



# Predictability Versus Accuracy of Various Orthodontic Tooth Movements Using Clear Aligner Therapy - A Systematic Review

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## KEYWORDS

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Accuracy,  
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## ABSTRACT:

Orthodontics has progressed on a larger scale. Initially in the 1900s, metal rings were employed to support wires that resulted in more dental caries-prone teeth. Thus, in 1960s the concept of securing a bracket directly to a tooth emerged. Later, in the early 1970s transparent or translucent non-metallic materials were introduced.<sup>1</sup> However, as the desire of almost every patient for an aesthetic appliance has been increased in recent years, and also conventional fixed mechanotherapy is considered unattractive & uncomfortable from some of the patients' perspective,<sup>2</sup> research for more comfortable and aesthetic treatment modality has led to the development of Clear Aligner therapy.<sup>3</sup>

## 1. INTRODUCTION

Orthodontics has progressed on a larger scale. Initially in the 1900s, metal rings were employed to support wires that resulted in more dental caries-prone teeth. Thus, in 1960s the concept of securing a bracket directly to a tooth emerged. Later, in the early 1970s transparent or translucent non-metallic materials were introduced.<sup>1</sup> However, as the desire of almost every patient for an aesthetic appliance has been increased in recent years, and also conventional fixed mechanotherapy is considered unattractive & uncomfortable from some of the patients' perspective,<sup>2</sup> research for more comfortable and aesthetic treatment modality has led to the development of Clear Aligner therapy.<sup>3</sup>

Kesling proposed the notion of aligning teeth with a clear thermoplastic appliance nearly half a century ago, in 1945, but it was initially limited to finishing

phase of fixed mechanotherapy treatment. Align Technology has introduced Invisalign in 1997.<sup>4,5</sup> Align Technology launched a new aligner material called SmartTrack in 2013. It has superior qualities and can exert continuous force for a longer period of time.<sup>6</sup> The treatment process employs CAD/CAM stereolithographic technology to predict treatment results and produce a set of custom aligners.<sup>4,5</sup> ClinCheck is Align Technology's patented program that predicts the sequence of tooth movement in terms of time required and amount of correction accomplished.<sup>7</sup>

It is a removable, thermoplastic polyurethane material. It was originally advised only for mild malocclusion corrections. The main disadvantage of Clear Aligner therapy was its questionable efficiency in treating complex malocclusions.<sup>8</sup> As a result, this treatment method drew the attention of many researchers around the world and is constantly



developing in a variety of ways, including different attachment designs, newer materials and newer auxiliary tools such as "Precision Cuts" and "Power Ridges".<sup>3,5</sup> These enhancements were designed with the goal of enabling advanced biomechanics and broadening the scope of Clear Aligner therapy.<sup>9</sup>

Various studies have shown that the disposition, form, size, and number of attachments have a major impact on the efficiency of orthodontic tooth movement.<sup>2,3</sup> Patient compliance and aligner retention are also important aspects. The initial attachments were ellipsoid in shape, but they were eventually replaced with sharper and heavier conventional attachments such as horizontal rectangular, vertical rectangular, and beveled for better force delivery & anchorage. The Align Technology has designed smaller optimized attachments specifically for rotation  $>5^\circ$  or extrusion  $>0.5\text{mm}$ .<sup>10</sup>

The quality of orthodontic tooth movement with Clear aligner therapy depends upon number of aspects, including virtual treatment plan, number, type, design & position of attachment, amount & site of interproximal reduction, staging of orthodontic tooth movement, and most importantly operator's understanding of aligner biomechanics.<sup>1</sup> When compared to traditional fixed mechanotherapy, reduction of overall treatment timing and chair side time with aligner therapy is still debatable topic. Each aligner is designed to shift a single tooth or a small group of teeth by 0.25-0.33 mm every 14 days.<sup>4</sup> According to the Invisalign producers, bicuspid can derotate up to  $50^\circ$  and the root movement of the upper central incisor can be up to 4mm. Still the clinical potency of Clear Aligner therapy is debatable.<sup>11</sup> There are very few properly designed systematic review evaluations on aligners, but the ones that exist compare fixed mechanotherapy with clear aligners therapy. Some articles determine the use of Clear Aligners for Non extraction mild to moderate cases in Non growing patients.<sup>8</sup> Orthodontists report 70-80% midcourse correction in patients receiving Clear Aligner therapy, whereas Align technology claims just 20-30% midcourse correction or refinement.<sup>4,11</sup> Some authors have claimed that

