

# Clear aligners: possible error considerations from the first visit to the delivery of retainers

Mirko Martelli<sup>1,2\*</sup>  
Wanda Lelia Russomanno<sup>2\*</sup>  
Stefano Di Vecchio<sup>2\*</sup>  
Beatrice Dapei<sup>2\*</sup>  
Patrizio Bollero<sup>3,4</sup>  
Alessandro Dolci<sup>1</sup>  
Liliana Ottria<sup>1,3</sup>  
Marco Gargari<sup>1,2</sup>  
Francesco Gianfreda<sup>3</sup>

<sup>1</sup> Department of Clinical Science and Translational Medicine - University of Rome Tor Vergata, Rome, Italy

<sup>2</sup> U.O.C. of Dentistry "Fra G.B. Orsenigo" - San Pietro Fatebenefratelli Hospital, Rome, Italy

<sup>3</sup> U.O.S.D. of Dentistry with protected pathways, Diagnosis, Hygiene and Oral Prevention Centre - Tor Vergata Hospital, Rome, Italy

<sup>4</sup> Department of System Medicine - University of Rome Tor Vergata, Rome, Italy

**Corresponding author:** Mirko Martelli  
e-mail: mirko.marte@libero.it

\*Equally contributed first author

## Abstract

This article examines the possible and main errors that can occur during the first meeting with the patient, the collection of documentation, the treatment planning, the review of the 3D simulation of the therapy, the clinical management, the delivery of the aligners, and the possible finishing phase until delivery of the final restraints.

Clinical data collected on a sample of 250 patients at the Orthodontics division of the U.O.C. of Odontostomatology at the Fatebenefratelli San Pietro Hospital in Rome are analyzed to highlight the common causes of errors and provide practical guidelines for identifying and correcting them. This process is essential to ensuring optimal results and meeting patient expectations.

It follows that careful management of each phase of treatment with clear aligners is essential to obtaining predictable results. Identifying and correcting potential errors improves treatment effectiveness.

**Keywords:** Clear aligners, Clinical errors, Treatment planning, Orthodontic patient management, Orthodontics, Malocclusion.

## Introduction

Thanks to their aesthetic features and comfort compared to traditional orthodontic appliances, clear aligners offer numerous advantages in therapy management for the orthodontist and patient comfort. However, documentation collection, design, implementation of orthodontic practices such as IPR, and the correct delivery of these devices are complex processes that can be subject to errors (1). Inadequate management of these steps can compromise effectiveness, treatment duration, and patient satisfaction. This article highlights the main errors committed during treatment and provides guidelines to avoid them.

### *First visit and communication with the patient*

The first visit is crucial in establishing a trust-based relationship with the patient, collecting all the necessary information to allow the clinician to develop an appropriate treatment



## License

This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](https://creativecommons.org/licenses/by-nc-nd/4.0/).

Authors contributing to Oral and Implantology agree to publish their articles under the

[Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](https://creativecommons.org/licenses/by-nc-nd/4.0/),

which allows third parties to copy and redistribute the material providing appropriate credit and a link to the license but does not allow to use the material for commercial purposes and to use the material if it has been remixed, transformed or built upon.

## How to Cite

M. Martelli, W.L. Russomanno, S. Di Vecchio, B. Dapei, P. Bollero, A. Dolci, L. Ottria, M. Gargari, F. Gianfreda.

**Clear aligners: possible error considerations from the first visit to the delivery of retainers.**

Oral and Implantology  
Vol. 17 No. 1 (2025), 44-49.  
DOI: 10.11138/oi.v17i1.118

plan, and considering the compromises often needed for adult patients. During this phase, it is essential to clearly understand the patient's expectations and clinically translate them while respecting biology, developing a clinical process to follow to achieve the final goal promptly and effectively (2). However, common mistakes such as inadequate communication of expectations, failure to understand the patient's motivations, failure to adequately explain the process and treatment timelines, and failure to highlight potential therapeutic and aesthetic compromises can undermine the success of the therapy. It is, therefore,

advisable to establish a relationship of trust, understand the patient's expectations by discussing aesthetic and functional goals, provide clear and detailed information about the process and expected timelines, and use 3D simulation to understand the therapy and final result.

