SCIENTIFIC ARCHIVES OF DENTAL SCIENCES (ISSN: 2642-1623)

Volume 6 Issue 4 April 2023

Review Article

Aligners: Hybrid Approach Suggestions to Increase the Success Rate

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Received: April 03, 2023; **Published:** April 26, 2023

Abstract

With evolving esthetic alternatives for orthodontic treatments, the success rate for one such technique aligner is falling far from gold standards. This review article has attempted to describe the evolution of aligners, the various materials used, the properties of aligner materials, and biomechanics involved. It also describes the modifications to improve efficiency such as attachments and introduction of hybrid treatment modalities to improve their success rates. A detailed description of biomechanics in orthodontics and the movements possible with aligners are discussed. The role of attachments, mode of their action and their impact on overall success of aligner therapy has been highlighted. Apart from this special emphasis on hybrid procedures has been given. The indications and contraindications of the aligner therapy have been described in brief. Finally, a brief description of shortcomings in aligner materials and how they can be improved along with ideas for future research are mentioned.

Keywords: Aligner; PET-G; Attachments; Hybrid Model; Biomechanics

Introduction

Teeth aligning dates back to around 2000 BC, as evidenced by archeologists with crude metal wrapped around the teeth in mummified bodies. It was thought that catgut had been used in order to close the gaps between the teeth. This information suggests that aligning teeth was practiced since several civilizations. With the advancement in technology and the need of the patients the treatment mode is transformed from banding to bonding and now to invisible orthodontics [1].

Knowledge of the anatomy and identifying deviations of those anatomical landmarks of each tooth is basic requisite for every orthodontist. Orthodontic treatment consists of a meticulous evaluation of the dentition and occlusion, followed by treatment planning before initiation of the treatment. Conventional braces are preferred by practitioners for the control they offer though they are aesthetically less appealing. On the other hand, aligners an evolving esthetic alternative uses tooth surface area and brings tooth movements using viscoelastic forces of the material [2]. Assuming the various permutations and combinations possible in the course of tooth movement before achieving the final result and the interactions it makes with other teeth in the process are very important key factors to be considered for planning treatment. Though Aligners is a great technology it's a very technique sensitive procedure. Orthodontists should acknowledge the amount of progress it has made in a short span compared to decades old braces technology. Although the entire credit cannot just be owed to the comfort the patient feels but the convenience of practitioners, their availability of orthodontists, and the success rate of the treatment are crucial factors in promoting it in countries where those treatments initiated and became prevalent.

The invisible orthodontics is in trend due to its superior esthetic concern which attracts people of all age groups to prefer them [3]. Among the invisible treatment options, aligners are being widely spoken and have attracted both the orthodontist and patients. The

concept of aligning and moving the teeth without braces was demonstrated by Kesling in 1945, followed by Nahoum after which many authors made efforts to modify it [4-6]. In 1975 H.R Barrer introduced the spring aligner or spring retainer [7]. By the 1990s, aligners started gaining popularity. In 1993 cases were being treated using aligners. Sheridan demonstrated the plastics were capable of resolving crowding with arch length deficiency of around 10 mm. He combined interproximal reduction and the usage of these plastics to move the teeth into desired position [8,9].

In 1999 CAD/CAM technology was incorporated to design the aligners [10]. In the year 2000 Boyd reported the first case of treating mild crowding and spacing using aligners [11]. Many studies were carried out in order to analyze the treatment efficacy when aligners were opted as the treatment choice. Studies that were conducted from 2003 - 2005 suggested that the treatment effectiveness ranged from 29% to 47% [12-14].

Indications for aligners [15-17]:

1. Mild to moderate space discrepancies (crowding and spaces) and Rotations ex: rotations < 15 degrees, spacing < 5 mm, moderate class 2 division 2 malocclusions, mild deep bites all alone or combined without less complexity.
2. Gaining space by tipping of incisors.
3. Crossbite corrections in growing children.
4. As retainers following orthodontic treatment.