Fixed Mechanotherapy surpasses Clear Aligner therapy in terms of expansion results.<sup>6</sup>

With the addition of attachments and precision cuts in the latest version of the Clear Aligners, it is evident that the previously noted shortcomings have been resolved.<sup>8</sup> Additionally; there haven't been any new systematic reviews on the accuracy of clear aligners in achieving the anticipated movement of teeth. Thus, it becomes necessary for a researcher to evaluate recent database as a part of advanced research on Clear Aligner therapy for assessment of predictability and accuracy of different orthodontic tooth movements as well as the effect of attachments & interproximal reduction on them.

## 2. AIMS AND OBJECTIVES

**Aim:** To evaluate the amount of accuracy achieved for initially predicted various orthodontic tooth movements using Clear Aligner therapy.

This systematic review is undertaken to answer the following questions:

1. Are the initially predicted orthodontic tooth movements accurately achieved using Clear Aligner therapy?
2. What is the effect of number, size, shape, position & type of attachments for accurately achieving various orthodontic tooth movements?
3. What is the effect of interproximal reduction for accurately achieving various orthodontic tooth movements?

## 3. METHODOLOGY

**Table-I**

Search Strategy Score	
MeSH Term <sup>a</sup>	Search Results
Orthodontic tooth movement, Clear Aligners	22,732
Orthodontic tooth movement, Invisalign	6,652
Orthodontic tooth movement, Clear Aligners, Predictability	2,371
Orthodontic tooth movement,	19,839



Clear Aligners, Accuracy	
Orthodontic tooth movement, Clear Aligners, Predictability, Accuracy	10,365

a-MeSH indicates Medical Subject Headings

The present systematic review was prepared as per the guidelines of the Cochrane Handbook for Systematic Reviews for interventions.<sup>20</sup> All the studies related to predictability and accuracy of various orthodontic tooth movements using clear aligner therapy were thoroughly screened through literature survey conducted by search engines like PubMed, Google Scholar and Science Direct. The survey covered the period till April 2024 using the Medical Subject Heading (MeSH) terms like “Orthodontic tooth movement” which was crossed with “Clear Aligners” and “Orthodontic tooth movement” which was crossed with “Invisalign”, “Orthodontic tooth movement” which was crossed with “Clear Aligners” & “Predictability”, “Orthodontic tooth movement” which was crossed with “Clear Aligners” & “Accuracy”, “Orthodontic tooth movements” which was crossed with “Clear Aligners”, “Predictability” & “Accuracy”

#### Eligibility criteria for study selection

##### ➤ Types of Studies:

Randomized Clinical Trials, Prospective and Retrospective studies for Predictability and Accuracy of various orthodontic tooth movement by Clear Aligner therapy.

##### ➤ Participants:

Patients utilizing Clear Aligner for the treatment protocol. No restriction was set for number of participants.

##### ➤ Types of Intervention:

Active intervention: Predictability and Accuracy determined for orthodontic tooth movement treated with clear aligners.

Control: Exclusive for determining Predictability and Accuracy of orthodontic tooth movement for various tooth treated with clear aligners

##### ➤ Outcome Measures:

Does the predicted amount of orthodontic tooth movement is accurately achieved by clear aligner therapy for various tooth.

#### 4. DATA COLLECTION & ANALYSIS

According to the recommendations, data is collected on the following items: year of publication, sample size, study design, treatment, predictability and accuracy rate, and authors’ conclusion. In addition, to document the methodological soundness of each article, a quality evaluation is done with respect to specific domains like confounding bias, selection bias, bias in measurement of intervention, loss to follow-up/missing data, detection bias and reporting bias. By using above domains, judgment regarding risk of bias for each study is assessed. Present of bias YES suggest high risk of bias and NO suggest low risk of bias.