#### Documentation collection

Accurate documentation collection is essential for treatment planning. Errors in this phase, such as inaccurate dental impressions (Fig.1) or digital scans (Fig.2), poor quality intraoral and extraoral photographs (Fig.3), insufficiently detailed radiographs, and errors

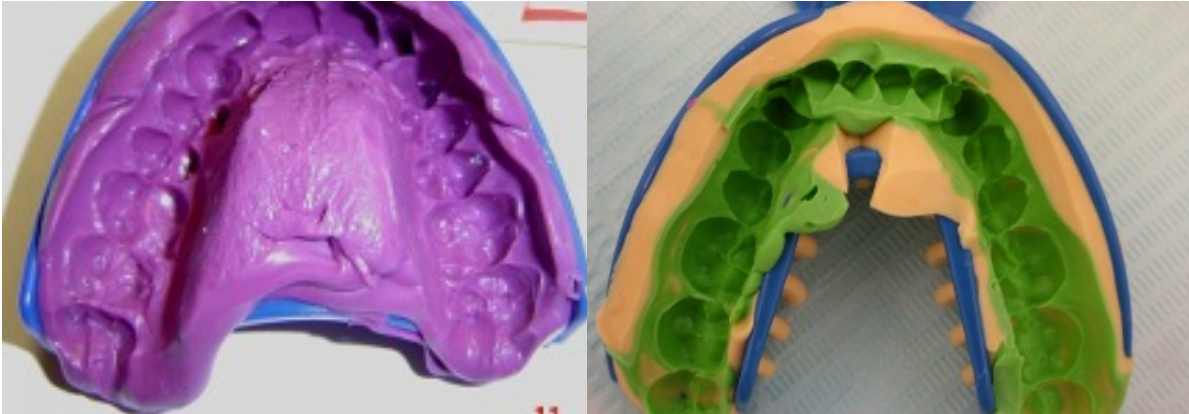


Figure 1. Incorrect PVS impressions

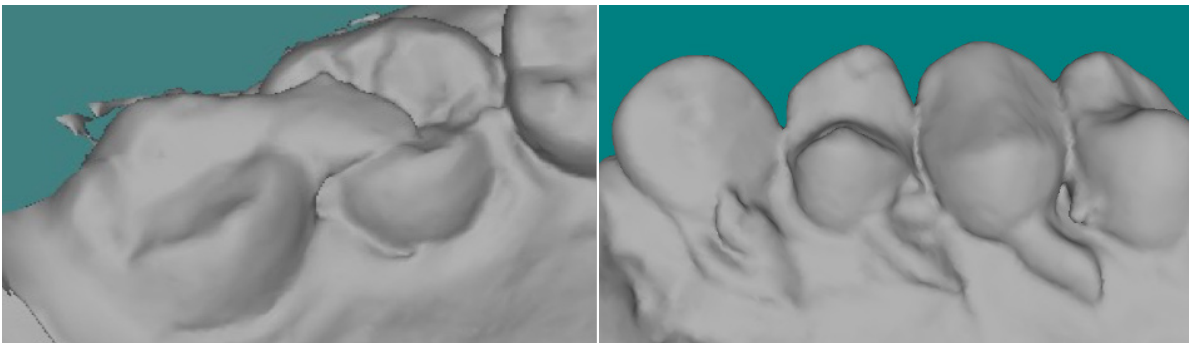


Figure 2. Inaccurate digital scans



Figure 3. Poor quality intraoral photos with incorrect framing

in completing demographic data, represent potential factors for therapeutic failure (3). Blurred or distorted photographs can compromise the initial assessment, inaccurate dental impressions can produce aligners with a poor fit and ineffective dental movement, and incomplete or low-quality radiographs can conceal underlying problems or potential diagnostic errors. Additionally, inconsistent patient demographic data can lead to future device delivery misunderstandings or difficulties retrieving the patient's care plan, especially in pediatric cases or growing patients (4). To avoid such errors, it is advisable to use high-quality equipment, follow standardized protocols for documentation collection, and carefully verify the completeness of the collected data.