Contra indications for aligners [15,18,19]:

1. Skeletal malocclusions.
2. Children or adults who require additional supervision as it is a procedure mostly dependent on patient cooperation and participation.
3. Moderate to severe space discrepancies (crowding and spaces) and rotations. Ex: rotations < 20 degrees, spacing < 6 mm.
4. Cases requiring translation of teeth i.e. root displacement.
5. Tooth extrusion (Explanation in biomechanics).
6. Extraction cases, or missing teeth, and cases requiring space closures.
7. Patients with hypocalcified enamel.

Materials used

Most commonly used materials in aligner manufacturing include Polyester [polyethylene terephthalate (PET) and poly- ethylene terephthalate glycol (PETG)], polyurethane or co-polyester, poly-propylene, polycarbonate, ethylene vinyl acetate, and polyvinyl chloride. Different combinations of these materials can be used for varying properties [20-27]. Among emerging technologies, 3d printing has become a more customer preferred technology due to its user friendly nature and mass production ability. 3D printed aligners have more accuracy than aligners manufactured by thermoforming due to less steps involved in the process and the reduced scope of errors in each step [25]. 3D printing uses acrylonitrile-butadiene-styrene plastic, stereolithography materials (epoxy resins), polylactic acid, polyamide (nylon) or glass-filled polyamide, photopolymers, wax, and polycarbonates as their main ingredients [28,29]. Nanomaterials like gold, silver, copper and zinc are also being used for disinfection and to prevent microbial growth by some companies [30].

Properties

An ideal aligner material should have adequate stiffness (modulus of elasticity) to exert forces on teeth to bring planned changes in tooth position and at the same time should be flexible enough to facilitate wearing and removal for the user with ease [31]. An ideal Aligner material should not deform when loads (forces due to occlusion) are applied and should be able to return their shape after the loads are removed. The aligners should have a high range of activation i.e. the amount of change required can be brought about in one or a few aligner sets. Aligner materials that are currently in use have a very low curve for activation when compared to other materials such as the wires used in orthodontic tooth movement [32]. There is a rapid stress relaxation (deactivation) of the material after its use. The stress relaxation is about 90% in the first 2 hours of the aligner materials. Also, the stress relaxation increases by 10 folds as the frequency of removal and insertion of an aligner tray increases by the user [33-36]. Shape memory polymers are being used to make aligners to counteract these drawbacks [37-40]. Patient compliance is very important while choosing aligners as treatment options due to this factor [41,42]. Material thickness has a direct impact on the amount of force it delivers. Ex: thicker the aligner material greater is the force. Thinner material provides more consistent force with a comparatively slower rate of degradation of forces [25,43-47].

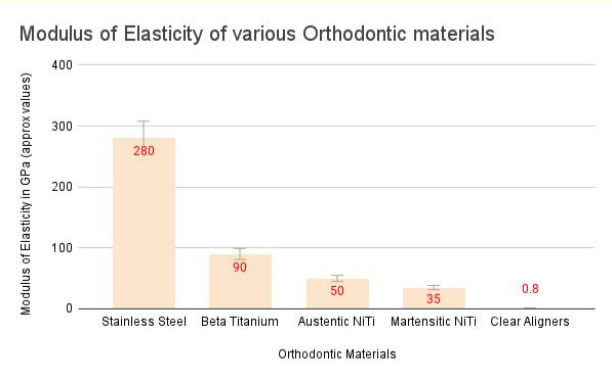

Figure 1: Modulus of elasticity of different orthodontic materials [2,35,36,86].

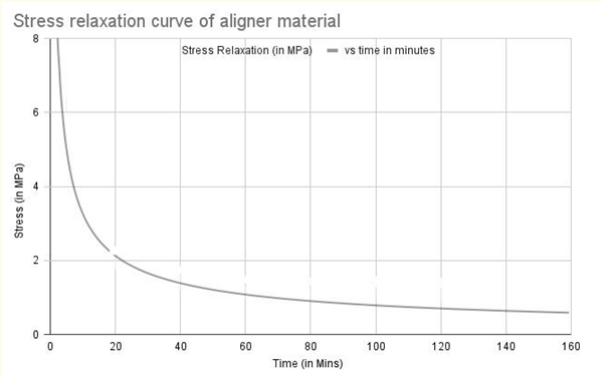

Figure 2: Stress relaxation curve of aligner material [2,33,34,47,86].

