

Clear Aligners : A Revolutionary Change in Orthodontic Treatment

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Abstract

Orthodontic treatment is not just about braces. Clear aligners, a modern alternative to braces consists of a series of clear plastic, removable appliances that move teeth in small increments. It provides a hygienic, convenient and a clear solution to the correction of malocclusion without brackets and wires. It provides a clear change in the concept of cosmetic and orthodontics in permanent dentition. Clear aligners offer predictable results visualization even before the treatment. As the aligners were introduced, controversy existed whether moderate to difficult orthodontic treatment could be routinely accomplished. A wide range of cases can be effectively corrected. Aligners are only the appliances and the technique for working with it is continually being developed and honed. Refinement, adjustment and rebooting are all a part of the technique and everything depends on the clinician's skill just as with patient with any fixed appliance.

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Introduction

A standout amongst the most common clinical conditions in dentistry is malocclusion which is influencing more than 70% of the worldwide population. While most patients look for orthodontic treatment to enhance their appearance, malocclusion may likewise control different dental problems, for e.g., tooth decay, periodontal diseases or tooth loss, temporomandibular joint pain and cerebral discomfort. For correction of malocclusion, orthodontic treatment has been finished with regular braces. Despite the fact that facilitates are powerful in adjusting an extensive range of malocclusions; they are subjected to numerous limitations and inconveniences like unattractive appearance, frequent laceration, poor oral hygiene and so forth.

Innovation has changed apparatuses, procedures and connections in each industry, and dentistry is no exemption. In general and orthodontic practices, the appearance of clear aligner innovation speaks to a troublesome innovation with conclusions varying generally on how and where it can and can't be utilized generally adequately. Everybody needs straighter teeth however numerous patients are unwilling to wear traditional braces to accomplish the outcome. Having noticeable wires and brackets on teeth has turned out to be unsuitable aesthetically which has prompted advancement of aligner orthodontics or "invisible braces".

With aligner orthodontics, the patient puts on a progression of clear, thin, removable aligners, which tenderly guide teeth from their present position to acquired position. They are modified for every patient, giving unsurprising and promising outcomes. Because of their system, aligners have huge favorable circumstances over conventional method with wires and brackets. The aligners are clear so they show up almost undetectable to the eye. They are thin so they are more comfortable to wear and cause less interference and tissue injury. They are totally removable which makes it significantly less challenging to clean teeth and additionally eat and drink.

Aligners

* An aligner is a uniquely designed clear plastic plate that fits over your teeth and rectifies their malpositioning. (Fig.1)

* They are made in medical grade plastic (FDA affirmed) to make aligners.

* Each aligner moves teeth a smidgen by applying light, persistent and continuous pressure on them.

* They are hygienic, advantageous and an unmistakable answer for adjustment of malocclusion without wearing brackets and wires.

* They are removable and patients can eat, brush and floss their teeth and make the most of their typical life.

* They are about imperceptible and no one can see the aligners when you are wearing them.

* They are made by a universally licensed one of a kind procedure, which includes propelled innovation bolstered by altered programming and mechanical frameworks.

* The treatment involves a progression of aligners. Each set must be worn by the patient for 22hrs in a day for 2 weeks before progressing to the following set. Treatment span is 6 two years relying upon the seriousness of the case.

* Recommended age limit for use is 14 to 65 years old.

* Aligners apply exact, light, continuous and nonstop powers on the teeth so they are not agonizing but rather a slight distress might be experienced toward the start of treatment, which leaves inside 24 hours. Aligners are made in restorative review plastic, not at all like metal wires supports, which hurt your cheeks and lips.

Types of Aligner Systems

1. Manual Setup Aligners: Entire processing & fabrication done by the 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)
- Max Dent Ortho's Removable aligner systems
- MTMAligners
- 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

- Predictable and can accurately show the

results of treatment and exact no. of aligners at the beginning of the treatment!

- Only one impression required in the beginning
- Only 10 minutes of chair-side time required per 6 weeks per patient
- Highly precise, automated & sophisticated procedure
- Can treat all varieties of cases, including extraction cases, crossbites, rotations, edge to edge, bi-maxillary protrusion etc.

