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Correction Of Second Molar In-Out Discrepancy And Malalignment Using A Modified Bondable BaTR Molar Tube

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Abstract:
This case report describes the use of a specially designed bondable BaTR (Brackets for Variable Torque and Rotation) molar tubes to address significant in-out discrepancies and malalignment of second molars, which are critical for achieving a stable and functional orthodontic outcome. Second molars often present challenges due to limited accessibility and variable eruption timing, leading to potential compromises in their final position. Traditional methods, such as direct bonding with standard molar tubes and wire bending, can be technically demanding and may introduce unwanted side effects. The BaTR Molar tube features adjustable legs that allow for customized offset, torque, and rotation modification. In this case, a patient presented with crowding and buccally placed upper second molars. BaTR Molar tubes were bonded to the upper second molars with a 1mm offset created by bending all four legs of the tube. This offset increased the wire deflection in the buccal direction as compared to bonding molars with conventional molar tubes. The use of BaTR Molar tubes facilitated effective alignment of the second molars without complex wire bending.

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I. Introduction

Achieving proper alignment and torque control of all teeth, including the second molars, is paramount for a stable and functional orthodontic outcome[1]. Second molars play a crucial role in establishing the final occlusion, influencing posterior intercuspation, and maintaining arch length[2]. Their correct buccolingual positioning and axial inclination are essential for optimal masticatory function and periodontal health. Despite their significance, second molars often present unique challenges in orthodontic treatment. Their distal location in the arch limits accessibility for bonding and their eruption timing can be variable, sometimes complicating treatment mechanics[3]. Consequently, orthodontists may at times prioritize the alignment of the more anterior teeth, potentially accepting a less-than-ideal position for the second molars due to the perceived difficulty in achieving precise corrections. This can lead to compromises in the final occlusion which ultimately affects long-term stability. Addressing in-out discrepancies and malalignment of second molars effectively is therefore critical for comprehensive orthodontic care.

Traditionally, orthodontists have relied on various techniques to address second molar malalignment. Direct bonding with standard molar tubes is a common approach, but the limited access and visibility, coupled with the often-smaller clinical crown of second molars, significantly increase the difficulty of achieving accurate bracket placement. This frequently results in undesirable in-out discrepancies that require further correction, often involving bayonet bends in the arch wire. While these bends can help to position the second molar buccally or lingually, they introduce complexities in wire sequencing, can induce unwanted side effects on adjacent teeth, and require precise execution and adjustment. Segmental mechanics utilizing auxiliary wires or buttons and ligatures can be effective but may require multiple adjustments and prolong treatment duration. Use of a segmental .018" X .025" stainless steel wire to align the second molar at the end of treatment has been described[4] but this method increases the treatment time and complexity as well. This case report describes the application of a specially designed bondable BaTR Molar tube, in the treatment of a patient exhibiting a significant in-out discrepancy and malalignment of a second molar.

II. Molar Tube Design

The BaTR (Brackets for Variable Torque and Rotation) Molar tubes of each quadrant consists of four legs that extend along the meshwork (Figure 1). The in-built tip and torque is of the MBT system[5]. The legs are oriented in a mesiodistal direction and can be bent 90°, bent and cut or folded completely to get the desired torque, rotation and in-out modification[6].

Figure 1- BaTR Molar Tube with legs extended mesiodistally.

III. Mode Of Action

By bending the occlusal and gingival legs by 90 degrees, cutting them in half after bending, or folding them, clinicians can influence the bracket's final in-out placement. By bending all four legs (Figure- 2a), the molar tube rests 1 mm away from the buccal surface. On bending and cutting in half (Figure- 2b) the molar tube rests 0.5 mm away from the buccal surface and folding the legs completely makes the molar tube rest 0.25mm away from the buccal surface. This offset alters the slot's labiolingual position with respect to adjacent tooth and imparts a lingual force as the NiTi wire undergoes more deflection ultimately resulting in quicker alignment.

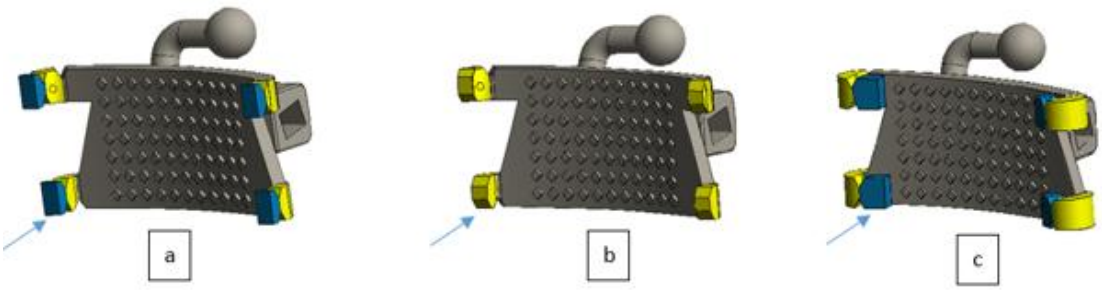

Figure 2- Three options in a BaTR Molar Tube for in-out movements

IV. Clinical Scenario

A patient came with the chief complaint of crowding and proclined teeth. The upper second molars on both sides were buccally placed (Figure-3). Conventional orthodontic mechanics for correcting buccally placed molars often involve intricate wire bending, such as bayonet bends, or the use of auxiliary appliances[7]. These techniques can be technically demanding, time-consuming, and may introduce unwanted side effects if not meticulously executed. The treatment plan involves orthodontic therapy with fixed appliances on both arches to address the overall alignment and the specific buccal displacement of the second molars. For the maxillary second molars instead of standard molar tubes, BaTR Molar tubes are selected. In this specific scenario, the primary modification focuses on utilizing the design of the tube to achieve the desired buccal offset. Additionally these molar tubes offer the advantage of adjustable torque and rotation as well.