##### Quality assessment of the articles in the study

The quality of each article was scored by using an adapted version of three methods previously used by Fudalej and Antoszewska,<sup>18</sup> Cozza et al,<sup>19</sup>. The following characteristics were evaluated: Study design, Sample size, Sample description, Error analysis and Statistical Analysis. Each characteristic received a score according to the criteria described in Table II. The quality of each study was categorized as High (6-8 points), Medium (3-5 points) or Low (0-2 points). The data from the selected articles was evaluated for the accuracy of previously predicted tooth movement along with determining the most and the least accurately achieved tooth movements.

Table-II

Methodological quality scoring protocol (maximum score: 8 points)	
Study Design	3 points: randomized clinical trial 2 points: if randomization process is not well described, or if it was a controlled prospective study 1 point: uncontrolled prospective study 0 point: retrospective study or not



	mentioned	Analysis	0 point: error analysis value not cited, or error analysis not Performed
Sample Size	1 point: larger than or equal to 15 subjects or prior estimate of sample size 0 point: less than 15 subjects and no prior estimate of sample size	Statistical Analysis	2 points: adequate 1 point: partially adequate 0 point: no statistical tests conducted
Sample Description	1 points: description of predictability and accuracy for all tooth ) 0 point: only few tooth involved		
Error	1 point: error analysis value cited		

**Table-III**

Authors & year of publication	Study Design	Sample Size	Sample Description	Error Analysis	Statistical Analysis	Total Score
Tommaso Castroflorio et al (2023)	2	1	1	0	2	6
Ting Jiang et al (2021)	0	1	1	0	2	4
Neal D Kravitz et al (2009)	2	1	0	0	2	5
Nada Haouili et al (2020)	2	1	1	1	2	7
Orfeas Charalampakis et al (2018)	0	1	1	0	2	4
Luca Lombardo et al (2017)	0	1	1	1	2	5
Thorsten Grunheid et al (2017)	0	1	1	0	2	4
Neal Kravitz et al (2008)	2	1	0	0	2	5
Bilello et al (2022)	2	0	1	0	2	5

**Table-IV**

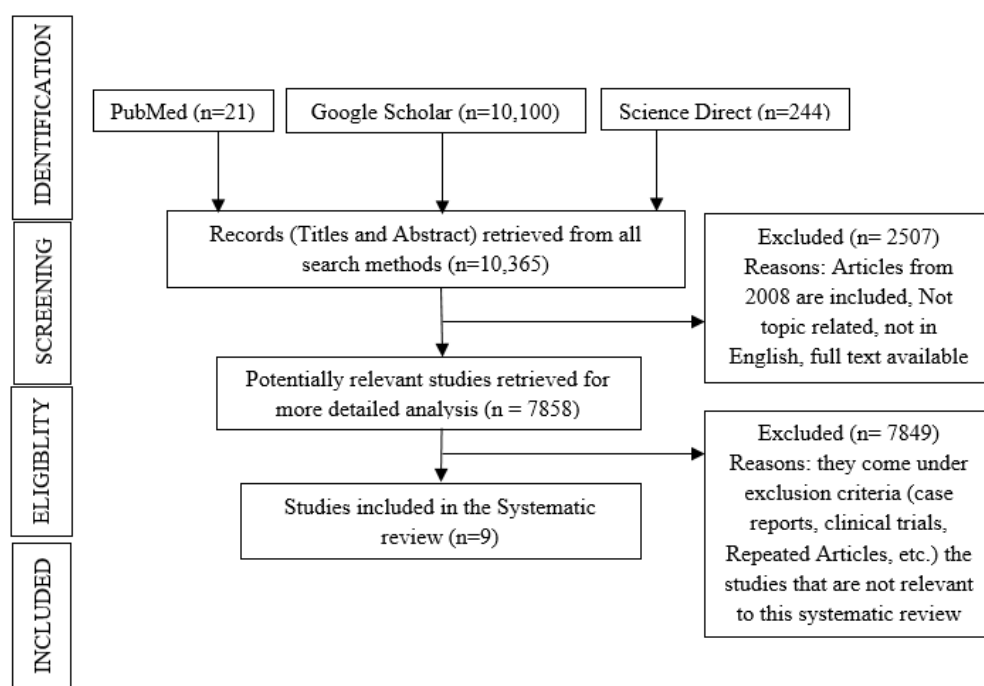
Sr. No	Author and of Year study	Study Design	Sample size	Tooth involved	Assessed Parameters
1	Tommaso Castroflorio et al (2023)	Prospective study	79 patients	All teeth except 3 <sup>rd</sup> molars	Angulation, Inclination, Rotation, Bucco-lingual movement, Mesio-distal movement, Vertical movement
2	Ting Jiang et al (2021)	Retrospective study	69 patients	Maxillary and Mandibular Incisors	Torque, tipping, rotation and translation
3	Neal D Kravitz et al	Prospective study	37 patients	Maxillary and Mandibular Anterior	Expansion, Constriction, Intrusion, Extrusion, Mesiodistal