### Treatment Planning

Treatment planning requires a detailed case evaluation and effective communication with technicians. Typical errors at this stage include selecting cases that are too complex to be treated solely with clear aligners, such as severe malocclusions (severe Class III or skeletal asymmetries), underestimating the difficulty of complex dental movements like severe rotations, extensive dental translations, or vertical movements, and failing to consider the need for firm anchorage (5). These errors can lead to unsatisfactory results. To avoid such issues, it is necessary to carefully analyze the case's complexity and determine whether it is suitable for treatment with clear aligners or requires integration with fixed appliances (6). Furthermore, it is essential to communicate with the technicians, providing detailed and specific instructions about the desired dental movements and using advanced planning tools, such as simulation software, to visualize the expected outcomes and make any necessary adjustments to the treatment plan.

### Poor communication with the patient

Clear and continuous communication with the patient is essential for the success of the treatment. Common mistakes at this stage include failing to explain the need to wear the aligners for an adequate number of hours each day and not informing the patient about potential temporary discomforts. It is crucial to educate the patient about the importance of cooperation, clearly explaining the significance of wearing the aligners for the prescribed duration and preparing them for possible initial discomforts, such as hypersalivation, speech issues, and temporary soreness. Additionally, it is essential to educate the patient on good oral hygiene and proper cleaning of the appliances to prevent inflammation that could compromise the treatment process (7).

### Poor communication with technicians

Effective communication with technicians ensures the treatment plan is correctly interpreted and implemented. Common errors include failing to specify the necessary technical details for the case and inadequate verification of the consistency between the virtual plan and the clinical situation. To avoid such errors, it is essential to provide technicians with detailed instructions, ensure every technical detail is communicated (8), and review the virtual plan by carefully comparing the 3D design with the patient's clinical situation.

### Review of the 3D simulation

The 3D simulation (Fig.5) is a crucial tool for treatment planning. Errors in reviewing it can lead to inconsistencies between the virtual treatment plan and the actual clinical outcomes. It is essential to ensure that all planned dental movements are feasible and consistent, and that movement aids, such

