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CLINICAL REPORT

Cone Beam Computed Tomography [CBCT] in Guided Implant Surgery -A Case Report

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ABSTRACT

Cone Beam Computed Tomography [CBCT] is a newer dental imaging which helps in planning implant position and selection of the length and width of the implant to be used. It can also clearly demarcate or relate the relationship of vital structures to planned implant position. This case report describesa systematic approach to a CBCT based implant planning and surgical guidance. The easy steps, result in transferring the accurate detail to the surgical site and there by achieving success.

Key Words: Guided Implant surgery, All on 4 Concept, CBCT

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Esthetics plays a huge role in our lives. Individuals with missing anteriorteeth avoid meeting people, hardly smile and shun from socializing with others.Implants have become a viable option for the replacement of missing teeth either anterior or posterior.

The introduction of endosseous implant treatment has initiated a revolution in oral rehabilitation for partially and fully edentulous patients.

The concept of 'Osseointegration' introduced in the mid-sixties soon has shown to deliver predictable long term success rates in replacement of teeth. Cone Beam Computed Tomography [CBCT] is becoming increasingly popular in planning of treatment with implants in the restoration of dentition. The conventional computed tomography popularly known as CT scan have been replaced in the dental fraternity with CBCT.[1]

With the introduction of newer Digital imaging, predictable Implant planning is possible.[2,3,4]Presented below is the case report of a guided implant surgery performed in an individual requiring complete rehabilitation of dentition.

CASE REPORT

The patient is 64 years of age, male, completely edentulous with no relevant medical or systemic conditions or illnesses which preclude implant treatment. The patient demanded for a fixed replacement.

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The basic requirements for guided surgery are, a cast made out of an accurate impression and the CBCT of the patient. Mguide Guided implant stent is prepared usingstereolithography. With the help of special surgical drills, it is possible to carry out the implant placement in a very simplified manner. Orthopantomogram was taken to rule out any basic pathology and CBCT was taken of maxilla.[Figure 1]

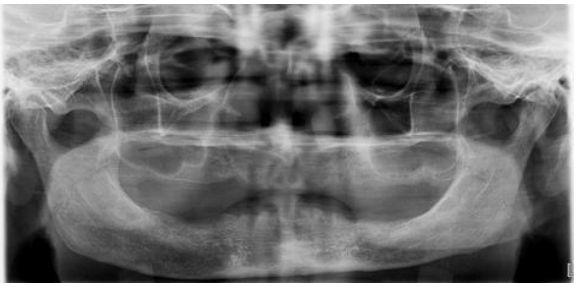

Figure 1.Orthopantogram of the patient

Accurate impressions were made with elastomeric impression material and with help of M guide - Guided Implant Stent was prepared using stereolithography models.[Figure 2 &3] The maxillary surgical stent was tried and the area anesthetized with local anesthetic.[Figure 4 &5] The surgical procedure for maxilla were performed under local anesthesia. Broad spectrum Antibiotics (Clavulanic acid + Amoxicillin) were given 1 hour before surgery and dailyfor five days thereafter. Analgesics were given for 4 days and then just if needed.A surgical template for ostectomy was positioned and fixed with two anchor pins. [Figure 5]Flapless guided surgery was carried out and Implants were placed through the sleeves of the surgical template in the planned anatomic sites.[Figure 6] Four implants [ADIN Dental Implant Systems Ltd, Afula, Israel], were placed, Insertion torque of 35 nm was given.With guided implant surgery the accurate placement of implant in the planned position was possible. [Figure 7]

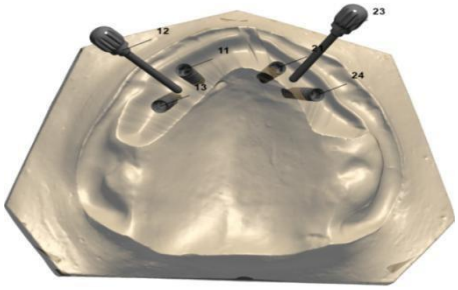

Figure 2.Virtual Planning on the Model

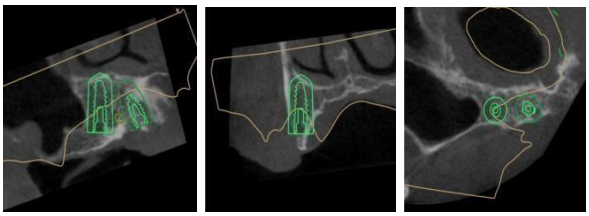

Figure 3. CBCT with Implant site planning using MGUIDE

Figure 4.Surgical Guide

Figure 5.Placement of Surgical Guide

Figure 6. Implant placement

Figure 7. All on 4 implant placement and radiographic presentation

The guided implant surgery kit includes the length of the drills plus the sleeve thickness which enables accurate placement of implants and the procedure can be completed in less time. The patient was followed up, evaluated for osseointegration and planned for rehabiliatation later.

