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Case Report

COMPUTER-GUIDED IMPLANT PLACEMENT AND IMMEDIATE LOADING: A CASE REPORT

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ABSTRACT

3D computerized implant planning has become an important diagnostic and therapeutic tool in the dentistry of the new millennium. This case report illustrates how the combination of virtual planning and guided surgery allow implant insertion and immediate loading with fixed prostheses. Computer-assisted implantology, including three-dimensional virtual implant planning, guided surgery and CAD / CAM fabrication of provisional and final restorations, enabled a precise and reproducible treatment workflow with predictable aesthetic and functional results in this case of full maxillary arch rehabilitation. The combination of immediate implant placement and immediate loading was considerably more complex and required a high level of organization between the implantologist, technician and patient. After using a tooth-supported surgical guide and subsequent extraction of supporting teeth, a fixed prosthesis was delivered.

KEYWORDS: *guided surgery, implant, fixture, loading, immediate*

INTRODUCTION

Computer-assisted implantology is one of the greatest innovations of modern implantology. It simplifies surgical implant insertion and avoids anatomo-functional intraoperative complications such as injury to the nerve, sinus perforations, fenestrations or dehiscence (1–4). These objectives are reached thanks to an accurate instrumental diagnosis using advanced technologies such as computed tomography (CT) and computer planning. The ideal implant positions from a prosthetic point of view can be virtually planned with the help of guided surgery software that allows three-dimensional visualization before implant surgery (2, 5, 6). The innovation consists of the possibility of transferring the virtually planned implant position into the real clinical situation through a surgical guide (3, 7). Although the current state

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of 3D technology is advanced, inaccuracies in implant placement may still occur; it depends on various factors such as incorrect anatomical support of the template (bone, mucosa, teeth, implants), some intrinsic factors of the surgical guide (diameter tolerance between drill and guide, wrong manufacturing) and human-related factors during the digital workflow (7). Through computer-guided implantology, the immediate positioning of the implant after tooth extraction and the immediate loading of the implant with a fixed temporary reconstruction allows the patient to solve the aesthetic and functional problems during time of osseointegration. Furthermore, in guided surgery protocols, postoperative morbidity is significantly reduced compared to traditional surgery. With the following case we demonstrate the feasibility of immediate implant placement and loading approach by rehabilitating a patient with partially edentulous maxilla.

CASE REPORT

The 72-year-old patient coming to our clinic with grade III mobility on the residual teeth in the upper arch, horizontal bone loss, destructive caries (Fig. 1-2). The patient, a smoker without allergy reported, has hypertension and chronic atrial fibrillation. A direct approach to the jaw was followed. The diagnosis, the decision tree and the therapeutic approach are based on clinical examination and detailed three-dimensional virtual planning of implant insertion. Initial panoramic radiography revealed a good amount of crestal bone that could be proper to the insertion of more implant units. Various treatment options have been proposed to the patient, including a removable dental prosthesis. Finally, it was decided for a fixed prosthesis with immediate loading. A cone beam computed tomography (CBCT) was performed not only to obtain a precise diagnosis but also to produce a maxillary template and surgical guide (Fig. 3). Based on the anatomical conditions and the prosthetic planning, six implants were virtually planned using RealGuide 3.0 software in positions 16, 14, 12, 23, 25, 27 (Fig. 4-5). A temporary fixed dental prosthesis was prepared on the basis of the same digital file before surgery. To improve the stability of the template, 3 vestibular anchoring pins were inserted. The day of surgery, a single dose of antibiotic (2 g amoxicillin and clavulanic acid) was administered one hour before surgery according to international guidelines. An oral cavity asepsis was performed with clorexidine 0.2% for one minute. Local anesthesia was induced using a 4% articaine solution with 1:100,000 epinephrine. The two-stage approach included guided flapless insertion of the six Prama implants (Sweden & Martina, Padua, Italy) with a surgical guide supported by teeth 25 and 13. (Fig. 6). The template was then removed and the two residual supporting teeth were extracted. Then a new surgical guide was dressed to patient a the remaining implant inserted. All implants were placed with a torque of 48 Ncm and had good primary stability (Fig. 7). After removal of the surgical guide, the standard titanium abutments were mounted on the implants with a torque of 15 Ncm (Fig. 8). The post-operative panoramic radiograph (OPT) showed the parallel axes of the six implants (Fig. 9). The provisional prosthesis was mounted and spaces between abutments and prostheses were filled with dual composite resin (Fig. 10). The occlusion required only minor adjustments due to careful digital preoperative planning. After six months fixtures successfully osseointegrated without complications. The provisional prosthesis was disassembled and a conventional impression was taken to fabricate the final prosthesis. Oral mucosa was healthy. The final prosthesis in cobalt-chromium and composite veneer material was screwed in with 25 Ncm and the screw access area was covered with composite material. The patient followed a regular maintenance program. Healthy mucosal conditions and stable peri-implant crestal conditions were observed at the one-year follow-up appointment.