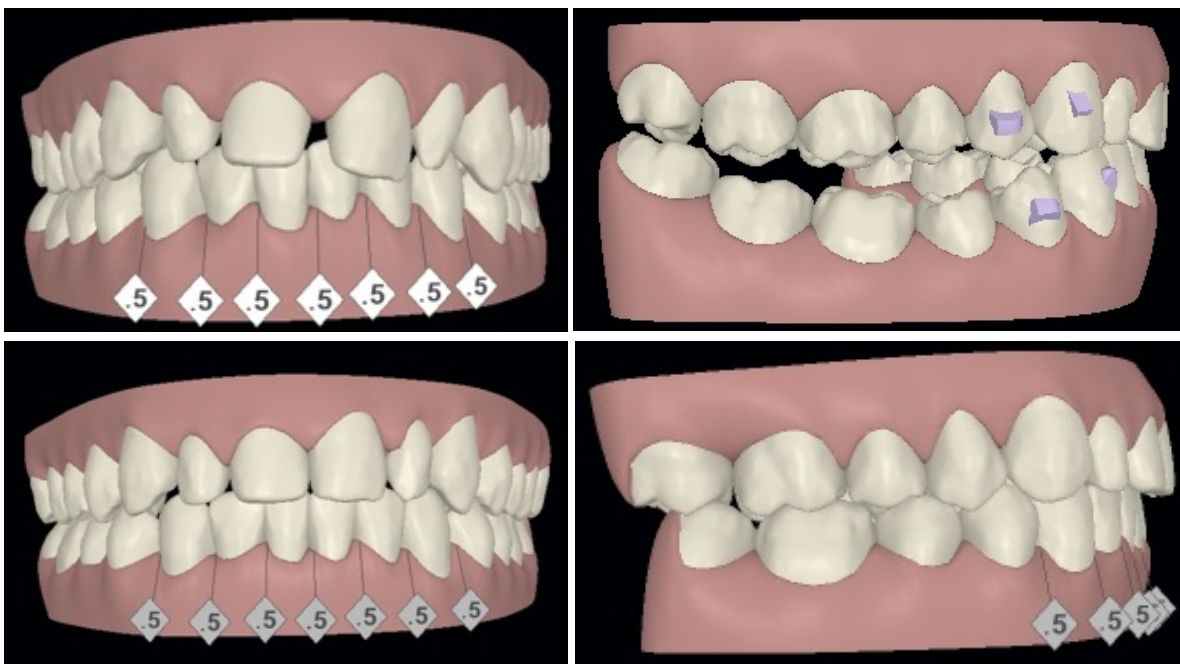


Figure 4. Digital treatment planning

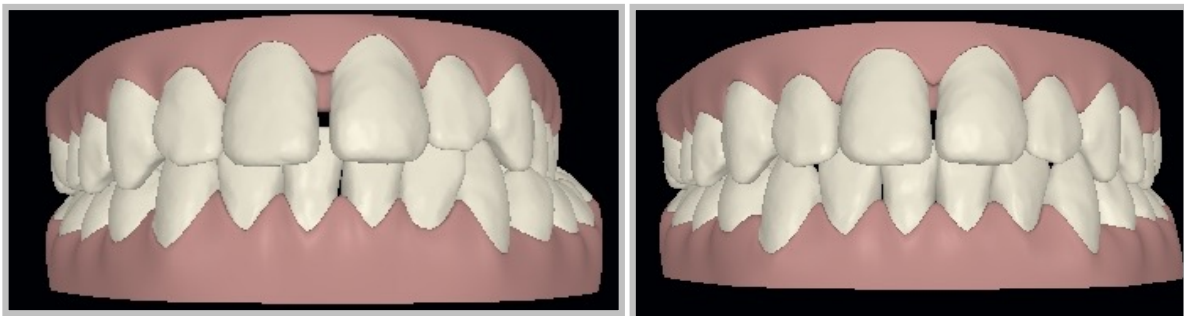
as attachments, are correctly positioned to ensure maximum effectiveness (9). Therefore, each plan stage must be carefully examined, ensuring that the dental movements are accurate and realistic and that the attachments are optimally placed. Collaboration with the technicians is key to discussing any concerns or necessary adjustments (10, 11).

#### *Attachments and IPR*

Attachments and IPR (Interproximal Reduction) are crucial for successful treatment with clear aligners (12). Errors at this stage may include incorrect placement of the attachments, which can reduce the effectiveness of the planned dental movements, and improper execution of IPR (Fig. 6), which can cause enamel damage and issues with spacing and alignment. To ensure treatment success, attachments must be placed precisely using specific guides and tools, and IPR must be performed carefully, using the appropriate instruments and properly finishing the enamel after the procedure.

#### **Clinical Management**

Accurate clinical management is essential for the success of the treatment. Typical errors at this stage include failing to monitor the therapy's progress, lack of patient compliance (such as not wearing the aligners for the prescribed amount of time), and inadequate documentation of the treatment's progress and modifications. To avoid these errors, it is essential to schedule regular follow-up visits, educate the patient on the importance of wearing the aligners as prescribed, and accurately document all progress using photos or scans. The aligner delivery phase is crucial for the success of the treatment. Common errors include failing to provide the patient with proper usage instructions and not giving detailed information on how to care for and maintain the aligners. A less common but possible mistake is delivering devices intended for another patient. Therefore, it is essential to explain to the patient how to wear and remove the



**Figure 5.** Review of the 3D simulation: the treatment can still be improved.



**Figure 6.** Errors caused by IPR.

aligners correctly, provide information on maintenance, and ensure that the devices are delivered to the correct patient. Refining and delivering final retainers are essential for maintaining the results achieved. Typical errors at this stage include insufficient refinement, which may leave irregularities that compromise the aesthetic result, and the lack of an adequate retention plan, leading to relapse and loss of results. To ensure the preservation of the results, careful refinement is necessary, as well as planning an appropriate retention strategy and educating the patient on the importance of following the retention plan.

## Materials and methods

The analysis was based on 250 clinical cases treated with transparent aligners at the Orthodontics division of the U.O.C. of Odontostomatology at the Fatebenefratelli San Pietro Hospital in Rome. It focused on common errors and best practices. Data collection, however, considered the first visit, documentation, treatment planning, 3D design review, clinical management, and the finishing and retention phase. Errors were identified through medical record review, interviews with orthodontists, clinical observations, and patient feedback, providing a comprehensive framework for improving outcomes with clear aligners.

