Tray-Grid Guide for Accurate Mini-implant Insertion

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ABSTRACT
The use of Orthodontic mini-implant anchorage is rapidly growing. With the improved understanding of the biomechanics, an array of tooth movements are possible with mini-implants. Precise positioning of miniscrews is critical to their success. Surgical stents, guides and templates can transfer a radiographically planned, three-dimensional implant position to the surgical site more accurately. A new technique using thermoplastic sheets and a grid made of 0.012” stainless steel ligature wire (Tray-Grid Guide; TGG) was devised that provides reliable guidance in terms of both location and angulations with minimal complications. It was found to be effective and efficient to obtain a precise and accurate placement of mini-implants. It is particularly valuable when the mini-implant is prescribed and inserted by different clinicians or when the orthodontist is inexperienced in implant techniques.

Keywords: Mini-implant anchorage, Tray-Grid Guide (TGG), Erkodent sheets, Ligature wire.


INTRODUCTION
Traditionally, anchorage in orthodontics has been reinforced by various intraoral and extraoral methods. With the advent and introduction of mini-implants as anchorage system, several disadvantages, including complicated appliance design and the need for patient cooperation, have been almost eliminated.1,2 The mini-implant anchorage system is less invasive, easy to place and remove, allows immediate loading, cost-effective and has few anatomic limitations when compared with conventional implants. With our improved understanding of the biomechanics, an array of tooth movements are possible with mini-implants.3-7

Success with mini-implant anchorage system depends on factors related to the clinician, patient and the screw itself. Incorrect mini-implant insertion technique has been identified as a primary cause of failure in this system.8,9 Precise positioning of the implants requires a careful assessment of clinical and radiographical implant site to maximize the available bone volume and avoid important anatomical structures like roots, nerves, blood vessels, etc. To maximize the depth of implant into the bone, the clinician must consider three major parameters:

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Fig. 1: Armamentarium used

Fig. 2: Erkopress machine for preparation of tray

Fig. 3: Accurate impression made with alginate

Fig. 4: Working cast poured with Orthokal stone

Fig. 5: Twisting of 0.012" SS ligature wire

Fig. 6: Grid prepared with double-stranded 0.012" SS ligature wire

Fig. 7: Grid placed at implant site on the cast

Fig. 8: Tray fabrication with the grid in Erkopress machine
Mini-implant Insertion Procedure

As the mini-implants are self-drilling and self-tapping, it is not necessary to raise flaps for transmucosal insertion. Identify the point of insertion on the grid and make a window through the tray using a round bur for implant insertion (Fig. 12). After administration of 0.2 ml of local anesthesia, the mucosa surrounding the insertion site is rinsed with 0.02% chlorhexidine solution for 2 minutes to reduce the risk of contamination during mini-implant insertion. Transfer the marked transfer tray to the patient (Fig. 13). Place the implant through the window taking radiographic findings into consideration. Once the mini-implant is in place, gently remove the tray (Fig. 14). If necessary, screw
the mini-implant further to secure into the bone, taking care not to deviate from its original direction. Take a final periapical radiograph to confirm the predetermined position of mini-implant (Fig. 15).

DISCUSSION

Precise positioning is critical for the success with mini-implant anchorage system. Insertion too close to adjacent tooth roots increases the risk of implant failure and may also interfere with planned tooth movements. A variety of techniques and devices have been proposed to obtain precise implant placement. In most of the previous methods, either thermoplastic material trays or steel stents were used. A new device was designed, Tray-Grid Guide (TGG), which consists of both transfer tray and steel grid. Unlike, the previous rigid grids which were made of rectangular stainless steel wires, our grid is made of double-stranded 0.012" ligature wire keeping in mind the flexibility required for its use in any part of the arch. The grid is used radiographically to confirm the precise location for implant placement prior to its insertion making it more effective and efficient. The Erkodent transfer tray is easy to fabricate, rigid enough to withstand the muscular forces, thereby giving support and minimizing any discomfort to the patient. Mini-implant insertion through the window in the tray allows precise and accurate placement both vertically and horizontally. Extralaboratory work is required in TGG fabrication, but precise implant placement in the patient outmarks the efforts.

CONCLUSION

TGG provides an accurate and efficient point of insertion three dimensionally taking care of adjacent anatomical structures. It is particularly valuable when the mini-implant is prescribed and inserted by different clinicians or when the orthodontist is inexperienced in implant techniques.

REFERENCES

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