



## Fixed VS Clear Aligners: A Review

**Naveen Kumar Krishna<sup>1\*</sup>, Manju Prasad Muniyappa<sup>2</sup>, Shivaprasad Gaonkar<sup>3</sup>, Nawal Saleem<sup>4</sup>, Mithun J Shah<sup>2</sup> and Mohamed Saleem<sup>5</sup>**

<sup>1</sup>Principal, Professor and Head of Department, Department of Orthodontics and Dentofacial Orthopedics, KGF College of Dental Sciences and Hospital, Karnataka, India

<sup>2</sup>Reader, Department of Orthodontics and Dentofacial Orthopedics, KGF College of Dental Sciences and Hospital, Karnataka, India

<sup>3</sup>Reader, Department of Orthodontics and Dentofacial Orthopedics, Dayananda Sagar College of Dental Sciences, Karnataka, India

<sup>4</sup>Senior Lecturer, Department of Orthodontics and Dentofacial Orthopedics, KGF College of Dental Sciences and Hospital, Karnataka, India

<sup>5</sup>Vice Principal, Professor and Head of Department, Department of Prosthodontics, KGF College of Dental Sciences and Hospital, Karnataka, India

**\*Corresponding Author:** Naveen Kumar Krishna, Principal, Professor and Head of Department, Department of Orthodontics and Dentofacial Orthopedics, KGF College of Dental Sciences and Hospital, Karnataka, India.

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**Naveen Kumar Krishna, et al.**

### Abstract

A smile is incomplete without teeth, which also remains magnanimously deficit without proper alignment. Alignment not only provides us with an esthetic smile but also provides us with a physiological and functional balance which creates a stable equilibrium via balanced forces. A time transition in the area of orthodontics reflects a shift in the type of treatment; as of today the patient plays a pivotal role in deciding the type of treatment in terms of esthetics and availability of the patient, compared to the previous era. Clear aligners have taken over a significant part of the market share from the conventional fixed orthodontic treatment type as they are becoming increasingly popular owing to their easy availability and esthetically pleasing nature while keeping remote treatment an undeniable advantage. Therefore, this review has been scripted to understand the role and superiority of clear aligners in comparison to the conventional fixed orthodontic treatment, while understanding the shortcomings of the same.

**Keywords:** Orthodontics; Aligners; Brackets; Esthetics; Clear; Occlusion

### Introduction

Malocclusion is widely believed to have a negative impact on self-esteem, as well as physical, social, and psychological well-being [1]. Orthodontics is a dental specialty that focuses on improving a patient's shape, function, and esthetics [2].

Adults desire orthodontic treatment in order to enhance their smile, occlusion, mental wellness, and general quality of life [1,3]. However, some of them are hesitant to continue with the therapy given that to the long rehabilitation period, discomfort, expenses, and unpleasant appearance of typical buccal fixed appliances [1,4].

Conventional orthodontic techniques have historically been associated with a general compromise in facial attractiveness, which causes great concern among patients requesting orthodontic treatment [5].

For nearly a century, fixed braces have been the most widely used and effective orthodontic appliance. In recent years, an increasing number of patients have come forward with a desire for a more appealing and enjoyable orthodontic treatment technique, raising concerns regarding transparent aligners. Whether transparent aligners may be a viable alternative to braces was uncertain [6].

Orthodontic breakthroughs have corresponded with a significant increase in patients' cosmetic needs. Patients often express a desire to influence, or even determine, treatment components or goals in partnership with their orthodontist, driven by the impact of orthodontic appliances on their outward appearance [5].

Thanks to developments in orthodontics, patients can now receive invisible procedures that result in an exquisite orthodontic treatment. Although lingual appliances had a cosmetic benefit over buccal ones, their usage was limited because to the numerous challenges connected with them [1,8,9].

While the FDA approved CAT for orthodontic treatment in 1998, similar removable appliances have been in use since Dr. Harold Kesling introduced teeth positioners [2].

In the beginning of the 1940s, Kesling introduced the clear aligner. Nevertheless, due to skepticism in addition an absence of promotional materials at the time, it did not gain much popularity. Clear aligners became popular as dental materials and 3D technology improved. Sheridan pioneered the practice of interproximal tooth reduction (IPR) in combination with clear aligners in the early 1990s. Each tooth movement requires a new configuration. As a result, in order to create a new aligner, a new imprint was required at each visit, which created delays to the procedure as well as increased laboratory effort [10].

Advances in material science, simulation software, as well as 3D printing have allowed aligners to provide treatment options for complex orthodontic issues [2,12]. Virtual simulation allows an orthodontist to plan every aspect of treatment on a computerized three-dimensional model. Once predictable motions have been designed, they can be incorporated into tooth-borne transparent aligners, which use digitally prepared attachments to help them shift teeth. CAT uses both attachments and force points to achieve desired tooth movement [2,13].

The efficiency and effectiveness of clear aligners have been well evaluated in mild to moderate malocclusion instances, however little effort has been committed to assessing clear aligners in more challenging [14].

Clear aligner technology offers a paradigm leap in orthodontics, upending established approaches used by orthodontists [15].

The experienced dentist can remotely adjust, pause, and monitor the orthodontic prescription as well as the subsequent aligner sequence. The patient can continue clinical appointments with their main dentist whilst having their orthodontic therapy electronically monitored. This allows for more precise remote evaluation along with tracking of orthodontic therapy than most basic CAT methods. These are often conducted totally by the laboratory technician, involving little clinical dentistry participation [16].

