

Invisible Aligners - A Review

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Received : 17.05.2015

Review Completed : 27.05.2015

Accepted : 02.06.2015

ABSTRACT

Malocclusion is one of the most prevalent clinical conditions. While most individuals seek orthodontic treatment to improve their appearance, malocclusion may also be responsible for various dental problems such as tooth decay, tooth loss, gum disease, jaw joint pain and headaches. The only option available for correction of malocclusion till now was traditional orthodontic treatment i.e. braces. Although braces are generally effective in correcting a wide range of malocclusions, they are subject to many limitations and disadvantages like unattractive appearance, discomfort, frequent lacerations, poor oral hygiene etc. Due to these limitations of braces, only a relatively small proportion of people with malocclusion seek traditional orthodontic treatment thereby creating a large need gap. Invisible aligners were incorporated to cater to this large unmet need for an orthodontic system that addresses these patient concerns and also there is an unmet need among dental professionals for a treatment modality that increases the predictability and efficiency of treatment and enhances profitability of practice also.

Keywords: invisalign, clearpath, esthetic orthodontic treatment, clear aligners.

INTRODUCTION

The practice of orthodontics is faced with new trends. Adults are increasingly aware of the influence of appearance in their personal and professional lives. The frequency of malocclusions in adults is equal to or greater than that observed in children and adolescents¹. A 1999 study showed that the number of adults seeking orthodontic care has been declining. Furthermore, this study concluded that this trend is not likely to improve without a biological or technological breakthrough². Adults make up only a small percentage of the patients in orthodontic practices in the United States³. Possible explanations for the small number of adult patients include fear of pain or discomfort and esthetic concerns associated with general orthodontic treatment⁴. Moreover, hygiene and periodontal health are confounding factors associated with adult treatment⁵. To increase the adult patients in involving themselves in the orthodontic treatment, Invisible aligners are introduced which satisfies the aesthetic appearance of the adults, which is the main complaint.

HISTORY

In 1945, Kesling⁶ introduced the tooth positioning appliance as a method of refining the final stage of orthodontic finishing after debanding. In 1971, Ponitz⁷ introduced a similar appliance called the "invisible retainer" made on a master model that prepositioned teeth with base-plate wax. Sheridan and others⁸ later developed a technique involving interproximal tooth reduction and progressive alignment using clear Essix appliances. In 1997 Invisalign appliance is introduced and available to orthodontists in 1999.

ABOUT ALIGNERS

An aligner is a custom made clear plastic tray that fits over your teeth and corrects their malpositioning. Aligners are made in medical grade plastic approved by FDA. Each aligner moves teeth a little bit by exerting light, continuous & uninterrupted pressure on them. These aligners provide a hygienic, convenient and a clear solution for the

correction of malocclusion without having to wear brackets and wires. These aligners are removable and patients can eat, brush and floss their teeth and enjoy their normal life. These aligners are nearly invisible and nobody can notice the aligners when you are wearing them. Aligners are made by an internationally patented unique process, which involves advanced technology supported by customized software and mechanical systems. The treatment comprises of a series of aligners. Each set has to be worn by the patient for at least 22hrs in a day for 2 weeks before advancing to the next set. Treatment duration is 6-24 months depending on the severity of case. Recommended age limit for usage is 14 to 65 years of age. Aligners apply precise, light, uninterrupted & continuous forces on the teeth so they are not painful but a slight discomfort may be experienced at the beginning of treatment, which goes away within 24 hours. Aligners are made in medical grade plastic unlike metal wires braces, which hurt your cheeks and lips. Aligners are not a new appliance. Millions of People have already been treated with aligners in developed countries like USA, UK, Middle East and other European countries and their number is increasing every day.

TYPES OF ALIGNER SYSTEMS

1. MANUAL SETUP ALIGNERS: Entire processing & fabrication done by manual process in the laboratory by a technician.

Disadvantages:

- Non Predictable
- Multiple impressions required
- More chair side time
- Imprecise & inaccurate procedure
- Cannot treat complex & extraction cases

Examples:

- Conventional Laboratory Vacuum Forming Technique (e.g. using Biostar machine)
- MaxDent Ortho's Removable aligner systems

- c) MTM Aligners
- d) Clear Aligner International

2. CAD CAM ALIGNERS: Entire processing & fabrication is done by an automated process which is an amalgamation of Conventional dental laboratory procedures, Highly precise mechanical & software systems and Digital technology

Advantages:

- a) Predictable and can accurately show the results of treatment and exact no. of aligners at the beginning of the treatment!
- b) Only 1 impressions required in the beginning
- c) Only 10 minutes of chair side time required per 6 weeks per patient
- d) Highly precise, automated & sophisticated procedure
- e) Can treat all varieties of cases, including extraction cases, crossbites, rotations, edge to edge, bi-maxillary protrusion etc.

