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Invisalign: An Unperceived Aligners

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Abstract

In current scenario not only adults have Influence of appearance in their professional and personal lives but also children have influence of the same. Appearance does count at any age. The face and the teeth have also come to play a part in his presentation to the outside world. To enhance this desire, attention has been given to correct malformations of teeth. In earlier times this was done by crude methods. And then evolved the concept of braces; fixed on the labial surfaces. Esthetic requirements repels adult patient from accepting traditional metallic look orthodontic appliance. Tooth colored brackets and wires gained popularity for a few decades but gradually declined owing to its own disadvantages. Orthodontists have given a new dimension by shifting from the labial to the lingual so as to give rise to the concept of Invisible braces or Lingual Orthodontics.

Keywords: Clear Aligner, Esthetic Brackets, Invisalign, Lingual Orthodontics.

Introduction

Now days, not only adults have Influence of appearance in their professional and personal lives but also children have influence of the same. The maloccluded patients when think about the correction of their malaligned teeth,the first thing that come to their mind are braces and wires. However, according to the demands and needs of the patients dentistry has been revolutionized. Dentists are concerned about the aesthetics and it is the major concerns among patients who takes orthodontic treatment. To tackle the increasing aesthetic insist for an alternative to conventional braces, researchers have developed several solutions, such as composite braces, ceramic, lingual orthodontics and clear aligners.

In 1945, Kesling[1] introduced the tooth positioning appliance as a method of refining the final stage of orthodontic finishing after debanding. A positioner was a one piece pliable rubber appliance fabricated on the idealized wax set-ups for patients whose basic treatment

was complete. The practical advantage of the positioner lay in its ability to position the teeth artistically and to retain the alignment of the teeth achieved through basic treatment with conventional fixed appliances. Various minor tooth movements could be incorporated into the positioner. Kesling predicted that certain major tooth movements could also be accomplished with a series of positioners fabricated from sequential tooth movements on the set-up as the treatment progressed. In 1971, Ponitz[2] introduced a similar appliance called the "invisible retainer" made on a master model that prepositioned teeth with base-plate wax. He claimed that this appliance could produce limited tooth movement. Sheridan and others[3] later developed a technique involving interproximal tooth reduction and progressive alignment using clear Essix appliances. This technique was based on Kesling's proposal, but almost every tooth movement required a new model set-up and therefore a new set of impressions at almost every visit, making the technique excessively time-consuming. In 1997 with the introduction of the Invisalign appliance, available to orthodontists in 1999, Align Technology made Kesling's proposal much more practical. Instead of necessitating a new set-up for each new aligner, creation of an Invisalign appliance involves computer-aided-design and computer-aidedmanufacturing (CAD-CAM) technology, combined with laboratory techniques, to fabricate a series of positioners (aligners) that can move teeth in small increments of about 0.25 to 0.3 mm.

What Is The Invisalign Appliance?

The Invisalign appliance involves a series of aligners made from a transparent, thin (typically less than 1 mm) plastic material formed with CADCAM laboratory techniques. These aligners are similar to the splints that cover the clinical crowns and the marginal gingiva. Each aligner is designed to move the teeth a maximum of about 0.25 to 0.3 mm over a 2-week period, and is worn in a specific sequence. The Invisalign appliance is currently recommended for adults and for adolescents with fully erupted permanent teeth who meet an acceptable standard of compliance. Excellent compliance is mandatory since the appliance has to be worn a minimum of 20 to 22 hours a day and each aligner should be worn 400 hours to be effective.

Indications For The Invisalign Appliance [4,5]

• Mild crowded and malalingned problems (1-5 mm)

• Spacing problems (1-5 mm)

• Deep overbite (Class II div 2 cases)

• Narrow arches that can be expanded without tipping the teeth too much.

• Absolute intrusion (1 or 2 teeth)

• Lower incisor extraction for severe crowding cases.

• Tip molar distally mild relapse after fixed-appliance therapy

Contraindications[6]

- crowding and spacing over 5 mm
- skeletal anterior-posterior discrepancies of more than 2 mm (as measured by discrepancies in cuspid relationships)
- centric-relation and centric-occlusion discrepancies
- severely rotated teeth (more than 20 degrees)
- open bites (anterior and posterior) that need to be closed
- extrusion of teeth
- severely tipped teeth (more than 45 degrees)
- teeth with short clinical crowns
- arches with multiple missing teeth.

Advantages5[7]

- The trays are clear, aesthetic, comfortable - no metal brackets or wires to cause mouth irritation or lacerations.