## Results

The analysis conducted on patients treated with clear aligners highlighted that accurate management of each phase of treatment is essential to obtain satisfactory and predictable results. The main results obtained were:

1. Improved precision and predictability of treatment: the identification and correction of errors in patient data collection and treatment planning have improved the fit of the aligners, thus ensuring more predictable tooth movements.
2. Reduction of clinical complications (13) and treatment times: carefully considering potential errors is essential to optimize clinical results and ensure more effective patient management. Schematic and detailed communication with the team of technicians allows the treatment plan to be adapted to the actual clinical conditions of the patient, reducing the processing times of treatment plans and increasing the overall effectiveness of the therapy.
3. Patient satisfaction: The rapid detection and immediate correction of errors in the patient data collection phase and the delivery of the aligners have significantly improved patient satisfaction. This reduces the need for subsequent corrective interventions and thus ensures a more comfortable and rapid therapeutic experience (14).

## Discussion

These findings highlight the importance of rigorous and methodical management in treatment with clear aligners (15). The documentation phase proved to be fundamental: errors in the collection of images,

x-rays, and impressions have proven to compromise the effectiveness of the treatment. High-quality equipment and the adoption of standardized protocols have made it possible to minimize errors and ensure more accurate therapeutic planning. During the planning phase, coordination with technicians and 3D simulation proved essential for correct prediction of tooth movements. The simulation made it possible to identify any inconsistencies before the start of therapy, improving the predictability of the treatment and reducing the possibility of errors. Finally, clear and constant communication with the patient and periodic therapy monitoring were key elements for the success of the treatment. Errors in the delivery phase, such as failure to explain instructions for use, have been reduced thanks to more rigorous protocols, improving the overall patient experience and satisfaction (16).

## Conclusions

The design and delivery of clear aligners require attention to detail and careful management of all treatment phases. Errors in selecting malocclusions, treatment planning, 3D review, clinical management, attachment and IPR application, and refinement and delivery of final retainers can significantly compromise results. Following the proposed guidelines and adopting a rigorous and methodical approach can minimize these errors and improve the effectiveness of orthodontic treatments with clear aligners. Special attention to communication with the patient and technicians and diligent clinical management are essential for treatment success and patient satisfaction.

## References

1. Papadimitriou A, Mousoulea S, Gkantidis N, Kloukos D. Clinical effectiveness of Invisalign® orthodontic treatment: a systematic review. *Prog Orthod*. 2018 Sep 28;19(1):37. doi: 10.1186/s40510-018-0235-z. PMID: 30264270; PMCID: PMC6160377.
2. Witt E, Bartsch A. Effects of information-giving and communication during orthodontic consultation and treatment. Part 3: Optimized orthodontist-patient communication. *J Orofac Orthop*. 1996 Jun;57(3):154-67. English, German. doi: 10.1007/BF02191879. PMID: 8655110.
3. Casaglia A, DE Dominicis P, Arcuri L, Gargari M, Ottria L. Dental photography today. Part 1: basic concepts. *Oral Implantol (Rome)*. 2016 Jul 23;8(4):122-129. doi: 10.11138/orl/2015.8.4.122. PMID: 28042424; PMCID: PMC5159893.
4. Meriç P, Kılınc DD. Anamnesis and examination forms used in orthodontic clinics: A pilot study. *Am J Orthod Dentofacial Orthop*. 2022 Oct;162(4):e169-e175. doi: 10.1016/j.ajodo.2021.07.016. Epub 2022 Aug 5. PMID: 35934627.
5. Fernandez CCA, Pereira CVCA, Luiz RR, Vieira AR, De Castro Costa M. Dental anomalies in different growth and skeletal malocclusion patterns. *Angle Orthod*. 2018 Mar;88(2):195-201. doi: 10.2319/071917-482.1. Epub 2017 Dec 7. PMID: 29215300; PMCID: PMC8312537.
6. Tania M, Veerasankar S, Ponniah H, Dhayananth LX, Preeti R, Missier MS. Comparison of Patient Satisfaction between Invisible Appliance and Fixed Orthodontic Appliances - A Systematic Review. *J Pharm Bioallied Sci*. 2024 Apr;16(Suppl 2):S1017-S1021. doi: 10.4103/jpbs.jpbs\_1172\_23. Epub 2024 Apr 16. PMID: 38882823; PMCID: PMC11174202.
7. Daniels AS, Seacat JD, Inglehart MR. Orthodontic treatment motivation and cooperation: a cross-sectional analysis of adolescent patients' and parents' responses. *Am J*