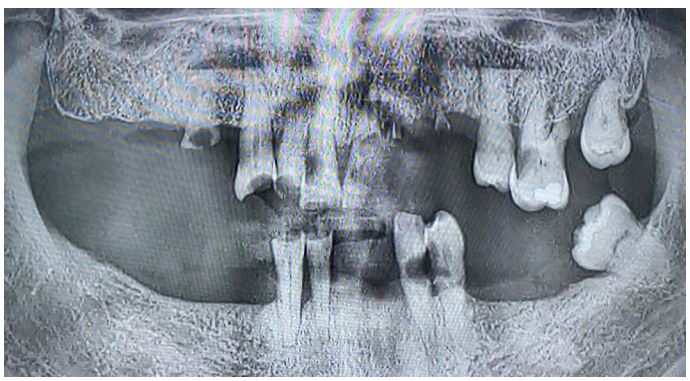


Fig. 1. *Pre-operative RX orthopantomography: the radiography demonstrates an unstable and compromised situation of the dental elements present in the arch.*

DISCUSSION

Computer-assisted implantology allowed precise, guided and immediate positioning of implants and proved to be particularly advantageous in the presented case to restore maxillary arch (8-14). The

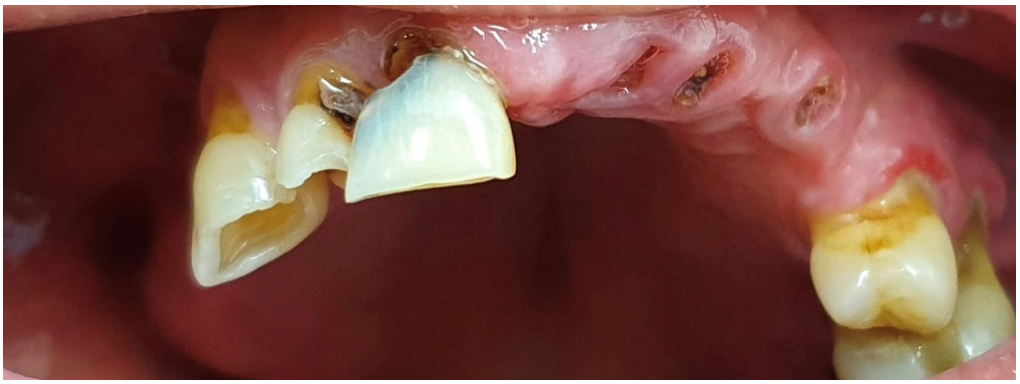


Fig. 2. *Pre-operative maxillary arch: objective examination shows destructive caries, retained root residues, dental elements with a high degree of mobility.*

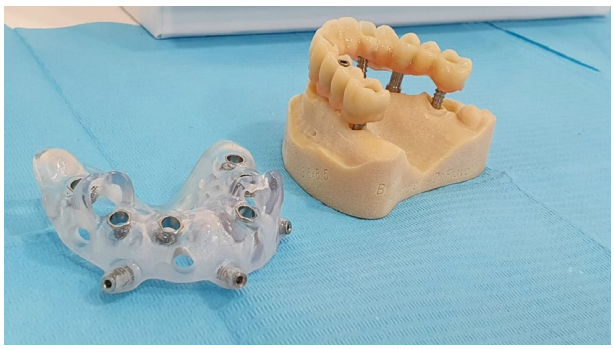


Fig. 3. *Surgical intervention components: surgical guide, pmma screw-retained prosthesis. The surgical guide has mixed dental and mucous support. It also has 3 pins to increase stability. The temporary prosthesis will be screwed on the temporary abutments.*

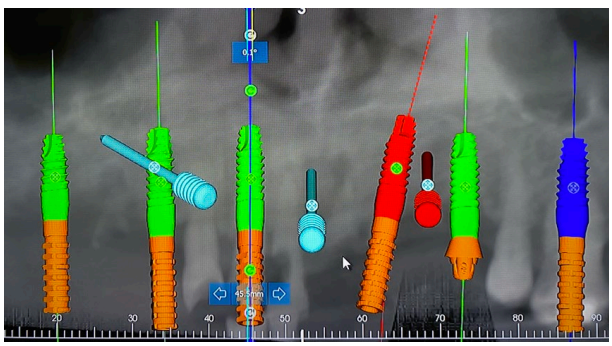


Fig. 4. *Guided implant design: CPR section. Placement of 6 transmucous implants. In position 2.3 a post-extraction has been chosen. The red color in the design phase confirms the surgical type of this implant.*

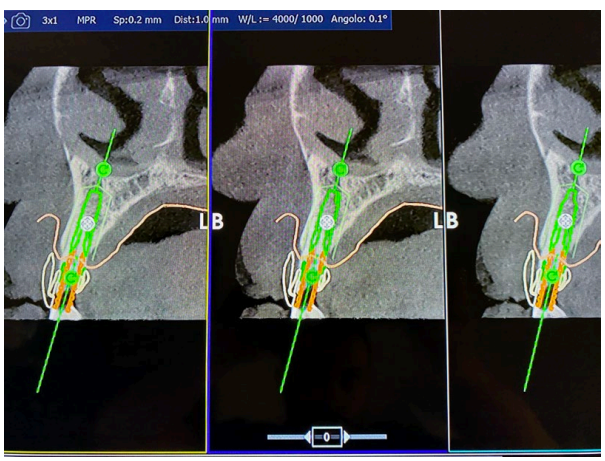


Fig. 5. *Guided implant design: cross sections: the correct position of the implant between the two corticals is confirmed.*