- Clear aligners are often not visible, allowing patients to smile with greater confidence
- Better oral hygiene than fixed. Unlike traditional braces, the trays can be removed for brushing, flossing, and eating
- Shorter dental appointments.
- Retention facilitated.
- Ideal for retreatment.
- Decreased occlusal abrasion from parafunctional habits during treatment.
- Disarticulation of the teeth may be advantageous for patients with TMJproblems.
- Technically much easier than lingual appliances.
- Approximating the treatment duration a little more precisely than braces
- Avoiding extractions of premolars by creating interdental space via interproximal reduction
- Less frequent trips to the dental chair by allowing the patients to replace their aligners on their own every few weeks
- Healthier periodontal tissue and less risk of enamel decalcification by avoiding brackets

Disadvantages[7]

Since these devices are removable, they require more patient motivation and self-discipline to achieve the desired results, to be effective, in fact, these devices must be worn 22 hours a day. These must be removed during meals, when drinking hot drinks that could spot or cause deformation, sugary drinks and during the oral hygiene at home.[7] Treatment time may exceed estimates due to poor patient compliance to dentist's instructions, not wearing aligners the required number of hours per day, missed appointments, excessive bone growth, poor oral hygiene and broken appliances can lengthen treatment time, increase the cost, and thus can affect the quality of the end results.[8]

Current Technique

Fixed orthodontic appliances have been the principle fibre of orthodontic biomechanical procedure. However the unwillingness to wear buccal braces as it has pitiableestheticlead to the invention of alternative treatment options for the adult population. Essix retainers,, lingual orthodontics,Trutain retainers and Invisalign appliances are some of the current treatment options. Because of their detachable nature,Trutain retainersand Essix retainers are indicated for mild nonskeletal malocclusions. Essix appliances have usually been used as anterior retainers from cuspid to cuspid. They are made from vacuformed plastic sheets which extends into gingival undercuts. With minor changes, it can achieve small tooth movements, and provide as temporary bridges and bite planes.[3]

Clinical Method

Pretreatment study models are prepared. In addition, it is important to prepare high precision impressions by using polyvinyl material. The bite is also recorded, and the impressions are sent to the Invisalign office. Highly sophisticated softwares are used, which through a 3D scan technology create a virtual patient. Other specific softwares include 'Tooth shaper' & 'Autobite tool' which identify the shape of the teeth and occlude them in centric relation.[2] Nelson[9] in his paper described the aligner software named the ClinCheck set-up that can be used for diagnosis and treatment planning and can also be used to evaluate the need for IPR, expansion, extraction, distalization, or proclination. This software can also be used to verify the performed modifications made by technician, as a consultation device to show treatment limits to patient, to verify that the aligner is tracking and to evaluating anchorage with the superimposition or

surgical simulation tools and staging. Aligners other than Invisalign are Clear path aligners, Inman aligners, Nuvola And Fantasmino System. ClearPath Aligners are USFDA approved, removable medical grade plastic appliances which patient wears instead of brackets and wires to correct malocclusion. Dental aligners are a modern alternative to braces, for teeth that are in need of straightening. [10] The Inman Aligner is a simple removable appliance used to align front teeth quickly and safely. It's ideal as a standalone treatment or to prealign teeth prior to further cosmetic options such as bonding or minimal veneers. The Inman Aligner has Nickel Titanium coil springs that power two aligner bows that gently oppose each other, guiding the teeth into their new position. These gentle forces are active over a very large range of movement, due to it shows fast results. Patients have to wear it 16-20 hours a day. [11] Fantasmino® aligners are made of poly-vinyl chloride (PVC), a material with elastic characteristics following a plastic deformation when exposed to moderate loads. This characteristic allows reducing the optimal wear time to 14 h per day: the deformations subdued by the aligner when worn generate a force that is transferred to the teeth. The thickness of the PVC aligners varies with the desired type of tooth movement but never exceeds 1 mm. [12] Nuvola® aligners are made of polyethylene terephthalate glycol (PETG), a light, resistant, and very clear material. It is resistant to time and wear, and its elasticity allows for a gradual tooth movement. PETG aligners have a thickness that changes throughout the different treatment phases: 0.75 mm at the beginning of treatment, 0.85 mm during the intermediate phase, and 1 mm at the end of treatment. This system requires an optimal wear time of 22 h.[12]

Compliance

Since the Invisalign appliance is removable, patient motivation is critical to achieving the desired result. For the appliance to be effective, patients must wear it at least 22 hours a day. They may remove it only when eating; when drinking hot beverages that may cause warping or staining, or beverages that contain sugar; and when brushing and flossing. The transparency of this appliance may increase the likelihood of its being misplaced when it is removed. In their 1998 study comparing Essix and Hawley retainers, Lindaurer and Shoff[6] found that one sixth of their patients lost their appliances; the majority of these losses were ascribable to the appliances being clear and removable. Aligners from the Invisalign appliance have very similar properties to those of Essix appliances.

