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Impact of Clear Aligners on Tongue Posture and Function in Patients with Tongue Thrust: A Longitudinal Study

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KEYWORDS:

Clear Aligners, Tongue Thrust, Orthodontic Treatment, Myofunctional Habits

ABSTRACT:

Aim: This study aims to evaluate the impact of clear aligners on tongue posture and function in patients with tongue thrust

Materials and Methods: This study examined 40 patients aged 10 to 21 with various dental issues, including Anterior Open Bite and spacing problems. The patients were divided into two groups: Group 1 received combined treatment of clear aligners and myofunctional therapy, while Group 2 received only clear aligners as a control. Evaluations six and twelve months post-treatment assessed long-term effectiveness using cephalometric parameters and Peer Assessment Rating (PAR) scores. The study aimed to explore the role of clear aligners in correcting dental misalignments and improving tongue posture among those with tongue thrusting issues, providing insights into enhancing overall oral health.

Results: Group 1 (20 patients) received an integrative approach combining clear aligners with myofunctional therapy, while Group 2 (20 patients) received treatment solely with clear aligners. After six months, Group 1 had an average peer assessment score of 1.7 ± 1.2 and a cephalometric measurement of 99.4° ± 2.6, indicating positive outcomes. In comparison, Group 2 reported a higher score of 3.10 ± 1.6 and a measurement of 95.8° ± 1.5, suggesting less improvement. After 12 months, Group 1's peer assessment score slightly increased to 1.9 ± 1.5, with a cephalometric value of 97.5° ± 2.4. Meanwhile, Group 2's score rose to 4.08 ± 1.4, showing a less favourable outcome, with a cephalometric measurement of 94.3° ± 1.3. One-way ANOVA analysis across groups revealed significant differences in treatment outcomes between the two methods.

Conclusion: Combining clear aligners with orofacial myofunctional therapy (OMT) significantly improves treatment outcomes, including better stability, reduced Peer Assessment Rating (PAR) scores, and enhanced cephalometric corrections. In contrast, clear aligners alone often result in higher relapse rates due to unaddressed tongue habits.

Introduction

Clear aligners areorthodontic devices made from a transparent plastic material. These custom-made trays are designed to gradually shift and straighten teeth, offering a discreet and aesthetically pleasing alternative to traditional metal braces. Their removable nature allows for flexibility in maintenance and oral hygiene, and they should be worn for approximately 18 to 22 hours each day. Clear aligners are particularly effective for addressing various malocclusions.[1,2] The treatment

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process typically involves a series of 3D-scanned aligners that are changed sequentially, with each new tray making incremental adjustments to tooth positioning over time. Habits play a crucial role in orthodontics, as they encompass the various muscle-related functions of the mouth and face, this includes essential processes such as breathing, swallowing, and the resting position of the tongue. These habits can significantly impact tooth alignment and the development of the jaw. Therefore, correcting improper habitssuch as tongue thrusting or mouth breathing is essential.[3,4] Addressing these underlying issues not only helps to rectify existing orthodontic concerns but also aids in preventing relapses after treatment is completed. This proactive approach ensures that patients achieve stable and lasting results in their orthodontic journey.[5] The importance of proper tongue posture cannot be overstated in orthodontic treatment. Ideally, the tongue should rest against the roof of the mouth, known as the palate, which promotes optimal jaw development and proper dental alignment.[6] Conversely, incorrect tongue posture, particularly when the tongue rests low in the mouth, can lead to several complications, including mouth breathing, crowded teeth, and various jaw issues that may arise over time. Tongue thrust, also known as reversed swallow, is classified as an oral myofunctional disorder in which the tongue pushes forward against or between the teeth during swallowing or while at rest.[7,8] This behaviour can contribute to malocclusions such as open bites and it may also lead to speech difficulties like lisping or tooth misalignment. While tongue thrusting is common in infants, it becomes a cause for concern if it continues beyond the age of 5 or 6. In instances where myofunctional issues arise, it may be essential to implement interventions such as myofunctional therapy or the use of specialized orthodontic appliances to rectify the underlying problems.[9] A condition known as tongue thrust can serve not only as an indicator of existing myofunctional difficulties but can also worsen the complications associated with low tongue posture and improper oral habits. The continuous pressure exerted by the tongue against the teeth can result in significant dental misalignments over time.[10,11] One common consequence of tongue thrusting is the development of open bites,leading to functional challenges and aesthetic concerns. Furthermore, the resultant misalignment can impose additional hurdles related to speech development and jaw growth, which are critical during formative years. Given these complexities, it is imperative for orthodontic professionals to thoroughly assess and address such habits.[12] By doing so, they not only foster improved dental alignment but also support overall oral health, enhance speech clarity, and facilitate proper jaw development, ensuring that patients achieve optimal functional effectiveness in their everyday lives.[13] This study aims to evaluate the impact of clear aligners on tongue posture and function in patients with tongue thrust.

