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RESEARCH ARTICLE

3D NITI MOLAR UPRIGHTER- AN ADJUNCT TO ADULT ORTHODONTICS

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ABSTRACT

Contemporary dental practice is all about increasing number of adults seeking orthodontic treatment. These patients are deprived of treatment and rehabilitation in an earlier stage of life, thus posse with greater challenges and need extreme skill and knowledge to manage them. Adult orthodontic patients are dealt with in a problem oriented approach, many a times not requiring conventional extensive orthodontic therapy. Most of them seek treatment as a part of other rehabilitative treatment procedures like crown and bridge prosthesis, to improve periodontal status, etc. These patients require adjunctive therapy to aid re-establish their structure, function and in turn aesthetics. One of such problems we come across is missing 1st molars and the adjacent teeth tipped into these spaces presenting with poor periodontal status and unfavourable for rehabilitation procedures. Many methods have been described earlier for uprighting these teeth. Here we are introducing a newer and relatively effective method of uprighting such teeth in a very controlled manner over a short period of time. It was originally developed as a modification of MUST (Molar Uprighting Simple Technique) appliance of ElieCapelluto and Isabelle Lauweryns.

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INTRODUCTION

In recent times, the number of adult patients seeking orthodontic treatment has increased greatly. These patients are deprived of treatment and rehabilitation in an earlier stage of life, thus posse with greater challenges and need extreme skill and knowledge to manage them. These patients can require treatment by comprehensive procedures or adjunctive procedures as a part of other dental disciplinary approaches. They present with an array of problems which need immediate attention for treatment either by comprehensive or adjunctive procedures as a part of other dental disciplinary approaches (Goldman, 1980). Many a times we come across patients with missing 1st molars and the adjacent teeth tipped into these spaces presenting with poor periodontal health and unfavorable for rehabilitation procedures. Many methods have been described earlier for uprighting these teeth to improve their periodontal health and aid in rehabilitation (Chu *et al*., 2003; Elie Capelluto, 1997; Gazit, 1993). Several of these use removable devices or fixed appliances with use of microimplants, complex designed springs etc. These require extensive patient cooperation or expensive adjuncts and skillful procedures (Goldman, 1980).

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Here we are introducing a newer and very effective method ofuprighting such teeth in a very controlled manner over a veryshort period of time. It is developed as a modification of MUST (Molar Uprighting Simple Technique) appliance ofElieCapelluto and Isabelle Lauweryns published in the Journal of Clinical Orthodontics (Elie Capelluto and Isabelle Lauweryns, 1997).

Need for molar uprighting

Ideal tooth positioning in molar uprighting is necessary for certain treatment objectives. These include:

- Improved masticatory efficiency
- Space availability
- Protection against occlusal trauma.
- Protection against inflammatory periodontal disease.
- Abutment parallelism

Contraindications

Uprighting of molars are contraindicated in cases with root resorption and aggravation of periodontal diseases are present, patient who is unable to maintain proper oral hygiene resulting in periodontal breakdown and posing a challenged relationship of the alveolar bone to the cementoenamel junction; with

occlusal trauma; in cases where the buccolingual width of trabecular bone in the edentulous span is narrowed (knife edge ridges) etc. While tooth movement through cortical bone is possible, the disadvantages of root resorption, dehiscence, and prolonged treatment time outweigh the advantages.

Many methods have been described for uprighting these teeth.These include:

- Using a 0.017 x 0.025 A-NiTi wire for initial brack*et al*ignment followed by the use of continuous M-NiTi wire.
- Use of an auxiliary uprighting spring
- Use of a T-loop [0.017x 0.025 SS or 0.019x 0.025 beta-Ti]

Most uprighting techniques tend to extrude the molar as it uprights and rotates around its center of resistance, causing occlusal prematurities and interferences. Rotation around a more apical center of resistance (as in cases with reduced periodontal support) results in an even larger extrusive component. Capelluto and Lauweryns (1997), first described the Molar Uprighting Simple Technique (MUST), designed for uprighting molars without extrusion (Elie Capelluto and Isabelle Lauweryns, 1997). Two slightly different models were developed. In the MUST 1, an .018" x.025" tube is soldered cervically to the molar tube, parallel to the occlusal plane. A shorter .018" x .025" tube is soldered horizontally to the distocervical wing of the premolar bracket. The active component of the uprighting spring is a superelastic .016" x .022" NiTi wire, which produces light and continuous force throughout treatment. This wire extends from the mesial of the premolar tube to the distal of the molar tube. In the MUST 2 design, the premolar tube is soldered vertically to the cervical wings of the bracket. The nickel titanium wire extends from the gingival of the premolar tube to the distal of the molar tube. Once inserted in the tubes, the wire is activated by pulling it mesially out of the molar tube.