An ideal aligner would be having 100% transparency and should retain its color and not pick up colors even if the user eats, drinks or smokes wearing them [48-50]. The main factor for aligner success are their aesthetics. A higher amount of translucency can be seen in amorphous thermoplastic polymers than crystalline polymers. Polyurethane, polyester, polyvinyl- chloride, polysulfone and polycarbonate are commercially used materials for aligner fabrication due to their optical properties [49].

An ideal aligner material will be chemically inert, does not dissociate or leach even if exposed for extended hours (at least 22 hours) to saliva for a period of up to 14 days. Resins polymerize for an extended period and 100% polymerization is never achieved. Due to this tendency, polymers can be cytotoxic and leach byproducts [50]. With the use of 3d printing resins for their economic and mass production viability, eradication of leaching form polymerization is not possible.

An ideal aligner material would not be cytotoxic to tissues around it. It should prevent biofilm formation and not accumulate plaque. It should prevent microbial inoculation and encourage healthy growth of surrounding tissues. Ideally it should promote health of the marginal gingival and result in better oral hygiene and gingival health.

The properties of the aligners depend upon the properties of its constituents and the thickness of the material. The composition of aligners available in the market are not disclosed and are kept as a trade secret. In order to achieve desired properties, combinations of various available thermoplastic materials are blended in various percentages to develop the aligner with required properties.

Schuster S., *et al*. identified the changes in aligners after their treatment period i.e. 2 weeks. A retrieved aligner analysis showed that the aligner exhibited abrasion at the cuspal region, biofilm accumulation, adsorption of integuments and hardening of the material especially in the buccal region. This phenomenon was called "Mastication cold work" by the author [51]. Studies identified the color change associated with aligners upon intra oral aging [49]. Studies also revealed that thermoplastic materials undergo degradation in the oral environment causing the leaching of polymers.

Phenomenon in aligner treatment

Shape molding effect

A three-dimensional force is generated on all over the tooth surface by introducing pre-established activations between the tooth and aligner such that the intended tooth is molded or guided to move according to the shape of the aligner. 80% of the teeth movement attained by aligners can be accounted to shape molding effect [2].

Watermelon seed effect

Aligners engage all the tooth surfaces (buccal, lingual, occlusal) thereby transmitting compressive forces to the entire tooth surface

unlike a particular spot as in traditional braces. This phenomenon produces a resultant vector that eventually passes through the center of resistance of the tooth. The geometry of each tooth is different, the center of resistance of each tooth is located at a different level and eventually the forces that are distributed over the teeth are also uneven. Hence, the forecast of the resultant vector, the possible pressure areas on the teeth would help to design the aligner tray in a way so that the resultant vector passes through the center of resistance and helps in movement. Placing attachments, ramps and buttons can be used as adjuncts in attaining this [2,52-54].

Piezoelectric effect

Piezoelectricity is a phenomenon where deformation of crystalline structures causes flow of electric current by causing a flow of electrons. When bone is under compression there is flow of electrons from one site to another creating a flow of charge and when force is released there is reversal of electrons and electric current is produced in an opposite direction. This rhythmic activity causes the changes in bone remodeling. Tawfik A., *et al*. identified piezoelectric effect with aligner materials and correlated it to the piezoelectric theory of tooth movement and bone remodeling [55].

Drawbridge effect

Phenomenon is observed while correcting class III malocclusion by camouflage. Mandible is rotated in the downward and backward direction (60% of the effect) along with molar intrusion (30%) causing the illusion of decreased length of the mandible, hence camouflaging the class III malocclusion [2].

Types of tooth movement

Tipping: It is considered to be the easiest type of tooth movement that can be achieved.