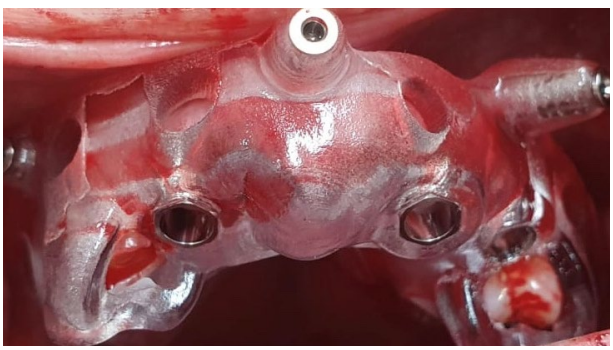


Fig. 6. *Intraoperative procedure: surgical guide positioning.*

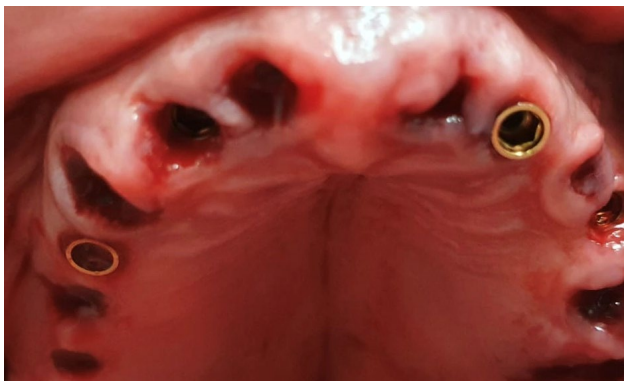


Fig. 7. *This intraoperative photo demonstrates the efficiency of the guided technique: the implants are inserted in flapless mode, which significantly reduces damage to the bone cortical.*

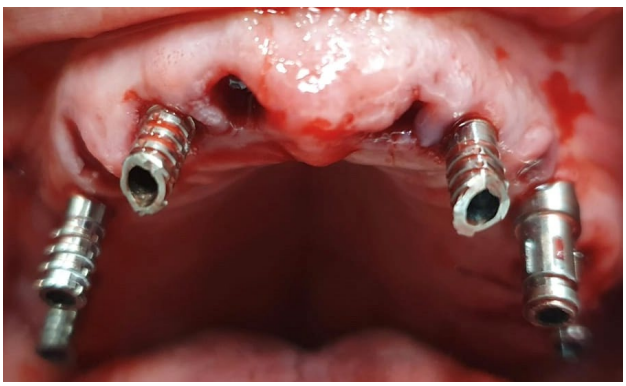


Fig. 8. *Positioning and intraoperative screwing of temporary abutments: the prosthesis is then positioned on the abutments, the occlusion is registered and then abutments are screwed with a torque of 35 n.*

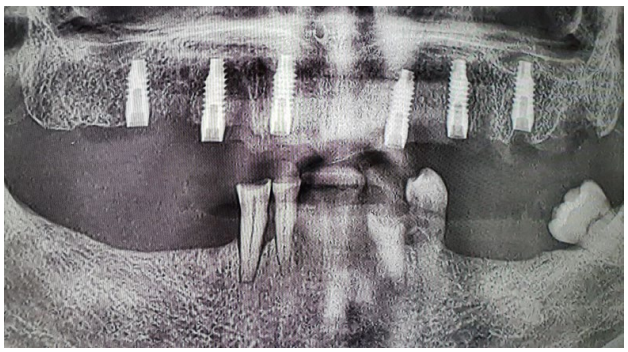


Fig. 9. *Post-operative RX orthopantomography.*



Fig. 10. *Final situation: screw-retained prosthesis in PMMA.*

significantly more complex combination of immediate implant placement and immediate loading required a high level of organization between implantologist and technician, minimizing patient compliance. Previously Pozzi et al. (15) is obtained excellent results with CAD/CAM zirconia bridges on immediately loaded implants inserted with computer-assisted / template-guided surgery. Several investigated factors that primarily influence accuracy in implant were analyzed as well as effectiveness of prosthetic rehabilitation after guided implant insertion (16-18). Preoperative communication between dentist and technician during the decision and planning phase is essential save time in the clinic, ensuring the highest surgical and prosthetic level performance. This case report supports the need for flapless surgery, optimal implant placement and immediate loading, as summarized in a recent review of randomized controlled trials (19).

CONCLUSION

The reported case highlights how the use of 3D software for planning implantology is predictable and repeatable. It fulfils the aesthetic and functional patient's requests.

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