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Digital and Interdisciplinary Approach to Perfect Prosthetic Results

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Abstract

This is a study of 10 patients where the treatment of partial edentulism was performed and presented with prosthetic restorations on implants using digital technologies. This study consisted of two groups, where in the first group were performed digital surgical guide and prosthetic treatments. In the second group, surgical and prosthetic treatments were performed but digital guidelines was not used.
Keywords: CBCT, surgical guide, prosthetics driven, individual abutment, Ti-base, ExoPlan, ExoCad

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Цифровой и междисциплинарный подход к идеальным результатам протезирования

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Резюме

Это исследование 10 пациентов, которым было проведено лечение частичной адентии; представлены протезные реставрации на имплантатах с использованием цифровых технологий. Исследование состояло из двух групп, где в первой группе выполнялись цифровые хирургические шаблоны и протезирование, а во второй группе выполняли хирургическое и ортопедическое лечение, но без использования цифровых направляющих.
Ключевые слова: КЛКТ, хирургический шаблон, приводной протез, индивидуальная опора, Ti-base, ExoPlan, ExoCad

■ INTRODUCTION

In our days, where we all are looking for quick solutions, efficient and affordable, digital technologies can make a difference, but dentistry doesn't do exception. Change to digital level in dentistry it is not anymore, a trend but an irreversible need that is becoming more and more accessible.

In present dental implants is the method of choice in the replacement of missing teeth and are widely used. In the past, implant treatments often had failed results. Now rate of success of these has increased to 95%, with the development of dental implant manufacturing technologies.

Dental implant, which replace the missing tooth, must be inserted in an anatomically and aesthetically correct prosthetic position, in a such way that his functionality can ensure long-term maintenance.

Development of cone bone computed tomography (CBCT) announced a second wave of enthusiasm, because the three-dimensional images of the craniofacial region provided new advantages in diagnosis and therapy. These developments contributed to the possibility of using paraclinical data, both for planning and for performing surgical guides, being an innovation in oral implantology.

Surgical guide for the implant is an innovator template fabricated in 3D of resins, made with help of three-dimensional design software.

Digital implant planning gives us the opportunity to ensure maximum accuracy for installing implants in a favorable prosthetic position according to the future prosthetic restoration.

With the development of science and digital manufacturing technologies CAD/CAM allowed the modeling of an individual design of the prosthetic restoration on the implant. Elucidation of problems created by the accuracy of the implant-abutment connection was possible when implant companies proposed "pre-milled abutment" blocks for individual metal abutments and Ti-base for zirconium abutments.

■ PURPOSE OF THE STUDY

Evaluation of the applicability of digital technologies in the treatment with prosthetic restorations on implants supported.

■ MATERIAL AND METHODS

The present article is based on the study of 10 patients in whom the treatment of partial edentulism was performed with prosthetic restorations on implants supported using digital technologies.

In this study were selected patients aged over 18 to 55 years, without somatic pathologies and without oral pathologies (cysts, tumors).

For 5 patients (study group, with 6 implants) virtual planning (wax-up virtual), surgical guide and prosthetic restorations on final implants (after the osteointegration period) fixed by the cementation method were performed.

For the other 5 patients from group II, 7 implants were inserted, and were not made surgical guide and prosthetic restorations on implants supported (after the osteointegration period) were fixed by the cementation method.

Cone bone computed tomography (CBCT) was performed in both groups for the planning of implant-prosthetic treatment.

Study group I were obtained impressions with their subsequent scanning in the laboratory, using lab scanner Medit Identica T300 where was obtained digital file format * STL* which allows us to alignment on CBCT.

The planning was done by the team consisting from a prosthetist, a surgeon and a dental technician. Subsequently, the surgical guide was designed and manufactured.

For all prosthetic restorations on implants supported were manufactured and designed individual abutments fixed by the cementing method.

Working methodology

In the clinic was performed clinical examination, paraclinical (CBCT), establishing the diagnosis and plannig the treatment plan, obtaining impressions on the prosthetic area, after which it was transmitted to the laboratory in order to cast the study model. The model was scanned with laboratory scanner Medit Identica T300, then in three-dimensional software ExoPlan was planned and designed the surgical guide. Manufacturing was done using the printer 3D Anycubic Photon Mono S and resins Harz Labs.

