CASE REPORT PEER REVIEWED | OPEN ACCESS

Simplified diagnostic-surgical stent for accuracy of implant placement and parallelism

Abdul Habeeb Bin Mohsin, Husna Khan, Mohd. Aijaz Ahmed, M. Mahesh Kumar, Sarah Samee

ABSTRACT

Introduction: This article describes a method of evaluation of available alveolar bone dimensions and guided implant placement in a patient with the fabrication of diagnostic-surgical implant template. Case Report: We present a case of 37-year-old female patient with a missing tooth to be replaced with dental implant using guiding template. The diagnostic template was transformed into a surgical template for implant surgery. The method described is simple, enabling the practitioner to perform radiographic diagnosis and placing the implant precisely using surgical template. This helps in treatment planning and to assess available alveolar bone at the site of planned implant insertion. Conclusion: This method is easy to follow; significant time and cost savings can therefore be realized by using this template to perform dental implant osteotomy. It provides adequate accuracy in terms of implant position, angulation and predictable treatment outcome.

Keywords: Implant, Imaging, Position, Stent

Abdul Habeeb Bin Mohsin[1], Husna Khan[2], Mohd. Aijaz Ahmed[3], M. Mahesh Kumar[4], Sarah Samee[5]
Affiliations: [1]MDS, Assistant Professor, Department of Prosthodontics, Sri Sai College of Dental Surgery, Vikarabad, India; [2]BDS, Dental Surgeon, Mahavir Dental Hospital, Hyderabad, India; [3](MDS), Post Graduate Student, Department of Periodontics, Government Dental College, Vijayawada, India; [4](MDS), Post Graduate Student, Department of Periodontics, Sri Sai College of Dental Surgery, Vikarabad, India; [5]BDS, Dental Surgeon, BMS Dental Hospital, Hyderabad, India.
Corresponding Author: Dr. Abdul Habeeb Bin Mohsin, 23-2-360/3 Moghal Pura, Hyderabad 500002, Telangana, India; Email: doc.habeeb@gmail.com

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INTRODUCTION

Radiographs used for the evaluation of the available bone dimensions for implant insertion is generally recognized procedure. For the posterior maxillary/mandibular regions a diagnostic radiograph of the jaws is mandatory if implant placement is considered at these sites in order to avoid possible damage to the inferior alveolar nerve or maxillary sinus penetration.

Taking panoramic radiographs is common practice because of the radiographic information it conveys, and its relatively low radiation exposure. However, in some cases periapical radiographs can also be used for assessing the bone dimensions.

Procedure of having a metal ball of known diameter incorporated into an acrylic template (stent) fabricated on diagnostic model of the patient. The use of diagnostic and surgical templates for implant placement may be helpful. For the advantage of transferring radiographic information diagnostic templates are modified to the surgical template [1].

Predictable implant-supported restorations require a determination of the final prosthesis in the treatment planning stage. A radiographic-surgical template can illustrate the final result and the procedures needed to accomplish it.

CASE REPORT

A 37-year-old female patient reported to the Department of Prosthodontics and Implantology with the chief complaint of missing tooth in lower left back teeth region since nine months and wants her tooth to be replaced. History of present illness revealed that there was a tooth decay and pain due to which she got her tooth extraction done nine months back. There is no relevant medical history. Intraoral examination revealed that there is missing lower left first molar with adequate mesiodistal, buccolingual and cervico-occlusal space present (Figure 1). Radiographically there is no pathology detected. Patient was advised to go for surgical profile; the results suggest that all the readings are in the normal range.

The case as discussed was planned so as to place one endosteal implant in the left mandibular first molar area with the help of an implant template. This template was first used to determine the position in a panoramic X-ray and then the same was transformed, used as a surgical template for the placement of implant. Single tooth implant placement planned with a technique to allow precise implant placement with customized diagnostic/ surgical template, internal precision guide and guide wire to facilitate improved pre-surgical implant diagnostics and prosthetically directed implant placement.

Accurate impressions were made using an irreversible hydrocolloid impression material (Tropicalgin by Zhermack). Impressions were poured with Type III dental stone (Figure 2). After the stone casts have adequately hardened, the most optimal position for the implant determined. Cast marked with a pencil. The processed acrylic tooth with clear auto polymerizing acrylic resin (DPI-RR Cold Cure) template is modified by drilling a hole and placing the metal ball through the occlusal surface (Figure 3) and placing the stainless steel wire on buccal side of the template (Figure 4). The position and orientation of the proposed implant is identified by the radiopaque metal ball within the proposed restoration. Incorporation of wires placed on the buccal surface of the template allows identification of the preferred implant site and parallelism (Figure 5). After removing the metal ball, the buccal wire remains a constant reference point to be used throughout the implant surgery.

The diagnostic template was transformed into a surgical template for implant surgery (Figures 6 and 7). A guide hole of 5 mm in diameter was drilled where the metal ball was previously placed as it is the optimum implant site. The surgical template helped to identify the position for implant placement. The safe-distance measured from the mandibular canal. The mesiodistal and buccolingual width was measured with the help of a bone gauge. This led to the choice of implant of 4.4 mm in diameter and 10 mm in length.

