VACUUM FORMED ACTIVE APPLIANCES AS AN INNOVATIVE TECHNIQUE OF ORTHODONTIC TREATMENT

ANDREI – IOAN ANDRONIC [1]

[1] *"Lucian Blaga" University of Sibiu*

Keywords: *aligners, aesthetics, orthodontic treatment, dental appliances*

Abstract: *One of the main disadvantages of fixed orthodontic appliances is considered to be the alteration of the aesthetic function. The last years have shown an increase in demand for appliances which are less visible or even invisible, hence different techniques for orthodontic treatment aim to improve the esthetic aspect. As a result, in 1998, the Food and Drug Administration approved the usage of vacuum formed active appliance during the active treatment of dental anomalies. The orthodontic treatment with this type of appliance is a relatively new technique that still needs improvements, though it has a growing interest on today's market, mainly because they have proven to be the most aesthetic and comfortable appliance. The present paper aims to present, from a theoretical approach, the indications, contraindication, advantages and disadvantages of this treatment, completed by a series of clinical observations, aiming to improve the clinical experience of both patients and orthodontist.*

INTRODUCTION

The alteration of the esthetic function is one of the main disadvantages of fixed orthodontic appliances. The increased demand in appliances which are less visible or even invisible has led in the last years to the development of techniques for orthodontic treatment aiming to improve the esthetic aspect. One of these which purpose is to improve esthetics is the lingual appliance. Still, the laborious treatment techniques and the discomfort caused to the patient have led to a lower success rate in this type of treatment.

In 1998, the Food and Drug Administration approved the usage of vacuum formed active appliances during the active treatment of dental anomalies. These dental aligners are orthodontic devices which are used in the treatment of malposition teeth. It is not a completely new treatment technique, considering that in 1954 Dr. H.D. Kesling (1) used certain tooth positioner devices for corecting the occlusion observing that these also have the capacity to move the teeth; Also vacuum formed appliances were used for several years in maintaining the results of active orthodontic treatments (vacuum formed retainers), hence the orthodontists came to the conclusion that these vacuum formed retainers have the capacity to reposition the teeth in case of dental relapse.(2) Exactly this active potential of the vacuum formed appliance was transformed into orthodontic therapy.

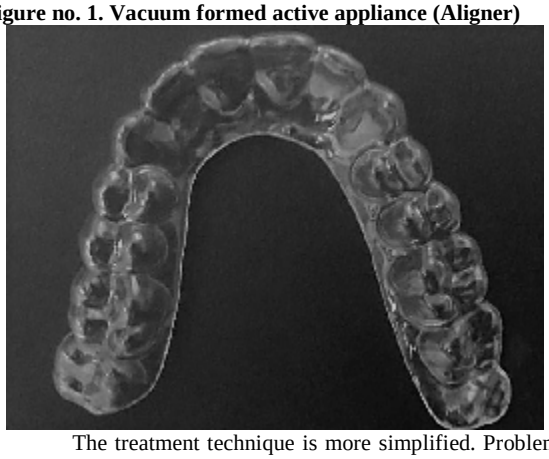
PURPOSE

The present paper aims to present, from a theoretical perspective (based on the speciality literature), the indications, contraindication, advantages and disadvantages of this treatment, completed by a series of clinical observations meant to improve the clinical experience of both patients and orthodontist.

MATERIALS AND METHODS

Vacuum formed active appliance has a series of clinical and practical advantages which have facilitated the entrance on the market of this type of orthodontic device. The esthetics is undisputed, these appliances being almost invisible. The advantages are many. The patients comfort is much more improved compared to the fixed appliance.