The tipping movement can be classified into 2 types:

1. Controlled tipping: If the crown tips in the direction of the applied force and the root apex tends to remain in its initial position without noticeable deviation, such force is said to produce controlled tipping. This kind of movement requires external moment application to counteract the moment that is created due to application of the force. The moment to force ratio of 8 will achieve controlled tipping [47,56-62].
2. Uncontrolled tipping: If the crown tips in the direction of the applied force and the root apex diverts in the opposite direction as a counter mechanism such tipping is called uncontrolled tipping. It can cause root resorption, bone defects and affect periodontal health. The moment to force ratio for uncontrolled tipping is less than 8 [63]. When a single force is applied on the crown, there is movement of the crown in the direction of force and the root moves in the opposite direction.

Translation: It is also known as bodily movement. When the force that is applied passes through the center of resistance, i.e. when the line of action of the force that is applied through the center of resistance of the tooth, teeth or jaw, it causes movement of all the teeth in the direction of the applied force thereby leading to bodily movement or translation. The required moment to force ratio for the tooth to undergo translation is approximately [10]. In translation motion both the crown and root of the tooth travel in the same distance [64-68].

Intrusion: Bodily movement of the tooth, in the apical direction along the long axis of the tooth that occurs when force is applied. Intrusion of teeth generally present with the complication of root resorption. Thereby, care needs to be taken when intrusion forces are applied. Intrusion forces can be categorized into true intrusion and relative intrusion. True intrusion - where the teeth that are intended to intrude alone are affected and the rest of the detention is unaffected. Relative intrusion - where slight intrusion of a set of teeth and extrusion or proclination of the other set of detention presents the illusion that a particular set of teeth are intruded. Example correction of Curve of Spee [58-59,69-71].

Extrusion: Bodily movement of tooth in the occlusal direction along the long axis of the tooth, when force is applied [57,72].

Rotation: When movement occurs along the long axis of the tooth either in the labial or lingual direction [47]:

1. Pure rotation can be of two types:
    a. Transverse rotation: When the orientation of the long axis of the tooth is altered.
    b. Long axis rotation: The orientation of long axis is not altered but the tooth itself rotates around the long axis.
2. Generalized rotation: It is the most common type that is often seen in day-to-day practice. It includes both rotation and translation in combination.

Torquing: It is defined as the lingual tipping of the root. In other words, it can be termed as reverse tipping, as tipping generally defines the crown movement.

The required moment to force ratio to produce a torquing effect is around 13 or more. This value further depends on the length of the root, level of alveolar bone and the morphology of the tooth concerned [47].

Tooth movements with aligners

Various tooth movements are possible with aligners. With the introduction of attachments many movements which were deemed impossible using aligners in earlier times have now been achieved with precision and ease. Among the various movements, tipping the crown labially also known as proclining the teeth is considered to be convenient and simple to achieve. Followed by intrusion of posterior teeth, rotation of incisors, intrusion of anterior teeth, intrusion of posterior teeth, extrusion of anterior teeth, translation, extrusion of posterior teeth, root movement [65].

Tipping of teeth

Proclination/Retroclination of teeth can be attained by creating a power ridge with a sharp instrument in the opposite direction of the desired movement. Ex: Power ridge needs to be placed facially for lingual tipping. This applies pressure on the teeth to tip in the direction. This technique can also be used to correct crossbite and scissor bite. It is the most common and easiest movement achieved by aligners [14,47,52,66,67].

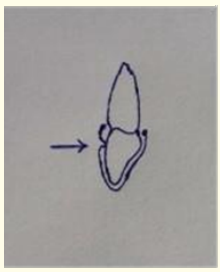

Figure 3: Power ridge causing tipping movements.

Intrusion: Intrusion can also be performed with the proper fit of aligners and no requirement of attachments. Attachments are not an absolute requirement to the tooth that needs intrusion. It is always advisable to place attachments on the anchorage teeth when intrusion is planned with aligners. A horizontal rectangular attachment can be placed on the anchorage tooth when intrusion is intended. Intrusion can also be performed by placing buttons on both labial and lingual side at the gingival level. Two deep grooves are also to be made at the incisal tip of the aligner and an elastic is to be passed from labial to lingual surface through the incisal grooves. Also, a simpler approach can be placing a highpoint on the occlusal surface of the teeth to be intruded. A more complex hybrid approach includes implanting a TAD in the gingiva and intruding the teeth with the help of an attachment. Teeth with high resistance like posterior teeth might require such adjuncts [47,68-71].

