

# The DSD ClicGuide System: a new concept for full-arch implant placement and immediate loading rehabilitation using the digital workflow: a clinical report of three cases

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## Abstract

One of the limitations of using guided surgery for full arch rehabilitation is related to the cases where it is necessary to perform osteotomy prior to the placement of the implant. The Digital Smile Design ClicGuide (DSD ClicGuide) is a digital rehabilitation planning system recommended in the rehabilitation of fully edentulous jaws, which orients implant placement procedures and immediate provisional loading based on an ideal three-dimensional design. This system consists of a sequence of surgical guides used during the clinical procedures that may include teeth extractions, osteotomies, implant placements, and immediate prosthesis installation, increasing the level of predictability of rehabilitation procedures in these complex clinical cases. The aim of this case series report is to describe the oral rehabilitation of three patients treated according to the DSD ClicGuide technique, who received a total of twenty dental implants. All the patients treated required total oral rehabilitation in at least one of the arches and required osteotomies in order to regularize the alveolar ridge before the placement of the implant. Once the rehabilitation parameters were defined and the treatment plan was approved, the following guides were printed and used in sequence: a base guide that was used as a reference for the osteotomy procedure; a guide for installing the implants; and a guide with the printed temporary prosthesis for immediate loading. It can be concluded that the DSD ClicGuide system enabled the osteotomy, implants placement, and installation of an immediate loading prosthesis in totally edentulous patients, with a high level of predictability.



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## Introduction

The treatment with dental implants has showed a high success and survival rates<sup>1</sup>, however, although this treatment is highly predictable, it is not impassive to induce discomfort to the patients, and the satisfactory clinical outcome may be dependent on the expertise and experience of the clinician, especially in challenging surgical conditions such as post-extraction sockets or complex cases<sup>2,3</sup>. The tomographic-guided surgery consists in making surgical guides that allow the implants placement according to the rehabilitation planning made based on the tomographic examination<sup>4,5</sup> and represents an improvement in the technique of installing of dental implants that aims to reduce complications related to surgical morbidity and improving its accuracy, which would benefit the oral rehabilitation of the patients<sup>4,6</sup>.

In vitro, clinical studies and systematic reviews have demonstrated that some factors may influence the accuracy of the surgical guided surgeries as the flap approach<sup>7</sup>, the distance from the washers to the mucosa<sup>8</sup>, size of the implants<sup>9</sup>, the mucosa thickness<sup>10</sup>; the tissue used to support the guides (tooth, mucosa, or bone)<sup>11</sup>; the position of the implants in the jaws (anterior or posterior region)<sup>12</sup>, the degree of guided surgery (Pilot, partial, or full)<sup>13</sup>, and the condition of the alveolar ridge (Healed of post-extraction sockets)<sup>6,14</sup>. However, one of the limitations of the guided surgery that is poorly described is the cases where the osteotomy to correct the bone irregulates before the implant's placement is necessary, especially when all the teeth remnants are extracted in order to enable a fully oral rehabilitation supported by implants<sup>6</sup>.

The Digital Smile Design ClicGuide (DSD Planning Center, Madrid, Spain) is a digital rehabilitation planning system indicated in the rehabilitation of fully edentulous jaws, involving implant placement procedures and immediate provisional loading based on the ideal three-dimensional design guided by the

patient's facial analysis. This system consists in a sequence of surgical guides that may involve extractions, osteotomies, implants placement, immediate prosthesis installation, and occlusal wear on antagonistic arches. So, this system can increase the level of predictability of rehabilitation procedures in these complex clinical cases.

The DSD ClicGuide system is based on the acquisition of tomographic images with DICOM format, the STL files acquired through intraoral scanning or models, as well as intra and extra oral photographs that will serve as a guide for the rehabilitation design based on the individual face and smile of each case. This information is imported into a software (Nemo Smile Design 3D, Nemotec, Madrid, Spain) that enables an elaboration of the ideal smile design taking into account the facial pattern to be rehabilitated that must be approved by the professional and patient before printing the set of DSD ClicGuides. Once the planning has been established, the guides for the different approaches are printed. The sequence of guides is composed by a base guide, which also serves as a reference for osteotomy, a multifunctional guide, a guide for implant installation, and a guide for temporary prosthesis in immediate loading system.