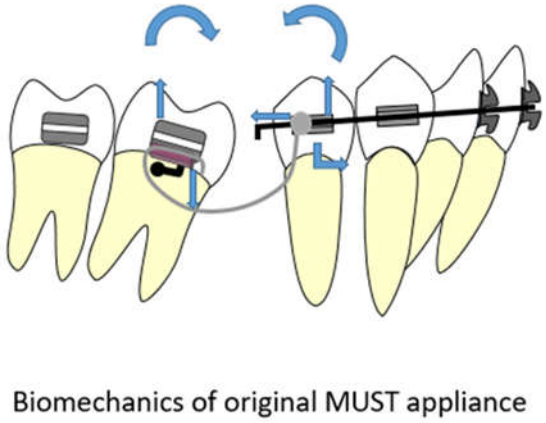


Fig 1 Biomechanics of the must appliance

Biswas PP and co-workers (2009) developed the modified MUST appliance by overcoming the limitations of the original appliance[6] which later published by Shetty *et al*. (2011). The Modified MUST appliance is fabricated from 0.017 X 0.025" heat activated NiTi wire in comparison to original MUST made of 0.016 X 0.022" NiTi. It is soldered to the power arm on the mesial side of 2nd premolar bracket and inserted from the distal side of 2nd molar tube. The mandibular arch is completely strapped up till the 2nd premolar and is stabilized with a 0.019 X 0.025" SS wire and cinched back. But making this appliance was time consuming and controlling the NiTi wire while bonding the premolar bracket was difficult. Also constant deboning and tipping as a counter effectof molar uprighting was seen on the premolar. Hence to overcome the drawbacks we present a more effective and comprehensive design for the modified MUST appliance.

METHODS

Rectangular NiTi wire [0.016 x 0.022" or 0.017x 0.025"] is used in conjunction with the standard fixed appliance. The wire is passed through the auxiliary slot of the molar tube (distally) while the other end is hooked on to the archwire. The wire is placed at the level of the gingiva and does not interfere with nor is affected by normal function. A sleeve is added to reduce damage to the gingival tissues due to impingement.

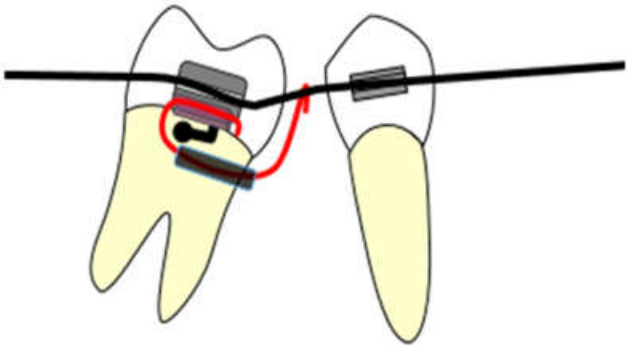


Fig 2:3 d Molar uprighter

RESULTS

Photographs were taken at:

- Pretreatment
- The appointment after the placing of the 3D NiTi Uprighter

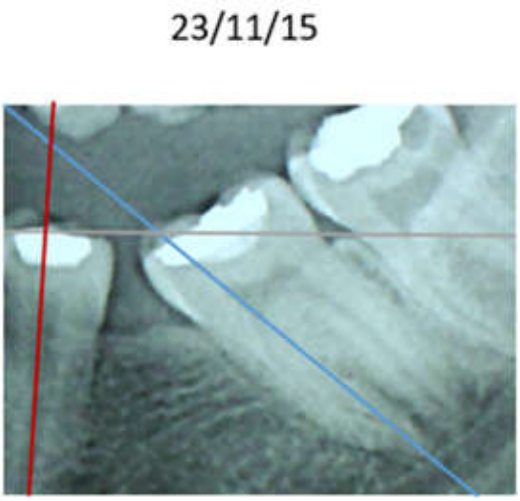
Fig 3: Case 1

As seen, uprighting was achieved.

Aside from evaluating the changes clinically and through photographs, radiographs can be used to ascertain the molar uprighting.

Fig 4: Case 2

The occlusal plane and the long axes of the premolar and molar are traced on the pretreatment and the treatment radiographs. The differences in the angle between the molar long axis and the occlusal plane and the angle between premolar long axis-occlusal plane give an indication of the molar uprighting as well as any counter effect on the premolar.



