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Review Article

I (Implant) On Right Place

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ABSTRACT

The horizontal (interradicular) and vertical positioning of the microscrew-implant is crucial of success of the treatment and can be determined more safely with a mechanical guide rather than by the clinician's skill and experience. Ideal placement at the first attempt is correlated with better stability. Several authors have developed 3 - Dimensional surgical guides that are recorded on radiographs. Previous guides mentioned in the literature either requires tedious laboratory procedures or appliances which are not easily available in routine orthodontic practice. Several authors have developed 3 - Dimensional surgical guides that are recorded on radiographs. In accordance with it this article describes User friendly Versatile Radiographic Guide (UFVRG) with its application in one clinical case.

Keywords: Microscrew-implant, Pilot drill, proper positioning, skeletal anchorage, User friendly Versatile Radiographic Guide (UFVRG).

INTRODUCTION

Orthodontic miniscrews provide stable skeletal anchorage for both direct and indirect orthodontic traction. [1,2] These implants, which have evolved from maxillofacial fixation screws, rely primarily on mechanical engagement, although a variable amount of osseointegration may also occur. While the commercially available materials and designs differ, there are two basic types of miniscrew threads. Non-drilling (or "self-tapping") miniscrews such as Leone Orthodontic Mini Implants require pilot holes to be drilled before they are inserted. More recent self-drilling screws such as the Aarhus Mini-Implants may require indentation of the cortical plates, but do not need pilot drilling. Precise three-dimensional positioning of palatal implants has been found critical to their success. [3,4] The insertion technique for miniscrews should maximize the available bone volume while avoiding adjacent anatomical structures such as dental roots, nasomaxillary cavities, and neurovascular tissues. [5, 6] Although root surfaces appear to repair after traumatic contact with bone screws, [7] it is still prudent to minimize the risk of such iatrogenic damage. Planned tooth movements should be taken into

account, especially when the insertion site is adjacent to a space that is to be closed. Improper positioning may result in interference with the required tooth movement and hence limit the effectiveness of the skeletal anchorage.

Visual and instrument access can be difficult when miniscrews are placed in posterior or palatal locations. Problems may also arise when the treatment planning and implant insertion are performed by different clinicians. Several authors currently recommend the use of a brass separating wire or custom-made wire guide, which is radiographed in place to show the relationship to the planned insertion site and the adjacent dental roots. [8,9] Aside from the additional radiographic exposure, such wire markers provide only limited topographical information, rather than a direct indication of the implant angulation. The ideal solution would be a stent that would transfer the planned three-dimensional implant position to the surgical placement procedure.

This article describes a User friendly versatile radiographic guide for implants. The design and fabrication are simple, and the guide provides reliable guidance for the pilot drill in terms of both location and angulation. The guide allows access for both visual monitoring and saline irrigation. It is particularly valuable when the miniscrew is prescribed and inserted by different clinicians, or when the orthodontist is inexperienced in implant techniques.

User friendly versatile radiographic guide: The UFVRG guide consists of stainless steel wire mesh (Fig.1), two soldered molar tubes (Fig. 2) and a 0.16x0.22 ss wire. It is fabricated using 0.16x0.22 stainless steel wire which is cut into small pieces and welded to form a mesh. Two molar tubes one lower double and upper triple are soldered. The 0.16x0.22 ss wire part goes into the triple tube and engages the molar tube. The vertical arm of mesh goes into the vertical double tube (Figs. 3). The mesh is used to identify the optimal implant site on bite-wing radiographs and to guide the drilling of pilot hole and placement of the miniscrew.

Clinical procedure: Whenever mini-implant anchorage is indicated, the desired implant site should be evaluated with a bitewing or periapical x-ray. [10, 11] If the interradicular septum is to be used for the implant, it should be at least 2.5-3mm wide, because the miniscrew will take up about half this space. [11] The mini-implant placement procedure is as follows: The UFVRG guide should be autoclaved in advance. [12] At the surgical appointment, the patient's teeth are prophied, followed by a 12% chlorhexidine mouthrinse to reduce the risk of contamination during surgery.