Since this technique was not previously reported, the aim of this case series was to describe the oral rehabilitation of three patients using the DSD ClicGuide technique.

## Description of the cases

### CASE 1

A 51-years old male patient, ASA 1, presented as main complaints the dissatisfaction with the smile and masticatory difficulty, due to the complete absence of the teeth in the maxilla and the partially edentulism in the mandible. The facial analysis was performed in order to present the treatment plan for the patient that gave the consent to perform the treatment (Figure 1 A-F). A

Cone beam tomography examinations, intraoral scanning and photographs were requested to prepare the rehabilitation plan using the DSD ClicGuide system (Figure 2 A-D). Once the rehabilitation parameters were defined and the treatment planning was approved, the following guides were printed: A base guides that was used as a reference for the osteotomy procedure (Figure 2E); a guide for installing the implants (Figure 2F); and a guide with the printed temporary prosthesis for immediate loading (Figure 2G). The base guide was first installed using the surgical kit selected for the installation of the implants (Unitite Guided Surgical Kit, S.I.N. Implant System, Sao Paulo, Brazil) and then the bone reduction was performed according to the virtual planning (Figure 3A). Once the base guide was installed and the osteotomy was performed, the guide for installing the

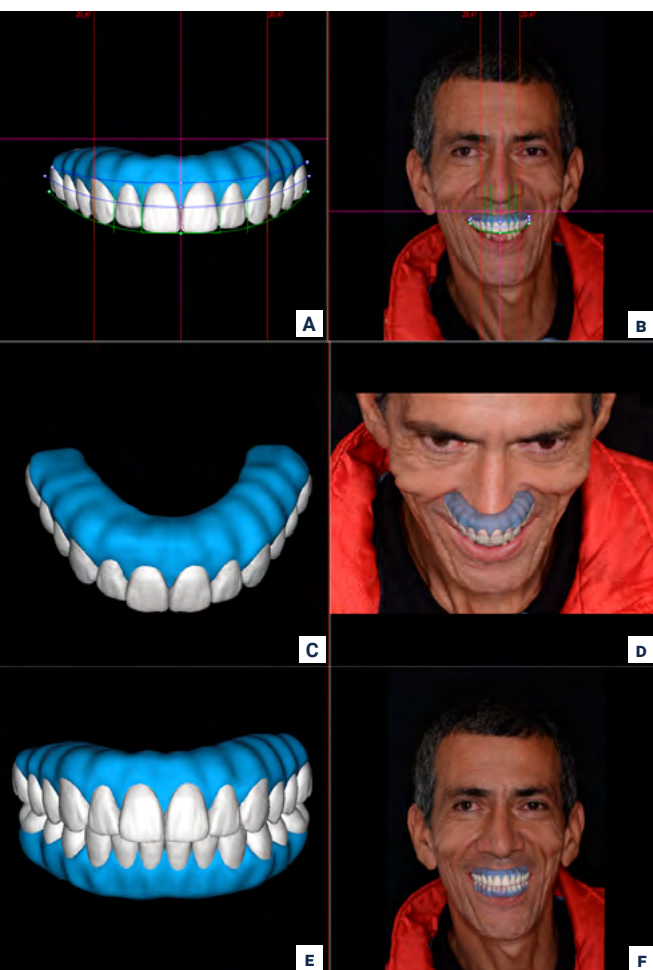


FIGURE 1 · Case 1 · Facial analysis

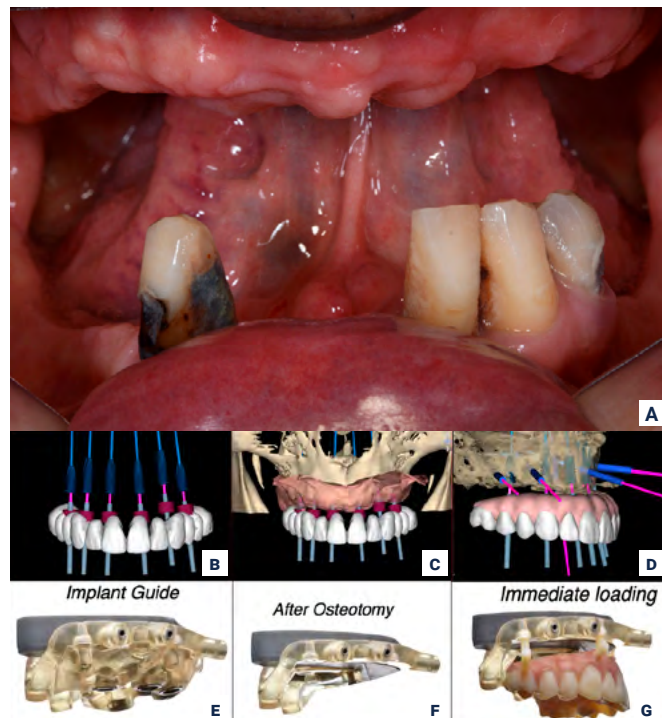
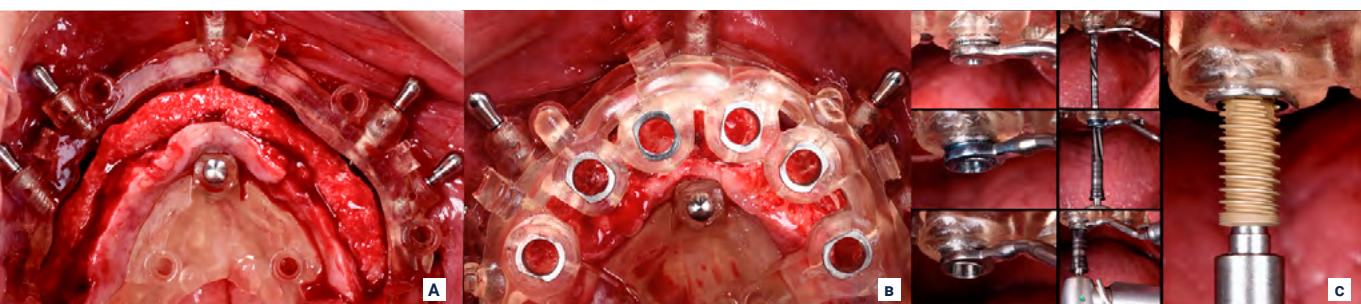


FIGURE 2 · Case 1 · **A** - Baseline clinical condition; **B-D** - Cone beam tomography examinations, intraoral scanning and photographs were requested to prepare the rehabilitation plan using the DSD ClicGuide system; **E-F** - Base guide that was used as a reference for the osteotomy procedure and guide to install the implants; **G** - Guide with the printed temporary prosthesis for immediate loading.

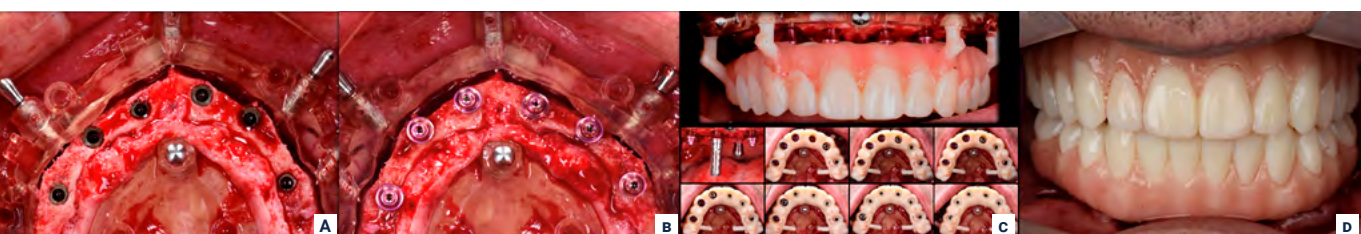
implants was attached to the base guide (Figure 3B), allowing the installation of hybrid implants with Morse taper connection and HA nanocoated surface (Unitite, SIN Implant System, Sao Paulo, Brazil) (Figure 3C). After the installation of the implants, straight abutments with a torque of 20Ncm (Miniabutments, S.I.N. Implant System, São Paulo, Brazil) were installed (Figure 4 A-B). Then, the titanium temporary cylinders were installed and the last guide was attached, with the printed temporary prosthesis to capture the prosthetic components (Figure 4C). The same procedures were performed on the antagonist arch and the occlusion was adjusted (Figure 4D). A total of ten implants were installed (six in the upper jaw and four in the lower jaw) and both arches received immediate loaded temporary prosthesis.