Examples

- Invisalign
- Clear Path

Advantages of Aligners for the Patient:

- Clear
- Removable
- Comfortable
- Predictable & Effective
- Customized

Advantages of Aligners for the Doctors:

- Evidence-Based & Scientific (Precision of Movement)
- Accuracy of regeneration of patient occlusion without any digital data manipulation.
- More Control over Treatment
- Superior Clarity of Aligners
- Faster Turnaround Time
- Unlimited Modification
- Quality
- Accurate and Precise IPR
- Ensures Better Treatment Outcome.
- Expanded Patient Base
- Decreased Chair Side Time

Limitations with Braces

Braces are for the most viable in remedying an extensive variety of malocclusions yet there are numerous limitations and disadvantages identified with them. Ordinary orthodontic treatment is related to unattractive appearance, oral inconvenience, and powerlessness to extend treatment physical requests on dental expert and root resorption emergencies.

Limitations with Aligners

Aligners are costly than the ordinary supports and producers charge dental experts more than they, for the most part pay for the provisions utilized as a part of traditional treatment. Contingent upon the individual estimating arrangements of every dental expert, the cost of Invisible aligners to the patient might be more noteworthy than for regular supports. A dental experts should likewise consolidate maker's assembling process durations into their

general treatment design. Dental expert presents a case to the maker, there is for the most part a pivot time of a month prior to the aligners are delivered. Aligners may not be suitable for all cases, for example, serious malocclusion, which may expect Aligners to be utilized as a part of traditional braces for ideal outcomes. In addition, since aligners are removable, treatment relies upon patients wearing their aligners as prescribed. A few patients may encounter an impermanent time of change in accordance with wearing aligners that may gently influence discourse.

Aligner Therapy Requires

- * Specially designed programming for deliberately migrating teeth on the computerized models in a successive request; (Fig.2)
- * Plastic material exceptionally defined for ideal aligner execution;
- * A rich arrangement of highlights to help the aligners in moving teeth (i.e., the vivified setups, discretionary increases of composite to upgrade capacity of the aligners, estimation expository apparatuses, and the use of assistant gadgets) and,
- * Most essentially, the specialist's level of preparing and involvement in the tooth development, orthodontic treatment standards, and usage of clear aligners.

How Do Aligners Work?

1) Getting Started:

- * Patients will begin off by finding aligners guaranteed supplier.
- * The doctor assesses patients' oral condition and talks about patient issues and treatment objectives.
- * Once it's built up that aligners is the correct treatment alternative for the patient; the specialist will take impressions, photographs and x-beams

2) Custom Treatment Plan:

- * The specialist sends the records: impressions, photographs and x-beams to aligners with a medicine.
- * For redo aligners, utilize these records to make correct 3D models of the teeth. At that point working with the specialist at each progression, and following the exact directions given on the remedy.
- * Aligners maps out a total treatment design of progressive modification that takes the teeth from where they are right now to where they need them to wind up.
- * Once the impressions are handled, the patient and specialist will have the capacity to see the anticipated consequences of treatment in "treatment set-up," an automated computerized portrayal of teeth when treatment.

3) The Aligners are Computer Crafted:

- * Once the patient and specialist are fulfilled and support the anticipated outcomes appeared in treatment set-up,
- * The fabricating process starts. Utilizing the most recent computerized mapping and trim innovation, aligners create custom aligners with programming guided exactness. Aligners are then sent to the separate specialist for conveyance to the patient.

4) Progress Wearing Aligners

- * Patients are encouraged to wear the aligners constantly, with the exception of while eating and drinking and amid everyday tooth mind, for example, brushing and flossing.

* Aligners are so certain they are scarcely observable so they won't affect patient's everyday life.

* Aligner by aligner, patient will have the capacity to see the distinction as teeth gradually change and adjust to the objective grin.

* Patient visits the specialist intermittently for registration and subsequent follow-ups (ideally once consistently) to see the improvement until the point when he inevitably has the colossal grin he generally needed.

How to Get Aligners?

1) Gather Patient Records:

- a) Impressions: Both upper and lower impressions in rubber base (PVS).
- b) Bite Registration
- c) Photos: Intra-oral, Extra-oral and profile photographs of patients.
- d) Radiographs: Lateral Cephalograms & OPG
- e) Diagnosis and Treatment Form: Filled completely.

2) Submit:

All these records to Aligner's office.

3) Treatment Plan:

* The intimation is sent with respect to receipt of records and section into framework post which you affirm the treatment get ready for the patient by assessing the tooth developments and before-after situations on the Online Demonstrative Setup.