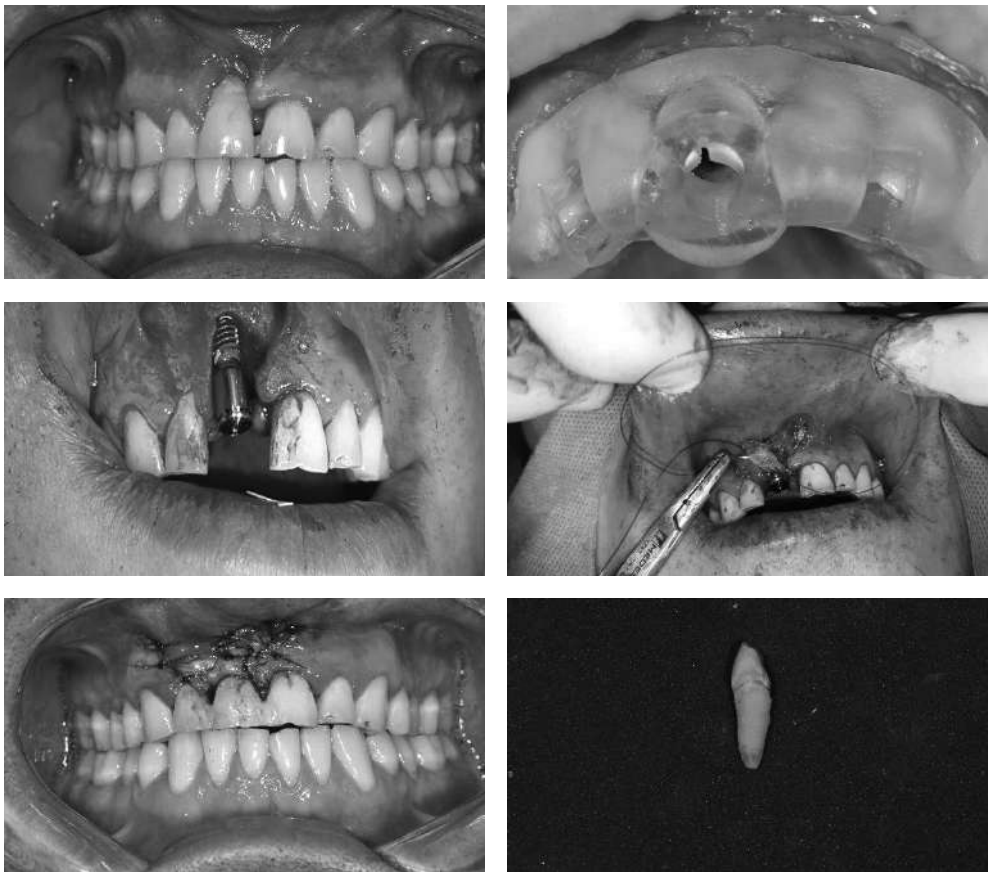

Fig. 1. Surgical step

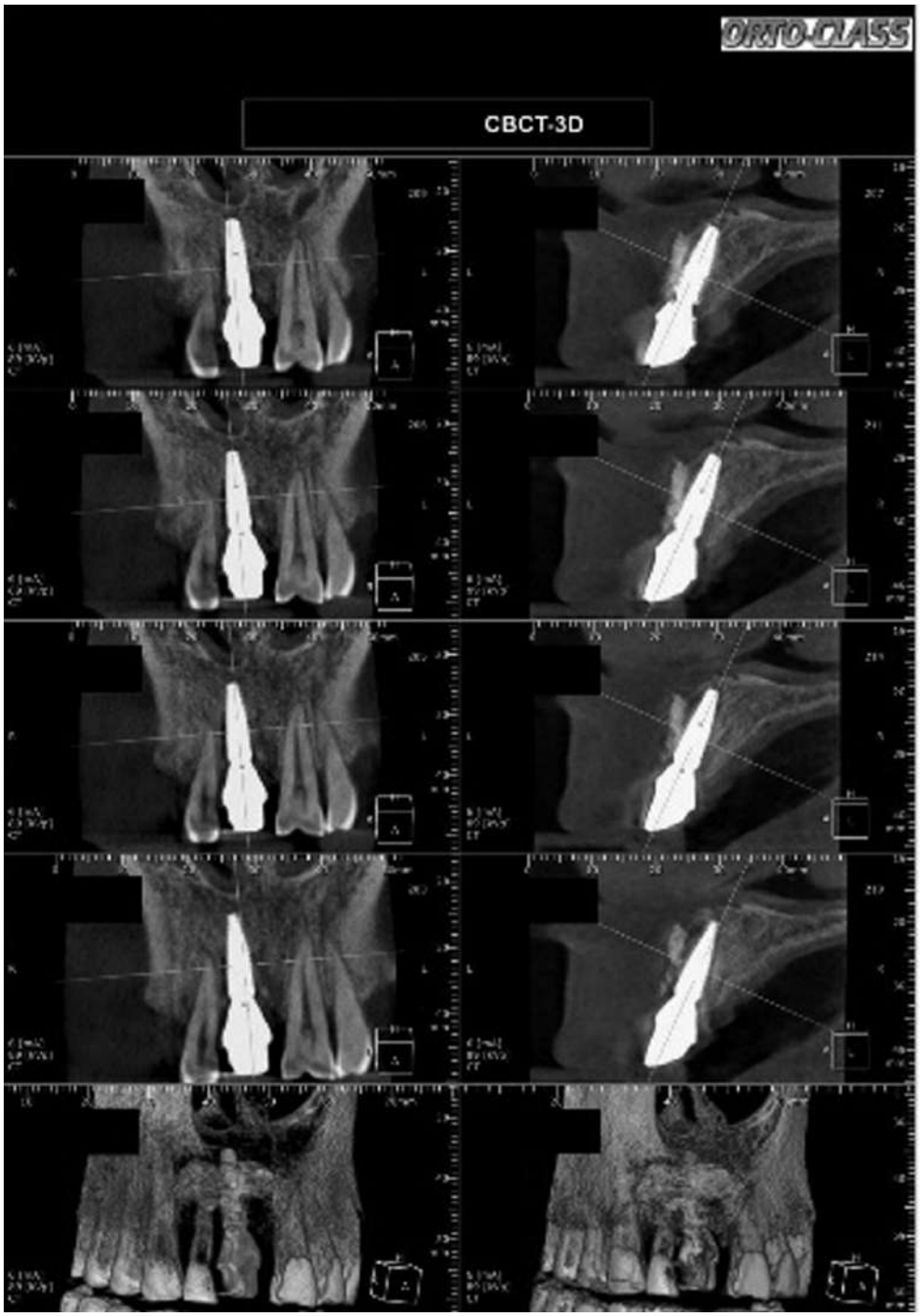

Fig. 2. CBCT analysis

At the surgical stage, was extracted the tooth 1.1 then with the help of the surgical guide the implant was inserted in the correct prosthetic position, in the way that the vestibular bone defect was compensated with artificial bone and free gingival graft, to obtain sufficient aesthetic volume. The crown of the extracted tooth was used as an adhesive temporary restoration.

After a period of 6 months, the paraclinical examination was performed (CBCT) for control.

In the clinic was obtained impression using opened tray technique.

In the laboratory was obtained the model with gingival mask, subsequently the technician together with the doctor, using a bur the emergent profile of the future individual abutment was modeled. The model was scanned with a laboratory scanner Medit Identica T300 after modeled the individual abutment on Ti-base support (CS K3Pro) in ExoCad software.

This project was designed in one stage after which we obtained two STL files, based on which the individual zirconium abutment and fix prosthesis were manufactured.

Fig. 3. Impression

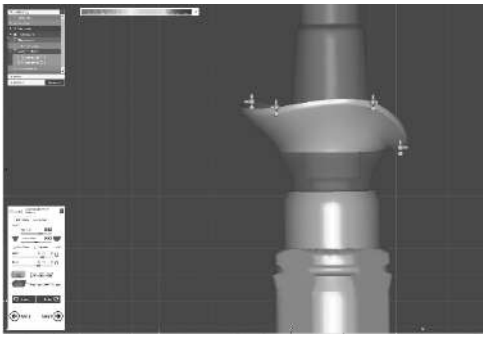

Fig. 4. Modeling of emergency profile

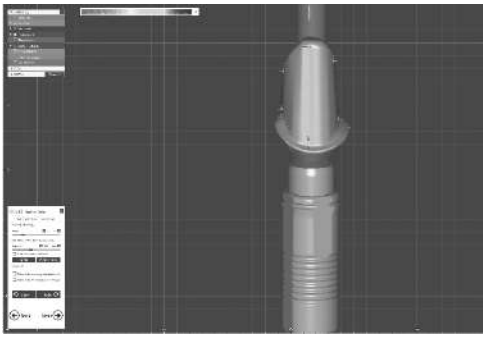

Fig. 5. Individual abutment overview

Fig. 6. Define limits

Fig. 7. Individual zirconium abutment and Ti-Base CS K3Pro Argon

Fig. 8. Model overview

Fig. 9. Intraoral view of individual abutment

