A Surgical Guide for Optimal Placement and Immediate Restoration of Implant

Santosh Nelogi, MDS[1]*
Bhasma Srinivas Rao, MDS[2]
Naveen H. C., MDS[3]
Amit Porwal, MDS[4]
Maheshwari Nelogi[1]

INTRODUCTION

The success of an implant is primarily dependent on the diagnosis of the preexisting conditions of the patient and also on the treatment planning. The essential aspect of treatment planning is proper assessment of an implant site through examination, palpation, and radiographic methods. Different radiographic methods have been used to evaluate the bone quantity and architecture at the proposed implant site, ranging from conventional to 3-dimensional models.[1] The assessment of implant sites and their further evaluation can be enhanced by using radiograph templates with radio-opaque markers for placement of implants at proposed implant sites.[2–6]

Precise and appropriate placement of a dental implant with proper angulation to achieve desired esthetic and functional results has always been a challenge to an implantologist. Implantology is a multidisciplinary field; therefore, a team approach between a maxilla-facial surgeon and a prosthodontist is essential in the precise and effective rehabilitation of the patient. Any communication gap between the surgeon and prosthodontist leads to confusion at the time of implant placement regarding the position or angulation of an implant. This confusion can make an implant unrestorable, especially in the anterior maxillary region.[7]

Position, angulation, implant diameter, and length of an implant need to be decided before the surgery is planned. A thorough review of the literature reveals several techniques of fabrication of surgical guide stents for the placement of an implant.[3–17] The surgical guide stent described in the literature cannot (1) guide the drill to the full depth, (2) give a picture of implant inclination within bone, (3) indicate the shape of the implant required in accordance with bone architecture at the proposed implant site, or (4) help achieve postrestoration esthetics in immediate restoration cases. These surgical guides only aid in positioning of the implant.

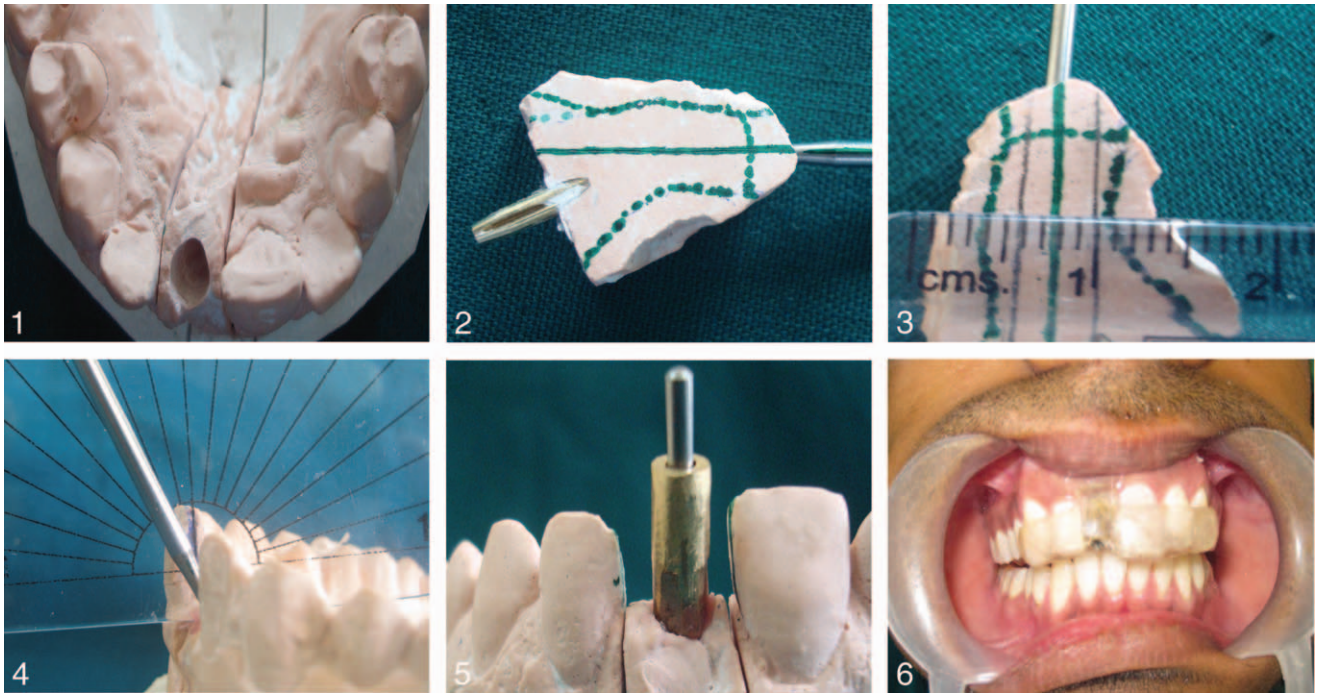
Hence, there is a need for an analog technique to fabricate a surgical guide that allows placement and restoration of an implant in a precise, predetermined position and allows esthetic restoration immediately after surgery.

