Implant placement using CBCT guided stent and conventional stent - A case report

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Abstract
Treatment planning of dental implant therapy is one of the biggest problem where practitioners face is whether to employ conventional or guided surgery. As with many clinical considerations, treatment plan depends upon the unique circumstances of each case and the preferences of the practitioner. Conventional method implant is placed according to the available diagnostic information, is a cost-effective approach that is advantageous in many cases. Guided surgery implant is placed by creating osteotomy through a digitally designed and printed surgical guide, has the potential to afford the highest level of precision and control, and can be invaluable depending on the complexity of the case and the anatomy of the patient. This case report discusses implant placement in completely edentulous maxilla using CBCT guided stent and partially edentulous mandible using conventional stent.

Keywords: Cone beam computed tomography, Implant planning, Surgical guide.

Introduction
Implant success depends on osseointegration and optimal position of the implant for the fabrication of an esthetic and functional restoration. Placing implants in optimal position helps in establishing favourable forces on the implants.

Transfer device is essential to establish a logical continuity between diagnosis, prosthetic planning and surgical phases. After the pre-surgical restorative appointments, the final prosthesis design, optional abutment number and location, occlusal scheme, and implant angulation have been determined then surgical guide template is fabricated by the dentist.[1] Surgical guide "A guide used to assist in proper surgical placement and also angulation of dental implants." Surgical guide templates helps in diagnosis and treatment planning but also facilitate proper positioning and angulation of the implants in the bone. Clinical and laboratory complications are decreased by restoration driven implant placement which accomplished with a surgical guide template. With increasing use and demand of dental implants has resulted in the development of newer and advanced techniques for the fabrication of surgical templates[2]. Accurate placement of the implant is the main objective of surgical template. The fabrication of the surgical guide templates is based on one of the following design concepts. These design concepts are classified into non limiting design, partially limiting design and completely limiting design based on amount of surgical restriction offered by surgical guide templates.

Nonlimiting Design: This design provides an information to the dentist as to where the proposed prosthesis is in relation to the selected implant site. This design indicates the ideal location of the implants without any emphasis on the angulation of the drill, thus allowing too much flexibility in the final positioning of the implant.

Partially Limiting Design: In this design, the first drill used for the osteotomy is directed using the surgical guide, and the remainder of the osteotomy and implant placement is then finished freehand by the surgeon. Partially limiting design failed to completely restrict the angulation of the surgical drills.

Completely Limiting Design: Completely limiting design restricts all of the instruments used for the osteotomy in a buccolingual and mesiodistal plane. The addition of drill stops limits the depth of the preparation, and the positioning of the implant.

In this case completely limiting design used for placement of implants in maxillary arch and partially limiting design used for mandibular arch.

Conventional Method: In conventional cases, radiographs are used to assess the bone available for implant placement as well as the surrounding anatomy. Placement of implant is by fabricating by study cast where better understanding of the mesial-distal and apico-coronal space available. Diagnostic wax-up can help to plan the surgical procedure in a manner that positions the implant to best support the eventual prosthesis. According to diagnostic wax up a surgical stent is fabricated in order to serve as a clinical tool for evaluation of implant position at the time of surgery. The availability of CBCT scanning gives practitioners an option that allows for extremely accurate evaluation of these characteristics in three dimensions.

Guided Surgery: CBCT scanning and digital intraoral impressions helps to generate a virtual representation of the patient's jaw and oral anatomy. It develops a digital treatment plan in which the exact position of the implant is determined. A surgical guide is fabricated

with titanium sleeves that controls the osteotomy in precise accordance with the preplanned implant position.

Case Report

A 55 year old female patient reported to the department of prosthodontics in mamatha dental college with the chief complaint of missing tooth in upper and lower jaw since 1 year. On intraoral examination revealed patient had completely edentulous maxillary arch and partially edentulous mandibular arch in relation to 36, 37 and 46, 47.After thorough intraoral and radiographic examination, we planned CBCT guided surgery for maxillary and conventional method for mandibular arch.

Fig. 1: Pre operative Orthopantomogram

CBCT Guided Implant Placement in Maxillary Arch: The initial CBCT scan and periapical radiograph indicated sufficient vertical and horizontal bone. Conventional maxillary complete denture fabricated and send the patient for digital impression appointment. A data collection appointment was scheduled to gather the information needed to produce a digital treatment plan and surgical guide. A digital intraoral impression was taken using an intraoral scanner. This information was then combined with the CBCT scanning data to produce a digital treatment plan. This digitization of the patient's arch was used to treatment plan the placement of the implant within a maximum amount of bone and a safe distance from important anatomical landmarks. Based on amount of bone availability implant sizes are determined.

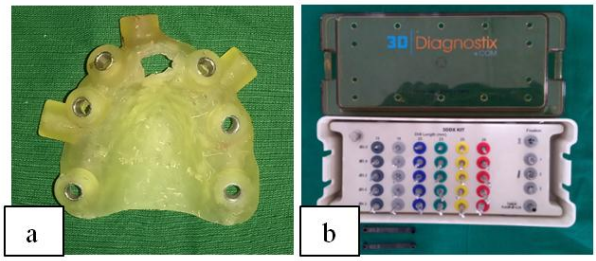

Fig. 2: a) CBCT guided Stent b) surgical drill kit

First, the surgical guide was tried in to verify the fit of the appliance prior to anesthetizing the patient. Then, after infiltrating the area with minimal local anesthetic, lateral pins are placed to stabilize the stent. Tissue punch was used to access the implant site. Remove the stent and Scoop out the tissue using spoon excavator. The osteotomy was performed through the surgical guide following the straight forward drilling protocol of the Adin Implant System and implants are placed.

