

# Orthodontic Relapse - Orthodontic Treatment with Invisalign: Case Report

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**Abstract**— Contemporary dentistry has been developing new, increasingly improved treatment modalities, materials and techniques that aim to modify disharmony dental elements, providing the patient with the required aesthetic aspect without compromising function. Thus, the Invisalign™ system has been the device of choice for various types of malocclusion and in certain situations have superior results compared to conventional orthodontics, since the movements are minimally planned. The present study aimed to evaluate the results of the Invisalign™ system treatment in a patient with relapse after conventional orthodontic treatment. A 34-year-old female patient had a slightly open bite, crowding of the antero-inferior segment, slightly rotated to mesiobuccal, anterosuperior diastema and buccal incisors, and the main complaint of recurrence after two conventional orthodontic treatments. It was observed that tooth movement occurred entirely in the upper and lower arch. The open bite was corrected, the crowds were dissolved through wear and improvement of the arch shape and the anterior superior diastema was completely closed. It is concluded that the present case report presented satisfactory and effective results in relapse treatment after orthodontic treatment with Invisalign™ system.

**Keywords**— Relapse, Clear Treatment, Clear Aligners, Invisible orthodontics.

## I. INTRODUCTION

Technological evolution has made patients increasingly demanding for aesthetic solutions in order to reestablish the loss or morphophysiological corrections of dental elements. It is in this context that in recent years there has been a growing increase in orthodontic treatment that provides a natural and harmonious result, avoiding the visual discomfort caused by traditional treatment (CHRISTOU et al., 2019).

In this evolution, polycarbonate and ceramic lingual brackets and removable aligners emerged, which pleased patients, especially adults, because of the greater facial aesthetic requirement and who hardly adhere to conventional treatment (HIRANI; PATEL; PATEL, 2016).

In the late 1990s, the Invisalign™ system (Align Technology, Inc., Santa Clara, California) became an alternative treatment for practitioners in the face of the aesthetic demands of patients and the comfort of removable polyurethane, cordless or transparent aligners. other metal accessories (DJEU; SHELTON; MAGANZINI, 2005).

With the advent of three-dimensional digital imaging techniques, Align has added to the Invisalign™ system computer-aided design / computer-aided manufacturing (CAD/ CAM) technology, enabling the precision

manufacturing of transparent removable devices for serial exchange and thus allow a sequence of tooth movements necessary to obtain the correction (KRAVITZ et al., 2009).

Invisalign™ aligner treatment offers a 3D computer simulation made from an addition silicone molding. It is made a virtual model, ClinCheck, which allows the professional and patient to view on the computer and track the movements from beginning to end of dental treatment. This results in a sequence of aesthetic aligners, which are custom, clear, removable blanking-like plaques that perfectly fit the anatomy of the dental arches, completely enveloping all teeth. Exchanges are periodic, inducing orthodontic movement (WEIR, 2017).

Invisalign™ treatment has been an increasingly present alternative in the orthodontist's clinical daily life due to the numerous advantages it provides, such as: low visibility treatment with clear aligners, as it can be confused with natural teeth, low possibility of injury to the teeth. oral cavity, such as gingivitis, caries or periodontal disease, full access to teeth for hygiene, no change in speech, reduced chair time, faster and more spaced consultations as aligners are received at once (BRÄSCHER et al., 2016).

Invisalign™ is indicated for patients with mild to moderate crowding and / or diastema (1-6 mm), dental

(non-skeletal) arch atresia, relapse of orthodontic treatment, moderate malocclusion, deep bite problems and especially malocclusion II (TURPIN, 2005).

Orthodontic recurrence can be defined as the tendency of teeth to return to their pretreatment position, and this occurs mainly in the lower canines and lower incisors. Thus, even after removal of the appliance, treatment continues with the use of restraint, which can be mobile, usually to the upper or fixed teeth, glued behind the lower teeth (YU et al., 2013).

However, previous reports in the scientific literature have shown, after 10 years of orthodontic treatment completion, only 30% to 50% of orthodontic patients effectively maintain the satisfactory alignment initially obtained, reducing to 10% at 20 years. Faced with orthodontic recurrence, it is necessary to reevaluate the patient's periodontal, physiological and psychological conditions in order to establish strategies to effectively manage the problem (YU et al., 2013).