Materials and Methods

This study meticulously examined a cohort of 40 patients, ranging from 10 to 21 years of age, all presenting with distinct dental issues, including anterior open bite, anterior proclination, and various spacing problems. Patients included were having mild to moderate anterior proclination malocclusion that could be effectively managed through dental correction. Furthermore, they needed a complete set of permanent teeth to facilitate the use of aligners and must demonstrate a high level of commitmentto wear the aligners for a substantial 20 to 22 hours each day. Additionally, participants needed to be willing to incorporate myofunctional therapy techniques into their treatment regimen, which included the utilization of aligner-integrated tamers designed to enhance tongue posture and some myofunctional exercises as referred by Shah et el[14]. Patients with severe skeletal discrepancies necessitating orthognathic surgery, individuals suffering from active periodontal disease, those with poor oral hygiene practices, significant tooth extractions due to extreme overcrowding were excluded from consideration. Prior to the onset of the study, informed consent was meticulously obtained from all participants, ensuring they were fully aware of the processes involved. The participants in the study were systematically divided into two distinct groups to investigate the efficacy of different treatment methods. Group 1 consisted of 20 patients who received a comprehensive approach combining clear aligners with myofunctional therapy specifically designed to address issues associated with tongue thrusting. This innovative treatment aimed to not only correct the alignment of the teeth but also to improve tongue posture and function, addressing any underlying structural concerns. Conversely, Group 2, which also comprised 20 patients,

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received treatment with clear aligners only, thereby serving as a control group to assess the impact of the additional myofunctional therapy. To determine the long-term effectiveness and stability of these interventions, meticulous evaluations were carried out six and twelve months after the completion of the treatment. These assessments incorporated both cephalometric parametersmeasuring the relationship between dental and skeletal structuresand Peer Assessment Rating (PAR) scores, which provided invaluable insights into the aesthetic and functional outcomes of the treatments. The primary objective of this study was to thoroughly examine the capabilities of clear aligners in not only rectifying dental misalignments but also in fostering positive changes in tongue posture and function among patients suffering from tongue thrusting issues. This multifaceted approach aimed to deliver a holistic understanding of how different treatment modalities could enhance overall oral health and function.

Statistical Analysis

In this research, all statistical analyses were conducted utilising the SPSS version 31.0 software. This robust and sophisticated tool is specifically designed for statistical computing and data analysis, particularly suited for applications within the social sciences field. Its capabilities allow for comprehensive data manipulation and the execution of complex statistical tests, providing researchers with valuable insights derived from their data.

