodontic appliances can be unique or from the multiple fragments resulting from its sectioning. Depending on the sectioning mode, the action of the base of the device on teeth and alveolar processes is different. At the jaw, the base of the plate can be sectioned on the median line in *L, Y*, in the trapeze or atypical sector. On the jaw the base of the plate can be cut on the median line, unilateral or bilateral [16].

The efficacy of the orthodontic plates depends on their stability, ie the quality of the anchorage. Besides the physiological forces due to gravity, mastication or phonation, more intense orthodontic forces arise from the active elements of the plates (springs, springs, screws) that tend to detach the device from the alveo-dental field.

The particular topography of the dental arcade and the different tooth implantation axes are geometrically translated through multiple inclined plans with very small surfaces and tilts. To this, are added obligatory the movements of the mobile formations in the oral cavity (bridles or frenches). This complex of factors causes the main forces acting at the level of the components of the dento-maxillary apparatus to give rise to unwanted side forces that tend to detach the plate from the alveolo-dental field, move the active elements unfavorably and impose unwanted effects. The effectiveness of orthodontic treatment depends directly on countering secondary forces; the anchor is an essential element in the design of an orthodontic plate, which is the source of resistance to the action of the active components of the orthodontic apparatus. When an orthodontic movement is performed with force to a tooth, an opposite force of anchorage is required. The anchoring elements of the most commonly used orthodontic plates are crochet hooks (Sthal crochet, delta, arrow, semicolon) and the bite guards.

The bite guard is an anchor element made of acrylate, similar to a group of engraved crowns interconnected to which the intermediate walls have been dismantled. Apply to unsteady teeth on their vestibular, oral and occlusal faces, do not penetrate subgingival and cause temporary occlusion.

The main differences or similarities between the collars and crotches as anchoring elements of the orthodontic plates are summarized in the following table 1.

BITE GUARDS	CROCHETS
Provides body teeth movement.	Allow individual tooth movements.
Determines temporary booster occlusion, favoring some stages of orthodontic treatment.	Schwarz crochet hooks allow the teeth to be egged and even favor this.
They come in contact with the entire dental surface and require very rigorous hygiene	Leave a large part of the surface of the dental crowns free.
For application, the presence of at least two teeth is required.	Allow individual teeth applications.
Ensures increased force efficiency, all portions of the plate anchored on the guides move in the sense of the action elements.	Exercises a great friction at the level of dental crowns.
Repair can be done in the laboratory or in the cabinet.	Repairs or replacements are only done in the laboratory.

Table 1

Experimental part

Materials and methods

Orthodontic appliances are therapeutic devices that are applied to the teeth and jaws, by their action producing the prevention or correction of dental or dentoalveolar arches abnormalities.

The main objectives of mobile dental treatments are to block or stimulate the jaw; mobile orthodontic appliances are used in the presence of discrepancies between the upper and lower arches, repositioning the mandible and modeling the perioral muscles around the oral cavity.

Database for the selection, examination and orthodontic resolution of 46 cases at the Orthodontic Clinic of the University of Medicine and Pharmacy Tirgu Mures in 2014-2016.

Results and discussions

Mobile devices were indicated, as appropriate, for patients aged between 6 and 12 years, acting on temporary and definitive teeth, especially during mixed dentition, when definitive teeth began replacing temporary patients. The therapeutic action of mobile orthodontic appliances were monitored by the ontodontist by patient scheduling after 27 days; the orthodontic treatments aim to correct the maxillofacial alignment and improve the masticatory function.

It is a modern therapy that favors the health of teeth, tissues that support it (periodontium), improving facial and dental aesthetics.

The mobile dental appliances is considered an indispensable accessory in the oral cavity of many children and adolescents. Development of osseous system depends on genetic (hereditary) and environmental (external) factors: mobile orthodontic devices can interfere with environmental factors (external) that are acquired, manage to correct nonsteroidal maxillo-facial development.