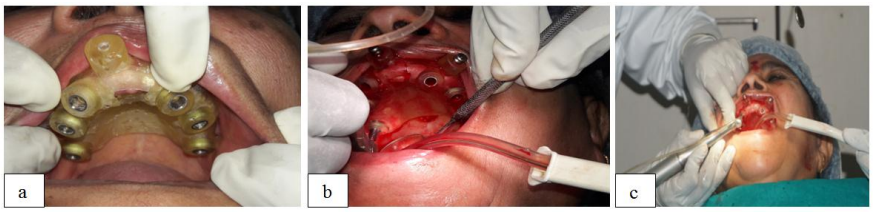

Fig. 3. a) Verification of fit of stent b) tissue punch c) preparation of osteotomy drill

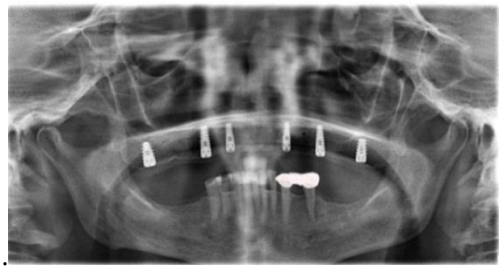

Fig. 4: Post operative orthopantomogram

Conventional Method of Implant Placement in Mandibular Arch: Periapical and panoramic radiographs are used to assess the bone available for implant placement as well as the surrounding anatomy. A study cast can be fabricated, upon which measurements can be made to provide a better understanding of the mesial-distal and apico-coronal space available in which to place the implant.

Based on amount of bone availability implant sizes are determined. A surgical stent is fabricated based on angulation and position of adjacent teeth and drill holes are made according to measurements of available bone. The surgical guide was tried and verify the fit of the stent prior to anesthetizing the patient. Stabilize the stent and using pilot drill to mark the osteotomy site through stent. Remove the stent and Tissue punch was used at the marked osteotomy points and scoop out the tissue there. The osteotomy was performed through marked points and place the paralleling pins to check the parallelism of osteotomy sites. The osteotomy was performed following the

straight forward drilling protocol of the Adin Implant System, and implants are placed in respective sites.

Fig. 5. a) Conventional stent b) Verification of fit of Stent c) Preparation of Pilot Drill

Fig. 6.a) Preparation of osteotomy b) Placement of parallel pins c) Placement of implant

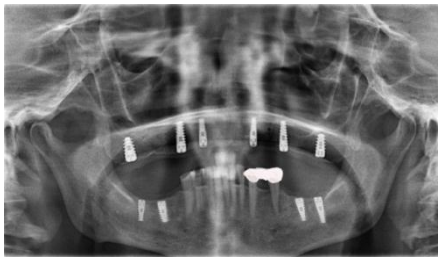

Fig. 7: Post operative orthopantomogram

Discussion

Improving implant accuracy has been the subject of fundamental interest. Many authors suggest that use of a surgical guide is the primary deciding factor associated with implant accuracy. Surgical guidance have been proven effective in increasing implant accuracy, but not always the chosen option due to lack of resources or the urgency of the case. Thorough treatment planning is important for correct selection between guided or conventional cases.

Choi et al. stated that surgical and anatomical factors that improve implant accuracy in freehand placement. These factors provide the foundational basis for a set of clinical guidelines that will improve the chance of success for freehand surgery and increase utilization of guided surgery when the risk for inaccuracy is most present.[4]

Ersoy et al. stated that CT-derived surgical guides allow clinically significant improvements in accuracy, time efficiency, and reduction in surgical error, benefiting the patient and dentist.

Computer-aided SLA surgical guides might be accurate tools for transferring ideal implant position from computer planning to the actual implant surgical phase of treatment.[5]

Beretta et al. stated that flapless computer-aided implant surgery provided clinicians with undeniable advantages. The flapless approach allowed the surgeon to minimize surgical trauma and patient morbidity in the immediate postoperative period. At the same time, computer-aided surgery reduced the possibility of intraoperative complications, further permitting an ideal prosthetic-driven implant placement.[6]

David et al. stated that the survival rate of implants placed with computer guided technology is comparable to conventionally placed implants ranging from 91% to 100% after an observation time of 12–60 months.[7]

Aizenberg et.al stated that flapless surgery compared to open flap surgery can lead to less postoperative swelling while no difference is seen regarding pain or post- operative bleeding.[8]

Nickeing et. al stated that based on evaluation of position and axis, results suggest that the accuracy of implant placement after virtual planning using cone-beam CT data and surgical templates is high and significantly more accurate than freehand insertion.[9]

Kochar et.al stated that the location, size, angulation and depth of implant are planned before beginning the surgery. Patients undergo less invasive surgery without flap elevation leading to faster healing and early rehabilitation that makes it an acceptable treatment plan. This results in minimizing the treatment time and enhanced patient comfort.[10]

Pozzi et.al stated that when treatment planning was made with CBCT scanning using 3D implant planning dedicated software and free handed, postoperative pain

and swelling at sites treated with free-hand because more frequently flaps were elevated.[11]

Conclusion

Guided and conventional methods have their place in the modern implant practice. Each case and the situation of the patient ultimately dictate which approach to adopt. Healthy patients with adequate bone are placed by the conventional technique using single implants in most situations. Guide is often indicated for placement of multiple implants or for patients lacking optimum bone quality or quantity. The critical factors for success still remain on proper diagnosis and case selection, the care, skill and judgment of the clinician, adherence to surgical and prosthetic principles.

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