In general, there are three types of aligner treatment [10]

- Complete aligner treatment.
- Hybrid aligner therapy, in which fixed appliances are used initially and aligners are used in the end (or vice versa).
- Aligner therapy in instances of recurrence.

The method of designing clear aligners is consistent with every single orthodontic software systems. Aligner resin can be used to create aligners for direct 3D digital printing using specific software applications [10].

With various choices to help the orthodontist create the study models needed for aligner manufacture or design the aligners for immediate 3D printing, the program is user-friendly and effective [10].

As clients continue to seek the ideal smile at a reasonable cost, the number of companies providing DIY braces has increased. As a consequence of the COVID-19 pandemic's influence on availability of orthodontic appointments, more customers are choosing DIY orthodontics over traditional orthodontist or dentist therapy [17].

Although the fact that it initially sounds enticing, simple, as well as economical, it eventually leads in major, permanent damage to the tooth, gums, and their supporting bone structure, putting the tooth structure in a damaged state [17].

Braces might make precise wire modifications of 0.5 mm to infiltrate or extrude teeth whenever needed. While aligners made it difficult to extrude a tooth, aligners which covered the teeth's occlusal surfaces prohibiting the occlusion from settling. thereby, clear aligners were incapable to produce sufficient occlusal connections in the exact same way as braces performed [6,18].

Braces employed rectangular archwires to straighten along with widen arches by torqueing roots and tilting teeth. likewise, transparent aligners are removable, doctors must rely on their patients' motivation and consistency to complete the treatment. Braces, on the other hand, exerted coronal and buccal stresses on the teeth's center of resistance, resulting in tilting and proclination during alignment [6,18].

Clear aligners can straighten individual teeth by moving one or more of them. This gradual, segmented action may decrease dental proclination. Clear aligners may be suitable for those with thin gingival biotypes to lessen the risk of gingival recession [6].

Alveolar bone resorption took 7-14 days, with equivalent time required for periodontal tissue healing. Orthodontic appliances should not be restarted more than once every three weeks [6,19]. Cutting the repair process short would result in tooth and alveolar bone deterioration. So it's probable that the clear aligners' 2-week interval was insufficient for alveolar bone to heal, resulting in more recurrence compared to braces, which have adjustments every 4-6 weeks.

A meta-analysis found that orthodontic therapy using transparent aligners was longer-lasting than therapy with braces [6].

Benefits of Clear Aligners Over Conventional Braces [5,6,10,16].

- Patients were able to consume food, brush, and floss
- Aligners were removable
- Less risk for caries and periodontal disease during treatment
- Eliminating the need to navigate brackets and wires
- More aesthetic based on patient perception
- Treatment process easier and more enjoyable for the patients,
- Possibility to do teeth whitening during treatment
- Less potential for emergencies and soft tissue injuries
- Better perception of improvement by patients associated.
- Can be used in handicapped or disabled patients who cannot visit the clinic
- Better suited in patients travelling or not residing locally
- Cost-effective in a country like INDIA, than in other countries.

However, it is difficult to repeat all of the tooth motions with the exact same quickness and flexibility as that of fixed orthodontics, resulting in an undeniable drawback of clear aligners [6,10,16].

Movements including intrusion, expansion, in addition buccolingual inclination tend to be more anticipated, although anterior extrusion, molar uprighting, and rectifying severe rotations are less so [2]. In comparison to fixed orthodontic therapy, CAT may be more effective in terms of treatment time for uncomplicated orthodontic patients and extremely specific tooth movements, but

it falls short in terms of achieving adequate occlusion, individual tooth torque, retention, in addition stability [2,6].

A 2015 systematic review found that transparent aligners were helpful in controlling anterior intrusion as well as posterior buccolingual inclination yet not for anterior buccolingual inclination. Extrusion is the most challenging movement (30% accuracy), subsequent to rotation. Bodily distalization of upper molars within 1.5 mm demonstrated the highest prediction (88%). Thus, clear aligners have been suggested in simple malocclusions [6,20].

In November 2021, the British Orthodontic Society joined 31 other professional dentistry in addition orthodontic societies from 25 other countries to form the European Federation of Orthodontic Specialists Associations, which issued a common declaration outlining the fundamental requirements for any orthodontic treatment [17,21,22].

The Indian Orthodontic Society (IOS) has taken great measures to prevent DIY aligners and refute the popular idea that a skilled orthodontist is not always required. In November 2021, the IOS sent a representation to the Dental Council of India (DCI) highlighting many Code of Ethics violations perpetrated by DIY-aligner enterprises while delivering in-home services. The guideline emphasizes the need for the highest standard of care based on proper evidence-based diagnostic procedures and therapy planning, biological waste management including sterilization techniques, and ethical business practices [17,21,22].

## Conclusion

Clear aligners and fixed appliances are both effective orthodontic. Fixed appliances have proven orthodontic treatment; nevertheless clear aligner treatment may result in discrepancies between expected and actual tooth motions. As a result, when making a treatment decision, it is important to examine the characteristics of these approaches. The complexity of the treatment should be used to determine the type of orthodontic technique while keeping in mind the patients requirements on the esthetic and maintenance.

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