Results

To illustrate the demographic characteristics of the patients, Table 1 provides a detailed statistical analysis based on age and gender. The findings reveal that within this diverse cohort, there are 27 males and 13 females, highlighting the prevalence of this condition among different genders. Table 2 details the results from Group 1 (N=20), where participants were evaluated six months after receiving the combined treatment. The average peer assessment score for this group was 1.7 ± 1.2, indicating a generally positive reception to the comprehensive treatment approach. In addition, cephalometric measurements presented an average value of 99.4° ± 2.6, suggesting a notable improvement in both dental and skeletal relationships. Conversely, Table 3 outlines the results for Group 2 (N=20), whose patients were assessed six months following their treatment with clear aligners alone. This group recorded a higher peer assessment score of 3.10 ± 1.6, reflecting potentially lesser improvements compared to Group 1. Their cephalometric analysis demonstrated an average measurement of 95.8° ± 1.5, indicating a different level of correction than that observed in the myofunctional therapy group. As the study continued, further assessments were conducted after a 12-month period. Table 4 highlights the outcomes for Group 1 (N=20) following one year of combined treatment. The peer assessment score showed a slight increase to 1.9 ± 1.5, while the average of the cephalometric analysis recorded at 97.5° ± 2.4 indicates sustained improvements over time. In contrast, Table 5 summarizes the findings for Group 2 (N=20) after 12 months of treatment with clear aligners. The peer assessment score escalated to 4.08 ± 1.4, suggesting a less favourable outcome than that observed in Group 1. Additionally, the cephalometric analysis for this group averaged 94.3° ± 1.3, underscoring the limitations associated with exclusive use of clear aligners for this particular condition. Finally, Table 6 provides a thorough estimation across all studied groups through one-way ANOVA, offering insightful statistical analyses that help clarify the comparisons between the two treatment approaches throughout the various phases of the study, ultimately elucidating any significant differences in treatment outcomes.

Table 1: Age & gender based statistical description of contributing patients

Age Group (Yrs)	Male	Female	Total	P value
10-12	5	2	7	0.06
13-15	7	4	11	0.50
16-18	6	3	9	0.02*
19-20	5	2	7	0.80

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Up to 21years	4	2	6	0.50
Total	27	13	40	*Significant
*p<0.05 significant				

Graph 1: Patients demographic distribution and associated details

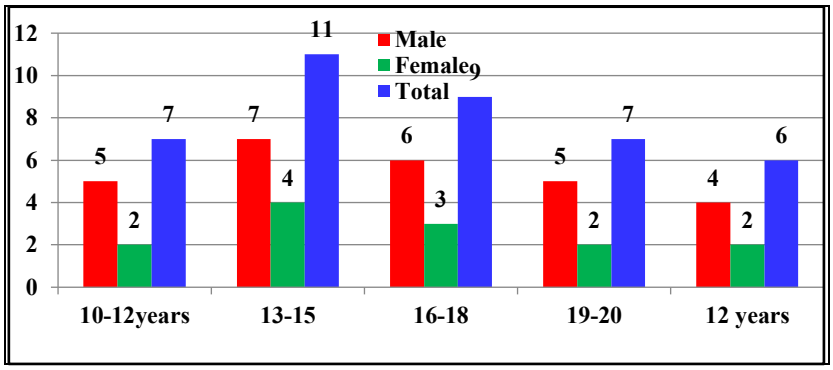

Table 2: Group 1 (N=20)Patients who received a comprehensive treatment that combined clear aligners with myofunctional therapy specifically designed to address issues related to tongue thrustingwere evaluated after six months. The Pearson Chi-Square test, a statistical method used to analyse associations between categorical variables, was applied for the analysis

Evaluating method	Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	df	p value
PAR score	1.7± 1.2	1.08	0.03	0.8	1.05	1.0	0.02*
Cephalometric analysis	99.4°±2.6	1.67	0.65	0.021	1.040	1.0	0.05
*p<0.05 significant							

Table 3: Group 2 (N=20)Patients who received a comprehensive treatment that included clear aligners only specifically designed to address issues related to tongue thrusting, were evaluated after six months. The Pearson Chi-Square test, a statistical method used to analyse associations between categorical variables, was applied for the analysis

Evaluating method	Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	df	p value
PAR score	3.10± 1.6	1.912	1.254	1.50	1.08	1.0	0.09
Cephalometric analysis	95.8°±1.5	1.718	1.912	1.34	1.67	1.0	0.06
*p<0.05 significant							

