

## Hybrid Aligner -A Birds View

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### Abstract

The evolution of the clear aligner system has been marked by significant advancements across various facets. Innovations in materials have led to enhanced flexibility and durability, while refined protocols have optimized treatment efficiency. Additionally, the introduction of attachments and auxiliary tools has bolstered biomechanical control, further augmenting the system's capabilities. Despite these advancements, certain limitations persist within the realm of clear aligner treatment, particularly regarding the predictability of specific tooth movements. These uncertainties underscore the need for alternative approaches to achieve more reliable outcomes.

The hybrid approach, which merges clear aligners with fixed appliances, has emerged as a promising solution to address these challenges. By combining the strengths of both modalities, orthodontists can capitalize on the advantages of each while mitigating their respective limitations. Notably, this hybrid strategy has been shown to significantly reduce overall treatment duration and enhance predictability, particularly in cases where clear aligners alone may fall short.

The primary objective of this article is to elucidate the application of the hybrid approach across various types of tooth movements. By showcasing its efficacy in diverse clinical scenarios, the article aims to underscore the versatility and effectiveness of this treatment modality. Ultimately, the hybrid approach represents a transformative advancement in orthodontic care, offering patients a more efficient and predictable path to achieving their desired outcomes.

**Keyword** – aligners , hybrid , orthodontics

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Date of Submission: 15-07-2024

Date of Acceptance: 25-07-2024

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### I. Introduction

In recent years, there has been an increase in the usage of transparent aligners due to patient requests for comfort and aesthetics. Treatment with orthodontic appliances that enhance smile appearance is not restricted to adult patients since young children (8 to 16 years old) have strong self-perceptions about smile aesthetics. [1,2] The clear aligner system has seen significant improvement in the previous several years in many ways. To enhance biomechanics, new materials, procedures, attachments, and auxiliaries were created. The use of clear aligners treatment is limited to non-extraction situations that meet certain diagnostic criteria, therefore selecting patients carefully is essential.[3] Clear aligner treatment is less effective for more severe situations; in these circumstances, permanent appliances are required.[4-6]According to a recent meta-analysis, adult patients undergoing orthodontic treatment using aligners often have lower treatment outcomes than those with permanent appliances.[7] The degree to which the anticipated dental movement are predictable has a direct bearing on the results, Because the software used to put up aligners replicates any kind of tooth movement, including those possible only via orthognathic surgery, care must be taken while designing the case. When it comes to identifying which movements are predicted and which are attainable with clear aligners, the worldwide scientific literature is quite clear and consistent. Therefore, hybrid mechanics is integrating transparent aligners with the combination fixed appliances, auxiliaries, or appliances made in a laboratory. The advantages of removable, transparent aligners are harnessed in hybrid aligner therapy, which also tackles the limitations of these aligners in terms of causing particular tooth movements<sup>8</sup>.

### Advantages

Wearing metal braces for the entire length of treatment is not an option for many adults seeking orthodontic care. Clear aligners and hybrid orthodontic solutions have changed the way we straighten teeth. In addition to the obvious benefit of enhanced comfort, patients can expect the following:

- Reduced time required to wear brackets
- Comfort and unhindered oral hygiene procedures
- Reduced total treatment time compared to clear aligners alone
- Limited emergency visits for problematic broken brackets or poking wires
- Easier home care
- Reduced treatment cost<sup>8,9</sup>

### Fixed Appliance With Clear Aligners

The most frequent hybrid aligner therapy involves combining lower full-arch labial appliances with upper clear aligners (Fig. 1). This procedure is often done on an adult patient with a deep overbite and an extreme Spee lower curve, particularly if mandibular space already exists. This patient's treatment includes a strong reverse-curve archwire to expand the bite and protrude the lower incisors, with the upper clear aligners providing the necessary occlusal protection<sup>10</sup>.

