Modified Surgical Stent for Accurate TAD Placement

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The development of temporary anchorage devices (TADs) has allowed for the creation of anchorage in situations where there once was none. Many studies have suggested that the most significant cause of miniscrew failure is insufficient distance between the surface of a root and the miniscrew. In order to reduce the miniscrew failure rate, a modified surgical stent has been shown to not only increase TAD insertion accuracy but also to increase TAD success rates.

Key words*: Surgical stents, TADs, miniscrew*

INTRODUCTION

Achieving maximum anchorage is an ever-present concern in orthodontics. The development of temporary anchorage devices (TADs) has allowed for the creation of anchorage in situations where there once was none. Despite the numerous benefits TAD usage has afforded, there are still drawbacks associated with them. According to Papageorgiou *et al*, miniscrews have a 12.0% failure rate when placed in the maxilla while there is a 19.3% failure rate in the mandible.[1] They also reported that two major reasons for TAD failure relates to which jaw the miniscrew is placed in and if root contact occurs during miniscrew insertion.[1] Many studies have suggested that the most significant cause of miniscrew failure is insufficient distance between the surface of a root and the miniscrew.[2,3] In order to avoid this failure mechanism, Kuorda *et al* determined that the ideal separation between a miniscrew and any adjacent root is at least 1mm.[4] In order to reach their maximum potential, lessen failures, and provide the most accurate insertion of TADs, a modified surgical stent can be used for precise TAD placement. The surgical template has been shown to not only increase TAD insertion accuracy but also to increase TAD success rates.[5]

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Technique

To use the surgical guide technique, impressions are needed to create models on which to fabricate a modified surgical stent. A drill is used to make an indentation at the ideal site for miniscrew placement. Two vinyl chloride tubes are then attached to the stent with a 1.5 mm copper wire running through them. The wire should be bent to match the angulation of the TAD placement. The tubes will rest on the stent with a horizontally leveled component along the occlusal table and an angled component (angled at approximately 30° from the vertical)[6] that connects to the previously made indentation (Figure 1). The copper wire that runs through the tubes serves as an indicator, allowing X-ray to be used to confirm TAD placement. Once correctly aligned, the guidance tubes are fixed to the stent using a cold-cure resin, and the appliance is trimmed to include adjacent teeth (Figure 2). As a part of the pre-surgical examination, clinically, the surgical guide is assessed within the mouth. Seating and alignment of the surgical stent is then confirmed with x-rays (Figure 3). If the radiographs indicate that the stent is not positioned for ideal miniscrew placement, the stent can be adjusted accordingly. When the ideal position has been achieved, the copper wire is sectioned and removed from the angled portion of the sleeve so that an instrument can be used to guide the miniscrew into its correct position (Figure 4). The miniscrew is then placed with or without tapping (Figure 5). Post-surgical x-rays should then be taken to confirm the miniscrew's positioning (Figure 6).

Figure 1. Setup of a TAD surgical stent with copper wire within vinyl chloride tubes.