Table 4: Group 1 (N=20) Patients who received a comprehensive treatment that combined clear aligners with myofunctional therapy specifically designed to address issues related to tongue thrusting were evaluated after 12 months. The Pearson Chi-Square test, a statistical method used to analyse associations between categorical variables, was applied for the analysis

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Evaluating method	Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	Df	p value
PAR score	1.9±1.5	1.05	1.02	1.14	1.14	1.13	0.08
Cephalometric analysis	97.5°±2.4	1.03	2.16	1.22	1.05	1.10	1.02*
*p<0.05 significant							

Table 5: Group 2 (N=20) Patients who received a comprehensive treatment that included clear aligners only specifically designed to address issues related to tongue thrusting, were evaluated after 12 months. The Pearson Chi-Square test, a statistical method used to analyse associations between categorical variables, was applied for the analysis

Evaluating method	Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	Df	p value
PAR score	4.08±1.4	1.52	1.43	1.62	1.28	1.0	0.90
Cephalometric analysis	94.3°±1.3	1.88	1.51	1.98	1.54	1.0	0.02*
*p<0.05 significant							

Table 6: Estimation amongst all studied groups using one-way ANOVA

Variables	Degree of Freedom	Sum of Squares ∑	Mean Sum of Squares m∑	F	Level of Sig. (p)
Between Groups	6	2.134	2.251	1.2	0.02*
Within Groups	35	2.216	1.650	_	
Cumulative	215.13	5.234	*p<0.05 significant		

Discussion

Abu ArqubS et al[15] reviewed in their study that clear aligners represent an innovative and highly effective solution for teeth straightening, offering a discreet and comfortable alternative to the traditional metal braces that many might find unappealing. Specifically designed to straighten teeth, clear aligners are made from custom-crafted, transparent plastic trays that fit snugly over the teeth.[16] These aligners function by applying gentle, continuous pressure to the teeth, gradually nudging them into their desired positions over a comprehensive treatment period that typically ranges from 6 to 24 months, depending on individual needs and complexity of the misalignment.Weir T et al[17] included in their study thatone of the standout advantages of clear aligners is their nearly invisible appearance. This trait significantly enhances aesthetics, allowing individuals to undergo orthodontic treatment without drawing attention to their dental appliances.[18] Additionally, clear aligners offer the convenience of being removable, which simplifies daily routines such as eating and maintaining oral hygiene. Patients can easily take out the aligners during meals and for brushing and flossing, promoting better oral health throughout the treatment process.Tartaglia GM et al[19] showed in their study that the journey with clear aligners begins with a thorough consultation that

