شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

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جامعة عين شمس

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HANAA ALY

Introduction:

Class II malocclusion is one of the most frequent and popular malocclusions that we face in our daily practice, the impact of this type of malocclusion is reflected on the patient profile, esthetics, and psychology.

Treatment of adult class II patients are more challenging than growing class II patient. Treatment modalities of the class II in adults involve either orthognathic surgery or camouflage treatment. Camouflage treatment can be either extraction or non-extraction approach[1].

Orthognathic treatment is indicated in severe skeletal discrepancies with some disadvantages including high risk of complications and high expenses[2].

Extraction treatment modality is indicated in moderate to severe crowding cases, yet its major disadvantages are the long treatment duration, space reopening, and root resorption[3].

Non extraction treatment involves maxillary molar distalization. This technique can show promising results regarding esthetics and prevent over retraction of anterior teeth, however, one main disadvantage is that most of the appliances used rely heavily on patient cooperation thus fixed noncompliance distalizers were introduced[4].

Maxillary molar distalization requires reduction of molar resistance for tooth movement, avoidance of distal crown tipping, good vertical control, and maintenance of anterior anchorage, which may be a challenge to every orthodontist[4]. To overcome these challenges, temporary anchorage devices (TADs) have been introduced. They are relatively easy to place, causes fewer trauma to

the oral tissues, stable under normal degrees of forces, relatively inexpensive and can be loaded immediately after insertion, reducing treatment time[5].

One of the appliances that invest the advantages of TADs in distalization is the mini-implant-aided transpalatal arch (MIA-TPA), which uses mini implant in palatal interdental region as an absolute anchorage[6].

Duration of the orthodontic treatment is one of the main concerns for both the operator and the patient as well. Typical duration of distalization is between 4.5 and 10.2 months, this time is added to the whole treatment time which can take up to two years or more[7,8]. Thus many acceleration techniques to reduce this duration were introduced[9]. Acceleration of tooth movement and alveolar bone remodeling can be induced by low level Laser therapy which is not invasive, easy and cheap[10,11].

The idea of this study was to investigate the effect of mini-implant assisted distalizer in combination with low-level diode laser as an acceleration technique on the rate of tooth movement during maxillary molar distalization.

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- Extra oral appliances

- Intraoral appliances

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- Inter-maxillary non-compliance appliances.

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I- Class II malocclusion in orthodontics

1- Definition & Prevalence

Class II malocclusion is broadly defined as a distal relationship of the mandibular teeth relative to the maxillary teeth[12].

Much has been written in orthodontic literature regarding the nature, characteristics of class II malocclusion[12–15]. It has been pointed out by many investigators that class II molar relation is one of the most frequently encountered problems in orthodontic practice[1,16,17]. According to an Egyptian study[18] conducted on 1936 primary school children, (25.7%) had acceptable occlusion, (51.5%) had Angle Class I malocclusion , (16.4%) had Angle Class II malocclusion, while (5.9%) had Class III malocclusion and (0.5%) of the study sample had Class IV malocclusion.

2- Treatment modalities for class II

According to Planche and Hadjean[19] class II treatment modalities rely on patient's growth potential, if the patient is growing, growth modification appliances should be used to redirect the growth of either maxilla or mandible, but in non-growing patients, three treatment strategies are possible:

a- **Orthognathic surgery**

De Clerck et al[20] argued that treatment of Class II malocclusions should focus first on improving the skeletal discrepancy, so in adult patient repositioning of the maxilla and mandible could be achieved with orthognathic surgery, adjusting the position of both in relation to the cranial base in the three dimensions and improving overall facial esthetics, but due to the risk of surgical procedure and the large expenses of the orthognathic surgery parents may refuse it, so alternative options should be available.

b- **Camouflage treatment**

Vaden et al[21] stated that moderate Class II malocclusion can be corrected with fixed appliances in combination with teeth extractions as an attempt for camouflage treatment. But extraction treatment has the following side effects: 1-unwanted profile changes, 2-longer treatment duration, 3- root resorption may occur, 4-greater anchorage reinforcement, 5-Difficulty in Space closure and paralleling the roots, 6- and space re-opening (relapse). Those side effects should be considered in treatment planning.

