

## Has aligner redefined the orthodontic rule book?

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The field of orthodontics has seen a lot of development and changes ever since its origin of more than 2,000 years. As we trace the evolution of the orthodontic appliance over the last 100 years, there has been a distinct shift toward orthodontic appliance that is more aesthetic, less visible and more convenient to use.<sup>[1]</sup> Here comes the role of clear aligners which originated from the tooth positioner introduced by Kesling in 1946,<sup>[1]</sup> fabricated by thermoplastic material moulding technology and, designed for minor tooth movements during the finishing stages of orthodontic treatment. With the increase in the number of adult patients seeking orthodontic treatment, and the focus of the modern society shifting towards appearance and convenience, the clear aligner therapy has boomed since its introduction in 1998.

But in the name of progress, are we disregarding the time tested, slowly evolved fixed orthodontic appliance for the clear aligner therapy which evolved from a mere retainer, while forgetting all the old concepts that it violates?

It is high time we give a serious thought to it.

In the past 20 years, the focus of new concepts in orthodontic treatment and philosophy seems to have changed, on faster, convenient and aesthetic treatment but not always necessarily better!

The orthodontic goals include - quality diagnosis, treatment planning and post treatment stability. The goal of orthodontic treatment has always been patient oriented, rather than profit oriented.

So, to satiate the thirst for aesthetic appearance and convenience, has the old principles of orthodontics found

a tough competition in the form of clear aligner therapy evolved from a mere retainer?

Where are we today? and where are we heading to?

There are various factors for a successful and stable treatment which remain unexplained in aligner therapy.

To discuss a few as given below-

Proper diagnosis is the first step in any successful treatment planning. In the orthodontic literature, the importance of taking diagnostic records, analysing them, learning and treating the aetiology of the malocclusion, and accordingly planning the treatment has been stated as the basics of orthodontic treatment.<sup>[2-4]</sup> However, the importance of facial profile, arch form, the role of the various cephalometric values in treatment planning seems to have been downplayed, and finds little relevance or mention in the clear aligner therapy.

Cephalometric analyses<sup>[5]</sup> presented an objective method of studying underlying skeletal factors for malocclusion and applying it in our treatment planning. But, suddenly, the importance of all this seems to have vanished. Is it right to stop considering their importance in our treatment planning?

Reidel stated, in the ninth point of the theorems of retention, that arch form, particularly in the mandibular arch, should not be altered by appliance therapy for stability concerns. Inter-canine and intermolar widths tend to relapse during the post-retention period, especially when expanded during treatment.<sup>[6-9]</sup> Schulhof et al.<sup>[10]</sup> indicated that a patient with a brachyfacial pattern will have a wider arch than one of the

dolichofacial type. This philosophy seems to be absent in the treatment protocol of aligner technology. Is it right to consider expansion as aligner recommends in its treatment protocol,<sup>[1]</sup> as a way of gaining space in all cases- mild or moderate malocclusion with no consideration to the patient's arch form or facial form or the stability of the inter canine width?

The current orthodontic concept of an optimal force is based on the theory that a force of a specific magnitude and duration can provide the maximum pace of tooth movement without causing tissue damage.<sup>[11,12]</sup> With the clear aligner system, tooth movement is dependent on distance rather than force, as it is with fixed appliance techniques. It is impossible to know exactly what forces are caused by continuous arch mechanics with fixed appliances due to static restrictions, but material properties and stress/strain relationships of orthodontic wires and springs are well understood.<sup>[3]</sup> There is no literature on the force magnitude induced by aligner therapy, despite the fact that both fixed appliances and clear aligners can shift teeth to clinically acceptable positions.

Treatment in the fixed orthodontic therapy follows a definitive pattern of wire sequencing, which is executed either following the principles of change in modulus of elasticity, or change in cross-section of wire, or a combination of both. However, the clear aligner therapy has chosen to turn a blind eye to all these principles and their application in treatment.

Wire changes are normally recommended every 4 to 6 weeks with fixed orthodontic appliances. Even when orthodontic pressures are optimal, some alveolar bone resorption will occur. Undermining resorption takes 7-14 days, with periodontal ligament (PDL) regeneration and repair taking the same amount of time. When an appliance is activated too frequently, it might cause harm to the teeth or bone by speeding up the healing process.<sup>[3,13]</sup> It's possible that the aligner system's 2-week aligner interval is too short, resulting in poor bone

growth and greater relapse. Furthermore, there is no evidence to back up the 2-week interval guideline.<sup>[14]</sup>

Quite a number of studies have highlighted the inconsistency of the treatment effects of aligners- tipping in place of bodily movement, 45-50 % accuracy in the desired treatment plan, more tendency of relapse compared to fixed orthodontic appliance, difficulty in obtaining proper occlusal contacts, high need of patient compliance, etc.<sup>[15,16]</sup>

Still, the clear aligner therapy continues to be promoted in the orthodontic market as an established replacement to fixed orthodontic appliances. All this leads me to wonder- are we really progressing or regressing? Where has all the literary knowledge of orthodontics that we have accumulated over the years gone- tip, torque, optimum force, especially the conversion to fixed appliance from removable appliance due to reasons such as patient compliance, effectiveness, etc.?

According to orthodontic literature, removable orthodontic appliances were introduced to the world in 1728. Their main disadvantage was high need of patient cooperation, which led to the evolution of fixed orthodontic appliances. Since its introduction, the efficiency of the fixed appliances in producing the desired tooth movement was challenged, counter challenged, with circumstantial evidence and what not. But still, it was universally accepted. The journey was not smooth but it survived against all odds with 98% of patient compliance till date. This was possible through years of research and contributions of great names- Andrew, Proffit, Graber, Begg, Bennett, McLaughlin, Mulligan, and many more others. But, since its introduction in 1998, Invisalign or the clear aligner therapy seems to have effectively obscured the 150 years of slow evolution of fixed orthodontic appliance.

Is it a journey well completed? Are we back to square one? From removable appliance to fixed appliances and back to removable again, in the form of aligners. Basically, what is an aligner? A removable appliance.

So, is this progressive evolution or is its mere marketing gimmicks?

Probably, it is not hard to understand. The brand value of the technique and its lucrative market share created by its massive publicity has forced all the stake holders to be mum on all these relevant, well proven orthodontic facts which only fixed appliances can deliver. Surprisingly, the company's own statement of 50% accuracy of this technique in achieving the desired tooth movements is also being overlooked due to the high cost and high gains involved for this treatment. However, all this could not stop me from questioning- where are we heading towards?

Has humanity really taken a back seat? It is high time we wake up and rise for our own survival and well-being.

Lastly, a question arises in my mind. In Angle's era, people who were good wire benders were considered to be good orthodontists. Likewise, in Andrew's era, good orthodontists were the ones who bonded brackets well. Now, in today's technology focused era of clear aligners, are we to assume that tech-savvy people are good orthodontists?

The greatest need of the hour right now is to think and act wisely.

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**How to cite this article:** Goyal M, Kumar M, Nongthombam H. Has aligner redefined the orthodontic rule book? TMU J Dent TMUJDent2022;9(4):1-4.