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includes a 3D scan of the patient's dental structure. This scan is essential as it allows the orthodontist to create a precise digital model of the teeth, which then enables a virtual simulation of the treatment plan.[20] Patients can review this simulated outcome, providing them with insight into how their teeth will shift over time. Regular check-ups with an orthodontist are vital during the treatment to monitor progress and make any necessary adjustments.Muro MP et al[21] reviewed in their study that while clear aligners are highly suitable for most adults and teenagers, it is important to note that they may not be appropriate for severe misalignment cases or complex orthodontic issues. In such instances, traditional braces might be more effective. In a broader context of orthodontics, myofunctional habits play a crucial role in dental and facial development. These habits encompass the patterns of muscle function associated with oral activities such as chewing, swallowing, and breathing.[22] Poor myofunctional habits, like mouth breathing or improper tongue posture, can significantly disrupt dental development, potentially leading to issues such as narrow dental arches, open bites, and crowded teeth.D'Onofrio L et al[23] reviewed in their study thateffective treatment approaches aim to correct these unhealthy habits through a combination of myofunctional exercises and the use of specialized appliances. These interventions are designed to promote proper muscle function, thereby assisting in the alignment of the teeth and overall oral structure. Establishing and maintaining healthy patterns, such as nasal breathing and appropriate positioning of the tongue at rest, are essential for ensuring long-term stability of dental corrections and preventing orthodontic relapses. Proper tongue posture is particularly vital for maintaining dental health. Kumar V et al[24] showed in their study that ideally, the tongue should rest against the roof of the mouth, a position that helps expand the palate and make room for all the teeth.[25] Conversely, poor tongue posture can lead to significant dental misalignment, which manifests as crowded teeth and can affect facial growth patterns negatively.Gurani SF et al included in their study that myofunctional therapy aims to retrain incorrect tongue resting habits and improve swallowing patterns, which is crucial for aesthetic reasons and reducing the risk of relapse after orthodontic treatment. These conditions were notably characterized by the anterior teeth in both the upper and lower jaws being positioned excessively forward. Through a thorough clinical diagnosis complemented by cephalometric analysis, it was identified that a significant number of these individuals displayed tongue thrusting habits, which were contributing factors to their dental challenges. The patients conveyed a strong desire for a treatment approach that fused modern orthodontic methods specifically, fixed orthodontic techniques employing clear aligners with myofunctional therapy aimed at addressing tongue posture.Research links poor tongue posture to temporomandibular joint (TMJ) disorders, highlighting its importance for overall health. Tongue thrusting, where the tongue extends through the teeth during swallowing or speaking, can lead to issues such as open-mouth posture and speech difficulties.[26] While normal in infants, it becomes concerning if it persists beyond age 5 or 6. Treatment typically includes myofunctional therapy, orthodontic appliances, and speech therapy. Addressing tongue thrusting and poor tongue posture is vital for optimal oral health and proper facial development, helping to prevent potential problems later in life.

Conclusion

The findings concluded that the combination of clear aligners and orofacial myofunctional therapy (OMT) for patients with tongue thrust significantly improves treatment outcomes. Specifically, this combined approach demonstrated enhanced stability in results, greater reductions in Peer Assessment Rating (PAR) scores, and superior cephalometric correctionsillustrated by increased contact between the tongue and palate and improvements in overbite. In contrast, the use of clear aligners alone often leads to higher rates of relapse, primarily because the underlying tongue habits remain unaddressed. Further research is necessary to deepen the understanding of these interactions and their implications for treatment.

References

1. Park JH. Clear aligners in North America: Where are we? *Am J Orthod Dentofacial Orthop.* 2026;169(2):131–132.
2. Porporatti AL, Schroder ÂGD, Kuczera MS, de Barros AB, Boucher Y. Clear aligners and bruxism: a systematic review. *J Oral Rehabil.* 2026;56(8):12–18.

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3. AlGhafli ZM, Mahjoub DT, Alzhrani SA, et al. Post-surgical orthodontic management using clear aligners: a systematic review of stability, efficiency, and patient outcomes. *Cureus.* 2026;18(1):29–34.

4. Upadhyay M, Arqub SA. Biomechanics of clear aligners: hidden truths and first principles. *J World Fed Orthod.* 2022;11(1):12–21.

5. Rossini G, Parrini S, Castroflorio T, Deregibus A, Debernardi CL. Efficacy of clear aligners in controlling orthodontic tooth movement: a systematic review. *Angle Orthod.* 2015;85(5):881–889.

6. Rahalkar A, Saini R, Punia K, Thakur N, Agarwal D, Sharma V. Assessment of effect of fixed orthodontic treatment on gingival health: an observational study. *Int J Health Sci.* 2022;6(SI):6014–6018.

7. Nucera R, Dolci C, Bellocchio AM, et al. Effects of composite attachments on orthodontic clear aligner therapy: a systematic review. *Materials (Basel).* 2022;15(2):53–59.

8. Baneshi M, O'Malley L, El-Angbawi A, Thiruvenkatachari B. Effectiveness of clear orthodontic aligners in correcting malocclusions: a systematic review and meta-analysis. *J Evid Based Dent Pract.* 2025;25(1):10–17.