- Orthod Dentofacial Orthop. 2009 Dec;136(6):780-7. doi: 10.1016/j.ajodo.2007.11.031. PMID: 19962600.
8. M. Martelli, W. Russomanno, S. Di Vecchio, P. Bollero, L. Ottria, M. Gargari, F. Gianfreda. Orthodontic treatment from childhood to adolescence with minimally invasive therapy: correction of atypical swallowing and dental alignment. A case report. *Oral and Implantology* Vol. 16 No. 3 (2024), 119-123. <https://doi.org/10.11138/oi.v16i3.56>
  9. Elnagar MH, Aronovich S, Kusnoto B. Digital Workflow for Combined Orthodontics and Orthognathic Surgery. *Oral Maxillofac Surg Clin North Am.* 2020 Feb;32(1):1-14. doi: 10.1016/j.coms.2019.08.004. Epub 2019 Nov 4. PMID: 31699582.
  10. A. Pitino, F. Gianfreda, A. Dolci, E. Fossati, G. Voghera, P. Bollero, M. Gargari, D. Karimi, M. Martelli. A Step-by-step technical report on the novel "PREMADE protocol" for fabricating acrylic provisional protheses for all-on-4® treatment concept. *Oral and Implantology*, Vol. 16 No. 3 (2024), 133-139. <https://doi.org/10.11138/oi163133-139>
  11. Ceruso FM, Ottria L, Martelli M, Gargari M, Barlattani A Jr. Transgingival implants with a convergent collar (PRAMA); surgical and screwed prosthetic approach. A case report. *J Biol Regul Homeost Agents.* 2020 Jan-Feb;34(1 Suppl. 1):71-77. DENTAL SUPPLEMENT. PMID: 32064838.
  12. Groody JT, Lindauer SJ, Kravitz ND, Carrico CK, Madurantakam P, Shroff B, Darkazanli M, Gardner WG. Effect of clear aligner attachment design on extrusion of maxillary lateral incisors: A multicenter, single-blind randomized clinical trial. *Am J Orthod Dentofacial Orthop.* 2023 Nov;164(5):618-627. doi: 10.1016/j.ajodo.2023.07.011. Epub 2023 Aug 21. PMID: 37610383.
  13. Rolland A, Sorel O, Gebeile-Chauty S. Développement de recommandations professionnelles sur la contention en orthodontie : version courte [Development of professional recommendations on orthodontic retention: short version]. *Orthod Fr.* 2023 Apr 28;94(1):55-68. French. doi: 10.1684/orthodfr.2023.115. PMID: 37114819.
  14. Barlattani A Jr, Martelli M, Gargari M, Ottria L. Articular disc of temporomandibular joint: an anatomical and histological study. Functional considerations. *J Biol Regul Homeost Agents.* 2019 Nov-Dec;33(6 Suppl. 2):199-208. PMID: 32338474.
  15. M. Martelli, W. Russomanno, S. Di Vecchio, P. Bollero, M. Gargari, L. Ottria, F. Gianfreda. Myofunctional therapy in occlusal and oro-facial disorders: multidisciplinary approach. *Oral and Implantology* Vol. 16 No. 3 (2024), 153-155. <https://doi.org/10.11138/oi163153-155>
  16. Castroflorio T, Sedran A, Parrini S, Garino F, Reverdito M, Capuozzo R, Mutinelli S, Grybauskas S, Vaitiekūnas M, Deregiibus A. Predictability of orthodontic tooth movement with aligners: effect of treatment design. *Prog Orthod.* 2023 Jan 16;24(1):2. doi: 10.1186/s40510-022-00453-0. Erratum in: *Prog Orthod.* 2023 Oct 24;24(1):47. doi: 10.1186/s40510-023-00499-8. PMID: 36642743; PMCID: PMC9840984.