	(2009)			teeth	tip, Labiolingual tip and Rotation.
4	Nada Haouili et al (2020)	Prospective study	38 patients	All teeth except 3 <sup>rd</sup> molars	Mesial-distal crown tip, Buccal-lingual crown tip, extrusion, intrusion, and mesial-distal rotation
5	Orfeas Charalampakis et al (2018)	Retrospective study	20 patients	All teeth except 3 <sup>rd</sup> molars	Vertical, horizontal, rotational movements and transverse width
6	Luca Lombardo et al (2017)	Retrospective study	16 patients	All teeth except 3 <sup>rd</sup> molars	Rotation, Mesiodistal tip, Vestibulolingual tip
7	Thorsten Grunheid et al (2017)	Retrospective study	30 patients	All teeth except 3 <sup>rd</sup> molars	Mesial- distal, facial- lingual, and occlusal-gingival, tip, torque and rotation for all tooth
8	Neal Kravitz et al (2008)	Prospective study	31 patients	Maxillary and Mandibular Canines	Canine rotation
9	Bilello et al (2022)	Prospective study	10 patients	All teeth except 3 <sup>rd</sup> molars `	Vestibulolingual tipping, mesiodistal tipping, rotation and vertical displacement.

## 5. STUDY CHARACTERISTICS

Fig. 1 Prisma Flow-chart



## 6. RESULTS

When predictability versus accuracy of various



orthodontic tooth movements by clear aligner therapy was searched on different search engines, we found 10,365 articles. Only studies from 2008 and full text articles were included. Case reports, case series, literature review, in vitro studies were excluded. Finally based on the inclusion and exclusion criteria only nine articles qualified. From which five are prospective studies<sup>1,4,7,16,21</sup> and four are retrospective studies<sup>6,11,12,15</sup>.

#### ✓ Study Design and treatment modalities

**Table-V**

Author & Year of study	Study design	Sample size	Most Accurate movement	Least Accurate movement
Tommaso Castroflorio et al (2023)	Prospective study	79 patients	Inclination	Bucco-lingual translation
Ting Jiang et al (2021)	Retrospective study	69 patients	Pure tipping movement for incisors	Torque
Neal D Kravitz et al (2009)	Prospective study	37 patients	Lingual constriction of Mandibular Canine	Extrusion of Incisors
Nada Haouili et al (2020)	Prospective study	38 patients	Labial Tipping of Maxillary Incisor	Mandibular Molar Rotation
Orfeas Charalampakis et al (2018)	Retrospective study	20 patients	Horizontal movements (Bucco-lingual)	Incisors Intrusion & Canines Rotation
Luca Lombardo et al (2017)	Retrospective study	16 patients	Bucco-lingual Tipping	Mandibular Premolar Rotation
Thorsten Grunheid et al (2017)	Retrospective study	30 patients	Torque	Rotation
Bilello et al (2022)	Prospective study	10 patients	Vestibulolingual tipping	Rotation for mandibular 1 <sup>st</sup> premolar

