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CASE SERIES

Guided Implant Surgery: A Step Towards Predictable Implants

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ABSTRACT

Digitalization in implant dentistry has made restoring of missing teeth more predictable and accurate. A clinical advantage with flapless guided surgery is that the technique is likely to decrease pain and discomfort in the immediate postoperative period. This technology has improved the 3-dimensional (3D) accuracy of implant placement and the patient comfort and time. This article presents three guided implant surgeries in different scenarios so that the wide prospect and advantages of this technology can be emphasized.

Keywords: Dental implant, Digital dentistry, Flapless surgery, Guided implant, Predictable.

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INTRODUCTION

Now comes a powerful wave of digital technology that is replacing labor in increasingly complex tasks. With the revolutionization in dentistry, its no more a world of arbitrary Implantology. 3D imaging had long back given us a view to the bone hence implant dentistry was led to be a bone driven placement which led to difficult prosthetics. In the rehabilitation of tooth loss with dental implants, thorough prospective planning is an important requirement for a successful restorative result.[1] During the last decade, the technique for implant insertion has developed mostly due to achievements in radiographic 3D imaging technique and computer technology.[2]

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Guided Implantology is becoming popular in today's digital era. It has been used to restore many missing teeth. It is said Computer-guided implantology has much promise and many advantages over conventional implant surgery in demanding cases.[3] But, there is always been a hesitation in trying this technology in different complex situations. Therefore to explore the applications and results of guided implantology three cases in different situations have been discussed.

CASE SERIES PRESENTING DIFFERENT SCENARIOS DONE BY TEMPLATE GUIDED IMPLANTS

Case 1

A female 30 years of age presented with root stumps in the lower left region and wanted a replacement. On examination, there was a root stump with respect to the left lower first molar. There was adequate interocclusal distance with minimal supraeruption of the opposing teeth (Fig. 1). The patient gave no relevant medical history. An immediate implant placement using a surgical guide was selected as the treatment option.

The patient underwent a cone beam computed tomography (CBCT). Maxillary and mandibular impressions were made and a cast was poured in dental stone. The stone cast was scanned using a laboratory scanner (3Shape). Both the data (the CBCT scan and the cast scan) was then superimposed using the implant planning soft-