### CASE 2

A 48-years old male patient, ASA 1, presented as main complaints aesthetic dissatisfaction and tooth mobility. The steps of image acquisition and rehabilitation planning of the DSD



**FIGURE 3** - Case 1 - **A** - The base guide was first installed using the surgical kit selected for the installation of the implants and then the bone reduction was performed according to the virtual; **B** - Once the base guide was installed and osteotomy was performed, the guide for installing the implants was attached to the base guide; **C** - Implants placement.



**FIGURE 4** - Case 1 - **A** - Implants in final position; **B** - Installation of the abutments; **C** - Installation of the temporary titanium cylinders and the printed temporary prosthesis to capture the prosthetic components; **D** - Final rehabilitation in the upper and lower jaws.

ClicGuide system were the same as previously described, but with the planning to perform an All-on-four rehabilitation in the maxilla. The base guide was installed surgically to perform the extraction and guide the osteotomy (Figures 5 A-B). Then, the implant installation guide was attached to the base guide (Figures 6 A-C), hybrid implants with prosthetic Morse taper connection (Strong SW, S.I.N. Implant System, Sao Paulo, Brazil) and the abutments were placed. Finally, the printed temporary prosthesis guide was attached in order to capture the prosthetic components and perform the immediate loading prosthesis (Figures 7 A-B).

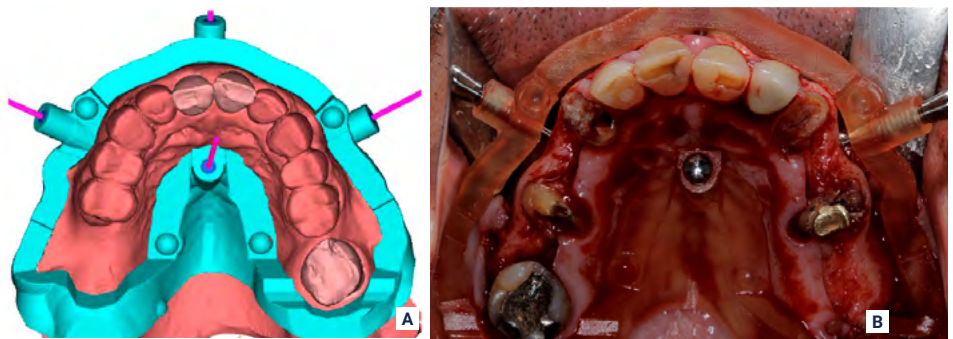


FIGURE 5 - Case 2 - A-B - The base guide was placed to perform the teeth extractions and to guide the osteotomy;



FIGURE 6 - Case 2 - A-C - Installation of the implants guide and the implants placement.

