Revista de Ciencias Médicas de Pinar del Río

ISSN: 1561-3194 **RNPS:** 1877
Rev Ciencias Médicas. 2025; 29(S2): e7048

CASE PRESENTATION

Guided surgery as an alternative in oral rehabilitation: a case report

Delia María Villacrés-Yancha [1], **Dayana Nataly Quishpe-Cedeño** [1], **Washington Javier Sánchez-Haro** [1]

[1]Universidad Regional Autónoma de Los Andes, Quevedo. Ecuador.

Received: December 30, 2025
Accepted: December 31, 2025
Published: December 31, 2025

Citar como: Villacrés-Yancha DM, Quishpe-Cedeño DN, Sánchez-Haro WJ. Cirugía guiada como alternativa en la rehabilitación oral: a propósito de un caso. Rev Ciencias Médicas [Internet]. 2025 [citado: fecha de acceso]; 29(S2): e7048. Disponible en: http://revcmpinar.sld.cu/index.php/publicaciones/article/view/7048

ABSTRACT

Introduction: the placement of a dental implant has been performed for several years using the freehand technique, with the current highlight being the support of surgical guides.
Objective: to describe a clinical case using two surgical guides to perform ridge regularization and the placement of dental implants under the All-on-Four concept.
Case Presentation: a 34-year-old female patient with generalized chronic periodontitis and advanced mobility in the lower incisors, presenting pain, halitosis, and aesthetic alterations. After clinical and imaging evaluation, multiple tooth extractions and rehabilitation through guided surgery were planned. Two surgical guides were designed: the first aimed at alveolar ridge regularization and the second for the placement of four mandibular implants. During surgery, block extractions were performed, guides were seated with fixation pins, controlled drilling was carried out, and implants were placed. Straight and angled abutments were installed according to position, and a provisional prosthesis was adapted five days later, with shortened occlusion up to premolars to favor healing. The patient evolved favorably, with adequate primary stability and planning for a future definitive prosthesis.
Conclusions: the data show that surgical guides manufactured through 3D printing are statistically precise for guided implant surgery. These guides offer significant advantages such as high accuracy, ease of fabrication, waste reduction, and shorter laboratory working time, which contributes to improving the profitability of the procedure.

Keywords: Surgery, Computer-Assisted; Dental Implants; Mouth Rehabilitation.

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Rev Ciencias Médicas. 2025; 29(S2): e7048

INTRODUCTION

In the field of oral implantology, dental implant placement has traditionally been performed for many years using the freehand technique, sometimes aided by manually fabricated surgical guides to mark the initial osteotomy site.[1] However, because precise apical positioning of the dental implant is critical to avoid invasion or damage to vital anatomical structures, digitally designed surgical guides have emerged as a valuable tool, enabling implant placement closely aligned with the digitally pre-planned position.[2]

Three-dimensional (3D) design software applications provide high accuracy and effectively address a wide range of clinical scenarios in dentistry. For instance, one article describes the immediate placement and restoration of maxillary incisors compromised by dental trauma, using measurable implant surgical guides.[3,4]

Implant placement accuracy is influenced by several steps performed prior to obtaining the final surgical guide. This process begins with 3D digital planning in specialized software, followed by the matching (superimposition) of the intraoral scan with the maxillary cone-beam computed tomography (CBCT), and culminates in the fabrication of the surgical guide itself—typically produced via two different techniques: additive (3D printing) or subtractive (milling).[5,6]

The additive technique is currently the most widely used due to its lower cost, shorter production time, and outcomes comparable to conventional CAD/CAM laboratory methods. Nevertheless, some deviation between the actual implant position and the initially planned position still occurs, influenced by factors such as guide fit and stability, clinician experience, and surgical guide type.[7] Based on these considerations, the present study aimed to describe a clinical case utilizing two surgical guides for alveolar ridge regularization and dental implant placement under the All-on-Four concept.