Fig 1: Preoperative

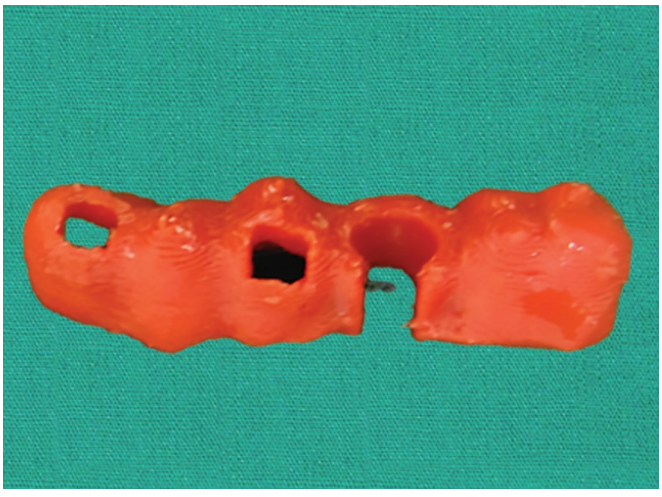


Fig 2: Surgical guide with orientation windows

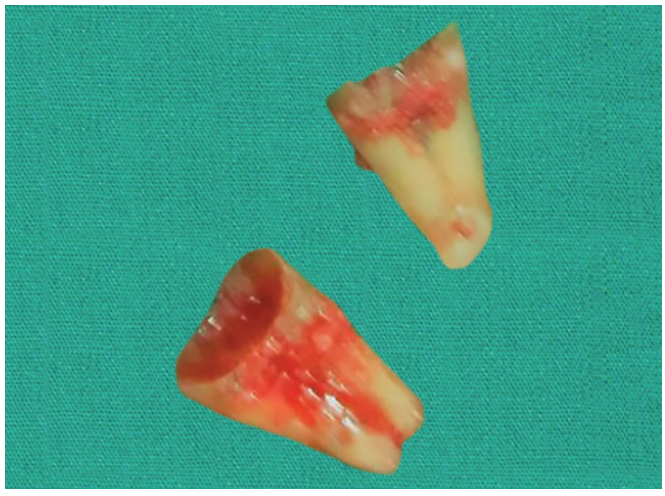


Fig 3: Extracted tooth in sections

Fig 4: Healing abutment in place

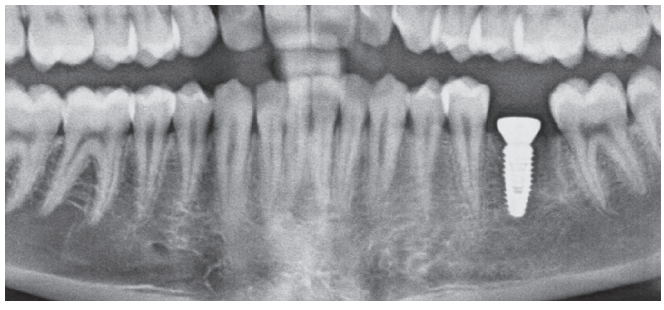


Fig 5: Implant placed in the extraction socket

ware so that the tooth and tissue surface and the bone details were integrated to give a complete data.

Implant planning software was then used to plan the implants both prosthetically and according to the bone using the multiple cross-sectional and 3D views. The software allows to slice off the tooth virtually, therefore eliminating the need to scrape the tooth in the cast manually. This cumulative data was then used to fabricate a 3D printed surgical guide (Fig. 2).

The tooth was extracted atraumatically under local anesthesia preserving as much bone as possible (Fig. 3). The extraction socket was curetted to remove any infected tissue present. The planning revealed that the inter-radicular septum could be used to place the implant in the best position. Since this bone is very thin it often leads to a slippage of the drill, and hence the implant gets positioned in one of the sockets. But, this replication was possible with the use of surgical guides by allowing accurate positioning of the drill sequence at the implant site. The implant was placed in a position similar to the computer simulation with excellent implant stability (Fig 4). Healing abutment was placed immediately, therefore, eliminating the need for second stage surgery (Fig. 5).

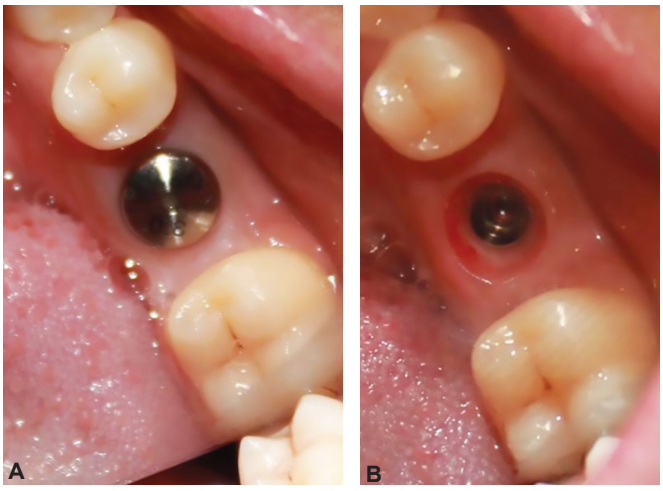
Three months later, the healing abutment was removed leading to a well-formed gingival cuff (Fig. 6). Open tray impression was made and the prosthesis was fabricated. The screw-retained prosthesis was then placed on the implant. Follow up after 1 year revealed minimal bone loss with successful prostheses (Fig. 7).

Case 2

A female 48 years presented with a periodontally compromised lower incisors along with crowding. The upper left central showed discoloration and was in crossbite, thereby hindering the rehabilitation of the lower incisors (Fig. 8).

Treatment planned for the patient included extraction of the upper left incisor, followed by all ceramic Emax Maryland Bridge. Implants were planned for the lower anterior region. Due to the crowding, the space available in the mandibular anterior region was not enough for four incisors; therefore three incisors were planned in the software supported by two implants (Fig. 9).

The patient underwent a CBCT. Intraoral scan for the upper and lower arches was made. Both the data (the CBCT scan and the intraoral scan) was then superimposed using the implant planning software so that the tooth and tissue surface and the bone details were integrated to give a complete data. A



Figs 6A and B: (A) 3 months follow up; (B) Gingival cuff formed after 3 months

Fig 7: Final prostheses

Figs 8A and B: (A) Preoperative of lower teeth showing crowding; (B) Preoperative showing the crossbite