Figure no. 1. Vacuum formed active appliance (Aligner)



The treatment technique is more simplified. Problems regarding the bonding of the elements in case of fixed appliance on the dental surface are now completely avoided, because this type of appliances are not fixed on the teeth. Another advantage is that it can also be used in patients with dental crowns or with amelogenesis imperfecta. Risk of root resorption is reduced. Dental hygiene is much more improved because the dental appliance can be alienated, whenever, by the patient alone. The chair and activation time are much more reduced because the practitioner now only surveys the progress of treatment and intervenes when it is necessary. Also, the emergencies connected to the detachment of certain elements of the appliance are avoided because an abruption of an appliance (rarely) leads to the replacement with the next appliance from the treatment series. The adult patients are very delighted with the much improved aesthetics of these dental aligners which can also successfully substitute the bite splints and can also be used in dental bleaching. The soft used in evaluating the cases which

[1]Corresponding author: Andrei Ioan Andronic, Str. Odesa Nr. 9, Sibiu, România, E-mail: andrei_andronic82@yahoo.com, Phone: +4070 164579
Article received on 20.10.2017 and accepted for publication on 04.12.2017
ACTA MEDICA TRANSILVANICA December 2017;22(4):116-118

would suit this type of treatment can also be used in the assessment of much more complex cases.

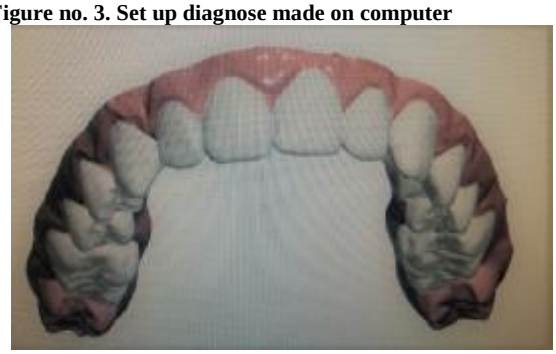
But there are also disadvantage, among which a major disadvantage is the fact that it relies on the seriousness of the patient mainly according to the period of wearing or quick transition of the appliances. Not respecting the period of wearing each appliance or changing it to quickly can lead to a failure in treatment. A much more restraint therapeutic indication is another major disadvantage. Losing the appliance can require an additional treatment phase and also prolong the wearing period. Complex dental movement are practically impossible with this type of device. Repositioning the root apex is also a movement which cannot be obtained with this type of device. The major treatment indications refer to the dental anomalies of class 1 Angle with minor or moderated dental crowding without any skeletal discrepancies. They are also efficient in modifying the single tooth position such as rotation or tipping. They can also reduce the frontal open bite and the type 1 anomalies with spacing. They are also indicated in patients with dental crowns where the adhesion of the fixed appliance is lower. Also, they are used in the treatment of orthodontic relapse or for finishing the cases previously treated with fixed appliances.

There are contraindicated in the treatment of complex anomalies where the efficiency of fixed orthodontic appliances is much more superior. Cases that require extractions are not suitable for the treatment with aligners. There are also contra-indicated, the cases which require bodily movements of the teeth. Manufacturing of these devices is a laborious process which contains more clinical and technical stages:

1. Case selection: the orthodontist selects the cases suitable for this type of treatment according to the clinical exam, analysis of the cast model and radiologic examination.
2. Impressions : it requires a much more detailed impressions of the dental arch. Therefore, the material used is an addition silicon and the impressions are taken in two steps. If the treatment aims a single arch, than the alginate is sufficient for the opposite arch. More so, the impressions stage can be replaced with scanning in dental chair of the dental-alveolar arch.
3. The set up diagnose: the dental technician aligns the teeth, manually or on a computer, obtaining the dental arch which should be at the end of the treatment. Afterwards, the distance which the tooth has to traverse until reaching the final position and the stripping required for creating the alignment space is calculated. Considering that an aligner set can move a tooth with maximum 0,25mm, according to the final destination, it is also being calculated the exact number of appliances required during the treatment.(3)

