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CLINICAL REPORT

Markus Bader– Surgical guide: An alternate for CBCT generated implant surgical guide

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ABSTRACT

Computer generated implant surgical guides with the help of CBCT, help in the accurate positioning of implants. However, the high cost and high dose of radiation limits its usage forconventional procedures. Through this study, we intend to introduce an innovative device which uses values obtained from a measurement software to customize a surgical guide for implant placement. We aim at reducing the dose of radiation for the patient as well to place the implants as precisely as a CBCT generated surgical guide thus, providing us with an easy, cost effective and accurate alternative to a computer generated surgical stent.

Key Words: Surgical Guide, CBCT generated guide

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INTRODUCTION:

The concept of stents which act as surgical guides for an accurate implant placement is now bridging the gap between diagnostic and pretreatment time lapse[1]. This is done, in order to reduce the time of surgery and also to precisely place the implants in relation to the available bone in bucco-lingual and mesio-distal directions. The advantage of these types of stents are quite variable and available for different implant systems as well.

Depending upon the amount of surgical limitation offered by the surgical guides, they are classified as either non-limiting, partially limiting or completely limiting surgical guides. With the advent of 3D printing and Stereolithography, the accuracy of these surgical stents are very good[2]. Owing to the cost of fabrication of this type of surgical guide and to reduce the dose of radiation the patient is put through, the usage of these surgical guides are limited in everyday practice. Hence, we have developed an innovative device with degrees of measurement embedded in it, to transfer the readings from diagnostic casts, so as to fabricate a surgical guide which works as precisely as the CBCT generated surgical guide.

CASE REPORT:

A 29 old male patient, reported to the department of prosthodontics for the replacement of his missing teeth in upper right back tooth and lower left back tooth region for the past 3 months. The radiograph explains the missing 14 and 36 tooth with sufficient amount of bone available for implant placement (fig 1). Following the treatment plan, bone mapping was done in the diagnostic cast to assess the width of the available bone(fig 2 and figure 3).

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This is done, so as to evaluate the diameter of the implant to be placed. The center of the ridge is marked, to locate the position of implant placement in the center of the available ridge.

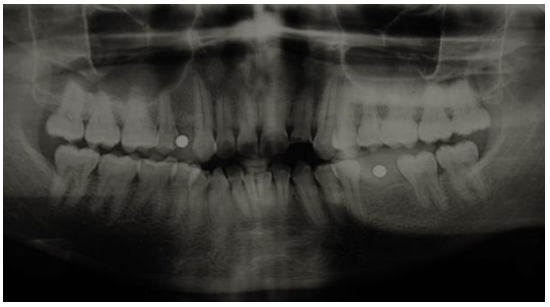


Figure.1-Pantamograph of the patient showing missing 14 and 36

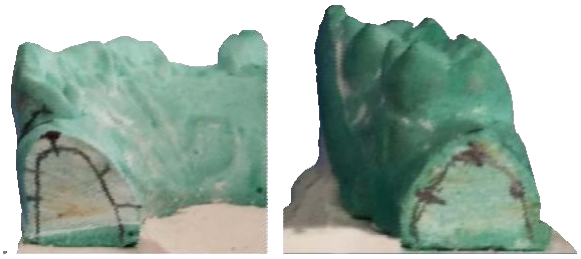


Figure.2 and 3-Bone mapping done in relation to 14 and 36 respectively

The image of the bone mapping of diagnostic cast as well as the edentulous space in relation to abutment tooth is taken and fed in to protractor software application in our mobile phones. When using this software, the preferred angulation for placement of implant in mesio-distal direction is measured using the side of the cast fig 4) and bucco-lingual width is measured using bone mapping image.

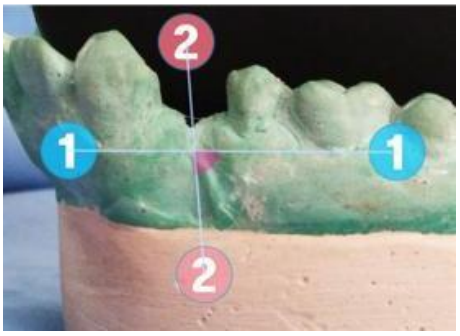


Figure 4-Buccolingual and mesiodistal measurement in relation to 14

The degree of angulation is directly measured from the software for both bucco-lingual and mesio- distal direction of placement of implant. With the help of the innovative device which we fabricated, the two angulations are marked such that the center of the pointer is placed in the center of the ridge in the edentulous area. A guide sleeve of 2mm inner diameter is attached to the pointer and placed over the ridge and stent is fabricated with clear acrylic which includes two adjacent teeth on either side of the ridge to ensure the fit of the surgical guide (fig.5)