This article describes a technique of fabrication of a surgical guide stent that enables the surgeon to maintain the predetermined angulation of an implant at the proposed site and at the same time provides information about the implant diameter and angulation of the abutment required for esthetic restoration.

PROCEDURE

1. An irreversible hydrocolloid impression is made, from which a cast is poured into dental stone.
2. Using a pin index system, the removable die of the proposed implant site is prepared.
3. Bone mapping is done under local anesthesia, and the distance of insertion into soft tissue is measured on the labial and lingual aspects of the alveolar ridge at varying vestibule depths.

[1] Department of Prosthetic Dentistry, Kle Vk Institute of Dental Science, Belgaum, Karnataka, India.
[2] Department of Prosthetic Dentistry, Mamata Dental College, Khammam, Andra Pradash, India.
[3] Department of Prosthodontics, Surendra Dental College and Hospital, Sri Ganganagar, Rajasthan, India.
[4] Department of Prosthetic Dentistry, Pacific Dental College and Hospital, Udaipur, Rajasthan, India.
* *Corresponding author,* e-mail: santrodent@rediffmail.com
DOI: 10.1563/AAID-JOI-D-12-00005



Figures 1–6. Figure 1. Die with mock-up osteotomy of the implant site. **Figure 2.** Analyzing rod in position along the long axis of the predicted implant location. **Figure 3.** Lines marked along the long axis indicating implant width to be selected. **Figure 4.** Die with analyzing rod in position in cast; line marked along the long axis of adjacent tooth showing abutment angle required for restoration. **Figure 5.** Analyzing rod with brass tube of 2-mm inner diameter. **Figure 6.** Implant surgical guide in position.

4. The measurements are then transferred onto the die to show the bone architecture at the implant site. From this information, the placement of the implant, its angulation within bone, implant size, and implant type required (cylindrical or tapering) with reference to bone morphology at the proposed implant site and potentially adequate bone can be tentatively determined.
5. Mock-up osteotomy is done on the die according to the marked bony architecture (Figure 1).
6. The prepared implant site is filled with wax.
7. The analyzing rod is aligned with the long axis of the marked bony architecture, which is centered over the outline representing the location and diameter of the implant and the angulation for implant placement (Figures 2 and 3).
8. The line is marked on the adjacent tooth along the long axis.
9. The die, along with a predetermined analyzing rod, is placed in position and viewed from the lateral side to anticipate the acceptable implant angulation and required angulated abutment needed to place the artificial tooth position in the conformed esthetic and functional position (Figure 4).
10. At this angulation of the analyzing rod, a round brass tube with an inner diameter of 2 mm is positioned over the analyzing rod, lightly contacting the cast (Figure 5).
11. When the tooth position and required abutment angulation are confirmed, autopolymerizing acrylic is added incrementally to stabilize the brass tube with adjacent teeth.
12. When resin is polymerized, the surgical guide is carefully recovered from the cast to avoid any damage or alteration of angulation of the brass tube.
13. The surgical guide is trimmed, polished, and ultrasonically cleaned. Further, it is sterilized by using cold sterilization for surgical procedures (Figure 6).

Discussion

A recent advance in implant dentistry with ongoing research in appliance therapy has led to the

fundamental development and modification of surgical guide stent for appropriate placement of an implant.[1–17] The new dimension of the surgical guide for dental implants requires precise placement of each implant along the *x*-, *y*-, and *z*-axes so that the restorative dentist can address the esthetic demands of the patient.

The surgical stent mentioned in this article helps in selection of proper implant to avoid any error at the time of surgery and also guides the surgeon to maintain predetermined angulation at the proposed implant site in all 3 dimensions: (1) along the mesiodistal plane (*x*-axis), (2) buccolingual plane (*y*-axis), and (3) length at the apex of the implant plus prosthetic table depth at the top of the implant (*z*-axis). This aids in preventing fenestration during surgery and ensures that the implant is correctly oriented with respect to the planned restoration.