4) Aligner Manufacturing:

* Once the Analytic Setup is endorsed, the arrangement is done and sent for assembling process start.

* The aligners are planned, produced and dispatched to the center in 2 weeks.

5) Progress with Aligners:

* Patients ought to be encouraged to wear the aligners constantly, with the exception of while eating and drinking and amid day by day tooth mind, for example, brushing and flossing.

* Each set must be worn by the patient for 22 hrs in a day for 2 weeks before progressing to the following set.

* Periodic checkups ought to be made to perceive how the patient is advancing.

* Aligner by aligner, you'll have the capacity to see the distinction as teeth gradually modify and adjust to the objective grin.

Case Records

Case Records include:

- 1) Impressions: Both upper and lower impressions in rubber base (PVS).
- 2) Bite Registration
- 3) Photos: Intra-oral, Extra-oral and profile photographs of patients.
- 4) Radiographs: Cephalometric and Panorama.
- 5) Diagnosis and Treatment Form: Filled completely.

1) Acceptable Impressions

Both upper and lower impressions are required for handling a case. Impression material ought to have a long time span of usability, ought to have the capacity to catch points of interest and furthermore withstand different pours without harming the subtle elements. Various materials can be utilized. Polyether and polyvinyl siloxane impression materials are the prescribed materials of decision. Two stage PVS impression material gives the best outcomes, however one stage PVS can likewise be utilized.²

2) Bite Registration

Bite registration is essential to set up patient's occlusion in the laboratory so the treatment is done inside parameters of beginning occlusion. It likewise helps like the set-up of individual arch dentition as per the prerequisite put forward by the diagnosis and Treatment form. PVS bite registration is the material of choice as this gives excellent details of the occlusal contacts and furthermore the properties of the material make it tough and impervious to distortion. Simple bite registration can be taken by spreading the bite registration material over the patient's teeth and requesting that he bite in normal occlusal position. A triple tray can likewise be utilized to register the bite of the patient.

3) Images / Photos

Both intra oral and extra oral photographs of the patient are required for quality verification of the cast and determination of permissible movement that can be incorporated without affecting the profile of patient.

Following are the points of view from which these photos should be taken:

- a) 5 Intra oral (upper & lower occlusal, frontal, right & left Buccal in occlusion)
- b) 3 extra oral (frontal profile, right lateral profile and left lateral profile)

All pictures should be recent and clearly represent the details of the patient dentition and profile. Individual pictures can be sent through it is preferred if a picture template is used to combine all the pictures on a single page print out.

4) Radiographs

Two recent radiographs of patient are essential. This aids in the assessment and understanding of the prescribed treatment plan.

- a) Panorax
- b) Lateral Cephalograms

There are conditions where the treating doctor finds it appropriate not to take radiographs due to certain conditions /limitations of patient. In such situations, the same should be communicated in details through diagnosis and treatment form.

Any essential information which may be gathered from radiograph can be entered in the diagnosis and treatment form for reference. Full mouth IOPA x-rays can also be submitted instead of Panorax.

Recent Aligners Protocol Improvements:

In recent times, various enhancements have been introduced to the protocol to utilize the Aligners. These modifications belong to varieties of anterior/posterior corrections, staging for inter-proximal reduction, staging for tooth movements, attachments, and staging of tooth movements.¹

Anterior/Posterior (A/P) Corrections

* Setups are created to enable simpler and easier creative imagination of the expected treatment objective when including inter-arch elastics in the plan for treatment.

* Elastic wear is usually recommended from the beginning of treatment, continuing until the expected A/P correction has been accomplished.

* Setups will default to exhibit A/P bite modifications including the effects of inter-arch elastics.

* The impact of elastics is simulated as a one-stage anterior-posterior movement towards the end of treatment.

Sharma, et al.: Clear Aligners : A Revolutionary Change in Orthodontic Treatment

* Fewer aligners are essential whenever concurrent staging is needed.

* Distalization staging may be asked for in the specific instructions of the treatment type or during Clin-Check Evaluation.

Staging for Inter-proximal Reduction (IPR)

* The timing of IPR is automatically staged if there is more desirable access to inter-proximal contacts.

* IPR is going to be staged if there is not a considerable overlap between teeth to prevent conducting IPR on surfaces that could be affected by instruments.