**Table-VI**

Author & Year of study	Study design	Sample size	Mean accuracy
Tommaso Castroflorio et al (2023)	Prospective study	79 patients	—
Ting Jiang et al (2021)	Retrospective study	69 patients	55.5%
Neal D Kravitz et al (2009)	Prospective study	37 patients	41%

Five prospective studies<sup>1,4,7,16,21</sup> and Four retrospective studies<sup>6,11,12,15</sup> are included in this systematic review. The treatment modalities include the various orthodontic tooth movements like torquing, tipping, intrusion, extrusion, bodily movement & rotation. Certain studies identified effect of attachments on various orthodontic tooth movements.

#### ✓ Age group

The age group included in these studies were from 14-44 years<sup>1,4,6,9,11,12,17,21</sup>. Few studies showed just the mean age of 18years and above<sup>16</sup>. One article<sup>7</sup> showed age extending more than 44 years.



Nada Haouili et al (2020)	Prospective study	38 patients	50%
Orfeas Charalampakis et al (2018)	Retrospective study	20 patients	73%
Luca Lombardo et al (2017)	Retrospective study	16 patients	73.6%
Thorsten Grunheid et al (2017)	Retrospective study	30 patients	–
Neal Kravitz et al (2008)	Prospective study	31 patients	35.8%
Bilello et al (2022)	Prospective study	10 patients	90.3%

The precision of achieved tooth movements never approached 100%, concluding differences between intended and actual outcomes. 4,7 Within maxillary and mandibular arches various tooth movement accuracy often depends on specific tooth.6

Compared to labial crown tip, maxillary lateral incisors showed greater lingual crown tip.<sup>4</sup> Mesial rotation of maxillary canine showed more precision compared to distal rotation.<sup>21</sup> Extrusion of incisors; specifically maxillary central incisors; showed more accuracy.<sup>6,21</sup> Mandibular canines showed reduced accuracy for derotation amongst incisors, canines and premolars of mandibular arch.<sup>12</sup>

Research by **Kravitz et al.**<sup>4</sup> showed difficulty was encountered while producing rotational movements greater than 15°. **Tian Jiang et al.**<sup>11</sup> found maxillary arch shows greater divergence. **Nada Haouili et al.**<sup>21</sup> found negligible accuracy difference between maxillary and mandibular teeth. Thus, contradicting result was achieved while evaluating for orthodontic tooth movement in intermaxillary arches. **Orfeas Charalampakis et al.**<sup>6</sup> stated vertical movements were more precisely achieved in maxilla compared to mandible.

In a study by **Kravitz et al.**<sup>16</sup>, correcting rotation greater than 5°, higher accuracy was achieved by interproximal reduction. No significant accuracy was found with the use of attachment. Whereas **Tommaso Castroflorio et al.**<sup>1</sup> discovered that using optimized attachments resulted in more effective tooth movement.

## 7. DISCUSSION

Orthodontic treatment aims of providing an adequate functional and aesthetic occlusion by carrying out appropriate tooth movements. The

interest of adults' patients towards the orthodontic treatment with more esthetic concern has caused the evolution of Clear Aligner Therapy. It is crucial for orthodontist to know about various orthodontic movement provided by aligners to accomplish desired treatment results.

In this systematic review, initially 10,365 articles were obtained from search related to predictability and accuracy of various orthodontic tooth movements by clear aligner therapy on various research platforms. Based on the inclusion and exclusion criteria only nine articles were reviewed in the end.

It was evident from this systematic review that Clear aligners do not provide complete accurate result to the formerly predicted movement. Depending on the tooth movement evaluated, use of attachments & use of interproximal reduction; mean accuracy achieved by clear aligner therapy ranged from 35-90%.

It was found that long term wear of one set of aligner may improve the accuracy achieved for various orthodontic tooth movements. According to **Lombardo et al.**<sup>13</sup> this could be due to excessive masticatory muscle impact. After comparing Active and Passive aligners **Rosaria Bucci et al.**<sup>9</sup> concluded that, after 10days of aligner wear, the passive aligners experienced more deformity due to masticatory muscle impact.