Thus, the present study aimed to evaluate the results of the Invisalign™ system treatment in a patient with relapse after conventional orthodontic treatment.

## II. CASE REPORT

A 34-year-old female patient sought treatment at a private clinic. Initially, clinical evaluation and panoramic radiography, lateral radiograph, posteroanterior teleradiography, 3D computed tomography and extraoral and intraoral photographs were performed.

It presented a slightly open bite, crowding of the antero-inferior segment, slightly rotated to mesiobuccal, diastema in the anterosuperior region and buccalization of the upper incisors (Figure 1). The main complaint was relapse after two conventional orthodontic treatments.

The patient was offered treatment with Invisalign™ removable aligners, as the patient did not want to use a conventional appliance.



Fig.1. Initial images: a) Smile before treatment; b) front view; c) Right lateral view; d) Right side view.

The clinical chart listed the teeth to be moved, those that would receive the attachments, resin increments to aid tooth movement and sent for planning preparation.

## Treatment Summary Invisalign™ - Comprehensive Treatment

Active aligners stage U: 1-7, L: 1-10

Passive aligners stage U: 8-10

Overcorrect aligners stage U: 11-13, L: 11-13

Attachment templates were provided for stage U: 2, L: 2

## Treatment Needs

Interproximal wear/0.2 mm slice on some teeth between 4.3 e 4.2, 4.2 e 4.1, 4.1 e 3.1, 3.1 e 3.2, 3.2 e 3.3 (Figure 2).

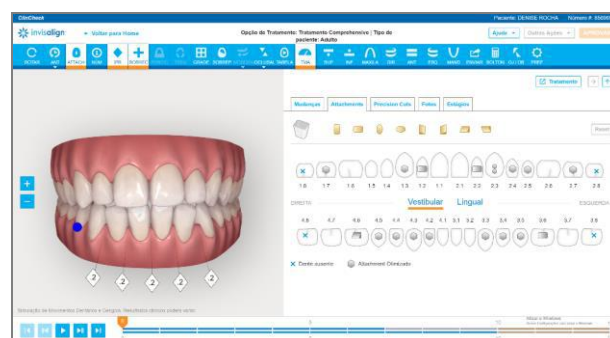


Fig.2. Invisalign™ virtual planning.

## Dental movement assessment

Tooth 2.7: extrusion movement (value - 0.8 mm)

Tooth 3.7: intrusion movement (value - 0.8 mm)

Tooth 1.7: extrusion movement (value - 0.8 mm)

Tooth 4.4: extrusion movement (value - 0.5 mm)

Tooth 4.7: intrusion movement (value - 0.7 mm)

## Protocol and Follow Up

1 - Treatment was initiated with an intraoral scan, iTero Element™ Scanner (Align Technology, Inc., Santa Clara, California) (Figure 3a-c);

2 - Then, the ClinCheck, virtual movement planning, analysis and conference of the orthodontist were performed to approve the treatment and then receive the aligners (Figure 2);

3 - In the first consultation, the first pair of aligners was delivered, the patient received all instructions for use;

4 - After 7 days, the attachments were installed with the aid of the template using IPS Empress™ Direct resin (Ivoclar Vivadent Clinical), color A1 (1.7, 1.3, 1.2, 2.2, 2.3, 2.4, 2.5, 2.7, 3.6, 3.5, 3.4, 3.3, 4.2, 4.3, 4.4, 4.5 and

4.6). Then, 0.2 mm interproximal / slice wear was performed on some teeth: between 4.3 and 4.2, 4.2 and 4.1, 4.1 and 3.1, 3.1 and 3.2, 3.2 and 3.3. Soon after the installation of the attachments and wear, a sequence of 4 aligners was delivered (change every 7 days);

5 - After 35 days, the attachments were evaluated if they were healthy and found to be well adapted. In this consultation were given 3 more aligners;

6 - After 21 days, again treatment evaluation provided 2 more aligners. During this period, teeth alignment was observed, with no need for correction;

7 - The case was treated and concluded with 10 pairs of aligners for a period of 70 days;

8 - Upper and lower fixed restraint was performed on the patient.

### III. RESULTS

The treatment initially proposed to the patient consisted of 10 aligners, and the changes every 7 days. Throughout the treatment, the attachments were well fixed and interproximal, slice wear were performed as planned.