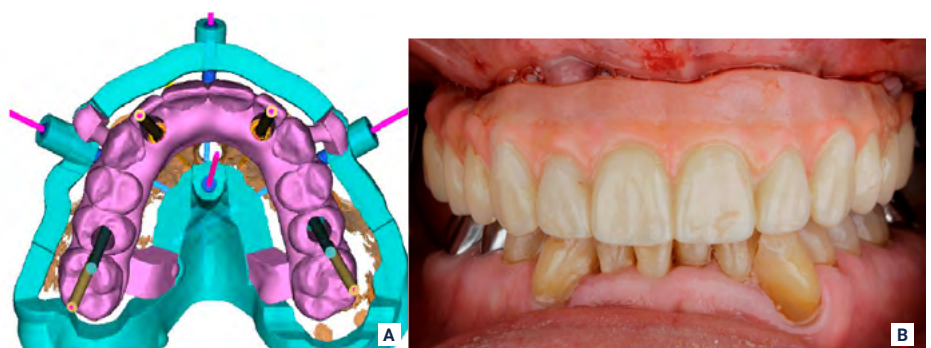
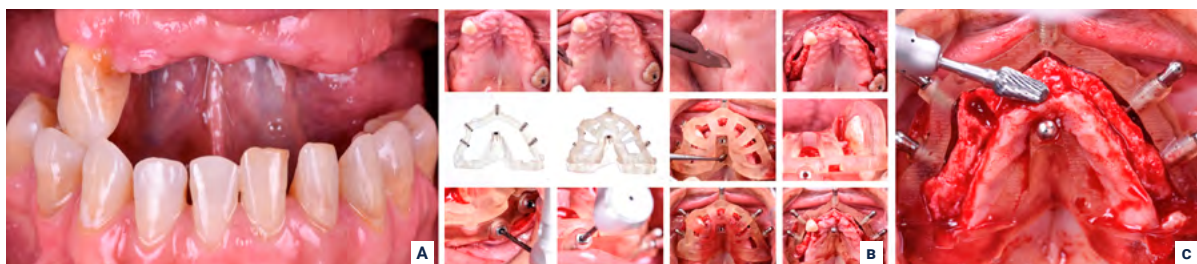


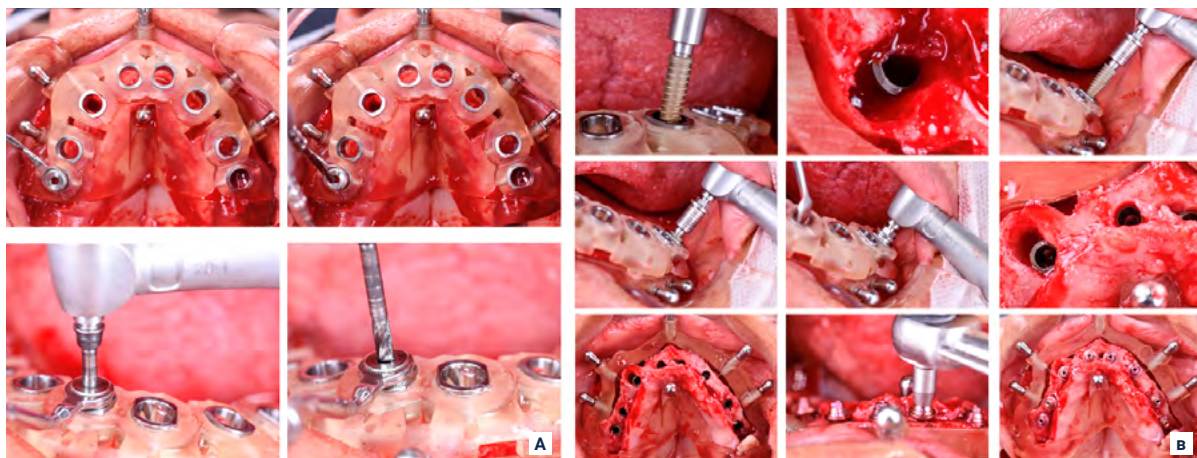
FIGURE 7 - Case 2 - A - Installation of the printed temporary prosthesis guide; B - Temporary rehabilitation.