Examples:

- a) Invisalign
- b) ClearPath

ADVANTAGES OF ALIGNERS

FOR THE PATIENT

1. **CLEAR:** It is virtually invisible. Hardly anyone gets to know patient is straightening his/her teeth. So now it can align his teeth and get the smile he always desired without having any social inhibitions.
2. **REMOVABLE:** patient can remove them to eat, drink, brush, floss or for special occasions.
3. **COMFORTABLE:** the edges are smooth so they won't irritate patient's gums or cheeks.
4. **PREDICTABLE & EFFECTIVE:** patient can see the treatment outcome even before starting it and start enjoying a better smile even before completing the treatment.
5. **CUSTOMIZED:** Doctor will take precise impressions and customize aligners for patient's teeth.

FOR THE DOCTOR

- 1) **EVIDENCE BASED and SCIENTIFIC (PRECISION OF MOVEMENT):** The entire process is designed to deliver customized aligner that moves each tooth directly along the most efficient way to achieve the desired goal. By optimizing each aligners output, the number of aligners and intermediate changes required are minimized leading to shorter treatment times for patients, and increased capacity for practice.
- 2) **ACCURACY** of regeneration of patient occlusion without any digital data manipulation, eliminating any potential inaccuracy of appliance fit.
- 3) **MORE CONTROL OVER TREATMENT:** treatment can be modified in between batches during the course of treatment.
- 4) **FASTER TURNAROUND TIME** from the time a case is received to the time aligners are shipped back to the doctor.
- 5) **UNLIMITED MODIFICATIONS** to the diagnostic setup.

- 6) **ACCURATE AND PRECISE IPR** using original patient dentition without any digital error introduced to it.
- 7) **Original Patient Data** used during the whole manufacturing process from casting to treatments and aligner fabrication which adds to the accuracy of the end product and ensures **BETTER TREATMENT OUTCOME.**
- 8) **DECREASED CHAIR SIDE TIME:** It reduces both the frequency and length of patient visits. It also eliminates the need for time-intensive processes such as bonding appliances to the patient's teeth, adjusting arch wires during the course of treatment and removing the appliances at the conclusion of treatment. As such, use of Invisible aligners reduces dental professional and staff chair time and can increase practice throughput.

LIMITATIONS WITH BRACES

Although braces are generally effective in correcting a wide range of malocclusions, they are subject to many limitations and disadvantages. Conventional orthodontic treatment is associated with:

UNATTRACTIVE APPEARANCE: Braces call attention to the patient's condition and treatment. In addition, braces trap food, which can further compromise appearance. Braces can also result in permanent discoloration of teeth. Many adults associate braces with adolescence.

ORAL DISCOMFORT: Braces are sharp and bulky and can abrade and irritate the interior surfaces of the mouth. The tightening or adjustment of braces results in root and gum soreness and discomfort, especially in the few days immediately following an orthodontic visit.

POOR ORAL HYGIENE: Braces compromise oral hygiene by making it more difficult to brush and floss. These problems can result in tooth decay and periodontal damage. Additionally, the bonding of brackets to teeth can cause permanent markings on the teeth.

INABILITY TO PROJECT TREATMENT: Historically, dental professionals have not had means to model the movement of teeth over a course of treatment. Accordingly, they must rely on intuition and judgment to plan and project treatment. As a result, they cannot be precise about the direction or distance of expected tooth movement between patient visits. This lack of predictability may result in unwanted tooth movements and can limit their ability to estimate the duration and course of treatment.

PHYSICAL DEMANDS ON DENTAL PROFESSIONAL: The manipulation of wires and brackets requires sustained manual dexterity and visual acuity, and may place other physical burden on the dental professionals.

ROOT RESORPTION: The sustained high levels of force associated with conventional treatment can result in root resorption, which is a shortening of tooth roots. This shortening can have substantial adverse periodontal consequences for the patient.

EMERGENCIES: At times, braces need to be repaired or replaced on an emergency basis. Such emergencies cause significant inconvenience to both the patient and the dental professional.