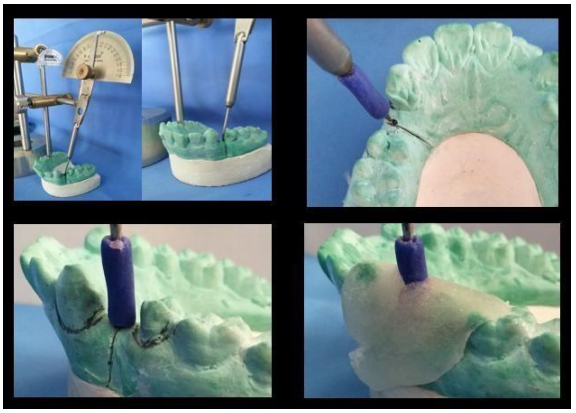
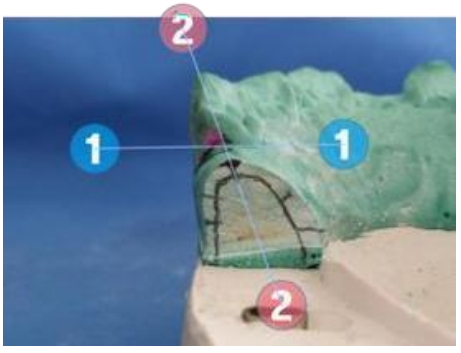


Figure.5 - fabrication of surgical stent with the device. Acrylic sleeve of inner diameter 2mm attached to the pointer for pilot drill(blue color is added to the acrylic in order to differentiate from the surgical stent)

With the help of the customized surgical guide, the implants in relation to 14 and 36 are placed. After the drills, the angulation for parallelism was also checked to verify the angulation of the implants respectively. Post-operative radiographs angulation was also checked to verify the precise angle transfer from device to the surgical stent.By this method, we have established the accurate



placement of the dental implants without the use of any CBCT or any other sophisticated method for fabrication of implant surgical guide stent (fig.6)

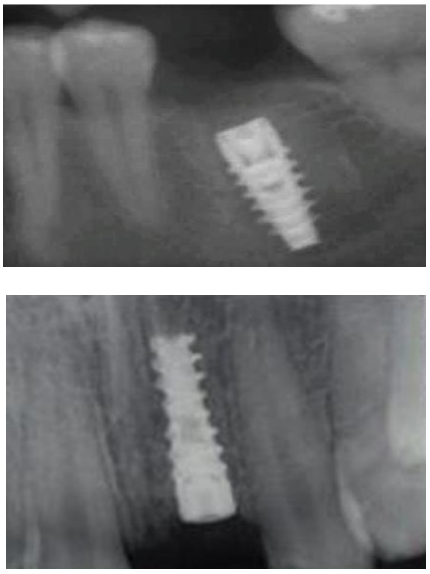


Figure 6- Post operative radiographs for confirming the angle of placement of implants

DISCUSSION:

The precise placement of dental implants is very crucial owing to the presence of anatomical structures such as mandibular canal, incisive foramen, maxillary sinus floor etc. Usage of guided implant placement is now widely prevelent with the use of CBCT and 3D printing as well. Due to the high cost for fabrication of these stents and as well as high radiation exposure of CBCT, these guided implant stents are not quite commonly used. In order to avoid the errors caused due to improper positioning and placement of implants, we designed a device for transfer of the measurements from the cast to the oral cavity, so as to accurately place the implants according to those measurements. DP Sarment et al, advocated that the transfer of the angulation to the device for formulation of the surgical stent played a vital role in implant placement[3].

The importance of guided implant placement is widely accepted in order to preserve the surrounding natural teeth and also the surrounding anatomical structures. The main advantage of the guide we fabricated is that it is cost effective, easy to use, more precise, the angulations can be measured in all directions and reduced radiation exposure. The various other innovations that can be done in the same device is introduction of various drills at the pointer end so as to convert the partially limiting guide sleeve into a completely limiting sleeve for accurate implant placement.

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