Extrusion: Extrusion cannot be achieved by aligners alone satisfactorily. According to Newton's 3rd law for every action there needs to be an equal and an opposite reaction. Here we don't have any supporting component to take the opposite intrusion forces as aligners are only tooth supported. Some authors suggest following other approaches to treat open bites would be better instead of aligners [72]. Hybrid approaches need to be employed for an effective extrusion using aligners. This can be classified as single teeth extrusion and a multiple teeth extrusion like in open bite cases. Bite ramps can be created as a modification in aligners but disoccluding occlusion alone cannot serve the purpose of extrusion. Power grids can be used to extrude teeth. The power grid is attached on the buccal surface of the tooth intended to extrude and composite buttons are placed on the adjacent teeth. Elastics are runned between the power grip and buttons in the form of a closed triangle. The elastics are changed 3 - 4 times a day until the desired tooth is extruded. Once extruded the tooth is secured and held in position with an aligner. Similarly, by placing buttons on the opposite arch extrusion can be performed especially in open bite cases [14,73].

Torquing: Torquing is one of the most difficult movements to produce, especially during aligner therapy. This can be achieved to a great extent by incorporating power ridges. These power ridges are capable of imparting force at the cervical area of crown both lingually and palatally. This along with limited covering of aligner at

the incisal edge produces a couple force, one of which is assumed to demonstrate lingual torque. Another possible way is similar to the one dealt in class II division 2 cases by moving the crown labially followed by complete movement of teeth palatally [47,74].

Rotation: Rotation correction can be carried out using buttons on both labial and lingual surfaces followed by passing elastics. This correction of rotation can be done either before the commencement of aligner therapy or during the treatment. When the active surface of each attachment is placed in the planned position, it is pushed by the aligner in order to produce a couple force which moves the root mesiodistally [75].

Arch expansion: Arch expansion using aligners alone is controversial, but hybrid models have been successful in achieving desirable results. Some studies suggest that Aligners along with RME, SARPE or MARPE can be used to achieve the desired results. Extensive research is still required for these hybrid models in order to use them regularly in clinical practice. Some studies suggest arch expansion can be possible with aligners alone [76].

Movements like space closure by translation of teeth and root movements are very difficult using aligners [77]. Some authors have reported hybrid methods by using combinations of TAD's, arch wires attached to composite attachments made on the tooth surfaces by punching out aligners [78]. Tooth movements like molar intrusion, rotation and space closures are not possible with aligners all alone. They need a hybrid approach to cause such movements.

Attachments in aligners

Attachments are tooth-colored "bumps" placed on teeth during clear aligner treatment. They help move the teeth while a patient wears aligner. They are removed once treatment is complete [79]. 20% of the teeth movement attained by aligners can be accounted to attachments on teeth [2]. The concept of attachments was developed to concentrate or create forces in a particular direction to attain a particular movement apart from the diffuse forces of the aligner which are applied uniformly throughout the tooth surface [19]. To increase effectiveness, composite attachments are bonded to teeth so that the aligner can be more retentive and to facilitate tooth movement [45].

Attachments follow the principal Stress = Force/Area. The area of attachment is small therefore has a higher stress on teeth due to comparatively higher force per unit area than aligners which apply generalized force on tooth surface, hence causing effective movements. Attachments generally have at least one side that is perpendicular to the tooth surface and acts as the surface for force receptacle.

Attachments in aligners can be of various shapes like circle, square, rectangle, triangle, ellipsoid, beveled and polygonal [113. Specific shapes of attachments can address specific needs better than other shapes. For example, rectangular shaped attachments can bring mesio-distal rotations, while derotation of teeth by generating torque can be easier for ellipsoid attachments and attachments with beveled surface facing gingiva can create extrusion forces. Based on the type of movement and the amount of movement, different attachments varying in shapes, count and placement position on the tooth can bring about the required movements. While future researchers or manufacturers can design irregular shaped attachments like trapezoids, varying polygonal dimensions whose face lengths can be manipulated as the amount of forces to be acted and in which proportion based on the software calculations of the desired movement. While various attachment shapes have varying success rates, Graber., *et al*. considered that the least effective attachment is ellipsoid shaped attachment due to its small size and lack of a defined active surface [80-83].