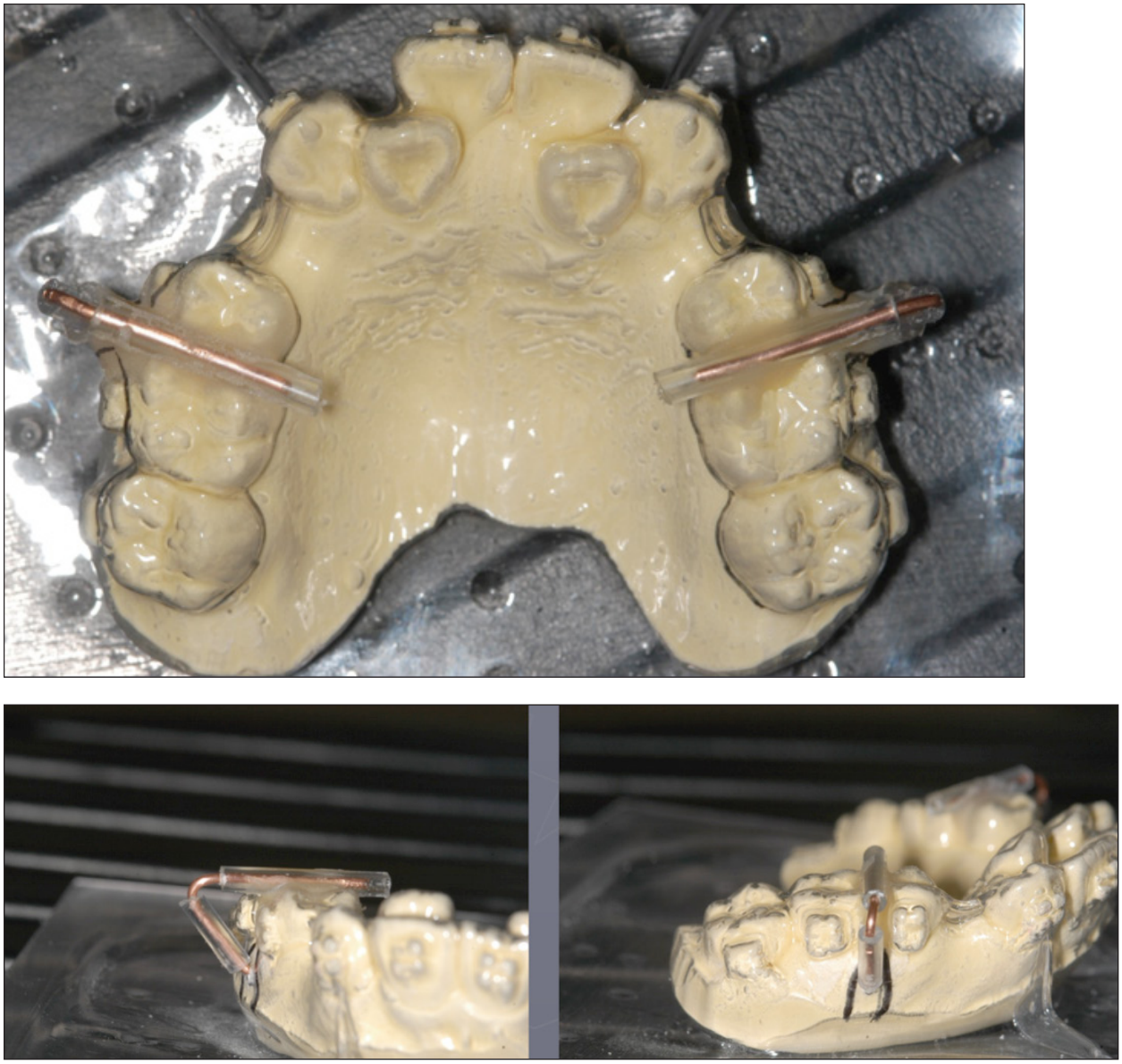


Figure 2. Trimmed surgical stent.

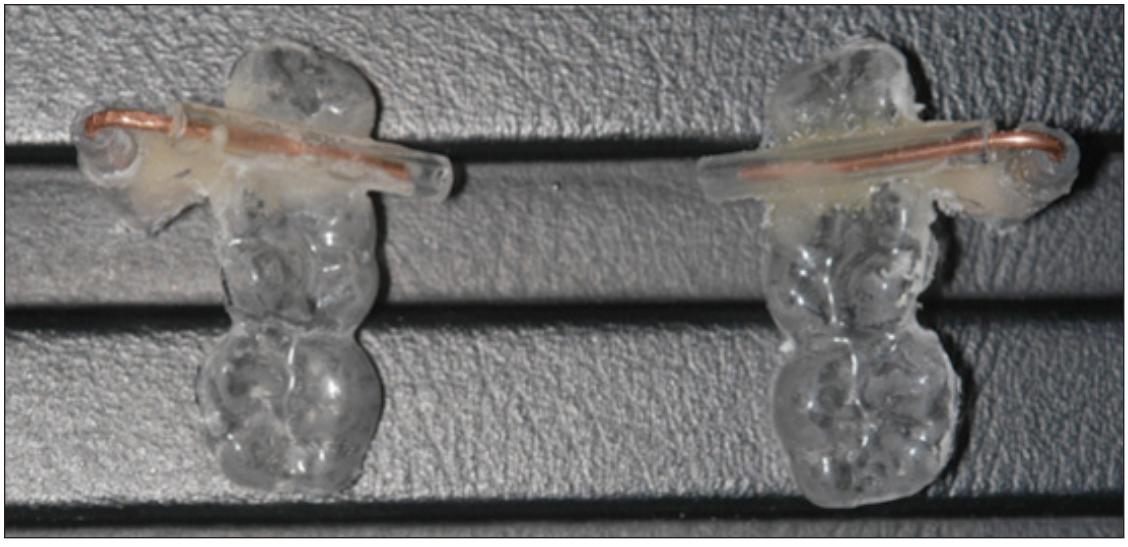


Figure 3. Pre-surgical intraoral radiograph, taken to confirm stent positioning. The positioning of the surgical stents seen in the radiographs are not ideal. Image below shows how the copper wire was repositioned prior to miniscrew placement.

