GUIDED SURGERY FOR IMPLANT SUPPORTED PROSTHESIS USING ALL ON FOUR CONCEPT: A CASE REPORT

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Abstract:

Dental implants are widely recognized as one of the most dependable and conservative methods for replacing lost teeth. The success of implant dentistry has grown more predictable with the development of newer materials and advancements in digital technology, particularly in the areas of guided implant surgery, implant planning software, and computed tomography. This case study demonstrates the use of 3D guided technology for dental implant surgery diagnosis, planning, and execution. Dental implantologists have been studying and researching the combination of CBCT with three-dimensionally guided implant surgery employing stents, since it has opened up new avenues for the discipline. A digitally designed and printed stent is used to create an osteotomy in order to install a surgically guided implant, which has the ability to achieve the maximum degree of control, precision, and accuracy.

Keywords: Guided implant surgery, CBCT, Surgical stent, All on Four, Full Mouth Rehabilitation

Introduction:

The field of clinical dentistry has seen a significant change with the introduction of computer aided design and manufacturing (CAD/CAM) technologies, particularly in the field of oral implantology, thanks to the fast advancement of computer technology in recent years. Computer-aided design/computer-aided manufacturing (CAD/CAM) and three-dimensional (3D) computed tomography (CT) scan images have been used to create this therapeutic approach of 3 dimensionally guided implant placements. Clinicians can plan implants in the simulated three-dimensional image created from CT data by using specialized software. This helps medical professionals to create a treatment plan that takes prosthetics and anatomy into account. The computer-guided stereolithographic surgical template is then created using the desired data. Predictability, precision in implant placement, low invasiveness, and reduced post-operative pain are the benefits of the 3D guided surgical procedure. Additionally, it shortens the amount of time needed for tissue recovery as compared to traditional implant insertion techniques because the template makes it possible to place implants without raising a flap. To get the

greatest clinical outcome, the accessible bone can be assessed eliminating the need for a bone graft.[1-3]

This case study describes the utilization of 3D CBCT computer-assisted diagnostics, virtual implant planning by merging the DICOM files for a prosthetic guided implant placement, the creation of a stereolithographic surgical template, and the insertion of dental implants using surgical guides at pre-planned sites.

Case report:

A 51-year-old male patient presented with the chief complain of ill fitting complete denture. On thorough examination, it revealed the patient had a set of complete denture fabricated one year prior with underextended flanges leading to poor retention. Intraoral examination revealed well rounded completely edentulous ridge in maxilla and the mandible and the inter-ridge distance was 29mm. The patient had no significant past medical history and deleterious habits.

After discussing various treatment modalities, the approach of full mouth rehabilitation using surgical stent guided implant placement was chosen.

The case was then planned and executed adhering to surgical protocols laid by the manufacturer.

Treatment planning→

An intraoral orthopantomogram and CBCT was done for evaluation and further treatment planning.

The denture was tried inside the patient's mouth to verify the location of the existing acrylic teeth and their location over the ridge.

CBCT data revealed inadequate bone in the posterior region of maxilla and mandible with the crest being in close proximity to the vital structures present (maxillary sinus in the maxilla and inferior alveolar nerve canal in mandible)

Considering the limited amount of bone available, it was decided to place implants following the All on Four concept with mesial angulation of the maxillary posterior implants.

Scan of the prosthesis→

A CBCT scan of the existing denture was made using radio-opaque markers in the intended site of implant placement.

The canine region in the anterior and first molar region in the posterior maxilla was selected to be the site of implant placement. For mandible it was the lateral incisor region and the second premolar region.

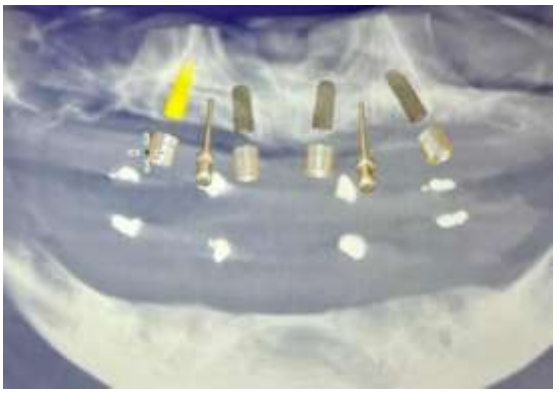
Software based planning and designing of the surgical guide→

The data of the CBCT of the hard tissue and the existing denture was merged together (DICOM on DICOM merging).

The posterior implants in maxilla were angulated mesially to bypass the maxillary sinus. The anterior implants were angulated labially according to the bone morphology.

In mandible the posterior implants were planned straight and anterior implants were angulated labially. Shorter length of implant in mandibular posterior region was to bypass the anterior loop of inferior alveolar nerve.

The finalised guide design was printed via a stereolithographic printer.



Osteotomy and Implant Placement:
The fit of the surgical stent was verified intra-orally prior to the day of surgery.
During surgery, the area was anesthetized and the stent was fixed using anchorage pins. The surgery was performed as per the guided instrument set in surgery cassette.
Using a tissue punch, soft tissue was scooped out and the sequence of drills was used starting with the pilot guided drill, the twist drill, final drill and the crestal drill.
Healing abutments were placed post the implant placement and the patient was kept on a therapeutic dose of antibiotic, analgesic and antiulcerogenic drugs for a period of five days along with chlorhexidine containing mouthwash.
The patient was recalled after one month for follow-up.

Discussion:
A new approach of guided implant surgery makes use of 3D CBCT and a stereolithographic surgical template to design the final position of the implants. This helps to make implant placement easier. It is critical to comprehend the methodology and final location of implants positioned with the help of a surgical template. Even though flapless guided surgery may need less time for the surgical intervention than conventional approaches, significantly more time is spent on preoperative preparation.[1-4]
When implant placement, the freehand/conventional method yields much more errors than either static or navigation approaches. When employing a computer-assisted static system and placing the implant at the right depth, there is a noticeable increase in accuracy at both the apical and coronal positions of the implant. It leads to a smaller angulation error (<5°) and crestal and apical position variation (<2 mm). It is a noninvasive technique that results in less trauma and morbidity than freehand techniques and supports the working surgeon's improved posture.[4]
However using surgical guides in the posterior areas or in restricted mouth opening might present some difficulties because of the different drill diameters.
Since a flapless technique is frequently employed it is beneficial when the implant location is close to anatomical features such as the maxillary sinus, mental foramen, and mandibular nerve and has a sufficient thickness of keratinized tissue. Hahn claims that this approach's success rate is comparable to that of traditional methods. The accuracy and speed of treatment were given by Nickenig and Eitner, who in 2007 verified the dependability of static aided computer navigation using a flapless technique.[4]
This approach's main flaw is its inability to gauge the operative bone region and provide access. Accidental perforation on and through the crest can also result in implant failure.[4]

Conclusion:
With the current age of digital technology, the ease, predictability and success of implant placement has increased immensely. Paying due attention to the limitations, the margin of error could be reduced both during implant planning and placement. A comprehensive knowledge about the software and rationale of implant placement would provide the best results to the patient.

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