Navigate your Implants- Fool-Proof Your Surgery

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Page | 43

ABSTRACT

Technology has entered all fields and streams in the world from manufacturing industries to health care. There have been rapid advancements in the field of dentistry too with the introduction of lasers, ozone therapy, the use of nanotechnology in various dental procedures etc. Implants are widely used now days as an ideal treatment to replace missing teeth when compared to another conventional prosthesis.

The world has recently been moving to using newer types of implants like bio implants, peek implants and to the addition, we now have navigated implants. Navigated implants is a method of surgical accurate and prosthetically driven placement of implants using a real time computer guided system based on information generated from CBCT or CT images. This procedure makes implant placement a completely error free procedure with added benefits to the operator as well as the patient as well as allowing placement in certain complicated cases.

Keywords: Implants, Navigate, CBCT, Sensors, Motion Trackers.

INTRODUCTION

The successful insertion of implants requires an accurate angulation and insertion depth in order to achieve a functionally and aesthetically satisfying result.[1]

During the last decade, image guidance systems have become a valuable tool in several surgical disciplines including oral implant surgery. Similar to the application of drilling templates, image guidance is mainly intended to transfer a preoperatively planned insertion concept into a clinical reality. Conventional as well as Navigated implant placement methods are intended to improve the precision of implant placement and thereby broaden the indications of implant surgery, e.g. into difficult anatomical situations.[1,2,3] Additionally, those methods are thought to enhance the safety of patients by reducing the risk of damage to adjacent anatomical structures. In contrast to drilling templates, image guidance provides the surgeon with multidimensional real-time information of the anatomy thus allowing modifications during surgery without loss of guidance.[4] The effectiveness of navigation systems depends on their accuracy. In recent years, navigation systems were developed specifically answering the increased demands of implant surgery. Due to their particular functional and aesthetic challenges, the insertion of implants to replace maxillary incisors or canines may represent a preferred indication for the application of a navigation system in implant surgery.[5, 6, 7, 8,9,10]

ARMAMENTARIUM

Navigated surgery comprises of 4 main components:

1) A computer

2) A hand piece attachment consisting of a universal hand piece along with metal clamp and a special calibrated part called Drill Tag.

3) A customizable patient jaw attachment consisting of a stent part called Jaw ref and matching calibrated area called as Jaw tag.

4) An optical sensor detecting special calibrated area on Drill Tag and Jaw tag which reports the relative positions to the system.[11, 12]

PROCEDURE

The process involves 4 steps;

1) STENT: The first step is making of a hot thermoplastic stent. The stability of the fabricated stent can be evaluated instantly for prediction of results.

2) SCAN: The step involves clamping of the stent made and the patient is scanned with CBCT and intraoral scans.

3) PLAN: The scans taken previously are added to the software. The crowns on the edentulous regions are created on the software followed by placement of the implant in the region in the software to obtain the most accurate angle, position, and depth of the implant. This ensures a prosthetic driven implant placement technique which is more accepted and precise as compared to the earlier surgically driven implants placed. This drafted plan for implant placement can be modified by the operator during surgery.

4) PLACEMENT: The presence of calibrations placed on the hand piece and also on the jaw attachment helps for the procedure to be motion tracked in real time on the path of placement which is made by the CT images.

This motion tracking technology of the tip of the plan previously planned helps for the placement at the most precise target site and helps us to achieve the most favourable prognosis.[11, 12,13,14,15]

Advantages

1) Less patient morbidity

2) Flapless implant placement can be done.

3) Intuitive changes can be made in real time during Implant Placement

4) Elimination of errors during fabrication of stents

5) Precise placement of Implants as every step is planned and executed meticulously

6) Useful in regions which present difficulty in Implant Placement due to anatomical landmarks.

Disadvantages

1) High Cost of Equipment.

2) Less in-vivo studies have been done using Navigated Implant Placement Systems.

CONCLUSION

Image Guided Implant Placement Systems provide an unprecedented advantageous aid in Implant Placement. The precision provided by the systems as well as the ability it grants the user to make intuitive changes during the implant treatment which previously presented as unsurpassable difficulties in the treatment of the patient would revolutionize the planning and accurate placement of implants.

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