The patient was instructed to use the appliance for 22 hours a day, removing it only for cleaning and feeding. The office visits occurred at intervals ranging from 7, 21 and 35 days. In the consultations, intraoral photos were taken, guidance on the need for cooperation regarding the use of the device and professional monitoring of the dental response through virtual planning.

After the use of all aligners, according to the planning, it was observed that tooth movement occurred entirely in the upper and lower arch. The open bite was corrected, the crowds were dissolved through wear and improvement of the arch shape and there was complete closure of the anterior superior diastema (Figure 3d-f and Figure 4).

There were no significant facial changes, but there was a slight improvement in the chin contour and patient profile.

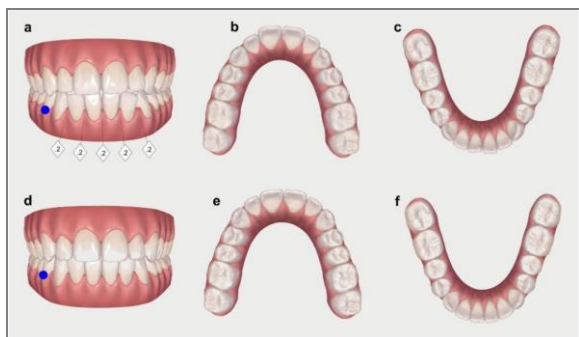


Fig.3. Intraoral scans. Initial scan simulation: a) Front view with interproximal wear (IPR) markings; b) Occlusal view of the upper arch; c) Occlusal view of the lower arch. Final scan simulation: a) Front view; b) Occlusal view of the upper arch; c) Occlusal view of the lower arch.



Fig.4. Final images: a) Smile after treatment; b) front view; c-d) Right lateral view; d-e) Left side view.

### IV. DISCUSSION AND FINAL CONSIDERATIONS

Improving the appearance of a smile in a more natural and aesthetic way is one of the main reasons why there has been a growing demand for faster and more effective dental treatments based on each patient's specific and individual needs (CHRISTOU et al., 2019).

Faced with aesthetic demands, dentistry has been developing new treatment modalities, materials and techniques, increasingly improved, which aim to modify dental elements in disharmony giving the patient the aesthetic aspect required without compromising the function (BLATZ et al., 2019).

Orthodontic treatments in recent years have evolved and occupied an important space in contemporary orthodontics. In this scenario, invisible aligners have emerged as alternatives to conventional orthodontic appliances in order to provide clinical results similar to metal brackets and in addition to meet, the aesthetic needs of the patient (WEIR, 2017).

The Invisalign™ system has been the device of choice for various types of malocclusion and in certain situations have superior results compared to conventional orthodontics because the movements are minimally planned (TEPEDINO et al., 2018).

The present case report presented satisfactory and effective results in the treatment of relapse after orthodontic treatment with Invisalign™ system. These findings are related to the correct evaluation of the patient's indication and collaboration to achieve the desired results.

According to the manufacturer, orthodontic treatment with the Invisalign™ system can effectively perform large dental movements. However, despite the efficiency recommended by the treatment, its clinical potency still remains controversial among professionals (PAPADIMITRIOU et al., 2018).

Some previous studies report successful clinical evidence in the results, while others, in contrast, argue for significant limitations, such as malocclusions with more than 5 mm spacing and agglomeration, anteroposterior skeletal discrepancies greater than 2 mm, discrepancies between centric ratio, teeth rotation above 20 degrees, anterior and posterior open bites, teeth extrusion, teeth inclination above 45 degrees, teeth with short clinical crowns and missing teeth arches (WOMACK, 2007; KRAVITZ et al., 2009).

It is evident that some movements are still challenging in treatment with the system and, under many conditions, there is a need to combine ancillary treatments to achieve the desired result, as also in conventional orthodontics, as biomechanics is no different (LI; WANG; ZHANG, 2015).

Given this context, it is necessary to emphasize that in order to obtain a successful orthodontic treatment, professionals need to carry out careful planning, with appropriate therapeutic approach, based on up-to-date and highly reliable scientific evidence. Patient opinion also plays an important role in assessing the possibilities and limitations of each treatment modality for better aesthetics associated with immediate placement of the prosthesis.

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