* Saving significant IPR might be required for Bolton's discrepancies are aligned to prevent eradicating enamel on an angle.

* IPR is conducted through the use of IPR gauge. (Fig.3)

Staging for Tooth Movements

* Cases are staged to allow combination movements to happen at the same time for each tooth.

* The tooth that requires moving the majority (lead tooth) are going to decide the minimum number of stages needed.

* All teeth move during the period of treatment.

Attachments

* The software professionals often recommend the positioning of small dollops of tooth colored composite material on specific teeth which is able to be encased in a tiny "bubble" in the aligners. They are generally referred as "engagers", "attachments" or "buttons". (Fig.4)

* Number, shape and location positions decided by the software program or customized by the doctor.

* Attachments are actually positioned in the middle of the crown vs. 2 mm from the gingival margin.

* There are reduced rotational and extrusion values to trigger automated attachment positioning.

* Rotational attachments are automatically sized in proportion to the clinical crown.

* One mm thick vertical rectangular attachments are utilized for rotations of round teeth or canines in addition to translation of teeth close to an extraction site.

* Use of 1 mm thick (buccal-lingual dimension) horizontal beveled rectangular attachments is standard on premolars for retention of aligners at the time of intrusive movements for example leveling the lower curve of Spee in deep overbite, for extrusions, and for management of the tooth long axis throughout torquing movements.

Staging of Tooth Movements

* Linear and rotational velocities of teeth are tracked individually.

* The limited range of treatment stages is established via the lead tooth depending on its rotational or linear maximum velocity.

* Slower rotations are staged in treatment.

* Movements of most teeth are simultaneous.

* This includes the benefit of developing the required space for movements and slowing the speed of all tooth movements apart from movement on the tooth that requires the most stages to achieve at a given velocity (the lead tooth).

* Visible space (approximately 0.05 mm) is offered between teeth during movements past other teeth. Expansion rather than IPR is employed as an important approach to increase space designed for correction of crowding.

General Instructions¹⁰

1. Every aligner must be worn for specifically 2 weeks i.e. 14-15 days.
2. Every aligner needs to be worn all through the day apart from during meals and brushing.
3. In case there is loss, damage or breakage of aligner, make sure you state to the manufacturer for the new aligner set.

Aligner Insertion^{11,13}

1. Ensure by using the proper aligner - the upper for the top teeth and the lower for the bottom teeth.
2. Doctor/Patient may place often the upper or lower aligner first. When placing each aligner, softly push the aligners over front teeth. Then, apply equivalent pressure, making use of fingertips, to the tops of left and right molars (Back Teeth) until the aligner locks into place.
3. If aligners don't fit appropriately, carefully BITE onto cotton or gauze piece to fit aligners into place.

Aligner Removal^{14,15}

1. Making use of your fingers, begin one side at the molars, and gradually progress around to the other side.
2. To avoid damage, prevent nonessential removal.
3. Do Not make use of any kind of sharp item to take out aligners.
4. Instantly wash aligner with water, shake off excess water, and keep aligners in the protective case supplied with your starter kit.
5. Do not utilize too much force to bend or turn an aligner to get it off.

Daily Care & Maintenance of Aligners

1. Clean aligners just before every insertion with a gentle bristle tooth brush using water or little toothpaste.
2. Rinse each and every aligner completely with water after each cleaning.
3. Do not use denture cleaners to wash aligners or soak them in mouthwash. These products may harm the surface of the aligner, causing it to become dull and more visible.

Proper Oral Hygiene

1. Take out the aligners for eating and drinking, except for drinking water (only).
2. Brush and floss teeth after every meal or snack before reinserting aligners.
3. Routine dental checkups and cleaning are suggested for the prolonged health of your teeth and gums.

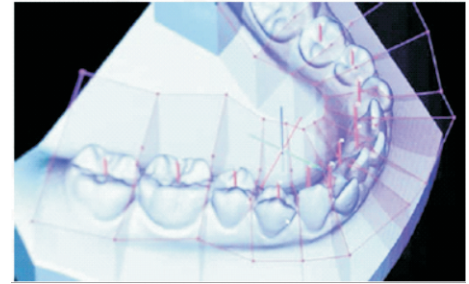


Figure: 2 Software



Figure: 3 IPR gauge



Figure: 4 Attachments with elastics

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Figure: 1 Clear Aligners