Fig. 10. Control intraoral radiography

Fig. 11. Final view

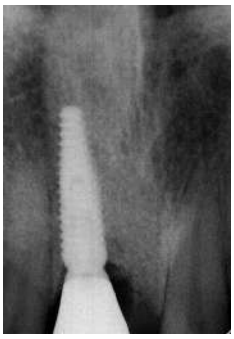

Fig. 12. Control intraoral radiography after 2 years

■ RESULTS AND DISCUSSIONS

Following the analysis of the results obtained in study group I , was observed that the position of the implants was identical to the planned one. Digital planning and the use of the surgical guide provided the possibility to insert the implants in a favorable prosthetic

driven position (prosthetics driven). This position ensures a prosthetic restoration with a balanced distribution of occlusal forces in the implant axis and the design of a prosthetic restoration according with the individuality of the clinical situation

In group II where digital planning was not used and surgical guide the implants were inserted by free-hand technique. In all cases, we obtained a deviated prosthetic position from the favorable prothetic position which made it difficult to perform and make a prosthetic restoration on the implant.

■ CONCLUSIONS

1. The study elucidated the importance of the interdisciplinary approach of each separate clinical case with the elaboration of a surgical protocol guided by prosthetic treatment.
2. The use of three-dimensional software allows the installation of implants according to the virtual treatment plan in a favorable prosthetic position.
3. Positioning of the implant in a favorable prosthetic position ensures the design of an individualized design similar to the natural tooth.

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