**Tommaso Castroflorio et al.**<sup>1</sup> & **Kravitz et al.**<sup>4</sup> stated that rotation of any tooth has a describable variation between desired and the achieved position. Interestingly, the first molar's & maxillary central incisors showed remarkable accuracy, while maxillary lateral incisors, canines, and premolars



were more challenging to regulate in terms of rotation. **Lombardo et al.**<sup>12</sup> also found that highest accuracy was achieved for mandibular molar followed by maxillary incisors and mandibular premolars. **Lombardo et al.**<sup>13</sup> discovered that canine rotation was the most inaccurately achieved tooth movement.

The rotational movement for the rounded tooth provided the least accuracy. **Grunheid et al.**<sup>15</sup> reported that anatomically rounder morphology, wider and longer roots; providing bigger surface area; requires more effort for orthodontic correction, resulting in restricted movement. **Kravitz et al.**<sup>16</sup> suggested lack of interproximal undercuts within aligners, causing slippage during derotation could be one of the reasons for least accuracy. **Kravitz et al.**<sup>4</sup> & **Orfeas Charalampakis et al.**<sup>6</sup> supported the concept of Overcorrection for derotation. Overcorrection has an impact on the accuracy percentage for specific tooth movements. **Kravitz et al.**<sup>4</sup> also stated that overcorrection is beneficial when rotation is greater than 15°. **Kravitz et al.**<sup>16</sup> reported that overcorrection upto 10% could be beneficial. Excessive overcorrection may not enhance rotational precision. Vibration therapy incorporated by **Lombardo et al.**<sup>13</sup> also enhanced rotational accuracy but only for Maxillary and mandibular incisors. **Bilello et al.**<sup>7</sup> suggested that while dealing with incomplete rotation one should always prefer refinement scans, interproximal reduction and attachment use.

The Bucco lingual torque was the most accurately achieved tooth movement through Clear aligner therapy. Contradicting this **Orfeas Charalampakis et al.**<sup>6</sup> stated that it is difficult to manage buccolingual inclination, occlusal contacts, occlusal connection, overjet, and overbite using clear aligner therapy compared to fixed mechanotherapy. **Tian Jiang et al.**<sup>11</sup> stated that due to restricted root movement on the labial side, the Labial movement is achieved more accurately than lingual movement. Thus, relieving mandibular anterior crowding through labial expansion using clear aligners demonstrate superior accuracy. Whereas, **Kravitz et al.**<sup>4</sup> stated that lingual constriction showed better accuracy than labial expansion. Mandibular incisor and canine retraction were twice as accurate as

expansion while relieving mandibular anterior crowding. Proclination of maxillary central incisors may require overcorrection, compared to Retroclination. **Tommaso Castroflorio et al.**<sup>1</sup> & **Lombardo et al.**<sup>12</sup> found bucco-lingual movement of the maxillary second molar to be easily achieved compared to all the other movements of various tooth. **Bilello et al.**<sup>7</sup> stated that aligner mechanics rely on pressure on the tooth crown from the deformed aligner surface, implying vestibulolingual tipping as a more precise movement. **Grunheid et al.**<sup>15</sup> reported that Maxillary & mandibular molars have higher crown torque during expansion, due to aligner restrictions around the cortical plate.

**Kravitz et al.**<sup>4</sup> & **Lombardo et al.**<sup>12</sup> found that Maxillary and mandibular lateral incisors demonstrated the most accurate mesiodistal movement while maxillary canines were less reliable due to obstacle created by larger roots during tooth movement.