Commercially companies like Align technology create attachments through their ClinCheck software which can calculate the amount of movements required, the amount of precise biomechanical forces and the direction of their forces needed to bring about a movement and can generate precise biomechanical forces on teeth [80,81].

Also, a concept of sequential engagement of attachments as teeth erupt can also be seen in literature. These follow a phenomenon of engaging attachments as the tooth erupts and this involves attachments of various shapes bound to the tooth at different levels and engaged at different phases of the eruption and treatment. The number of attachments per tooth can be determined and modified based on the progress of treatment.

How do forces act through attachment

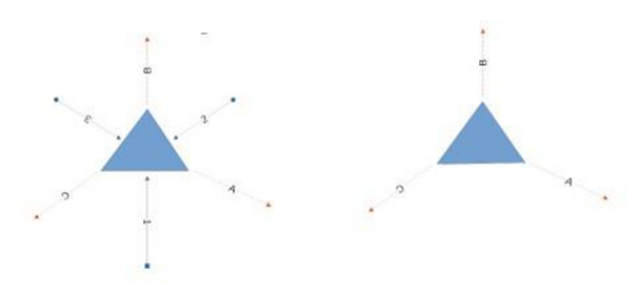

Figure 4: Triangular attachments depicting direction of forces.

For this purpose we shall take an example of a regular triangular attachment. In the above picture, the triangle in blue represents a triangular shaped attachment. The blue colored arrows represent forces exerted by aligners (along the sides of the attachment) to bring about a change in tooth orientation. The dotted arrows in red represent the resulting direction of movement due to the force. The net resultant force would be the sum of all 3 force vectors (A+B+C). To manipulate the resultant force and direction several modifications can be made in the attachment dimensions following simple trigonometric principles. To increase the resultant force towards one vertex of the triangle, we can increase the length of the opposite side. This results in the more forces due to larger area and the net resultant force will automatically be determined by the larger side of the triangle.

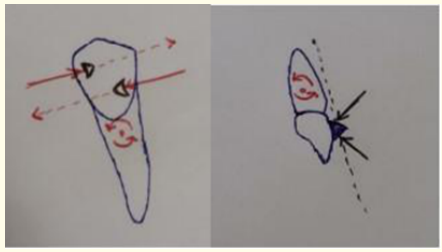

Figure 5: Attachments showing how movements can be brought in tooth position using attachments and the direction of forces acting through those attachments.

For simplicity we assumed it to a 2 dimensional object, but practically it would be a 3 dimensional object with another vector which could modify the vertical orientation of the tooth along the long axis of the vertical plane of the attachment (Not of the tooth unless the attachment is placed on the midline of tooth). A similar modification of bevel on attachment can aid in intrusion and extrusion movements of teeth. For complex movements like a torque or derotation more than one attachment would be needed to orient force in multiple directions to have the resultant tooth movement along the center of resistance of the tooth in the required direction. Angulated attachments can also be fabricated to bring about such movements.

This is a simple demonstration of how force on attachments act and how they affect the final tooth movement. Based on the complexity of the movement, several iterations can be made, let it be sizes of attachments (differential dimensional changes to height, length, and breadth based on different amounts of net forces), the number of attachments and their shapes and locations.

For rotating the tooth orthodontists generally prefer attachments with larger height (Z axis component extending towards labial or buccal mucosa) ex: rectangular attachments.

Disadvantages of attachments [82,83,90]:

1. Irreversible enamel modification (etching, bonding, etc)
2. Technique sensitive
3. Additional procedure
4. Prone to attrition and wear, so regular maintenance may be required.

Advantages of attachments [83,90]:

1. Helps in increasing the efficiency of force delivery through aligners and brings precise movements and force generation through aligners.
2. Attachments are also used to engage newly erupted teeth with very small clinically exposed crowns for retention and can also aid in accelerating their eruption process and at the same time engage in treatment right from the erupting phase itself.
3. Attachments are also required to aid teeth with circular cross sections to rotate which otherwise would not be feasible for their geometry.