CLINICAL CASE REPORT

We present the case of a 34-year-old female smoker with no relevant personal or family pathological history, who sought dental care due to chewing discomfort, halitosis, and aesthetic concerns. Clinical examination revealed generalized chronic periodontitis (Figure 1), with Grade 3 mobility in the mandibular incisors, along with inflammatory gingival lesions that were erythematous and painful on palpation, though without evident bleeding. The remainder of the physical and systemic examination was within normal limits.

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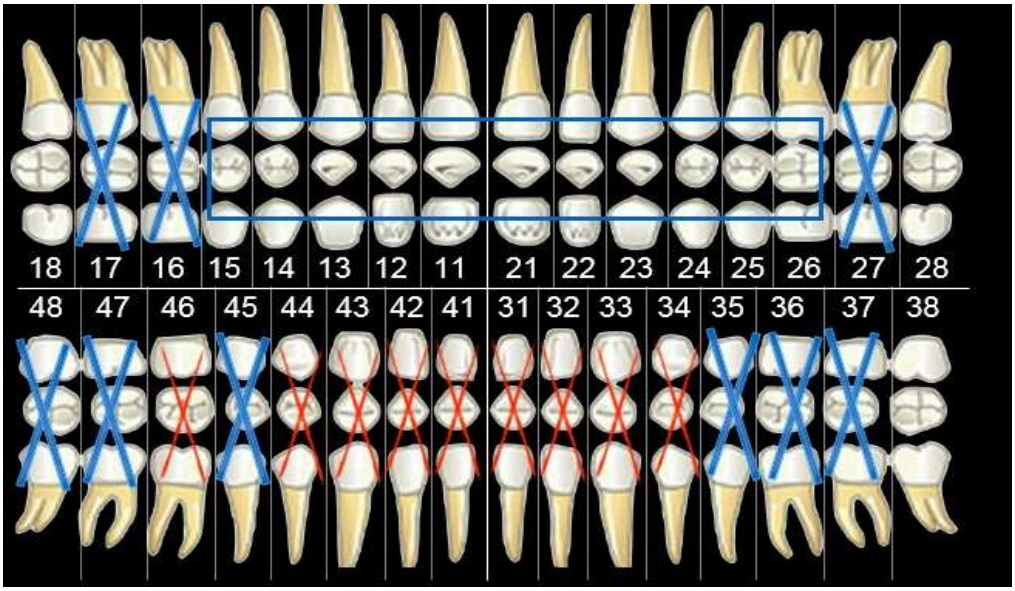
Fig. 1 Chronic periodontitis in the affected patient.

Complementary diagnostic studies included panoramic radiography, cone-beam computed tomography (CBCT), and laboratory analysis. CBCT revealed advanced periodontal compromise in the mandibular arch (Figure 2), while hematological and biochemical tests remained within physiological ranges. The odontogram (Figure 2) showed multiple teeth with severe mobility; thus, extractions of teeth #46, 44, 43, 42, 41, 31, 32, 33, and 34 were indicated.



Note: Teeth scheduled for extraction are marked with a red "X"; missing teeth are marked with a blue "X."

Fig. 2 Odontogram.

The treatment plan followed the All-on-Four concept, involving the placement of four implants at positions #44, 42, 32, and 34, all measuring 3,75 × 11,5 mm. Digital planning was performed using specialized software, and two 3D-printed surgical guides were fabricated: the first for alveolar ridge regularization after extractions, and the second for precise implant placement. The surgical procedure was carried out under supraperiosteal and inferior alveolar nerve block anesthesia. Due to the advanced tooth mobility, block extractions were performed (Figure 3).