In 2013, Janson et al[22] stated that, Class II elastics could provide camouflage treatment for class II malocclusion but there are two possible problems. The first, elastics have an extrusive force to upper molars, which means that they should not be used in high-angle cases. Second, the proclination effect of the elastics on the lower anterior teeth.

c- **Maxillary molar Distalization**

- **Definition:**

Alogaibi et al[23] referred to molar distalization as the procedure of increasing the length of the dental arch by the backward movement of the buccal segment teeth. The dental and skeletal effects of maxillary molar distalization have been extensively studied in growing and non-growing individuals[24–29], as it considered one of the most prevalent strategies for correcting the class II molar relationship[26]. This non-extraction treatment may be indicated in patients with minor mandibular crowding and maxillary dentoalveolar protrusion or mild skeletal discrepancies[30].

- **Classification:**

The most popular classification for maxillary molar distalization appliances is according to patient compliance as follows[31]:

- **Appliances for maxillary molar distalization:**

i. **Compliance distalization appliances.**

- Extra oral appliances
- Intraoral appliances

ii. **Non-compliance distalization appliances.**

- Intra-maxillary non-compliance appliances.
- Inter-maxillary non-compliance appliances.

i- Compliance distalization appliances

- Extra-oral molar distalizers

In 1888, Kingsley[32] used extra-oral Headgear for the first time and it was very effective in correction of Class II malocclusion. Headgear may limit maxillary forward growth and distalize the maxillary molars to correct the molar relationship. However, this procedure requires patient's good cooperation, the forces exerted are often transient and may require a prolonged treatment period[33].

Headgear was extensively studied in a lot of researches along the past decades[33–37], but Atac et al in 2007 [38] stated that headgears have a number of problems; the most significant are the compliance and esthetics. Although headgears are effective in distalizing maxillary molars, they are highly dependent on patient compliance and tolerance.

- Intra-Oral Molar Distalizers:

Intra-oral distalizers were introduced in an effort to increase the efficacy of maxillary molar distalization, to minimize treatment time, and to give the clinician primary control over treatment[39,40].

In 1978, In order to generate light continuous distalizing power, Wilson[41] developed the Bimetric Round Arch modules with intermaxillary hooks that received Class II elastics and omega-adjustable stops inserted mesially into molars.

In 1995, Ritto[42] introduced his maxillary removable molar distalization splint. This system was smaller than the traditional

removable plates, so the patient is more relaxed. The system is esthetically acceptable and thus the clinician expects greater cooperation, it can be used for unilateral or bilateral molar distalization.

- **Dilemma of compliance:**

Non-compliant patient could result in extended orthodontic treatment, destruction of teeth and periodontium, extraction of extra teeth, discomfort, and increased stress for clinicians and the family[1,43,44]. Thus, much effort has been made to develop effective approaches for non-compliant Class II malocclusion patients, particularly when non-extraction protocols have to be used.

ii- Non-compliance distalization appliances.

- **Intra-maxillary non-compliance distalization appliances:**
  a. Pendulum appliance.
  b. K-loop Molar Distalizer.
  c. Distal-Jet appliance.
  d. Distal propeller.
  e. Frog appliance.

a. Pendulum appliance:

In 1992, Hilgers[44] identified a new mechanism for molar distalization using the Pendulum appliance. The Pendulum appliance was well tolerated and produced 5 mm of distal molar movement in three or four months. With minimal anchorage demand, unilateral molar distalization was very successful, but for patients with erupted

second molars, or patients with increased lower facial height, it was contraindicated.

In 2004, Kinzinger et al[45] studied the efficiency of a pendulum appliance for molar distalization related to second and third molar eruption stage and he concluded that the best time to start therapy with a pendulum appliance is before the eruption of the second molars. However, if distalization of the first and second molars is to be carried out simultaneously (in which case the banded first molars are pushing the second molars along during distalization), extraction of the third molar is strongly recommended. However, greater loss of anchorage and vestibular drift of the second molar must be accepted[46].