### CASE 3

A 41-years old female patient, ASA 1, presented as major complaints an aesthetic dissatisfaction, low self-esteem and masticatory difficulties (Figure 8A). The rehabilitation planning was carried out using the DSD ClicGuide system that indicated the extraction of the upper right canine and installation of implants through the sequence of system guides. The figure 8B shows the surgical sequence for installing of the base guide, which also served as a reference for bone osteotomy planned virtually (Figure 8C). Afterwards, the guide for installing the implants was attached (Figure 9A), and eight implants and their respective prosthetic components were placed (Unitite, S.I.N. Implant System, Sao Paulo, Brazil) (Figures 9B). The next step was the coupling of the last guide with the printed temporary prosthesis to capture the temporary cylinders using flow resin, finishing, polishing and installation of an immediate loading prosthesis (Figure 10A-B).



**FIGURE 8** - Case 3 - **A** - Baseline clinical condition; **B-C** - Surgical sequence of the installation of the base guide, which also served as a reference for bone osteotomy planned virtually.



**FIGURE 9** - Case 3 - **A-B** - Installation of the implants by the guided surgery.

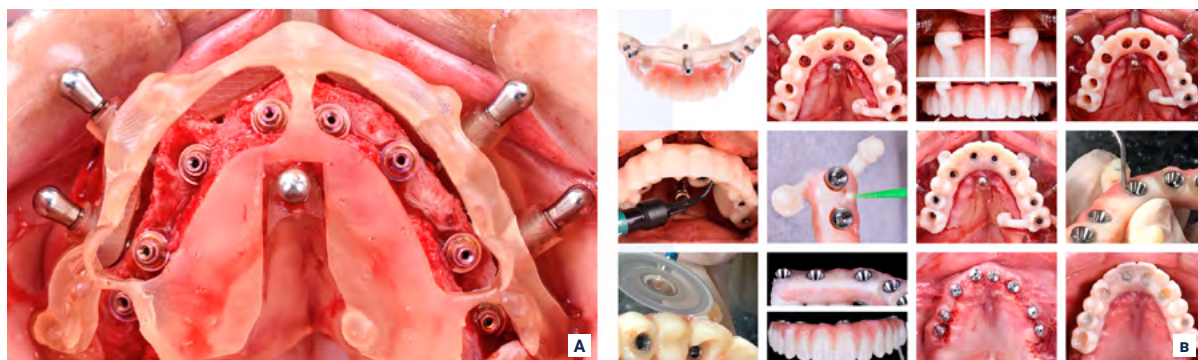


FIGURE 10 · Case 3 - **A** - Installation of the abutments; **B** - Installation of an immediate loading prosthesis.

## Discussion

The rehabilitation of totally edentulous patients with implants installed in healed or post-extraction socket is considered a highly complex procedure. Although this type of clinical case be the classic indication for rehabilitation in implant dentistry<sup>15</sup>, factors such as the morbidity associated with the surgical technique<sup>16</sup>, and the obtention of a good prosthesis design<sup>4</sup> make it difficult to adequately solve all the cases with success and comfort. Thus, the technique proposed in this study have the aim to facilitate the rehabilitation of these patients through a full digital workflow procedure, from the planning of the prosthesis and surgical guides to the execution of all clinical procedures in a guided manner.

The three clinical cases reported in this study were treated using the DSD ClicGuide Technique, which allowed the execution of the osteotomy procedure, the implants placement, and the immediate provisional rehabilitation supported by these implants. This technique consists in the attachment of sequential different guides (osteotomy, installation of implants, and rehabilitation guides) which connected with the base guide (ie. osteotomy guide). In fact, these procedures performed freehand promote greater clinical time and morbidity for patients<sup>16,17</sup>, as well as being less accurate in relation to the installation of implants in a guided way<sup>13</sup>. In addition, prosthetic rehabilitation supported performed after the guided surgery has higher level of occlusal and esthetic quality<sup>4</sup>.



An important factor that interferes with the accuracy of guided surgery is the installation of implants in post-extraction sockets<sup>14</sup>, especially in cases where the osteotomy procedure is necessary. In fact, performing the flapless approach is considered one of the most attractive factors in the application of the guided surgery technique because it is listed as the main factor related to the reduction of surgical morbidity compared to the freehand installation of the implants associated with the open flaps<sup>13,16</sup>. However, the clinical cases described had atrophic or irregular ridges that did not allowed the placement of the implants without a flap detachment, and osteotomy for planning these edges was planned as an option to solve these cases without requiring the use of reconstructive bone techniques.