In the surgical stent mentioned by Balshi and Graver,[8] Edge,[9] and Becker and Kaiser,[10] a 2-mm hole was made in the template that acted as a surgical stent. The drawback of this stent was that it does not give a picture of the implant inclination within the bone or postrestoration esthetics. In the work of Parel and Sullivan[11] and Hobo et al,[12] the preparation for the site is done by free hand, whereas the implant angulation described by Engleman et al[2] is known by placing the guide pins into the osteotomy site. However, with this technique, implant angulation with respect to post–esthetic restoration can be determined only after pilot drill; thus, any change in angulation of the implant will be arbitrary, and the surgery will be a blind procedure without knowing the implant along the *x*-axis. Whereas in our technique, the implant angulation at the proposed site is adjusted and planned before the surgery to avoid any fenestration at the time of surgery.

O'Neilly and McGlumphy[13] described a technique that helps in placing implants along all 3 axes but does not help the restorative dentist know the postrestoration esthetic and abutment angulation required for the implant at the particular implant inclination.

The technique mentioned in this article helps the restorative dentist to know the desired abutment angulation required for the placement of esthetic restoration before surgery so that immediate provisional restoration can be fabricated. Further, the technique proposed can be used for single or multiple implant placements. In multiple implant placements, this technique helps the operator to ensure parallelism between the implants and also achieves the desired inclination of implant in accordance with the bony architecture.

The advantage of this technique is that it is simple and easy to fabricate and uses materials that are inexpensive and readily available. When the surgeon uses this surgical template for placement of implant, the implant is placed as per the predetermined position and hence helps the restorative dentist in planning the restoration. Since the implant position and the desired abutment angulation are known, a provisional restoration can be prefabricated so that it can be cemented at the time of surgery if an immediate provisional restoration is desired.

Summary

The described technique allows assessment of an implant site and thereby helps in determining the proper location, inclination required for an implant at the proposed implant site, and the required implant diameter and angulation of the abutment at a given implant inclination. Clinically, this technique also provides the clinician reliable information with a good margin of safety.

References

1. Benson B, Shetty V. Dental implants. In: White SC, Pharaoh MJ, eds. *Oral Radiology: Principles and Interpretation*. 6th ed. St Louis, Mo: Mosby; 2008:597–612.

2. Engelman MJ, Sorensen JA, Moy P. Optimum placement of ossiointegrated implant. *J Prosthet Dent*. 1988;59:467–473.

3. Basten CH. The use of radiographic template for predictable implant placement. *Quintessence Int*. 1995;26:609–612.

4. Pesun IJ, Gardner FM. Fabrication of a guide for radiographic evaluation and surgical placement of implants. *J Prosthet Dent*. 1995;73:548–552.

5. Basten CH, Kois JC. The use of barium sulphate for implant templates. *J Prosthet Dent*. 1996;76:451–454.

6. Zahran HM, Fenton A. A radioopaque implant template for partially edentulous patients. *J Prosthet Dent*. 2010;103:390–392.

7. Watson RM, Davis DM, Forman GH, Coward T. Considerations in design and fabrication of maxillary implant-supported prostheses. *Int J Prosthodont*. 1991;4:232–239.

8. Balshi TJ, Garver DG. Surgical guide stents for placement of implants. *J Oral Maxillofac Surg*. 1987;45:463–465.

9. Edge JM. Surgical placement guide for use with ossiointegrated implants. *J Prosthet Dent*. 1987;57:719–722.

10. Becker MC, Kaiser AD. Surgical guide for dental implant placement. *J Prosthet Dent*. 2000:83:248–251.

11. Parel SM, Sullivan DY. *Esthetics and Ossiointegration*. OSI Publication. Dallas: University of Texas Health Science; 1989.

12. Hobo S, Ichida E, Garcia LT. *Ossointegration and Occlusal Rehabilitation*. Tokyo, Japan: Quintessence Pub Co Ltd; 1989.

13. O'Neilly PJ, McGlumphy EA. New implant surgical guide. *J Prosthet Dent*. 1993;70:506–510.

14. Chang MY, Shen FU. A newly simplified surgical implant stent design. *J Prosthet Dent*. 1994;72:217–218.

15. Burns RD, Crabtree GD, Bell HD. Template for positioning and angulation of intraosseous implants. *J Prosthet Dent*. 1988;60: 479–483.

16. Johnson MC, lewandowski AJ, McKinney FJ. A surgical template for aligned placement of the osseointegrated implant. *J Prosthet Dent*. 1988;59:684–688.

17. Kennedy BD, Collins TA Jr, Kline PC. Simplified guide for precise implant placement: a technical note. *Int J Oral Maxillofac Implants*. 1998;13:684–688.