DISCUSSION

Evolution of Imaging Technology

Since the introduction of X-rays by Wilhelm Roentgen more than a century ago, the imaging techniques have improved over the years. the conventional computed tomography which was widely used in Implant planning, is being replaced by the newer one, CBCT (cone Beam Computed tomography). CBCT is redefiningprecision in Guided implant surgeries. Only an exhaustive and comprehensive radiological assessment can provide the necessary information to select such optimal sites and the number and size of implants to be placed. The selection of the radiological technique should be based on weighing the required image quality against the radiation risks and costs involved. In the perspective of implant surgery, a correct identification of some anatomic structures such us the mandibular canal is important to avoid nerve damage or other perioperative complications.

Computed tomography is a very common imaging technique, which allows the capture of information through a spiral movement of the radiation source and the detectors around the region of interest. For maxillofacial applications, dedicated software was developed capable of reformatting the data of the axial slices into panoramic images and multiplanar cross-sectional images. The advantages offered by computed tomography (CT) technology are direct volumetric reconstructions, faster data transfer to workstation and archives device, and faster and easier data transformation for use in 3-D analyses including functional imaging and real time imaging for guiding interventional procedures. On the other hand, CT sections impart relatively high radiation doses to the patient. This radiation dose has to be balanced by the required information for implant placement. Its use can seldom be justified except for the imaging of large jawbone segments. A further development and improvement of CT equipment has inspired researchers and clinicians to use it as low-dose CT. This is where the cone beam CT may offer a promising alternative approach.

With CBCT technology, the images can be recorded in less than a minute. Dental clinicians can have the diagnostic quality of periapical radiographs, panoramic radiographs, cephalograms, occlusal radiographs, and TMJ images at their disposal, along with views that cannot be produced with regular radiographic machines such as axial and cross-sectional views. A number of clinical applications have already been reported in the literature.

Implantologists have long appreciated the value of 3-dimensional imaging. Conventional CT scans are used to assess the osseous dimensions, bone density, and alveolar height, especially when multiple implants are planned . Locating landmarks and anatomy such as the inferior alveolar canal, maxillary sinus, and mental foramen occurs more accurately with a CT scan. The use of the third dimension has improved the clinical success of implants and their associated prostheses, and led to more accurate and aesthetic outcomes.[5]

With CBCT technology both the cost and effective radiation dose can be reduced. CBCT has been in use in implant therapy and may be employed in the clinical assessment of bone graft quality following alveolar surgery in patients with cleft lip and palate. The images produced provide more precise evaluation of the alveolus. This technology can help the clinician determine if the patient should be restored or if teeth should be moved orthodontically into the repaired alveolus.

Guided Surgery in Dentistry

The Guided implant surgery is carried out in a very simplified and predictable manner. A surgical guide is a medical device that is 3D printed based on a CBCT and is custom-made for the specific patient. It is used to accurately assist in immediate placement of an implant in the bone structure. It replicates the exact surfaces of the patient's intraoral situation and assists the surgeon to perform the clinical application of drilling implants into the bone with optimal accuracy. Once the surgical guide is placed on the patient's jaw, it uses sleeves to help guide your surgical instruments and, if appropriate, your implant, accurately to the position you have accurately planned. It presents easy visualization, diagnosis and planning. Good Predictability with just a raw

DICOM data from commonly available CT scanners has attracted its users.[7, 8]

CBCT image data is loaded into our software providing the dentist with a user-friendly interface for viewing the anatomy of the dental implant site. The software allows the dentist and technician to plan with confidence the optimal location for dental implants taking into account anatomical, functional and aesthetic considerations. The treatment plan decided upon and approved by the dentist is then printed using resin.Use of surgical guides helps in reduction of surgical time, reduced trauma, pain swelling, short recuperation time, accurate transfer from virtual to clinical setting, improved prosthetic results and enables immediate loading and flapless surgery in selected cases.Guides are manufactured from medically approved acrylic resin. Drill sleeves are medical grade titanium tubes.T he correct angulation is built into the guide and the exact length is known from the top of the sleeve to the apex of the implant. Many surgeries can be done flapless.

All the above said advantages along with accuracy, precision and smart approach to surgery has benefitted the patient towards better quality of care.

CONCLUSION

There can no doubt that CBCT has made guided implant surgery simpler and more precise.

Conflict of Interest: None Declared

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