The patient was premedicated with antibiotics (novamox cipla 1 g, one hour prior to surgery). Surgery was performed under local anesthesia. The template was placed in the mouth and a crestal mark was placed with a pilot drill. Supracrestal incisions were made, buccal and lingual full thickness mucoperiosteal flaps were raised. Using the surgical template, LASAK –Implant BioAccel– Tapered implant D4.4/L10 mm was placed at tooth #36 location (Figure 8). Surgical cover screws were placed and the flaps were approximated with primary closure (Figure 9). Postoperative panoramic radiograph was taken (Figure 10).

DISCUSSION

Diagnostic imaging techniques help develop and implement a comprehensive treatment plan for the implant team. Imaging modality can be organized into three phases. Phase one objectives include all necessary information to determine the quantity, quality, and angulation of bone; the relationships of critical structures to the prospective implant site; and the presence or absence of disease around the surgical site. Phase two objective is to evaluate the site of surgery during and immediately after surgery, assist in the optimal position

Figure 1: Preoperative view showing missing lower left first molar.

Figure 2: Diagnostic study model.

and orientation of dental implant. Phase three is termed post-prosthetic implant imaging. Panoramic radiographs are sufficiently reliable to evaluate the available bone height before inserting posterior mandibular implants and are a widely used standard radiographic examination tool when planning an implant treatment because they impart a low radiation dose while giving the best radiographic survey [2, 3].

Figure 3: Diagnostic template with metal ball.

Figure 4: Buccal wire for parallelism.

Figure 5: Radiopaque metal ball and buccal wire in panoramic X-ray.

For a successful implant supported definitive restoration the implant must be placed at a correct pre-planned position and angulation [4]. The implant should be placed at least 1.5 mm from the adjacent teeth with a minimum 3 mm inter-implant distance. The distance of implant from buccal and lingual cortical plates should be greater than 0.5 mm. In the buccolingual plane, the angle between the implant trajectory and residual bone

Figure 6: Template transformed into surgical template.

Figure 7: Surgical template intra-orally.

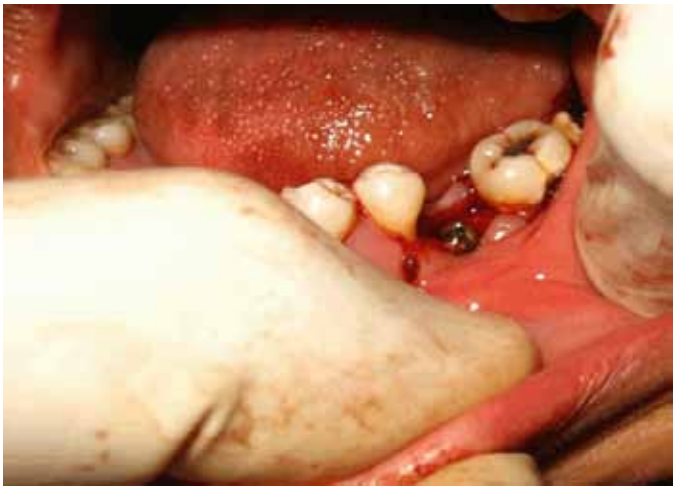

Figure 8: Final Implant placement.

Figure 9: Flaps approximated with primary closure.

Figure 10: Panoramic X-ray after implant surgery.

trajectory should be less than 20° to prevent unfavorable bending moment [5–7]. It has been well documented in literature that the implants placed using templates are more accurately positioned than those without the stent [8, 9].

Mietner et al. (2003) stated that the simple implant template provides high reliability and accuracy. Yet simple device that can be used by anyone skilled in the art of dental surgery.

Template designs in the late 90's were either diagnostic or surgical and focused on determining the correlation of implant site with surrounding vital structures [10, 11]. They did not help in determining the relative parallelism between adjacent implants and/or teeth [12].

This template does not require advanced computer technology or complicated equipment and complicated steps for fabrication. Significant time and cost savings can therefore be realized by using this template to perform dental implant osteotomy. It provides adequate accuracy as well in terms of implant position and angulation. It stands out from other techniques that it helps to determine relative parallelism between adjacent implants and/or teeth.

CONCLUSION

This case report has outlined the fabrication and clinical use of the diagnostic-surgical implant stent. Implant rehabilitation with use of stent provides greater precision. A simple planning can greatly improve the efficiency of implant therapy.

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Author Contributions

Abdul Habeeb Bin Mohsin – Conception and design, Acquisition of data, Analysis of data, Drafting the article, Critical revision of the article, Final approval of the version to be published

Husna Khan – Conception and design, Drafting the article, Final approval of the version to be published

Mohd. Aijaz Ahmed – Conception and design, Acquisition of data, Analysis of data, Drafting the article, Final approval of the version to be published

M. Mahesh Kumar – Conception and design, Acquisition of data, Critical revision of the article, Final approval of the version to be published

Sarah Samee – Acquisition of data, Analysis and interpretation of data, Drafting the article, Critical revision of the article, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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