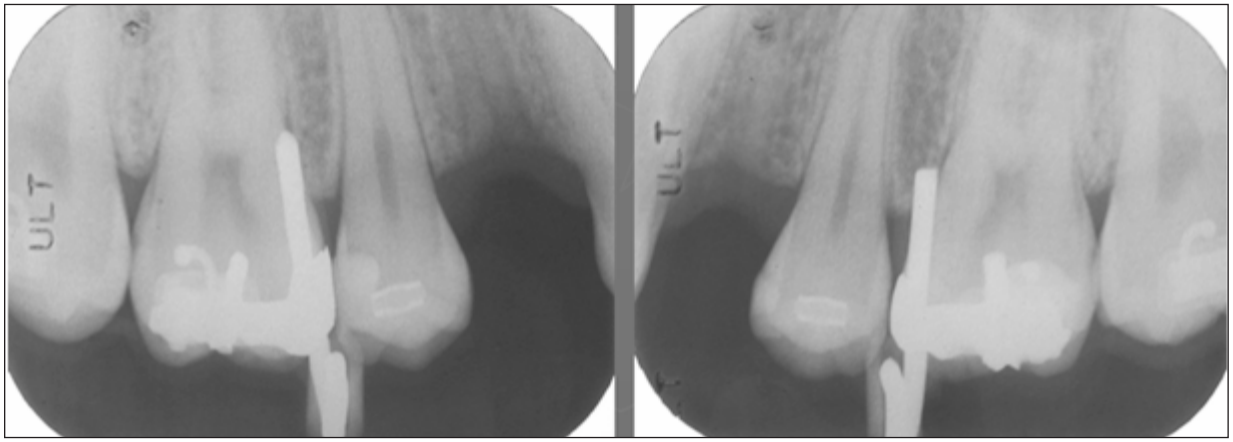


Figure 4. Sectioning and removal of copper wire from surgical stent.

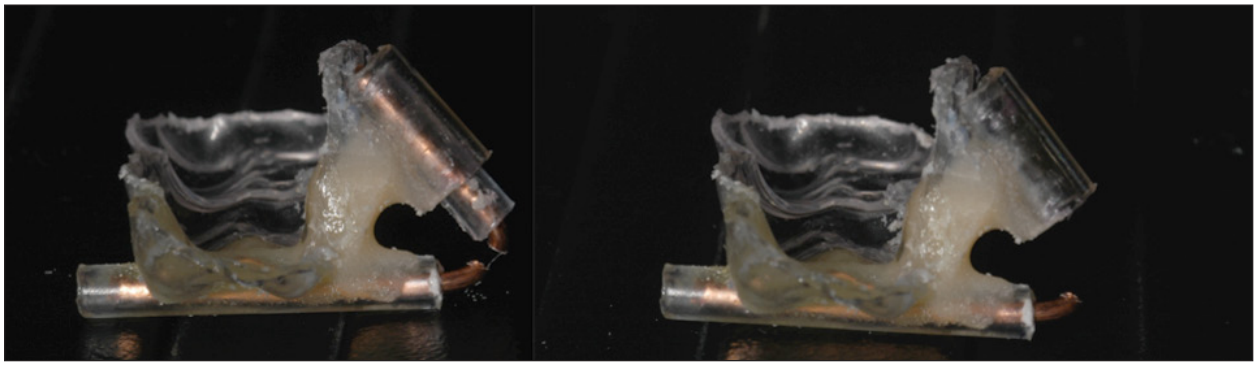
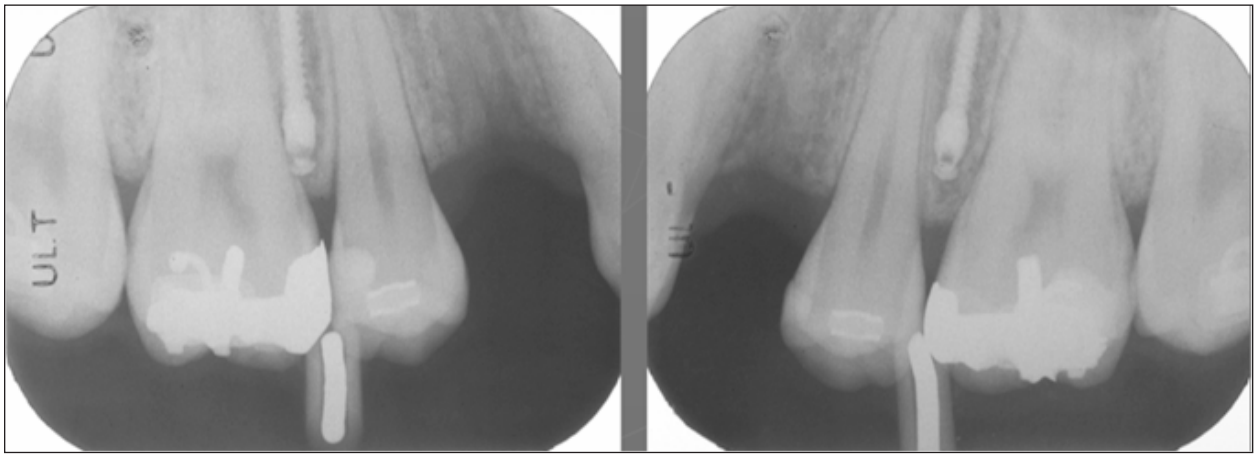


Figure 5. Use of surgical stent for TAD placement. Self-drilling method is demonstrated in the left image. Self-tapping method is demonstrated in the right image.

Figure 6. Post-surgical radiograph confirming ideal TAD placement.



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