In the world of evidence based dentistry, some mechanical faults in aligners are being traded off for their optical properties, which would need a deeper consideration. While aesthetics and comfort remain the prime concern of the patient, orthodontists prefer them for a more convenient chair side time and periodontal health. But the duo are neglecting the treatment outcomes in the process of decision making [45].

Literature has provided evidence that aligners provide better access in cleaning the oral cavity and maintaining oral hygiene [30]. It is also proven that the underlying periodontal tissues health is better when aligners are placed when compared to conventional braces. The pain experienced with aligners is less when compared with conventional braces as documented by several authors. With conventional braces there are often incidences of breakage of the wires, debonding of tubes and brackets which might impinge the mucosa and cause irritation, which is generally not observed with aligners. Reports suggest that patients complain of soreness especially in the initial days when braces are placed in the oral cavity [83-90].

Aligners are preplanned and fabricated and the end product is digitally presented, which allows easier patient education and the changes that are to be observed rather than following the feedback mechanism method as with conventional brackets. But this methodology prevents rectification or correction by the clinician if desired tooth movement of any particular tooth is not achieved. This technique has a disadvantage of lack of negative feedback mechanism where any outliers of treatment are identified and corrected with an alternative approach. A general trend of 30% loss of expected correction can be observed following each tray in aligner treatment [85]. The following tray might not always compensate for this loss leading to a cumulative effect of 30% per tray till the final tray and the case may require further refinements, hence increasing clinical time, treatment time, number of trays and leading to an overall increase in cost of the treatment.

From a patient's point of view, aligners are easy to wear, maintain and aesthetically appealing than the regular braces. When treatment outcomes are concerned aligners have proved to cause less root resorption than braces, aligners work on push mechanisms whereas the braces follow the pull mechanism to move the teeth [85]. Aligners generally cover all the tooth surfaces which provides an advantage in specific cases like deep bites with strong musculature and altered inclination of the cusps of posterior teeth. Due to complete occlusal coverage interference, contact between the upper and lower occlusal surfaces is modified thereby allowing an easier tooth movement which is difficult with routine braces. The aligners also act as a posterior bite block and aids in controlling the vertical growth which inturn is useful in anterior open bite cases. Similarly, disengagement of the posterior surface with aligners helps in correction of crossbite which otherwise might need additional steps if conventional braces are used.

Reports have suggested that complex treatments are difficult to perform and do not provide successful outcomes when aligners are used [30]. Excessive research is still required regarding the materials that are being used in the fabrication, and modulate the existing cost of aligners and further advances in technology so that their use can be extended to treat complex cases and also cases that require some surgical interventions.

While aligners use and acceptability is increasing widely in the orthodontic products, a deeper analysis of the failures need to be done. Hybrid procedures that can be undertaken with other adjuncts like braces and tads need to be considered for some otherwise hard to attain movements. Competitors of aligners are the traditional stainless steel braces which have been a widely accepted or a gold standard for close to a century in orthodontics. They have an excellent modulus of elasticity, great stress strain graph, and a high stress relaxation curve which is exponentially high for aligners to compete with.

Scope for future research:

1. Aligner materials with better physical properties like high Modulus of Elasticity, and high stress strain ratio and an improved stress relaxation need to be developed.
2. Attachments are a great area of research requiring advancements.
3. Also adapting Hybrid approaches catering esthetic requirements of anterior teeth and treating the complex malocclusions in posterior teeth could be a great breakthrough for aligners' success.

Conclusion

With evolution of various dental materials in the field of dentistry, orthodontic materials have never been laid behind. The development of aligners technology has a significant impact on encour-

aging adolescents to undergo orthodontic treatments. Although there is a growing demand for esthetic solutions like aligners the efficiency of aligners is questionable. So, we strongly believe just like embedding appliances into wire approaches in traditional orthodontic treatments, if aligners adopt hybrid approaches to include appliances, TADs and braces in esthetically less significant areas, it could greatly impact the success rates of the aligner therapy. This way we can greatly enhance the success rate of the aligners and treat patients with the comfort of esthetics.

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