Lower labial appliance with upper clear aligners used for several months after extracting premolars or lower incisors or surgically exposing impacted teeth (Fig. 2). The patient's malocclusion is addressed with a brief period of fixed appliances to address the most challenging motions, such as translation into extraction space or significant extrusion, followed by a transition to clear aligners. This provides for predictable outcomes.<sup>11,12</sup>

Clinicians can also employ partial appliances and clear aligners in the same arch, as is usual when treating mesioangularly tipped molars. According to the literature, the accuracy of transparent aligners is inadequate to derotate canines and premolars.<sup>5</sup> Rounded teeth are the most difficult to manage with aligners (1/3 of the projected number), but upper incisors are easiest to rotate because to their wider mesiodistal width and flatter shape.<sup>4,6</sup> The hybrid technique, particularly for the most problematic teeth to derotate, includes of a fixed partial lingual appliance to improve movement predictability, fewer attachments in esthetic regions, and a limited number of clear aligners.(Fig-3) Recently, anterior lingual appliances were placed underneath full-arch clear aligners to enhance their recommended movements. (Fig. 6)<sup>9</sup>

According to published research, proclination or retroclination is clinically designed to conceal vertical movement, but pure intrusion and extrusion movement are unexpected with obvious aligners<sup>[10,11]</sup> When there is very little vertical correction, this kind of adjustment is permitted. In clear aligner therapy, the upper incisor intrusion is said to be the most difficult movement, particularly in cases of severe deep bite malocclusions.

Lower incisor proclination, as opposed to actual intrusion, may result in a bite opening of 1.5 mm.<sup>[11,12]</sup> Moreover, only 29.6% of the movements scheduled in the setup are realized at the conclusion of the clear aligner treatment due to the unpredictable nature of extrusion movement. Nonetheless, a growing body of research indicates that aligners may significantly increase incisor palatal tipping and extrusion in open bite situations. The aligners' inadequate hold on the teeth is probably the cause of the difficulties in attaining pure extrusion<sup>13</sup>.

In the event that just a small number of teeth need vertical correction, a hybrid technique using fixed partial lingual appliances with varying tube heights is used to help the intended motions. [Fig. 4]. The height differential between the teeth of interest and the neighboring teeth determines the location of the lingual tubes; hence, an exact impression is required to replicate the presence of a lingual archwire in the setup and preserve the space underneath the F22 clear aligners [Figure 4]. The aligners adhere to the CuNiTi archwires expression and fully enclose the partially fixed lingual appliances<sup>9</sup>.

### Laboratory-Fabricated Appliances

Hybrid aligner therapy utilizes laboratory-made devices alongside fixed appliances to address various orthodontic needs. These devices, such as banded appliances like rapid palatal expanders, fixed functional appliances like the Herbst and MARA, and distalizers, are commonly employed prior to clear aligner use as part of a comprehensive treatment plan for adolescents with skeletal issues. For instance, the MARA offers a more reliable option compared to the mandibular advancement feature in Invisalign<sup>11,14,15</sup>.

During clear aligner treatment, boneborne expanders(fig 5) and distalizers with bondable pads are frequently utilized. The distalizing appliance are the Carriere 3D Motion Appliance<sup>16</sup>, the Horseshoe Jet<sup>18</sup>, and the Beneslider<sup>17</sup> (fig 6). These appliances can either be used simultaneously with clear aligners in the opposing arch or placed underneath aligners in the same arch to aid in moving posterior teeth.

## **Auxiliaries**

Clinicians can also take advantage of auxiliaries, such as miniscrews and bondable buttons, during clear aligner treatment. The use of miniscrew anchorage to extrude impacted upper canine, protraction, distalization, intrusion, extrusion<sup>19</sup>.

## **II. Discussion**

Defining hybrid aligner treatment can be tricky as not all applications of fixed appliances fall under this category. Instances such as transitioning to fixed appliances due to noncompliance, using an expander before clear aligner treatment, or attaching buttons for elastics shouldn't be classified as hybrid aligner treatment. The essence of hybrid aligner treatment lies in the planned integration of fixed components with clear aligners to achieve dental or skeletal movements that aligners alone may not reliably accomplish.

