

Living with Invisalign: Orthodontic Treatment amidst the Pandemic

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ABSTRACT

Tooth movement can be performed by using sequential positioners, which are created by changing tooth positions on set-up models to replicate treatment progression. The notion is based on Kesling's 1945 positioner concept, albeit its subsequent application to splint therapy was labour consuming and did not result in precise tooth movement. Invisalign was created in 1997 by Align Technology, Inc (Santa Clara, CA, USA) by utilising 3D imaging technology to address these issues and allow for large-scale customisation. Their approach has many advantages, but it has certain limits, which are explained in this article. Patients increasingly prefer more aesthetically pleasing types of orthodontic therapy. Clinicians must understand the indications and limitations of such invisible therapies in order to adequately inform their patients. One of the most consistently requested practices throughout the COVID-19 pandemic has been to keep our hands away from our face and mouth. This is to limit the spread of disease and slows the rate of infection. Unfortunately, patients cannot avoid touching their mouths during the treatment process. This means it's more important than ever to practice good hygiene, which clearly is usually an easy task with Invisalign's clear aligners.

Keywords: Orthodontics; Pandemic; Aesthetics; Clear aligners; COVID-19

INTRODUCTION

As the number of adult orthodontic patients grows, so does the desire for aesthetic and pleasant alternatives to traditional permanent equipment. Clear aligners that meet this demand are likewise vulnerable to quick technological advancements in aligner materials and manufacturing procedures. Clear aligner technology advancements have expanded the volume and complexity of cases addressed with this procedure.

Clear aligners offer a more aesthetically pleasing and comfortable treatment experience, improve dental hygiene, cause less pain than fixed orthodontic appliances, reduce the frequency and duration of consultations, and necessitate fewer emergency visits. However, the cost of manufacture, reliance on patient cooperation, and incapacity to treat certain malocclusions limit their use [1].

In August 2021, an electronic search in the English language was

undertaken in the following electronic databases: Google Scholar, Web of Science, and PubMed. We reviewed the bibliographies of the included papers as well as relevant review articles. Only human research, both prospective and retrospective, was considered, while animal studies, editorials, and case reports were discarded.

CONSEQUENCES FOR CLINICAL AND RESEARCH

Clear aligner systems can be roughly classified into two types based on production methods: Aligners created from thermoplastic materials *via* manual setup and systems that design and manufacture aligners using CAD-CAM technologies (Figure 1). Because it is impossible to detail every system in this review, only the most often used systems will be examined [2] (Figures 1 and 2).

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Figure 1: Invisalign is the virtually invisible and hygienic alternative to braces.

Indications

- Malaligned and Mildly crowded teeth [1-5 mm]
- Deep overbite [Class II division 2 cases]
- Spacing problems [1-5 mm]
- Narrow arches.
- Tip molar distally
- Lower incisor extraction of severe crowding cases.

Advantages

- The trays are aesthetic as it is clear and also comfortable as no metal brackets or wires are there which lead to laceration of mouth
- Technically much easier than lingual appliances
- Better oral hygiene compared to fixed
- Ideal for retreatment
- Shorter dental appointments
- Precise treatment duration than braces
- Avoiding extractions of premolars by making interdental space *via* interproximal reduction
- Less frequent trips to the dental clinic by allowing the patients to replace their aligners on their own every few weeks

Disadvantages

- Removable in nature
- Patient motivation required
- It should be worn 22 hrs/day
- Devices should be removed during meals.
- Poor patient compliance
- Fewer incidences of missed appointments, bad oral hygiene and increase in bone enlargement lengthen the treatment time and affect quality results
- Increase in price



Figure 2: Represents the comparison of Invisalign vs. Braces.

MANUFACTURED ALIGNERS USING MANUAL SETUP

The manual method is a time-consuming process that includes hand tooth repositioning, wax setting, and the creation of vacuum-formed retainers. This method enables for the simple and cost-effective production of aligners in a laboratory setting. It facilitates treatment follow-up and allows the orthodontist to make essential treatment changes in the earlier stage (Figure 2).

A workable cast is obtained after taking full arch imprints with polyvinyl siloxane material. Teeth that are to be shifted in each aligner are determined on the working casts and removed from the cast with a 0.25 mm handsaw. The target teeth are then detached and shifted to the desired place before being secured with block-out wax. At this step, if necessary, the interproximal reduction is performed. Following this adjustment, plastic sheets are moulded on the setup model using a pressure moulding machine or a vacuum moulding machine. Following the final trimming treatments, the patient is given a three-piece set of aligners [3,4].

Aligners come in a variety of thicknesses (0.020 inch, 0.025 inch, or 0.030 inch). Gradually thicker aligners provide you with more control over your teeth's movement while also reducing the pain produced by orthodontic forces. Two or three aligners of differing thickness levels are made from one set of impressions, and the patient is instructed to wear each aligner for 10 to 15 days. At each appointment, the aligners are made from a fresh working cast and retrieved from a new impression, allowing the physician to change the treatment plan as needed and track the advancement of tooth movement [5].