Regarding vertical movements **Orfeas Charalampakis et al.**<sup>6</sup> stated that masticatory forces benefit Aligner-induced intrusion with reactionary displacement of anchorage teeth, providing better anterior intrusion. **Kravitz et al.**<sup>4</sup> stated Aligners achieve little anterior tooth intrusion for central incisors. Concept of "relative extrusion" was discovered by **Hauoili et al.**<sup>21</sup> It combines extrusion with more predictable movements to achieve superior result. Maxillary incisor extrusion showed better accuracy than molar extrusion. Thus, Invisalign therapy may excel in bite closure (open bite) conditions, with greater accuracy in incisor extrusion and molar intrusion. Compared to fixed appliances only half amount of the bite opening is accomplished, preventing deep bite repair and demanding hybrid mechanics. In terms of attachments, studies have appreciated that use of different attachment may or may not affect the desired tooth movement. **Tommaso Castroflorio et al.**<sup>1</sup> found that the present designs were not effectively helpful for tooth movements. **Ferlias et al.**<sup>2</sup> conducted an in vitro investigation to find the efficacy of various attachments for derotating upper second premolars. Vertical rectangular attachments permitted positive derotation movements for both mesial and distal rotations. Certain drawbacks were



encountered using attachment within aligner therapy, which includes intrusive force, tipping, and torque to the subjective tooth other than derotational force. In contrast, without attachments aligner therapy resulted in minimum side effects but with least derotation ability. Attachments tend to cause buccal root torque with lingual force during distal rotational force & lingual root torque with buccal force during mesial rotational force.

**Kravitz et al.**<sup>16</sup> stated that there was no significant difference in rotational accuracy between the attachment-only, interproximal reduction-only, and no attachment groups. However, **Tommaso Castroflorio et al.**<sup>1</sup> reported that interproximal reduction has a positive approach towards the various tooth movements when utilized within aligner therapy.

**Groody et al.**<sup>10</sup> compared horizontal and optimised attachments for maxillary lateral incisor extrusion accuracy. Horizontal types of attachment comprised non-beveled, incisally bevelled, and gingivally bevelled designs. They discovered that horizontal attachments resulted in higher extrusion rate compared to optimised attachments. Regardless of attachment mechanism, the average extrusion rate did not exceed 73%. Similarly **Hauoili et al.**<sup>21</sup> in a study reported an inconsistent results regarding maxillary incisor extrusion accuracy even with the use of attachments. Only 50% average accuracy is achieved in aligner-based tooth movement.

**Tian Jiang et al.**<sup>11</sup> & **Grunheid et al.**<sup>15</sup> suggested biomechanical similarities of aligner therapy to other orthodontic mechanotherapy. Aligner material has superior flexibility similar to the heat activated NiTi wires used in fixed mechanotherapy & it provides light force required for the tooth movement. **Orfeas Charalampakis et al.**<sup>6</sup> stated that Invisalign therapy to be not as effective as fixed mechanotherapy due to increased chances of relapse.

## 8. CONCLUSION

Clear Aligners are most recent esthetic perspective of orthodontic mechanotherapy. The biomechanics of Clear Aligner therapy is quite different from the biomechanics of fixed mechanotherapy. Thus, for

treating various malocclusions with Clear aligner therapy & to achieve accurate treatment results, the knowledge of aligner biomechanics amongst orthodontist becomes a research question. The present systematic review provides the information regarding the predictability and actual accuracy of orthodontic tooth movement achieved with Clear Aligner therapy.

The present systematic review concluded that accuracy of tooth movement achieved differs depending on movements required & type of tooth involved. In general, majority of studies provided the Bucco-lingual tipping to be the most accurate tooth movement, whereas rotation; especially for the rounded tooth like canine and premolars; be the least accurately achieved tooth movement. Intrusion was more accurately achieved tooth movement compared to the extrusion. The tipping or torquing is more achievable tooth movement compared to translation. Further, certain studies specified the use of interproximal reduction and attachments can be advantageous for achieving the desired orthodontic tooth movement. In contrast few studies stated no significant difference; both statistically and clinically; with attachment use. Thus the use of attachment and its effect on accuracy of various orthodontic tooth movements is yet controversial and requires further in-depth research. There are very few researches related to Aligner wearing time and its effect on accuracy of various tooth movements; thus there is still scope for further research on the same.

The present research concludes that there is still a “gap” between predictability & actual accuracy of Orthodontic tooth movement achieved using Clear Aligner therapy that can be overcome by thorough understanding of Material Science, Aligner Biomechanics along with thorough Diagnosis & Treatment Planning.

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