Due to the particular characteristics that differentiate it from fixed dental appliances, a mobile dental device manages to act both on supporting bone structures (periodontium) and on the teeth; at the time of wearing, the mandibular posture changes as the old patient used to.

The mobile dental device is performed in the laboratory, following careful study of the shape of the dental arches and the palate of the patient. It is made of an acrylic part, to which various metal components are added, with the role of moving and/or anchoring the dental and supporting elements.

The model should be wet, water-saturated and insulated with an acrylicbased insulator. This operation can be

replaced by boiling the basic soap solution for 1 min. Remove the gypsum portions from the surface of the models, and if the teeth did not completely erupt (11 cases - 23.91%) carefully remove the interdental space and the parcel by engraving with approximately 1-2mm, protecting with great care pattern parts that represent dental hard substance.

Modeling of wire elements, hooks and springs takes place on the model.

The actual realization of the base of the plate was made possible by two different techniques: powder and liquid technique, by sprinkling with powder on the surface of the pattern; the operation is repeated until the desired base thickness is obtained; otherwise, creamy areas will appear in the acrylic mass or on the surface to give an unpleasant appearance; saturation with liquid continues at a relatively slow rate until the translucent appearance of the plate becomes slightly opaque. The model is placed in a pressure vessel at a temperature of 40°C and 2.1-2.5°C for 20 min.

Pasta technique - prepare the acrylic paste by mixing 2.5/3 powder with liquid. The mixture must be saturated with liquid so that after 2-3 min when it starts to draw in the yarn, its consistency will allow for stretching using the spatula on the surface of the model. Carefully follow the *hidden* areas below the crotch retention or the sides of the screws, so that there are no air gaps at these levels.

Laying the material on the surface of the model, molding with excess liquid to the desired thickness and extent, and finally the base of the machine will be polished with a quantity of monomer. It is introduced into a pressure vessel as in the previous technique.

The paste technique has the advantage of obtaining more compact structures of the bases of the high quality orthodontic appliances.

The manufacture of photopolymerizable acrylics is similar to the use of barometrizer acrylate. The devices have very good precision and a great design.

The cutting of the appliances is done with a Horico metal disc with a thin cylindrical cutter or preferably with a narrow-sided saw blade because the aspect of the section will be perfectly continuous.

The mobile dental device uses the natural evolution of the jaw and the oral cavity of young patients. The application of the mobile device allows the teeth and support tissues to be directed to the most normal position; are perfect for dental and facial corrections during the period of evolution and are prescribed for severe dental malocclusions and dental-facial dystrophies. The use of mobile orthodontic braces is associated with the prevention and modification of habits.

Can be used by pre-school children with milk teeth to enlarge the palate and dental arches; manage to correct the unhealthy habits of the little ones; allow proper dental hygiene; Corrects the phonetics of small patients, reduces the risk of periodontal and dental lesions caused by bacterial plaque deposits. General prophylaxis addresses both systemic, general, and loco-regional and local health. General non-specific systemic prophylaxis should be seen in the context of the integrated nature of the system in the bio-psycho-social vision, with a view to prevent all kinds of illnesses, but especially contagious diseases in the fight against which it is of interest and directly and medically dental.

Local prophylaxis will have to take place in several stages. Primary prophylaxis is directed to stimulation teeth and contains a number of means, such as rational nutrition, fluoridation by local and general means, etc.

Secondary prophylaxis aims at treating and preventing local and loco-regional complications of carious disease and periodontal disease.

The tertiary prophylaxis in which prosthetic therapy is performed includes the correct restoration of morpho-physiology, the prevention of dental migrations, periodontitis and dysfunctional syndrome.

Conclusions

The mobile orthodontic appliacces made in the dental laboratory, following the jaw mark, remedy mild or moderate dental abnormalities by exercising controlled forces on the teeth and jaws.

Orthodontic treatment is a way of straightening and aligning teeth, improving the appearance of teeth and how they work; treatment can also help improve the long-term health of gums, teeth and jaws by balancing pressure on all teeth.

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