One example of an aligner system that requires human setup is the Clear Aligner system CA (Scheu Dental, Germany). A computer application called Aligner Aid (AAP, IV- Tech, South Korea) is employed in this approach to correctly assess the tooth movement acquired. Although naked eye visualisation can be used to assess tooth movement, this programme is advised when more than one tooth is to be moved. A photo of the working cast is shot with a digital camera before the initial setup, and this photo is placed over the photo of the setup model [6,7].

CAD-CAM TECHNOLOGIES PRODUCE ALIGNERS

The use of digital technology in orthodontics has transformed the profession and appliances available. CAD-CAM technology has found their way into orthodontics and aligner treatment, just as they have in other sectors of dentistry. The most well-known aligner system, Invisalign[®], has become a generic moniker for various high-quality CAD-CAM systems. This technique is widely regarded as the most advanced and widely utilised clear aligner technology currently available. CAD-CAM technology is used to develop and manufacture the aligners in the Invisalign[®] system. Invisalign[®] is a leader in aligner therapy thanks to its mix of computerised virtual treatment planning and stereo lithographic prototype technology for manufacture Today, Align Technology is a market leader, and Invisalign has become a household name for computer-generated aligners, with more than 4 million patients treated using this method [8].

ALIGNER TREATMENT BIOMECHANICS

Understanding the mechanics of tooth movement using aligners could lead to better patient selection and treatment sequencing, resulting in improved outcomes. The displacement driven system and the force driven system can both be used to explain the tooth movement mechanism with clear aligners. Simple movements like tilting or slight rotations are mostly controlled by the displacement-driven method. Aligners are made to match the position of the tooth in the next staged location, and the tooth moves until it aligns with the aligner. This technique has been shown to be ineffective in controlling tooth movement and in creating root motions. To promote tooth movement, the force-driven system, on the other hand, requires biomechanical principles. Aligners are made to exert specific stresses on the teeth. The shape of the aligners used to generate these forces isn't always the same as the shape of the tooth. Clincheck® (Align Technology, Santa Clara, CA, USA) program determines the movement required for each individual tooth, the mechanical principles used to produce this movement, and the aligner form. Pressure points or power ridges are used to change the geometry of the aligner in order to apply the required forces.

The Pressure points make uprighting and intrusion movements of the teeth more difficult, whereas power ridges control axial root movements and torque. Despite the changes in the shape of the aligner, movements like root paralleling, extrusion, and rotation were still difficult to achieve with aligners until the Align Tech. Smart force attachments for the Invisalign® system were introduced by (Align Technology, Santa Clara, CA, USA). These attachments are small composite bulges that create a force system that is conducive to the intended movement. When compared to fixed-appliance systems, extrusion of a single tooth with transparent aligners is somewhat challenging; however, auxiliaries such as buttons and elastics can be employed to help with this movement. Aligners can also be used to extrude a set of teeth (such as the maxillary incisors). The use of temporary anchoring devices in conjunction with transparent aligners increased the number of treatments that could be done with aligners [9].

SCOPE AND LIMITATIONS OF TREATMENT WITH ALIGNERS

Despite the fact that the number and complexity of cases treated with clear aligners continue to rise, this technique cannot treat all malocclusions. In mild to moderate crowding or diastema, posterior expansion, intrusion of one or two teeth, lower incisor extraction instances, and distal tipping of molars, clear aligners are a good option. Extrusion, severe rotation correction, molar uprighting, and extraction space closure are all known to be more difficult with aligners. Nonetheless, attachments in the Invisalign® system can be used to achieve incisor extrusion, molar transition, and extraction space closure.

EFFICACY AND EFFICIENCY OF CLEAR ALIGNERS

As the clear aligner system grows in popularity and popularity, reservations about its efficacy persist. Clinical research on the

effectiveness and efficacy of clear aligners has been sparsely documented to date. The efficacy of clear aligner systems has been difficult to objectively quantify because previous literature has mostly consisted of case reports or product descriptions [10].

CLINICAL EFFECTIVENESS OF CLEAR ALIGNERS

Expert published the first retrospective cohort study on the efficacy of clear aligners in 2005, comparing the treatment outcomes of Invisalign® patients to the outcomes of traditional fixed braces using the American Board of Orthodontics grading system. They found that both systems are similarly effective in space closure, marginal ridge alignment, and root paralleling; however, the Invisalign® system fails to correct anteroposterior discrepancies, provide occlusal contacts, and provide posterior torque.

