Impression of multiple implants using photogrammetry: Description of technique and case presentation

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Abstract

Aim: To describe a technique for registering the positions of multiple dental implants using a system based on photogrammetry (PICabutments®). The case is presented in which a prosthetic treatment was performed using this technique.

Study Design: Three Eurotekni- kal® dental implants were placed to rehabilitate a 55-year-old male patient with right posterior maxillary edentulism. Three months later, the positions of the implants were registered using a photogrammetry-based system (PICabutments®). After processing patient and implant data, special abutments (PICabutments®) were screwed onto each implant. The PICcam- er® was then used to capture images of the implant positions, automatically taking 150 images in less than 60 seconds. From these images, software was used to determine the relative positions - angles and distances – of each implant. Information regarding the soft tissues was obtained from an alginate impression cast in plaster and scanned. A Cr-Co structure was obtained using a 3D printer. Registration of the fit was verified in the patient's mouth using the Sheffield test and the screw resistance test.

Results and Conclusions: Twelve months after loading, peri-implant tissues were healthy and no marginal bone loss was observed.

The clinical application of this new system using photogram- metry was presented in a case of multiple dental implants facil- itated the rehabilitation of a pa- tient with right posterior maxillary edentulism by means of a prosth- esis with optimal fit. The prosthet- ic process was accurate, fast, simple to apply and comfortable for the patient.

Key words: Dental implants, photogrammetry, dental pro-sthesis technique, CAD/CAM.

Introduction

Dental implants are one of the most widely used therapies for the rehabilitation of partially or completely edentulous patients. It is scientifically proven that achieving proper passive fit of the implant-supported pros- thesis improves the long-term prognosis of this therapy (1-3). The classic system for fabricat- ing implant-supported pros- theses is the classical impression technique, CAD/CAM.

The system of registering the implant positions using photogrammetry was designed to provide the spatial position of the implant. This process transfers the information to the CAD software together with the PICabutments®. The PICabutments® and the digitized plaster model were aligned with the Exocad® software (Exocad GmbH, Darmstadt, Germany) using three-point registration and subsequently improved alignment by Best-fit® (Fig. 1). This process transferred the information to the CAD software together with the PICabutments®.

Three months later, the position of the implants was registered using the PICcamer® (PICden- tal). Firstly, the patient’s dem- ographic data and medical history were entered into the system. Then, the positions and the reference of the implants (master model, platform diameter, di- ameter and height of the healing abutment) were entered into the system. The PICcamera® needs to capture 50-60 images of the scanned object while elimin- ating shadows that occur with ambient light. The PICca- mer® needs to capture 50-60 images of the scanned object while eliminating shadows that occur with ambient light. The PIC- camera® needs to capture 50-60 images of the scanned object while eliminating shadows that occur with ambient light. The PIC- camera® needs to capture 50-60 images of the scanned object while eliminating shadows that occur with ambient light.

Clinical Procedure

A 55-year-old male with no rel- evant medical history came to the Oral Surgery Unit of the University of Valencia requesting the rehabilitation of bilateral edentulism in the maxillary arch (Fig. 1, 2). The patient’s gingiva and periodontal structures were normal. TheExocad® software (Exocad GmbH, Darmstadt, Germany) was used to design the prosthesis with the PICabutments® software. The Exocad® software was used to design the prosthesis with the PICabutments® software. The Exocad® software was used to design the prosthesis with the PICabutments® software. The Exocad® software was used to design the prosthesis with the PICabutments® software.

The clinical case, 150 pictures were taken in less than 60 sec- onds to obtain the relative posi- tion of each implant (angle and distance) in vector format. This information was automatically compiled into a vector PICbase® (PIC-dental). The healing abutments were placed and an alginate im- pression was taken and cast in plaster. The plaster model was scanned with a 3D scanner in open STL format to obtain infor- mation regarding the patient’s soft tissues (Fig. 1). This infor- mation was then introduced in the CAD software together with the PICabutments®.

The model was processed in a manner that al- lowed the addition of false gum for further work in the labora- tory (Fig. 2).

Once the internal structure of the implant-supported fixed par- tial denture, its passive fit was checked in the patient’s mouth. The Sheffield and one-screw tests were used: a distal screw was placed instead of the screw at 14 in this case - and a periapical radiograph was ob- tained to check the correct pros- thetic settlement on the other two implant connections (Fig. 2). The screw resistance tech- nique was used as a subjective complementary test of the pas- sive fit. Distal screws at 14 and 17 were screwed with a torque of 10 Ncm and then a medial screw was introduced verifying that the tactile sensation was soft and presented no resistance to screwing. After these verifica- tions, the Cr-Co structure was sent to the laboratory to have the ceramic loaded. The prostheses, once finished, was screwed onto the implants (Fig. 3), with 25 Ncm torque. Occlusal adjustments were performed and the correct set- tlement on the implant con- nections was verified with a radiograph (Fig. 3). A follow-up plan was established and twelve
months after loading, the peri-
implant tissues were healthy 
and no peri-implant marginal 
bone loss was observed (Fig. 5). Discussion The provision of ten-
sion-free, functional and esthetic 
implant-supported restorations is 
a key parameter for avoiding so-
phisticated prosthetic structures 
that lead to prosthetic failure. 

Bearing in mind that with con-
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the taking of impressions is a 
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sion technique is a key parameter 
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