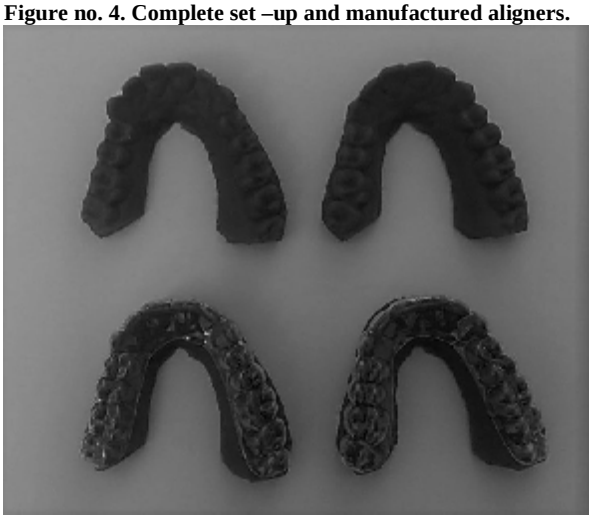
Figure no. 2. Set up diagnose made by dental technician

Figure no. 3. Set up diagnose made on computer



4. Patient approval: the patient receives the final projection of the treatment, the required number of appliances and the price. If the patient is satisfied, than the appliances are confectioned. The intermediate models are printed with help of a 3D printer and on each one of these the aligners are manufactured.

Figure no. 4. Complete set –up and manufactured aligners.



5. Application: after creating the necessary space through interproximal reduction (stripping) of teeth with abrasive strips or disks, the appliances are fitted and the patient is informed about the wearing indications. The appliance must be worn 24 hours excepting the meals and hygiene periods. The appliances must be changed after 2 weeks of wearing. The patient is scheduled for supervising the treatment.

Figure no. 5. Vacuum formed active appliance clinical view

The dental movement is obtained by the pressure applied by the appliance on the tooth until it reaches the final correct position. Once obtained, the final treatment result is maintained through the last aligner, worn during the night or, through a fixed retainer on the treated arch.

RESULTS AND DISCUSSIONS

An internet search reveals at least 27 different clear aligner products are currently on offer for orthodontic treatment. The treatment principle is the same, having only slight differences according to producer. Some producers recommend the confectioning of three different appliances in a set with different elasticity (soft, medium, hard) while others produce a single aligner in a set. The orthodontics chooses the producer according to his theoretical and practical knowledge.

The orthodontic treatment with vacuum formed active appliance is a relatively new technique that needs time to improve. Applying certain dental attachments (4) complex dental movements possible (6) and in the future treatment indications will surely be extended. Orthodontist feedback is also important for improving the treatment. A much enhanced aesthetics and the reduction of the treatment period are the most important advantages of these aligners which are slowly getting in the top of the patients preferences. The major disadvantage remains the restricted treatment indications, making these appliances eligible for a smaller number of patients.

CONCLUSIONS

From the present article the following conclusions could be drawn:

- The vacuum formed active appliances must not be perceived as a replacement of the fixed orthodontic treatment, but as a completion of the therapeutic process.
- Complex dental and maxillary anomalies are still treated with fixed appliances.
- The major treatment indication of aligning appliances remains class 1 Angle with small or moderate crowding within the frontal area.
- Applying dental attachments can enlarge the area of therapeutic indications.
- They are the most aesthetic and comfortable orthodontic appliances.
- The aligner therapy gains ground even more and once the technology progresses, this type of treatment will evolve as well.

REFERENCES

1. Kesling HD. The philosophy of the tooth positioning appliance, Am J Orthod. 1945;31:297–304.
2. Tuncay OC. Biologic elements of tooth movement. In Tuncay OC, editor: The Invisalign system, Berlin; 2006
3. Beers A. Invisalign software. In Tuncay OC, editor: *The* Invisalign system, Berlin; 2006.
4. Boyd RL. Esthetic orthodontic treatmentusing the Invisalign appliance for moderate to complex malocclusions. Journal of Dental Education. 2008;72:948–967.
5. Djeu G, Shelton C, Maganzini A. Outcome assessment of Invisalign and traditional orthodontic treatment compared with the American Board of Orthodontics Objective Grading System. American Journal of Orthodontic Dento-Facial Orthoptics. 2005;128:292-298.
6. Vlaskalic V, Boyd RL. Clinical evolution of the Invisalign appliance. Journal of the Californian Dental Association. 2002;30:769-776.