

Sequential Removal Orthodontics: An Alternative Approach

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A B S T R A C T

Orthodontic treatment is one of the most essential and effective way to make individual smile in to radiant and more attractive smile. Sometimes patients are hesitant about the pain and discomfort related to brace, as well as as metallic smile is a deterrent for style conscious young adults who want straighter teeth but refuses traditional metal orthodontics. Invisalign aligners are utilized to fix crooked or mal aligned teeth, and also close spaces and alter overbites. The treatment includes wearing clear, plastic plate that is custom made for the mouth, making Invisalign a less-recognizable option. This review article has been prepared by doing a literature review from world-wide web and pubmed/medline.

Key word: Sequential Removal Orthodontics

INTRODUCTION

The word orthodontics came from two Greek words orthos' means normal, correct, or straight and 'dontos' means teeth. Correction of malocclusion by correcting and improving the position of teeth is main concern of orthodontist.¹ Orthodontic treatment has a vast horizon ranging from straighter teeth through enhanced occlusion. It is also a great way to improve a person's overall self-image. During orthodontic treatment braces are used to move the teeth by applying the pressure. Fixed orthodontic treatment requires placement of multiple types of small brackets to the teeth, which are connected by wire and rubber bands. A wire is regularly tightened by the dentist or orthodontist to gradually shift the teeth and jaw. With all the advancements in the field of orthodontia still wearing braces has never been easier. The brackets appear ugly on the patient's smile, looking even dark on the teeth. It is very unattractive for any typical individual and it is even a more concerning issue for the individuals who are more established, who can't bear resembling a metal-mouth just to have straighter teeth. Having metal free mouth is what any person in personal relation job always dreams of- flashing metal isn't consider being a fashion. Investigators brought forward a few solutions like ceramic or composite braces, lingual orthodontics, and clear aligners to address the increasing aesthetic demand as an alternative to conventional braces.²⁻⁴

As stated earlier metal braces are not complied well due to them being unaesthetic. Invisalign and its revolutionary

multiple clear aligners has become an aesthetic alternative to metallic smiles, which are not that noticeable.⁵

Invisalign is a virtual orthodontic appliance that is utilized to straighten the teeth without support of an undetectable way.

Invisalign makes utilization of the series of transparent, removable teeth aligners that will gradually straighten the teeth, which is the best alternative for patients who consider dental braces that require no consideration of metal wires or brackets.

These clear aligners have come as a boon for those who want a treatment without compromising on their smiles.⁶ Invisalign is perceived as a viable orthodontic procedure that corrects a wide assortment of bite, spacing and crowding issues utilizing a series of uniquely custom made, almost invisible, comfortable and removable aligners. While Invisalign is regularly asked for its aesthetic advantages, numerous patients don't understand that it additionally has various oral health advantages.⁷

With the advent of CAD/CAM its uses for Invisalign treatment plan gives a projection of post treatment objectives beforehand so that the patient knows what all to expect after completion of the treatment protocol. Worldwide 300,000 patients have been treated by using Invisalign.⁸

The clear aligners from Invisalign have been patented. With progressive repositioning of teeth and frequent change of aligners gives the promised results. Being removable and the ease of using it makes cleaning of teeth

as well as the aligners easier after meals. The aligners are smooth and comfortable and they don't irritate your gums, cheeks and tongue. The invisalign system also eliminates any allergic reaction with metal.⁹

INVISALIGN-WHAT EXACTLY THIS IS ??

The patented clear aligner technology of Invisalign is a clear choice and alternative for image conscious population who would never opt for the visible wires and braces. Invisalign was presented in the late 1990s by Align Technology Inc, and because of cutting edge innovation permitted a much less complex way to deal with this kind of treatment. In 1998, Align Technology (Santa Clara, Calif) presented Invisalign, a series of removable polyurethane aligners, as a stylish contrasting option to fixed labial braces.^{8,10}

These aligners are made of medical grade plastics, are biocompatible and approved for human use in the oral cavity. Using the latest CAD CAM technology the trays are molded and carved with laser precision (Figure:1).¹¹ Invisalign is a different way of aligning teeth. The technology uses computer assisted 3D virtual models to correct dento alveolar malocclusions. A series of aligners is necessary to achieve the desired result. These aligners move the patient's teeth gradually into their desired new position. Each aligner is programmed to move a tooth or a small group of teeth 0.25 to 0.33 mm every 14 days.

This revolutionary tooth movement technique has attracted all the more patients towards teeth straightening.^{12,13}

PROCEDURE

A series of simple steps including radiographs, photographs, impression making alongwith prescription from the dentist is sent to the laboratory. The ClinCheck® software model creates the treatment protocol.