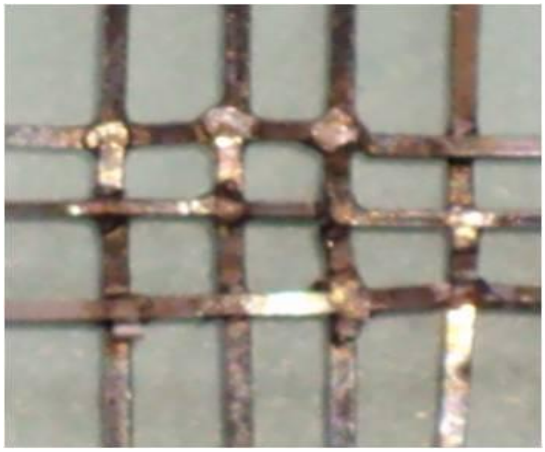

Fig 1- Stainless steel wire mesh

Fig 2- Soldered molar tubes

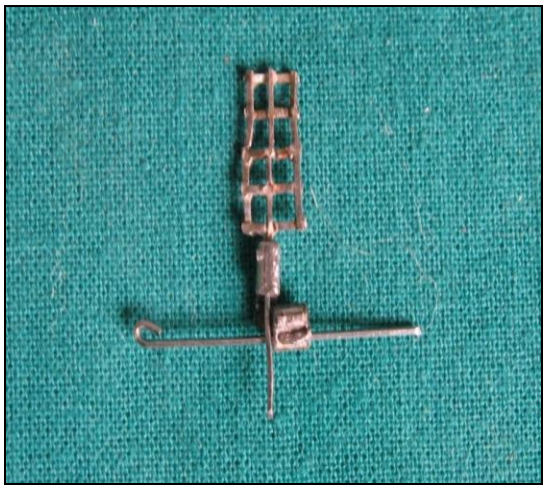

Fig 3- The UFVRG device

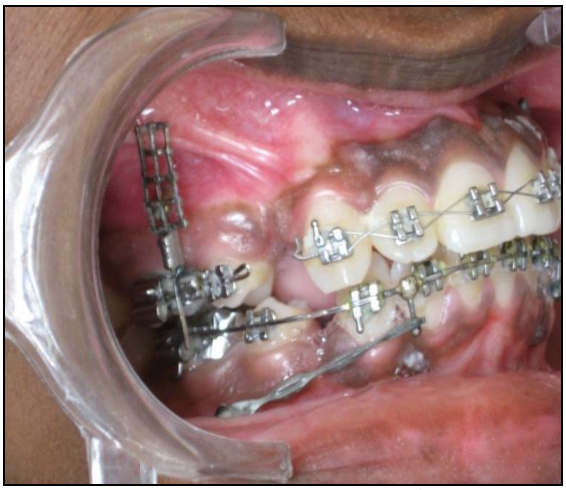

Fig 4- Place the UFVRG on the area of interest

The RSG is attached to the fixed appliance (Fig.4). The mesh position can also be adjusted by placing slight bends in the vertical arm, although these modifications require more chairtime. A radiograph is taken to evaluate the relationship of the UFVRG to the adjacent roots (Fig.5). If there are no image superimpositions between the UFVRG and any anatomical structures, the drill angle will be safe. On the other hand, if a superimposition of the UFVRG indicates that damage could occur to the roots or maxillary sinus, the UFVRG should be repositioned, using the first radiographic image as a guide. Another radiograph should then be taken to ensure that the repositioning was correct. Under local anesthesia, a 1mm (.040") pilot drill is inserted through the mesh, using a slow speed of about 800rpm and continuous normal saline irrigation (Fig.6). The UFVRG is removed, allowing insertion of the mini-implant (Fig.7). Finally, with the UFVRG is reattached, and a final radiograph is taken to confirm the proper miniscrew position in the interradicular septum (Fig.8).

