Three-Dimensional Evaluation of Clear Aligners versus Fixed Orthodontic Treatment of Lower Anterior Crowding: A randomized clinical trial

A Proposal

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In

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Introduction

Orthodontic treatment is one of the most essential and effective ways to make individual smile in to radiant and more attractive smile. Influence of appearance in personal and orthodontist lives have led to a considerable interest among the adult population seeking orthodontic treatment in the last few year.

Clear aligner's technique (CAT) is the new age of aesthetic orthodontic treatment methods developed especially for adults who are very self-conscious of how they appear.

A beautiful and attractive smile is known to have a positive effect on individuals. It also improves self-confidence, communicative success, careers, and private life. Thus, smile design aims to give a beautiful, healthy, ideal smile through a combination of medicine and art.[1]

The etiology of malocclusion can be broadly categorized under either hereditary, environmental, or a combination of both factors. Exploring the etiology of malocclusion is imperative for selecting the most appropriate treatment approach as well as the most appropriate retention device. Crowding and spacing are considered the most common manifestations of malocclusion [2-4]

Dental crowding can be defined as a disparity in the relationship between the tooth size and jaw size which result in the imbrications and rotation of teeth. Tooth size-arch length discrepancy (TSALD) is a well-defined means of assessing dental crowding . The factors that may predispose to crowding of teeth are large sized teeth, small bony bases or the combination of the above two, or as the result of an evolutionary trend towards a reduced facial skeletal size without a corresponding decrease in tooth size.[5]

Mandibular crowding can be resolved by interproximal reduction (IPR) or proclination of the mandibular labial segment. Excessive proclination can

cause poor esthetics, gingival recession, and unstable results. It is important to ascertain how much proclination an individual orthodontic appliance produces.[6]

Newer wires and innovations in the bracket systems have simplified and reduced the time span of the aligning stage. One such innovation is Nickel titanium (NiTi) wires with the advantages of super elasticity, torsional strength, stress constancy, physiological compatibility, shape memory, dynamic interference, and wear resistance hysteresis.[7]

Influence of appearance in personal and orthodontist lives have led to a considerable interest among the adult population seeking orthodontic treatment in the last few years. The clear aligners therapy is the most aesthetic treatment nowadays. The frequency of malocclusions in adults is equal to or greater than that observed in children and adolescents . [8-9]

The history of clear aligners is back to 1945, when Dr. H. D. Kesling first proposed a clear, vacuum-formed tooth-positioning appliance for minor tooth movement. It was a labor-intensive process that required manually repositioning teeth reset in wax, and a clear vacuum-formed retainer was made for every tooth movement in a series of stages until the teeth were aligned. This technique was capable of minor tooth alignment. However, the amount of labor required for the task precluded its use on a wide scale, particularly for correction of more complex malocclusions [10].

The workflow for clear aligner therapy traditionally uses a single intraoral impression or digital scan to generate multiple digital setups. These setups are then 3-dimensionally (3D) printed as a series of dental models onto which clear plastic aligners can be manufactured through thermoforming[11].

Aligners are indicated for patients with mild to moderate crowding, spacing, non-skeletal constricted arches and in relapsed cases after fixed

appliance therapy. In addition, patients with nickel allergies are good candidates for clear aligners, since traditional brackets and wires contain some component of nickel in stainless steel. Also, due to the aligners being removable by concept, less oral hygiene maintenance issues are likely to be encountered, making patients with special needs good candidates for such appliances. [12-14]

When treatment with aligners was compared to that involving fixed orthodontic appliances in adult populations, several studies showed that the use of aligners resulted in significantly poorer outcomes, whereas others demonstrated near equal efficacy of the two treatment approaches. The previous studies were based on treatment of adults with varying ranges of malocclusion severity, using earlier generations of aligner technology. [15-19]

Despite over 15 years of commercial availability and many millions of cases treated worldwide, very little research has assessed how clear aligners achieve their results.[20]

For this reason, this study will be conducted using CBCT to assess the effects of orthodontic treatment with clear aligners, as compared to that with NITI arch wires in the treatment of lower anterior teeth crowding.

Aim of the study

The present study will be performed to:

Evaluate and compare clear aligners versus fixed orthodontic treatment of lower anterior crowding with the use of CBCT within maximum 6 months or until correction of lower anterior crowding whichever is nearest to occur.

Subjects and methods

Patients with lower anterior crowding will be collected from Orthodontic Clinic and Faculty of Dental Medicine for Girls, Al-Azhar University.

Study design: Randomized Clinical Trial.

Randomization will be done by using Microsoft Office Excel 2007 . patients information will be entered into a computer ,then the computer randomly assigns the patients to two groups that helping to prevent bias.

Control group (n=10) patients will receive a conventional therapy with fixed appliances and the investigational group (n=10) will receives the new treatment therapy by using clear aligners for the treatment of mild to moderate lower anterior crowding.

Eligibility criteria:

Inculsion criteria[21]:

1.Adult female patients (CVMI stage 6).

2.Patients with mild to moderate lower anterior crowding.

3. Healthy compliant and motivated patient.

4.No missing of any tooth except wisdom teeth.

Exclusion criteria[21]:

1. Previous orthodontic treatments.

2. Any systemic or bone diseases.

3. Pregnant and lactating patient.

4. Prosthetic replacement in lower anterior teeth.

5.periodontitis with pocket depth more than 5 mm.

Method:

The following record will be taken for each patient before delivery appliance:

- Upper and lower orthodontic cast.
- CBCT.
- Intraoral and extraoral photography.

Treatment groups:

Group (A): Patients will be treated with conventional fixed orthodontic treatment in lower anterior crowding.

Group (B): Patients will be treated with clear aligner therapy in lower anterior crowding.

Sample size calculation:

Based on Bhatia [21] and Using G power statistical power Analysis program (version 3.1.9.4) for sample size determination, A total sample size (n=20; subdivided to 10 in each group) will be sufficient to detect a large effect size (d) ranging from 1.32 to 1.4, with an actual power (1-β error) of 0.8 (80%) and a significance level (α error) 0.05 (5%) for two-sided hypothesis test.

Ethical approval:

The research protocol approved by ethical committee of Faculty of Dental Medicine, girls, Al-Azhar University, (P-OR-22-01). The steps of the procedure will be explained to the patients / parents and an informed consent will be signed .

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