This 3D interactive software allows the technician to move each tooth in three dimension, predict the "collisions (2 teeth occupying the same space) and build the sequence of movements precisely to obtain the optimal tooth movement and the resolution of the malocclusion. (Figure:2)

After the treatment protocol is approved by the treating dentist, a series of aligners are sent to the treating dentist. Number of the aligners are determined by the complexity of the condition. The number of aligners delivered is based on the complexity of the case and can range from as few as ten for minor corrections, up to 25 for moderate corrections and whopping 40 for severe conditions.

The aligners are numbered and are accompanied with date chart and specific instructions and are to be worn for maximum period of time in a day, only to be removed while eating and maintenance of oral hygiene. These aligners are

generally replaced every two or three weeks and 6-8 weeks of follow up with the consultant. To facilitate specific orthodontic movements some patients requires bonded aesthetic attachments and/ or elastics.^{12,14}

ALIGNER INSERTION

1. Ensure you have the correct aligner— upper for maxillary teeth and lower for mandibular teeth.
2. To help maintain a strategic distance from disarray each aligner is engraved with unique case #, a-UII for upper and -LII for lower, followed by the stage number.
3. Aligners can be worn in any of the arch first, they need to be placed in the incisors area and then slowly adjusted over the molars till it snaps into the desired position. One should not bite the aligners in to the desired position as this will cause irreparable damage.
4. One should expect minor fitting issues when the aligners are changed but they are resolved subsequently. Whatever the issues it is not advisable to jump the sequence of the aligners in any case.
5. The force have been incorporated into the aligners in such a way that it gradually reduces from 200 grams to 40 grams within 48 hours. It is advisable to start the use of the aligners in late evening so that by the morning the force is reduced by 100 grams and that would facilitate easy removal.



Figure-1: Invisalign teeth aligner



Figure-2: 3D interactive Clincheck® software

ALIGNER REMOVAL

1. The aligner is removed by tugging the fingers at molar area and slowly dislodging it while moving on the other side.
2. Avoid removal of the aligner frequently.
3. No sharp object should be applied on the aligners
4. Aligner needs to be stored after rinsing and shaking off the excess water.
5. The old stage aligners are replaced by new ones and they need to be stored in a zip lock pouch till the treatment is completed.¹⁵

MECHANISM OF ACTION

After the impressions are made, a complete treatment course is planned taking into consideration the pre-treatment occlusion and the predictive orthodontic final outcome. This is achieved using 3D computer imaging technology and is used for fabricating custom made series of individualized aligners. As these aligners are replaced sequentially at the stipulated time (two weeks at least) the teeth move incrementally at the rate of 0.25mm per tooth until a desired position is attained.¹⁶

TREATMENT DURATION

As the aligners are changed the movement of the teeth become slow as the replacement time approaches and even slower when the treatment tends to finish. It is

recommended that aligner should be worn till teeth are aligned to the desired position and also till your consultant suggests to discontinue. The consultant reviews the progress every six weeks and treatment takes approximately 7 to 15 months depending upon the number of aligners which can range from 10-30.⁶

TRADITIONAL BRACES V/S INVISALIGN

Traditional braces causes discomfort, pain, mouth ulcers, tooth discolorations, plaque deposits, poor gingival health, dental caries, inability to chew and diet restrictions.¹⁷ Comparison between traditional braces and invisalign is listed in Table:1

INDICATIONS

1. Somewhat crowded and mal aligned issues (1–5 mm). Treatment that should be possible with slight lateral and/or antero-posterior expansion, with some minor inter proximal tooth diminishment, or by extraction of a lower incisor.
2. Spacing problems (1–5 mm).
3. Profound overbite issues (Class II division 2 malocclusions) where the overbite can be lessened by intrusion and advancement of incisors.
4. Narrow arches that can be expanded without tipping the teeth excessively.