Several other factors can interfere with the accuracy of the implant installation in relation to the treatment planning and these deviations can impair the rehabilitation procedures of these patients<sup>6,7,11</sup>. The manufacturing of the guides through computed tomography associated with oral scanning promotes greater predictability in the accuracy of the guided surgery by increasing the quality of the surgical guides<sup>4,18</sup>. Specifically, in the clinical cases that were treated by the DSD ClicGuide technique, it is likely that the association of the technologies of computed tomography, oral scanning, and DSD planning have allowed the creation of accurate guides for the different phases of treatment of these patients. In addition, the fact that the generated guides are fixed and the level of perforation of the guide is fully (from the initial drilling to the installation of the implants) may have positively interfered in the accuracy of the technique in such a way that it allowed the patients to be satisfactorily rehabilitated immediately.

Another critical factor in the guided surgery technique is that the lack of visualization of the drilling procedures and during the implant's placement can impair the sense of the degree of the primary stability of the implants. However, a good primary

stability was achieved in all twenty implants that were installed in all cases reported in this study. Indeed, the implants used in this case report presented a hybrid macrostructure that is cylindrical in the coronal region and gradually becoming tapered the apical region. This implants also presented compressive external threads and internal threads associated with a healing chamber that increases the stability of the clot, and these characteristics have been showed to enhance the osseointegration process<sup>19,20</sup>.

The three cases reported in this study demonstrated encouraging results obtained by the DSD ClicGuide technique in full-arch rehabilitation. However, prospective cohort or controlled clinical trials are necessary in order to assess the level of accuracy and the long-term clinical outcomes of the rehabilitations performed using this technique.

## Conclusion

The DSD ClicGuide system enabled the osteotomy, implants placement, and installation of an immediate loading prosthesis in totally edentulous patients.

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## Sistema DSD Clic Guide: um novo conceito para instalação de implantes e reabilitação total em carga imediata usando o fluxo de trabalho digital: descrição de três casos clínicos

### Resumo

uma das limitações do uso de cirurgia guiada para reabilitação do arco completo está relacionada aos casos em que é necessário realizar osteotomia antes da colocação do implante. O Digital Smile Design ClicGuide (DSD ClicGuide) é um sistema de planejamento de reabilitação digital recomendado para reabilitação de arcos totalmente desdentados, que orienta os procedimentos de colocação do implante e a carga provisória imediata com base em um design tridimensional ideal. Esse sistema consiste em uma sequência de guias cirúrgicos utilizados durante os procedimentos clínicos, que podem incluir extrações dentárias, osteotomias, colocação de implantes e instalação imediata de próteses, aumentando o nível de previsibilidade dos procedimentos de reabilitação nesses complexos casos clínicos. O objetivo desta série de casos é descrever a reabilitação oral de três pacientes tratados de acordo com a técnica DSD ClicGuide, que receberam um total de vinte implantes dentários. Todos os pacientes tratados necessitaram de reabilitação oral total em pelo menos um dos arcos e osteotomias para regularizar a crista alveolar antes da colocação do implante. Uma vez definidos os parâmetros de reabilitação e aprovado o plano de tratamento, os seguintes guias foram impressos e utilizados em sequência: um guia base que foi utilizado como referência para o procedimento de osteotomia; um guia para instalação dos implantes; e um guia com a prótese temporária impressa para carregamento imediato. Pode-se concluir que o sistema DSD ClicGuide possibilitou a osteotomia, colocação de implantes e instalação de uma prótese de carga imediata em pacientes totalmente desdentados, com adequado nível de previsibilidade.

**PALAVRAS-CHAVES:** Reabilitação bucal; Osteotomia; Tomografia Computadorizada de Feixe Cônico.

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