9. Saini R, Dar FA, Shair T, Rafique S, Ribin MM, Saini D. Clinical comparative analysis of TAD-augmented and conventional orthodontic treatments in skeletal open bite correction: an original research study. *JCHR.* 2025;15(6):2557–2568.

10. Schneider HG, Szekelyhidi A, Dymke E. Tongue thrust – modifying and complicating factors in marginal periodontitis. *Stomatol DDR.* 1982;32(11):753–764.

11. Paglia L. Interceptive orthodontics: awareness and prevention is the first cure. *Eur J Paediatr Dent.* 2023;24(1):5–11.

12. Ovsenik R, Marolt Mušič M, Primožič J. Changes in swallowing pattern and tongue posture during transition from deciduous to mixed dentition: a longitudinal ultrasonography study. *Eur J Orthod.* 2024;46(1):26–31.

13. Volk J, Kadivec M, Mušič MM, Ovsenik M. Three-dimensional ultrasound diagnostics of tongue posture in children with unilateral posterior crossbite. *Am J Orthod Dentofacial Orthop.* 2010;138(5):608–612.

14. Shah SS, Nankar MY, Bendgude VD, Shetty BR. Orofacial myofunctional therapy in tongue thrust habit: a narrative review. *Int J Clin Pediatr Dent.* 2021;14(2):298–303.

15. Abu Arqub S, Chheda H, Crumpton J, Yang X, Farha P, Upadhyay M. Clear aligners in extraction-based orthodontic treatment: a systematic review and meta-analysis. *Orthod Craniofac Res.* 2026;29(1):12–29.

16. Saini R, Batra P, Saini N, Punia K, Shair T, Raza M. Comparison of muscle response in patients treated with rigid and flexible fixed functional appliances. *J Orthod Sci.* 2024;13(1):29.

17. Weir T. Clear aligners in orthodontic treatment. *Aust Dent J.* 2017;62(6):58–62.

18. Gaonkar P, Mohammed I, Ribin M, Kumar DC, Thomas PA, Saini R. Assessing the impact of AI-enhanced diagnostic tools on orthodontic treatment planning: a randomized controlled trial. *J Pharm Bioallied Sci.* 2024;16(Suppl):S1798–S1800.

19. Tartaglia GM, Mapelli A, Maspero C, et al. Direct 3D printing of clear orthodontic aligners: current state and future possibilities. *Materials (Basel).* 2021;14(7):17–21.

20. Saini R, Shair T, Rafique S, Dar FA, Maddesia DK, Goyal RJ. Retrospective assessment of clinical efficiencies of clear aligners in managing open embrasures and radiographic root angulations in routine orthodontic therapies. *J Chem Health Risks.* 2023;13(3):1345–1350.

21. Muro MP, Caracciolo ACA, Patel MP, Feres MFN, Roscoe MG. Effectiveness and predictability of treatment with clear orthodontic aligners: a scoping review. *Int Orthod.* 2023;21(2):17–21.

22. D'Onofrio L. Oral dysfunction as a cause of malocclusion. *Orthod Craniofac Res.* 2019;22(1):43–48.

23. Saini R, Thakur N, Jindal Goyal R, et al. Analysis of smile aesthetic changes with fixed orthodontic treatment. *Cureus.* 2022;14(12):e32612.

24. Kumar V, Singh KJ, Jani K, et al. Correlation between early childhood oral habits and developing malocclusions: a pediatric-orthodontic cohort analysis. *J Pharm Bioallied Sci.* 2026;18(1):185–187.

25. Toshi T, Vashishtha M, Chadhha A, Galagali SA, Gopalkrishnan D, Saini R, Rangari P. Alterations in integumental facial dimensions after orthodontic treatment. *J Pharm Bioallied Sci.* 2021;13(2):S1474–S1477.

26. Gurani SF, Di Carlo G, Cattaneo PM, Thorn JJ, Pinholt EM. Effect of head and tongue posture on pharyngeal airway dimensions and morphology in three-dimensional imaging: a systematic review. *J Oral Maxillofac Res.* 2016;7(1):1–6.