| Parameters | Traditional Braces | Invisalign |
|------------------------|--|---|
| Color | Metal braces have typically silver colour, for tooth color braces patient has to pay extra. | Clear/invisible |
| Treatment time | 24x7 for a normal of 2 years, contingent upon patient needs. | 22-24 hrs/day for 6 months to year and a half, contingent upon patient needs. |
| Cost | \$1,800-\$5,500 | Average of \$5,000 |
| Maintenance | Brush brackets and wires consistently while brushing teeth; Waterpik might be useful. | Invisalign Cleaning system, or brushing and rinsing trays in luke warm water |
| Follow up visits | About every month | Change aligner trays every 2 weeks; visits every 4 to 6 weeks |
| Follow up to treatment | Positioner or retainer likely needed ongoing, maybe only at night | Positioner or retainer likely needed ongoing, maybe only at night |
| Pros | More effective for more complex issues. No temptation to leave them out, so less self discipline is needed for success. No extra cleaning steps required besides regular brushing and flossing | Invisible Removable No issues with food getting caught. No difficulty eating. No discomfort from wires. |
| Cons | May have some pain, sores or discomfort from wires, brackets or tooth movement May have some tooth discoloration or breakage May have difficulty eating sticky, hard foods | May have discomfort from tooth movement. Must remove before eating or drinking anything but water. Must brush after each meal to avoid staining. |
| NOT ideal for | Patients playing rough contact sports regularly | Patients with: bridgework back tooth bite issues The need to rotate canines or premolars The need to move teeth vertically Lack of discipline to keep trays in for at least 22 hours daily |

Table-1: Difference between traditional braces and Invisalign

5. Relapse after using appliance therapy.
6. Minor rotations.^{18,19}

CONTRA-INDICATIONS

1. Teeth with crowding and spacing more than 5 mm.
2. Anterior-posterior skeletal discrepancies of more than 2 mm (as measured by discrepancies in cuspid relationships).
3. Centric-relation and centric-occlusion discrepancies
4. Severely rotated teeth (more than 20 degrees).
5. Open bites (anterior and posterior) that need to be closed.
6. Extrusion of teeth.²⁰

DISADVANTAGES

1. It is a fact that the aligners are removable means they are not persistently adjusting the teeth; consequently they were to a great extent reliant on a patient's propensities and their consistency in wearing the aligners. The accomplishment of the Invisalign aligners depends on a patient's dedication to wear the aligners for at least 20–22 hours for each day, just evacuating them when they are eating, drinking, or brushing their teeth.
2. Invisalign® aligners are unable to rotate certain teeth. For eg. few round shape lower premolars are difficult for aligners to hold and rotate.
3. Various tooth movement capabilities of the wires and braces is not yet incorporated in these aligners but as advancements come in the near future we may attain greater tooth movements leading to better treatment results but of course will garner increased cost.
4. Likewise, these aligners have limited control over various root movements -paralleling, revolution rectification and tooth uprighting and extrusion.
5. Skeletal discrepancy is another area where the usages of the aligners will have no effects, it would require a surgery or prior orthodontic functional phase.
6. Some dentoalveolar movements of maxillary incisor protrusion has been reported by these aligners. Elastics to button bonded to the buccal aspects of the aligners were also used but dislodging of the aligners prevented the protocol. Having said that, 2mm sagittal A-P corrections of the buccal segment have been reported through meticulous treatment planning.
7. As the aligners are removable the operator doesn't have control over the treatment, if the patient for some reasons discontinue its usage the whole treatment plan has to be re-done which is called 'reboot' this causes increase in the cost of the treatment though one can buy a plan to cover the 'reboot'.
8. Align Technology admits that these aligners are bit costly than the traditional wire and brackets systems.

9. As the aligners are removed while eating their chances of being lost is high.
10. Severely tipped teeth (more than 45 degrees)
11. Teeth with short clinical crowns
12. Arches with multiple missing teeth.

ADVANTAGES

Being inconspicuous is the essence of these aligners, they do the treatment without hampering the appearance of the subjects and hence, has gain popularity amongst young adults.

To add, aligners being removable in nature do not interfere during chewing of food where as metallic braces comes with strict diet plan and hygiene protocol from the specialist.^{18,21}

FDA APPROVAL

FDA in 1998 has permitted Align Technology, Inc. to market its Invisalign aligners and these have been classified under Class II medical devices with mandatory 510k clearance.

INVISALIGN COST?

The cost of orthodontic treatment using braces or the aligners are almost equal and ranges from \$3000- \$8000 in USA. The treatment cost of using invisalign aligners are determined by various factors like specific needs of the particular patient and the plan designed for the same. Various other determinants which have effect on the overall cost of the treatment are duration of the treatment, your location, doctor's experience and dental plan/insurance. In some cases, complex treatment needs may result in costs that exceed the range above.²¹

CONCLUSION

If anybody has a desire for a delightful smile, metallic braces cannot be an option? Now, Invisalign® could provide for you that smile you generally needed without utilizing brackets also wires. Invisalign® is arrangements of customized, clear, retainer-like appliances that can be utilize to straighten the teeth. Basically unobservable and removable, patient might at last smile with confidence. The Invisalign framework has opened another territory for grown-ups orthodontics, serving patients who might not have any desire of routine appliances or for whom conventional removable appliances might be unsuccessful.

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