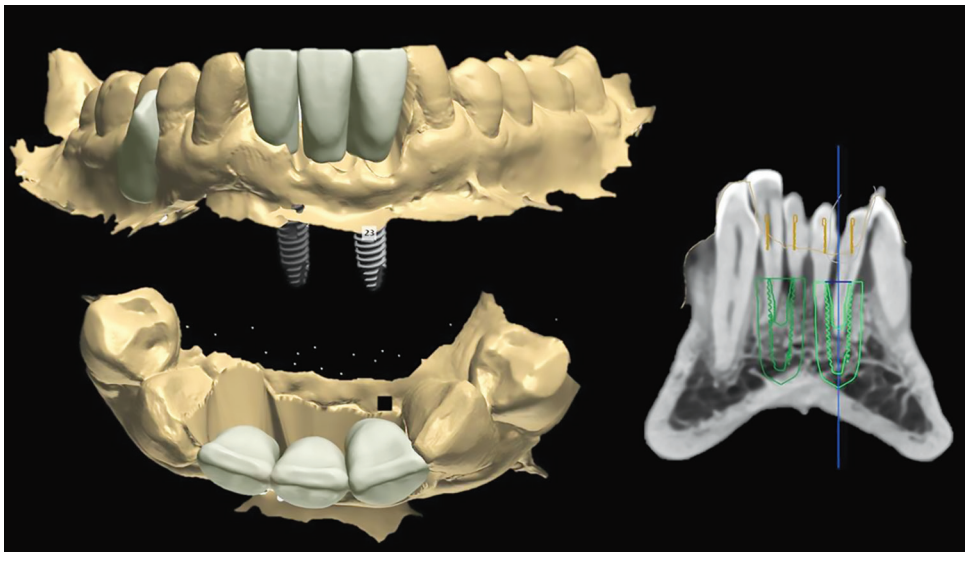


Fig 9: Planning of the implants and prostheses

surgical guide was fabricated in the same manner as described above.

The teeth were extracted atraumatically under local anesthesia preserving as much bone as possible. The extraction socket was curetted to remove any infected tissue present (Fig. 10) surgical guide was placed in the mouth to check the fit (Fig. 11). The implants were placed in position 32, 42 similar to the computer simulation with excellent implant stability. Healing abutment was placed immediately, therefore, eliminating the need for second stage surgery (Fig. 12).

Meanwhile, the upper incisor was extracted and both the upper and lower were temporized with an acrylic Maryland bridge since it was an esthetic region (Fig. 13) Three months later, maxillary Emax Maryland Bridge and lower screw-retained prostheses was done (Fig. 14) The patient was happy with the restoration.

Fig 10: Extraction of teeth

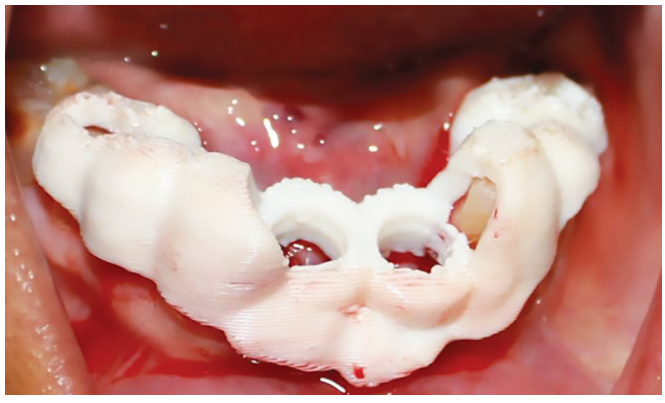


Fig 11: Surgical guide

Fig 12: Implants placed with healing abutments

Fig 13: Temporisation of upper Maryland and lower implant region

Figs 14A and B: (A) Postoperative mandibular implant prostheses; (B) Final prostheses upper Maryland and lower implant screw retained prostheses

Case 3

A male patient 58 years of age presented missing upper molar for 10 years. The patient was having difficulty in eating and hence wanted a replacement.

The patient underwent a CBCT. CBCT revealed that the bone available was very less and sinus lift would be required. But with guided implantology the sinus lift was avoided and a short implant of 4 x 7.3 mm was planned (Fig. 15). Intraoral scan for the upper and lower arches were made. A surgical guide was fabricated in the same manner as described above.

The multiple views available for the panning helped us to ensure that there was no breach in the sinus lining while planning. The same was executed with the help of the surgical guide fabricated (Fig. 16)