Research over the past 15 years has consistently shown clear aligners to be less dependable for specific tooth movements, like lower incisor intrusion, canine and premolar rotations, and certain space corrections. Despite technological advancements, these limitations persist. Therefore, the primary aim of combining fixed appliances with clear aligners is to address these challenges. While clear aligners are renowned for their esthetic benefits, they also serve patients with various oral conditions or functional issues, making them a versatile treatment option<sup>20-24</sup>.

Hybrid mechanics allow orthodontists to offer a form of clear aligner therapy to patients regardless of the complexity of their malocclusion or oral health status. Nevertheless, critics argue that resorting to fixed appliances signifies a failure in treatment. These criticisms often stem from misleading marketing claims suggesting clear aligners could completely replace traditional braces. However, the integration of fixed appliances and clear aligners has expanded orthodontists' treatment options, enabling them to effectively address a wider range of complex malocclusions.

## **III. Conclusion**

The hybrid aligners alongside partial fixed lingual appliances represents a compelling and innovative approach within the realm of orthodontic treatment. This combination harnesses the strengths of both modalities, leveraging the flexibility and discretion of clear aligners while also capitalizing on the precision and control afforded by fixed lingual appliances. By strategically deploying these tools, clinicians can address specific cases characterized by challenging or unpredictable tooth movements, all while prioritizing esthetic considerations.

One of the most notable advantages of this hybrid approach is its ability to streamline treatment protocols, effectively reducing overall treatment time without imposing a significant financial burden on patients. This efficiency is particularly valuable in today's fast-paced world, where individuals often seek orthodontic interventions that deliver results in a timely manner. Furthermore, by minimizing the duration of treatment, this approach can enhance patient satisfaction and compliance, contributing to a more positive overall experience.

Moreover, the hybrid aligner-fixed appliance strategy underscores the importance of personalized treatment planning, with clinicians tailoring their approach to the unique needs and goals of each patient. Through careful assessment and meticulous case selection, practitioners can identify situations where this combined modality is most appropriate, ensuring optimal outcomes and patient satisfaction.

In essence, the hybrid aligners association with fixed appliance therapy represents a synergistic combination of cutting-edge technology and clinical expertise. By harnessing the complementary strengths of each component, this approach empowers orthodontists to achieve remarkable results in cases that may have previously posed challenges. As the field of orthodontics continues to evolve, the integration of hybrid approaches such as this promises to reshape the landscape of modern orthodontic care, offering patients enhanced esthetics, efficiency, and overall treatment experience.

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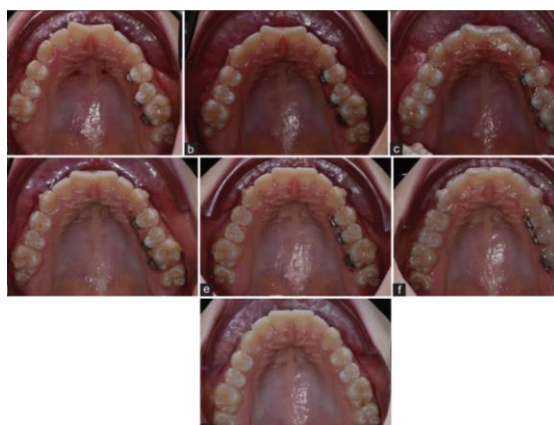
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**Fig 1 - Lower Full-Arch Labial Appliance For Use With Upper Clear Aligners.**



**Fig.2 Extrusion Of Impacted Lower Left Canine**



**Fig 3 - Rotations Correction With Lingual Tubes Placed On The Rotated Teeth And On The Adjacent Teeth**



**Fig 4 - Vertical Correction With Lingual Tube And Clear Aligner For Anterior Open Bite Correction.**



**Fig 5-Boneborne Expander Used With Clear Aligners.**



**Fig 6- Beneslider With Bondable Pads Used With Clear Aligners**



**Fig 7 Miniscrew Used With Aligners For Unilateral Distalization**