In principle, treatment of any sagittal arch length discrepancy is possible with a pendulum appliance, but, because no skeletal effects can be expected during pendulum appliance therapy, the exclusive focus of application has been and remains restricted to distalization in the dentoalveolar region[47].

b. K-Loop Molar Distalizer:

The K-Loop Molar distalizer is consisting of a 0.017" x 0.025" TMA wire, and was introduced by Kalra et al[48] in 1995, consisting of a Nance button to serve as an anchorage. The appliance produced about 175 gm of force. After six to eight weeks, the appliance was reactivated at 2 mm. Kalra stated that, during 4 mm of molar distalization, the premolars moved about 1 mm forward. They suggested that in the K-loop, the 40 ° gable bends provided moments that counteracted the tipping moments produced by the appliance.

c. Distal Jet appliance:

In 1996, Carano and Testa[49] introduced the Distal Jet appliance. The appliance has two bilateral tubes with internal diameter 0.036-inch attached to a Nance button, and coil spring and screw clamp sliding over each tube. The appliance could distalize the maxillary molars unilaterally or bilaterally in non-extraction treatment plans typically within 4-9 months, and could be modified to Nance appliance after distalization as an anchorage[50].

d. Distal Propeller:

In 2009, Jena and Panda[51] used an 11mm rotated hyrax screw to open in antero-posterior direction, called it the Distal Propeller. The distal hyrax screw wire is welded to the molar bands. The mesial arms of the hyrax screw were soldered to the premolar bands and for the palatal anchorage even integrated into the acrylic. Activation was done by opening 1 screw ¼ turn in every 5 days. They claimed that the molars were distalized bodily due to the rigidity of the appliance[51].

e- The Frog appliance.

In 2003, Walde et al [52] introduced the Simplified Molar Distalizer, The Frog Appliance. It composed of a Nance button which could be modified to be either banded or bonded to the premolars or the primary molars, a distal screw and one removable and adjustable spring. 1-2 mm per month of maxillary molar motion was provided by the Frog appliance. He concluded that there were more benefits to this appliance over others: quick assembly, easy activation, plus three-dimensional molar control.

- Inter-maxillary non-compliance distalization appliances:

These appliances can distalize the maxillary arch and procline the mandibular arch. They are indicated in class II cases with retroclined mandibular incisors or cases with deep overbite.

Fixed intermaxillary distalizers like:

a. Herbst appliance
b. Jasper Jumper appliance
c. Twin- Force Bite Corrector
d. FORSUS Fatigue-Resistance appliance
e. Eureka Spring

a- Herbst appliance

In 1905, Herbst appliance was introduced firstly by Emil Herbst[53], and several articles were written about the appliance later by Hans Pancherz in 1979[54,55]. It has the ability to inhibit maxillary anteroposterior growth and produce an increase in mandibular length and lower facial height. Herbst appliance results in intrusive and distal movements of maxillary molars including tipping of crowns distally and mesial drift of the mandibular anterior and posterior teeth, so treatment in mixed dentition is not recommended using this appliance[8].

b- Jasper Jumper appliance

James J. Jasper[8] introduced an appliance for correcting class II malocclusion in 1987. This device is indicated in class II growing patients, with deep bite and retroclined mandibular incisors. However a study conducted in 1991 by Blackwood et al[56] showed that jasper

jumper is contraindicated in dental and skeletal open bites with high mandibular plane angle and increased lower facial height due to molar distal tipping and the main disadvantages of this appliance are the large inventory that must be kept, fracture under load, cost, and the covering coat may degrade.

c- Twin- Force Bite Corrector

The twin-force bite corrector (TFBC) is a fixed, intermaxillary functional appliance with ball-and-socket joint that allow a wide range of motion and lateral jaw movement. The appliance is attached to the maxillary and mandibular arch wires by hex nuts fastened mesial to the maxillary first molars and distal to the mandibular canines. At full compression, the TFBC postures the patient's mandible forward into an edge to edge occlusion[57].

In 2017, Shaik et al[58] after 10 years follow up concluded that twin-force is easy to place, does not require laboratory work and patient compliance, and exerts 24h continuous force that helps in overjet reduction and forward mandibular growth. Perfect occlusion and harmonious facial profile were obtained in a short treatment period and maintained in the 10-year follow-up. The major drawbacks of this appliance are the difficulty to control the force and the dentition needs to be already aligned to use 0.016 x 0.022, or 0.017 x 0.025 stainless steel wires that guarantee necessary stiffness[53].

d- FORSUS Fatigue-Resistance appliance

Vogt et al[59] in 2006 showed that FORSUS appliance consists of three telescopes with a coil spring in its exterior part that gains it