Expert found that while the transparent aligner system is efficient in levelling and aligning arches in mild and moderate cases, as well as rectifying buccolingual inclinations, it is insufficient in establishing optimum occlusal contacts. The thickness of aligners, which interferes with the occlusal plane's settling, causes worsening in occlusal contacts. Only 41% of the projected tooth movement was realised, according to expert. Lingual constriction was the most efficient movement (47.1%), while extrusion was the least precise (29.6%) [11].

The control of the lower canine is the most challenging, expert. Compared the treatment results obtained with fixed appliances and evaluated the efficiency of the Invisalign system on mild to moderate cases treated with premolar extractions. Their findings showed that both systems can be employed to treat extraction instances, and that clear aligner-achieved root angulation is sufficient when correct attachments are applied. However, treating extraction cases necessitates substantial understanding of the system and experience. The majority of research focuses on the Invisalign system's impact. The effectiveness of tooth motions acquired with clear aligner equipment was studied by expert. Retrusion was discovered to be the most precisely obtained tooth movement in their research, followed by rotation, fan type expansion, and protrusion. The most exact single-tooth movement is retrusion of the mandibular central incisors, while the least accurate movement is rotation of the mandibular canine. The results of the existing studies should be treated with caution due to a lack of scientific data and weak methodology. This field necessitates more research.

TIME EFFICIENCY OF CLEAR ALIGNERS

For private practise orthodontists, time efficiency is a critical factor to consider because spending less time in the clinic with a single patient and finishing treatment sooner both pleases the current patient and allows the orthodontist to treat new patients. In non-extraction patients, expert looked at the differences in total treatment duration and chair time between conventional fixed appliances and Invisalign® aligners. invisalign® patients took 67% less time to complete their treatment [12].

The lack of a finishing and detailing phase, which can take up to 6 months with fixed appliances, was cited as one reason for the

short treatment time with aligners. Invisalign® treatment takes 44% longer than fixed-appliance treatment in extraction patients. In aligner therapy, patients with good compliance must visit the orthodontist every 10-12 weeks, whereas fixed appliance treatment requires every 4-6 weeks. As a result, in fixed appliance therapy, more appointments are needed. In addition, the clear aligners group's chair time is greatly reduced, allowing the physician to treat more patients.

EFFECTS OF CLEAR ALIGNERS ON PERIODONTAL STATUS AND ORAL HEALTH

The periodontal effects of clear aligners were reported to be detrimental in the literature as the number of adults treated with them grew. Plaque levels, gingival irritation, bleeding upon probing, and pocket depth all decrease when clear aligners are used. Plaque control was difficult with fixed appliances and wires, and periodontal tissues were harmed, making orthodontic therapy a risk factor for periodontal disease. Patients treated with fixed appliances and clear aligners, according to expert, had identical gingival and plaque indexes after receiving rigorous oral hygiene instruction and frequent plaque management. Clear aligners not only improve dental cleanliness and periodontal health, but they also prevent plaque accumulation and white spot lesions. According to the expert, clear aligner orthodontic treatment had a low incidence of newly formed WSLs.

POST ORTHODONTIC TREATMENT STABILITY OF CLEAR ALIGNERS

One of the most crucial problems to discuss with clear aligners, as with all types of orthodontic treatment, is stability. The American Board of Orthodontics objective grading system was used in one study to look at the post-retention stability of cases treated with clear aligners and fixed orthodontic appliance. No fixed retainers were used in the retention technique, only detachable thermoplastic Essix retainers. In terms of total alignment, both groups relapsed three years after the retention phase, while maxillary anterior levelling remained stable in the fixed appliances group but relapsed in the Invisalign group. Because only removable retention appliances were employed and the researchers depended significantly on patient compliance, this data can only provide a preliminary view into clear aligner post-retention outcomes, and the results cannot be generalised. Due to the fact that clear aligner therapy is a relatively new treatment modality, there are few retention studies on aligners in the literature, and more research is needed.

ROOT RESORPTION AND CLEAR ALIGNERS

Fixed orthodontic appliances have been shown to cause root resorption by providing excessive pressure at the apical level, resulting in external apical root resorption. However, few researches have looked into how thermoplastic aligners affect root resorption. Aligners can cause root resorption after the conclusion of orthodontic treatment, according to a systematic review published in 2017 that included just three researches.

However, the incidence and severity are lower than with fixed appliances. According to another study, aligner-induced root resorption is comparable to that generated by modest orthodontic forces. According to the expert, 41.81% of teeth after clear aligner therapy exhibited evidence of apical root resorption, with the upper and lower incisors being the most impacted teeth. The root structure and the large amount of movement demonstrated by the incisors account for this condition.

The pandemic has caused some major changes altogether of our daily lives this past year, but those challenges don't need to substitute the way of treatment. One thing we've realized during now's that staying safe and healthy with Invisalign during COVID-19 is convenient and manageable because of their flexibility. The treatment process with this innovative system is safe and effective, with the added advantage of being easier to navigate while practicing social distancing.