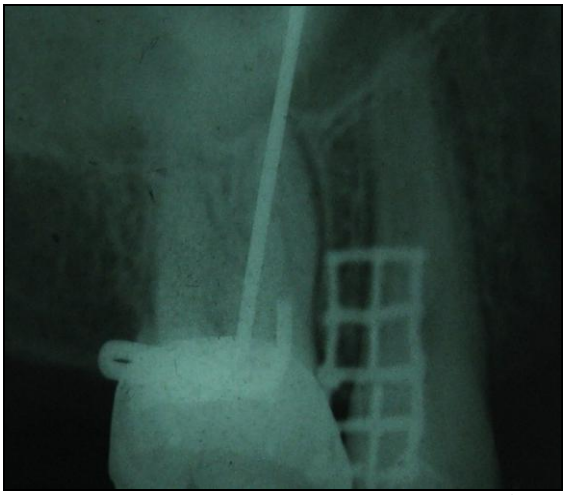

Fig 5- Take radiograph and determine proper position of the mini screw

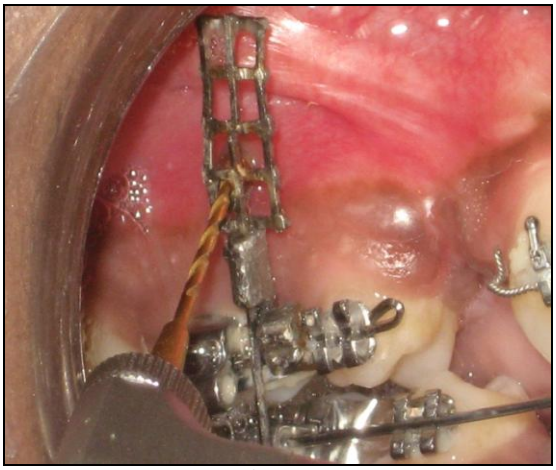

Fig 6- Pilot drill is performed through the UFVRG

Fig 7- Mini screw in place

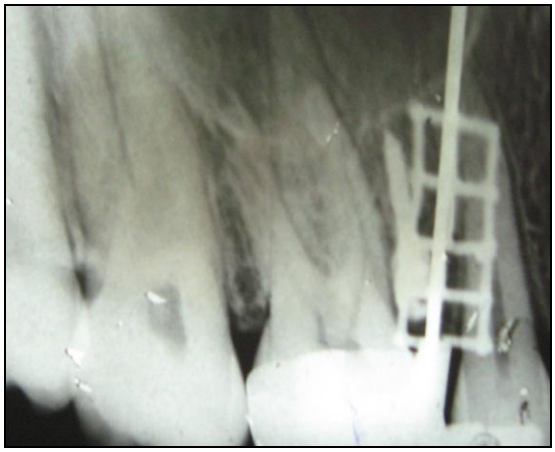

Fig 8- Proper placement is checked by taking radiograph

DISCUSSION

The most common causes of root damage from mini-implant insertion are improper site selection and an inaccurate angle of drill penetration. For every degree of variation from the ideal penetration angle, at a depth of 8mm, the tip of the surgical drill will deviate about 13mm. In other words, if the drill penetration angle is only 8° from ideal, the tip will deviate about 1.04mm. In the narrow interradicular septum, [13] even a minor error can result in root damage. Exposure of root dentin can cause inflammation and root resorption, which can be exacerbated by orthodontic tooth movement. [14]

According to Mah and Bergstrand, mini-implants should be placed at an angle of no more than 10° from perpendicular to the bone surface. [15] More extreme vertical angulations, such as the 60° recommended by Park, [16] cannot be achieved with the technique described above. A more vertical angle of insertion will reduce the horizontal penetration depth of the mini-implant into the bone, [16] but that reduction is not enough to avoid root damage if the pilot drill is mistakenly inserted into the buccal alveolar plate, where the bone is extremely thin, instead of the interradicular septum .Vertical angulation also places the drill closer to the maxillary sinus, which may be critical if the radiograph shows a close proximity between the root apex and the sinus. Although some authors have speculated that a more vertical angulation would result in better miniscrew retention, [17] the long-term stability of such implants has not been evaluated.

Several other three-dimensional surgical guides for mini-implant placement have been developed. The techniques of Freudenthaler and colleagues [18] and Kitai and colleagues [19] require computed tomography, which entails a relatively high cost and increased radiation exposure. [17] Morea and colleagues do not evaluate the position of their guide in relation to the adjacent roots on a follow-up radiograph. [6] The surgical guide of Suzuki and Buranastidporn [20] is the most similar to the one described in this article, but their lack of a radiographic guide prevents standardization of the focal point, object, and film position. Furthermore, these authors use a telescopic tube with an internal diameter of 3mm for a 1.5mm pilot drill, allowing a drill deviation of as much as 16°. Even though their telescopic tube is used to guide the screwdriver for mini-implant insertion, the screwdriver and mini-implant are not rigidly attached. Forcing or self-drilling the miniscrew can lead to metal fatigue and eventual screw fracture. [17]

In our experience, the orthodontist can insert a mini-implant as accurately as an oral surgeon if the RSG is used. In fact, studies have shown that without the aid of a surgical guide, root damage can occur even when a miniscrew is placed by an oral surgeon. [21] A bitewing is preferable to a periapical radiograph for evaluation of the interradicular septum, because the periapical exposure produces more obliquely projected and distorted images. If the bitewing does not allow adequate visualization of the interradicular septum height, however, a periapical x-ray may be used. Taking the pretreatment radiograph with the RSG in place will save the patient one radiation exposure. If an additional radiograph must be taken during RSG positioning, the minor increase in radiation dosage will be justified to avoid the risk of root damage. In any event, a final radiograph must be taken after implant placement to confirm the integrity of the adjacent roots. [16]

CONCLUSION

This surgical stent provides accurate three-dimensional positioning of miniscrews so that bone support can be maximized and damage to adjacent structures can be avoided. It reduces the need for direct visual access to posterior or palatal insertion sites, and is particularly valuable when the operator is inexperienced or the insertion is not performed by the prescribing orthodontist. By minimizing lateral movement of the pilot drill and implant, it also prevents widening of the implant hole and thus improves mechanical stability.

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