Extraction Cases

Patients having premolar extractions may not be suitable candidates for treatment with the Invisalign appliance because the appliance cannot keep the teeth upright during space closure. Bonded restorative attachments on the buccal surfaces can assist in limited movements, but clinical results have suggested only partial effectiveness.[5] Miller and others,[13] in their case study of lower-incisor extraction, found similar excessive tipping around extraction sites using panoramic radiographs.

Anterior Open Bites

Treatment of anterior open bites with the Invisalign appliance has had limited success. A few authors have reported difficulty achieving ideal occlusion during treatment of cases of anterior open bite. After retreatment of anterior crowding and open-bite relapse with the Invisalign appliance, Womack and others[14] found that the position of the maxillary central incisors was superior to that of the canines and posterior teeth. Although they noted anterior extrusion, it was not enough to achieve ideal overbite. In their 2003 randomized clinical trial, Clements and others[15] reported similar limitations; they found no significant improvement in anterior open bite after treatment. Overbite Although Joffe[5] suggested that

deep overbite problems can be corrected with the Invisalign appliance, others have provided evidence to the contrary. Kamatovic,[16] in a retrospective study, concluded that the Invisalign appliance did not correct overbite relationships. Occlusion Many authors have suggested that removable appliances have limited potential to correct buccal malocclusions. The lack of interarch mechanics may explain this limitation. In 2003, Clements and others[15] demonstrated that correcting buccal occlusions with appliances similar to the Invisalign appliance was least successful; for some patients, their buccal occlusions were worse after treatment. Djeu and others[17] found that fixed appliances were superior to the Invisalign appliance for treating buccolingual crown inclinations, occlusal contacts, occlusal relationships, and overjet. Vlaskalic and Boyd[18] also concluded that conventional fixed appliances could achieve better occlusal outcomes than the Invisalign appliance.

Posterior Dental Intrusion

Because of the thickness of the Invisalign appliance, intrusion of posterior teeth is often observed. Compensating for such intrusion must be accomplished in the retention period when the teeth are allowed toerupt freely into occlusion. Womack and others9 claimed that intrusion could occur from 0.25 mm up to 0.5 mm. This degree of intrusion was also confirmed by Boyd and coworkers in their 200014 and 200213 studies.

Tooth Movement

Because it is a removable appliance, the Invisalign appliance has very limited control over precise tooth movements. Root paralleling during space closure after extraction, tooth uprighting, significant tooth rotations and tooth extrusion have been inconsistently successful. Bollen and others[6] indicated that the Invisalign appliance yielded the most predictable results with tipping movements.

Intermaxillary Appliances

The Invisalign appliance, because it is removable, wraps around the teeth, which can inhibit the use of interarch mechanics (e.g., Class II and Class III elastics). Some clinicians have suggested using elastics on buttons bonded to the buccal surfaces as adjuncts to tooth movement, but retention of the appliance when wearing these elastics may be compromised.[5]

Treatment Time

The clinician's treatment time can be lengthened because of the additional time required for documentation during Invisalign case preparation. The treatment plan must include the sequential movements for every tooth from the beginning to the end of treatment. If changes are needed after treatment starts, significant additional time and documentation are required to modify the treatment plan. In addition, the lag time between formulating a treatment plan and inserting the appliance can be up to 2 months. This lag time can cause further delays if the dental changes are significant because of the additional time needed for planning and documenting the treatment again, in addition to the extra waiting period required to make new aligners. In their 2002 case study, Womack and others[14]described severe limitations that prevented their completion of a patient's mandibular alignment because of the delay between planning the virtual treatment and the delivery of the appliance.

Conclusion

Now a days, not only adults have Influence of facade in their professional and personal lives but also children have the same. The esthetic of patients wearing invisalign increases due to its transparent nature. Patients should be well educated about the advantages and disadvantages of clear aligner therapy. The Invisalign appliance can provide an excellent esthetic during treatment, comfort of wear, ease of use , and superior oral hygiene. The Invisalign

appliance may be a treatment option for simple malocclusions, as Joffe[5] suggests, but it has some limitations. Achieving similar results to those of more conventional fixed appliances may be difficult. The use of the Invisalign appliance in combination with fixed appliances has been explored to reduce the time needed to wear fixed appliances, but may result in considerably higher professional fees overall. Conversely, the Invisalign appliance can provide an excellent esthetic during treatment, ease of use, comfort of wear, and superior oral hygiene.[5] Additional research and refinement of the design should allow further development of this worthwhile treatment.

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