LIMITATIONS WITH ALIGNERS

In some instances, Invisible aligners may have certain limitations relative to conventional treatment. Aligners cost more to produce than conventional braces, and manufacturers charge dental professionals more than they generally pay for the supplies used in conventional treatment. Depending on the individual pricing policies of each dental professional, the cost of Invisible aligners to the patient may be greater than for conventional braces. Dental professionals must also incorporate manufacturer's manufacturing cycle times into their overall treatment plan. Once a dental professional submits a case to manufacturer, there is generally a turn-around time of 3-4 weeks before the aligners are delivered. Aligners may not be appropriate for all cases, such as severe malocclusion, which may require Aligners to be used in combination with conventional braces for optimal results. In addition, because aligners are removable, treatment depends on patients wearing their aligners as recommended. Some patients may experience a temporary period of adjustment to wearing aligners that may mildly affect speech.

HOW DOES IT WORK

1) GETTING STARTED

Doctor evaluates patient's oral condition and discuss patient problems & treatment goals. Once it's established that invisible aligners is the right treatment option for the patient; the doctor will take impressions, photos and x-rays that are necessary for custom aligner manufacturing.

2) CUSTOM TREATMENT PLAN

The doctor sends the records impressions, photos and x-rays to manufacturer with a prescription for custom aligners. They use these records to create exact 3D models of the teeth. Then working with the doctor at every step, and following the precise instructions provided on the prescription, they map out a complete treatment plan of gradual adjustment that takes the teeth from where they are currently to where they want them to end up. Once the impressions are processed, the patient & doctor will be able to preview the projected results of treatment in "treatment set-up," a computerized digital representation of teeth before and after treatment.

3) THE ALIGNERS ARE COMPUTER CRAFTED

Once the patient & doctor are satisfied and approve the projected results shown in treatment set-up, the manufacturing process begins. Using the latest digital mapping and moulding technology, they fabricate custom aligners with software guided precision and then send aligners to the respective doctor for delivery to the patient.

4) PROGRESS WEARING ALIGNERS

Patients are advised to wear the aligners all the time, except while eating and drinking and during daily tooth care, such as brushing and flossing. These aligners are so clear, they are barely noticeable so they won't have an impact on patient's day to day life.

Aligner by aligner, patient will be able to see the difference as teeth slowly adjust and align to the target smile. Patient visits the doctor periodically for check-ups & follow-ups (preferably once every month) to see the progress until he

eventually has the great smile he always wanted.

GENERAL INSTRUCTIONS

1. Each aligner has to be worn for exactly 2 weeks i.e. 14-15 days.
2. Each aligner has to be worn all throughout the day except during meals and brushing.
3. In case of loss, damage or breakage of aligner, please report to the manufacturer for the new aligner set.

ALIGNER INSERTION

1. Make sure of having the proper aligner - the upper for the top teeth and the lower for the bottom teeth.
2. Doctor/Patient may insert either the upper or lower aligner first. When inserting each aligner, gently push the aligners over front teeth. Then, apply equal pressure, using fingertips, to the tops of left and right molars (Back Teeth) until the aligner snaps into place.
3. If aligners don't fit properly, gently BITE onto cotton or gauze piece to seat aligners into position.

ALIGNER REMOVAL

1. Using your fingers, start on one side at the molars, and slowly work your way around to the other side.
2. To help prevent damage, avoid unnecessary removal.
3. DO NOT use any sharp object to remove aligners.
4. Immediately rinse aligner with water, shake off excess water, and store aligners in the protective case provided with your starter kit.
5. Do Not use excessive force to bend or twist an aligner to get it off.

DAILY CARE AND MAINTENANCE OF ALIGNERS

1. Clean aligners prior to each insertion with a soft bristle tooth brush using water or a small amount of toothpaste.
2. Rinse each aligner thoroughly with water after each cleaning.
3. DO NOT use denture cleaners to clean aligners or soak them in mouthwash. These products can damage the surface of the aligner, causing it to become dull and more visible.

PROPER ORAL HYGIENE

1. Remove your aligners for eating and drinking, except when drinking water (only).
2. Brush and floss teeth after each meal or snack prior to re-inserting aligners.
3. Regular dental checkups and cleaning are recommended for the continued health of your teeth and gums.

STORING YOUR CLEARPATH ALIGNERS

Store aligners in a case when not in mouth. This will help protect them from loss and damage. Always keep the most recently used aligners (previous case) also in a separate case / pouch. If current aligner is lost or broken, temporarily go back one stage and use the previous set of aligners while a replacement is being made. Keep out of reach of children and pets!

CONCLUSION

The new system has opened up a new area of adult orthodontics, patients who may not want conventional fixed appliances or for whom traditional removable appliances maybe unsuccessful may go for this treatment. Still some limitations are there in using clear aligners. But as a whole clear aligners are very useful advanced technology in treating orthodontic patients at its best.

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