Prior to bonding, all four legs of both BaTR Molar tubes are bent by 90 degrees(Figure-3). This bending of all four legs is done to create a 1 mm offset between the base of the molar tube and the buccal surface of each upper second molar. This offset is significantly greater than what would be achieved with standard molar tube placement. This is similar to a first order/ in-out bend, bent into an arch wire. The modified BaTR Molar tubes are then bonded to the upper second molars, ensuring accurate vertical and mesiodistal positioning. Due to the 1 mm buccal offset created by the bent legs, the slot of the molar tube is now positioned more buccally than it would have been with a conventionally bonded tube. When the initial nickel-titanium (NiTi) levelling and aligning wires are engaged, this slot position on the buccally placed second molars results in a 1 mm increase in wire deflection in the buccal direction. As rectangular NiTi and Stainless steel wires are used consequently, the second molars are very well aligned into the arch without the use of any complex wire bendings. (Figure- 5,6)

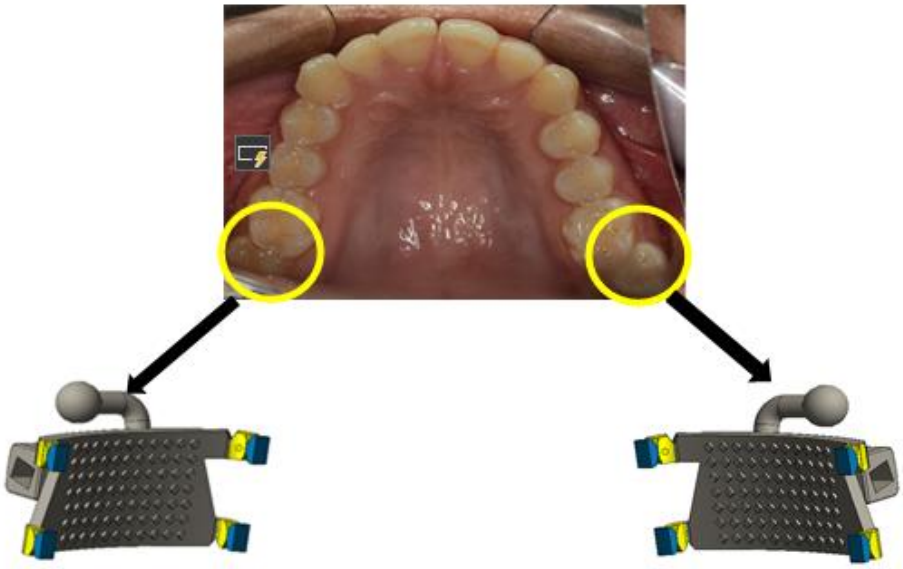

Figure 3- Buccally placed second molars and BaTR Molar tube legs bent 90° prior to bonding

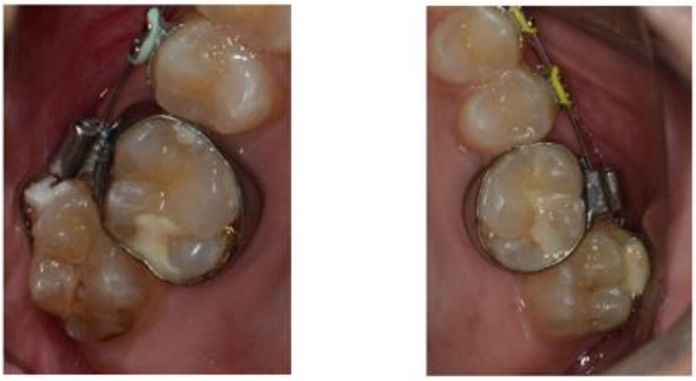

Figure 4- Deflection of the NiTi wire in second molar due to bend legs of BaTR molar tube.

Figure 5- Second molars aligned into the arch completely on reaching the rectangular stainless steel wire stage.

Figure 6- Final position of second molars after debonding.

V. Discussion

Aligning malaligned second molars presents a significant challenge in orthodontics due to their posterior positioning and limited accessibility. Conventional techniques such as piggyback or auxiliary wires, while aiming to deliver targeted forces, can be cumbersome to manage in the distal arch, potentially causing unintended rotations or extrusions of adjacent teeth if not meticulously controlled.. Similarly, sectional mechanics[8], while offering localized control for specific tooth movements, may complicate the subsequent coordination of the entire dental arch and necessitate intricate planning for seamless integration with the continuous arch wire. The restricted access and visibility in the posterior region further compound these difficulties, making precise wire manipulation and bracket engagement demanding, ultimately increasing chair time and overall treatment duration.

The introduction of innovative solutions like the BaTR molar tube aims to overcome these limitations by offering a more efficient and reliable approach. As described, a simple modification to the tube's legs allows for increased initial wire deflection, leading to a quicker and potentially more predictable alignment of the malaligned second molar, thereby mitigating the complexities associated with traditional wire bending and auxiliary appliances. This approach has the potential to reduce chair time and streamline the alignment process for these challenging posterior teeth.

VI. Conclusion

The BaTR Molar Buccal tubes are easy to use, very efficient and significantly reduces the treatment time as second molar alignment starts from the introduction of the first NiTi wire itself. The BaTR tubes offer a wide range of options for variable torque, rotation and in-out movement.

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