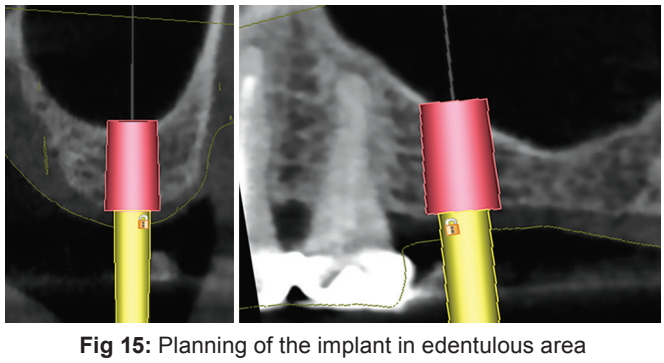
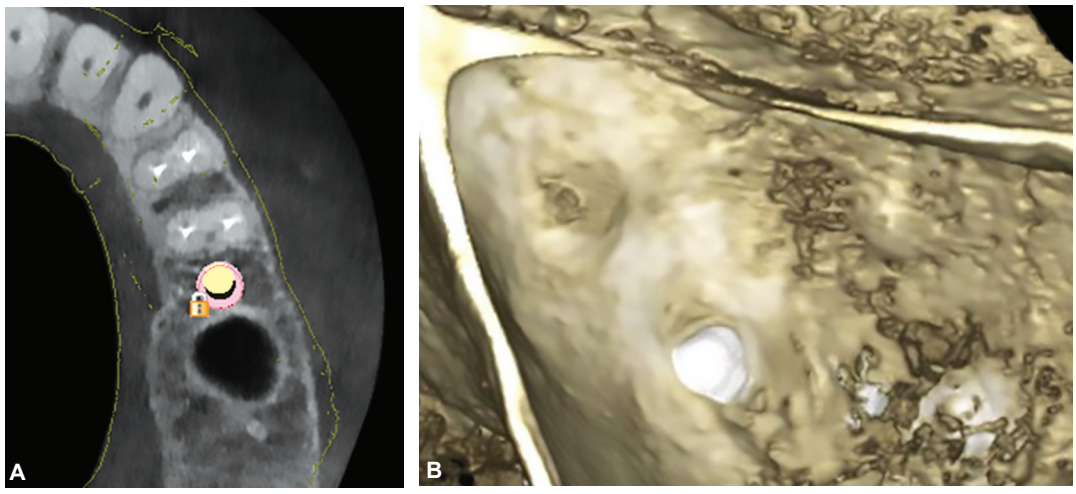


Fig 15: Planning of the implant in edentulous area

The implant was placed in the planned position accurately in the same position as in the computer simulation with the help of the surgical guide (Fig. 17) The implant had good stability and hence, healing abutment was placed.



Figs 16A and B: (A) View showing the proximity to sinus, (B) Implant just touching the sinus lining

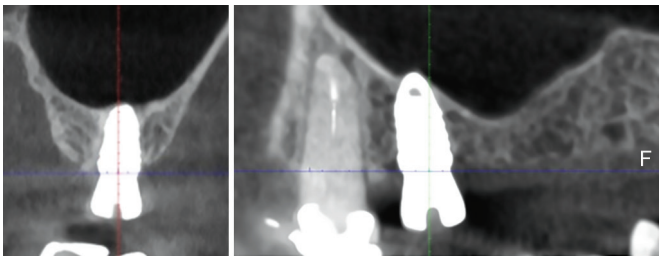


Fig 17: Postoperative comparing the planning to final outcome

Three months later the implant was restored with screw-retained implant prostheses. Follow up in 6months, 1 year revealed that implants were stable with minimal bone loss.

Therefore, with the help of guides, the immediate replacement of teeth in any region can be planned and executed with a good success rate. Advanced surgical procedures can also be avoided like sinus lift, as these guides provide a template for exactly positioning the implant in the required position preventing the breach in the sinus lining.

DISCUSSION

The introduction of cone beam CT and the increased availability of technology in the dental offices have made the digitalization of implants more and more accessible. The possible advantages of guided implant surgery protocols such as flapless and minimally invasive surgery, protection of vital anatomical structures, and immediate restoration have been extensively highlighted as marketing tools in dental implant dentistry.

The use of drill guides and cutting guides allows a virtual 3D plan, created on-screen in software to be transferred to the operative site, and as such may be thought of as an interface between the virtual plan and the physical patient.[4]

Guided Implantology in immediate placement of implants has been presented in three different scenarios and three different locations of the mouth. 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 to 60 months.[5] All the three cases have resulted in successful rehabilitation with 100% success rate.

Since the computer-guided implant placement techniques take advantage of the localizing capabilities of imaging, they may be advantageous compared to conventional surgical protocols when it comes to patients with a limited amount of bone.1 It is considered that longer implants have been observed to score better than shorter ones. In the study by Fortin et al. on guided implant placement in partially edentulous cases with severely resorbed maxillas, good results were reported (98% implant survival rate) after 4 years.[6]

Steenbergh et al. also suggested in his multicenter study that prefabrication, on the basis of models derived from three-dimensional oral implant planning software, of both surgical templates for flapless surgery and dental prostheses for immediate loading is a very reliable treatment option.[7]

Therefore, it can be concluded that guided Implantology is one of a viable treatment option in different scenarios with a proven good success rate. Despite the rising popularity of guided surgery and immediate loading, profound scientific evidence is lacking to support this approach in dental implant treatment.

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