One of the most consistently requested practices throughout the COVID-19 pandemic has been to keep our hands away from our face and mouth. This is to limit the spread of disease and slows the rate of infection. Unfortunately, Invisalign patients cannot avoid touching their mouths during the treatment process. This means it's more important than ever to practice good hygiene, which clearly is usually an easy task with Invisalign's clear aligners.

Patients usually find it an easy task to worry about both their oral health and their aligners. The trays are to be removed before eating, drinking anything aside from water, and brushing and flossing teeth. It is recommended to wash hands with soap and water for a minimum of 20 seconds before removing the aligners, paying special attention to your fingernails and fingertips because these will inherit the closest contact with the patient's mouth and aligners.

Washing hands is that the first line of defence against germs and infection. If soap and water are unavailable then hand sanitizer that is at least 60% alcohol can be used too. These products are fast-acting and significantly reduce the amount of disease-causing microorganisms.

Once the aligners are removed, they have to always be placed during a clean, sealed box or dipped in an approved solution. This keeps them safe from the disease-causing microorganisms, and also prevents them from being accidentally losing them. Before putting aligners back in your mouth, you would like to scrub your hands again and rinse the aligner with water. Taking care of aligners in this manner becomes a part of daily routine in no time in the least and helps protect your oral and overall health.

INVISALIGN IS CONVENIENT

Clear aligners treatments are rising up everywhere in recent years, which suggest even people who are unacquainted orthodontics have presumably heard about them. Although the design appears quite simple, aligners are made to maneuver the teeth within the same way as traditional braces by applying

gentle, continuous pressure. To produce the force necessary to maneuver the teeth, the patient must wear the aligners for 20-22 hours every day. Additionally, each aligner is switched out for subsequent within the series every 1-2 weeks to stay up with the movements of your teeth. When the patient is compliant with these guidelines, Invisalign can work whilst well as braces at correcting many of the foremost common orthodontic issues. Invisalign patients will normally be given several weeks' worth of aligners at a time, which may be extremely convenient during times like the pandemic.

INVISALIGN TREATMENT IS EASY TO TROUBLESHOOT

Once the patient has completed the last course of aligners, treatment could also be complete. Sometimes, the dentist schedules a revision scan to see if additional aligners are required to achieve the best results. Temporary closings and occasional stay-at-home orders have sometimes affected the ability to urge patients in quickly for this sort of appointment, but Invisalign aligners make it easy to troubleshoot solutions.

For example, if the patient is currently in aligners, ready to continue wearing the last set you got if we aren't able to provide a replacement set directly. One difference is that the aligners should be worn for less than 10-12 hours each day rather than the traditional 20-22 hours. Doing so helps extend the lifetime of the aligners until a meeting is out there. This keeps the patient's treatment plan on target and ensures no progress is lost.

It is vital to remain struggling on the teeth both during (aligners) and after (retainer) treatment is complete. Without continuous force, the teeth will eventually begin to shift back to their previous places. This can happen more quickly than you would possibly think and may even cause longer treatment times.

INVISALIGN LOWERS THE CHANCE OF AN ORTHODONTIC EMERGENCY

Traditional braces are made from brackets and wires which will be bent or broken. This can occasionally cause orthodontic emergencies that need immediate attention. Since Invisalign aligners are only one piece and made up of a durable material called Smart-Track, emergencies with them tend to be only a couple of. They are not indestructible, though! Aligners can still tear, crack, or break, especially if they are not handled with care. If the damage is comparatively minor, you'll still wear the aligner until it's time for subsequent within the series. The patient should refrain from using any aligner that has cracked or split during how that forestalls it from holding its shape. Besides causing potential pain, it'll not be ready to provide the consistent pressure needed to maneuver the teeth.

CONCLUSION

Nowadays, not only do adults have Influence of facades in their professional and personal lives but also children have the same.

The aesthetic of patients wearing Invisalign increases due to its transparent nature. Patients should be educated about the benefits and drawbacks of clear aligner therapy. Invisalign appliance can provide a superb aesthetic during treatment, the comfort of wear and tear, simple use, and superior oral hygiene. Traditional braces are made from brackets and wires which will be bent or broken. This can occasionally cause orthodontic emergencies that need immediate attention. Since Invisalign aligners are only one piece and made up of a durable material called Smart Track, emergencies with them tend to be only a couple of. They are not indestructible, though! Aligners can still tear, crack, or break, especially if they are not handled with care. If the damage is comparatively minor, you'll still wear the aligner until it's time for subsequent within the series. The patient should refrain from using any aligner that has cracked or split during how that forestalls it from holding its shape. Besides causing potential pain, it'll not be ready to provide the consistent pressure needed to manoeuvre the teeth.

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