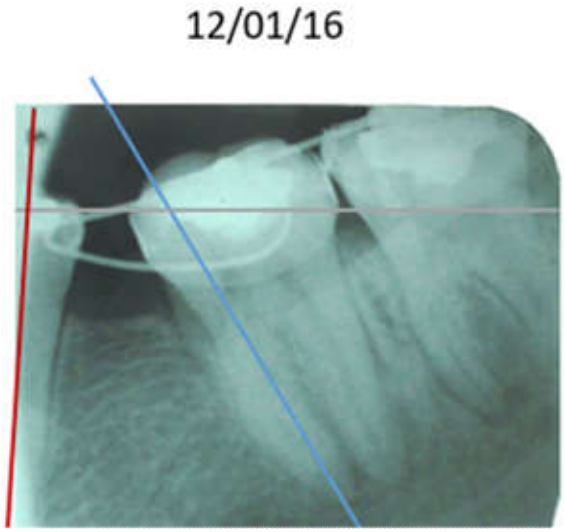


Fig 5. Molar uprighting produced by 3 d uprighter in 1.5 months

In this case, there was a change of 19^0 in the angle between the long axis of the molar and the occlusal plane.

DISCUSSION

Most uprighting methods tend to bring about an extrusive force to the molars. This leads to occlusal interferences which will require occlusal adjustments. This interferes with the process of uprighting and can be detrimental to the periodontium. Intitally we sought to modify the appliance by hooking the 0.017x 0.022 NiTi wire directly on to the arch wire itself. This was to avoid the deleterious effects on the premolar. In the original MUST appliance, a tube is soldered on to the premolar for attachment.

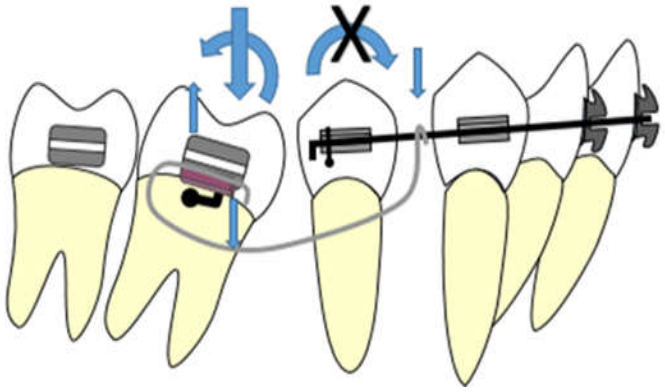


Fig 6. Biomechanics of the 3 d uprighter appliance

Our initial attempt resulted in molar uprighting but we were unable to prevent rolling-in of the molars i.e. we lacked sufficient control in the transverse plane. We, then made another modification by incorporating a continuous archwire that passed through the molar as well.The archwire helped prevent the rolling-in of the molars and had a synergistic effect in the uprighting of the molar

The advantages of the uprighter recommended here are as follows:

- 16x22 or 17x25 rectangular NiTi is used. This is easily available and economical.

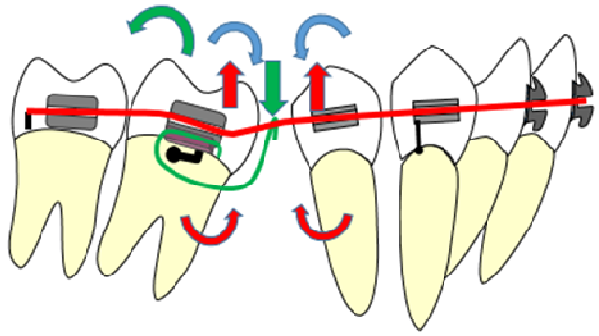


Fig 7. Biomechanics of the 3 d uprighter appliance attached between 4 and 6

- There is no elaborate wire-bending required. Nor is there the need for soldering.
- A light continuous force is applied.
- Fewer adjustments are necessary during treatment because of low deflection property of NiTi.
- In the edentulous span, the wire is not disturbed by normal function because it is positioned at the level of the gingiva.
- Patient discomfort is minimized by offsetting the spring over the edentulous ridge and a sleeve is added to prevent tissue injury.

Conclusion

Before selection of any appliance or method to upright the molar, it is important to carefully assess the case. Cases have to be considered on an individual basis as treatment will vary, depending on the level of periodontal disease. Although the appliance presented should be clinically useful, further research is needed.

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