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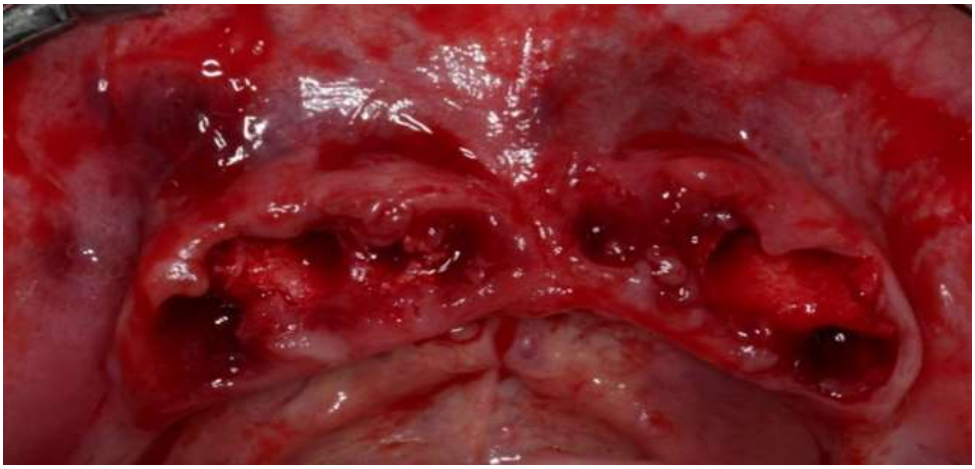

Fig. 3 Occlusal view of the mandible showing post-extraction sockets.

Subsequently, vestibular and lingual flaps were elevated to allow seating of the first guide, which was stabilized with three vestibular fixation pins. Alveolar ridge regularization was performed using a micromotor and carbide burs until the level indicated by the guide was reached. After removing the first guide, the second guide was seated for implant placement, following a fully guided drilling protocol. Implants were inserted with insertion torques exceeding 40 Ncm, allowing immediate placement of micro-unit abutments: 17° angled abutments on the distal implants and straight abutments on the mesial ones, with the intention of delayed loading at five days.

Provisionalization was achieved using a pre-fabricated prosthesis, captured onto provisional abutments (Figure 4), and adjusted with shortened occlusion limited to the premolars, restoring incisal and canine guidance (Figure 5). The patient was allowed to heal for four months, after which fabrication of the definitive prosthesis was planned.

Fig. 4 Provisional abutments with Teflon, screwed in place and ready for provisional prosthesis pickup

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Fig. 5 Maximum intercuspation and occlusion with shortened bite up to premolars.

DISCUSSION

Digital guides represent a crucial tool for achieving guided implant surgery aligned with prosthetic planning. They enable accurate transfer of the preoperative implant plan—designed using Blue Sky software—to the surgical site, facilitating seamless implementation of the prosthetic protocol.[8] In esthetic zones, where immediate implantation and restoration demand high surgical precision, it is essential to rigorously anticipate limitations related to drilling during surgery.[9]

Existing literature has demonstrated significant improvements in the accuracy of immediate implant surgery through the use of digital guides. However, due to the unique anatomical features of the surgical site and limitations in the adaptability of the drill and guide plate, guided cavity preparation and implant placement do not always perfectly match the preoperative plan. Controlled studies have indicated that fully guided systems offer greater accuracy than partially guided approaches.[10.11]

This clinical case report demonstrates that the use of dual surgical guides enhances surgical outcomes in ridge regularization procedures and enables predictable placement of both straight and angled implants. Data show that 3D-printed surgical guides are statistically precise for guided implant surgery. These guides offer significant advantages, including high accuracy, ease of fabrication, reduced material waste, and decreased laboratory time, thereby improving the cost-effectiveness of the procedure.[12]

In immediate implantation, linear and angular deviations can be substantial depending on the guide type and specific patient conditions. Despite technological advances, the inherent rigidity of surgical guides means that intraoperative deviations may complicate subsequent adjustments if not properly addressed through real-time measurements and evaluations.[13,14]

Recently, several research teams have integrated principles of intraoperative precision measurement into clinical implant procedures, combining digital guide technology with 3D-printed plates to create measurable implant guides. This approach has yielded optimal outcomes in manual implant surgeries.[15]

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CONCLUSIONS

Data indicate that 3D-printed surgical guides are statistically precise for guided implant surgery. These guides offer significant advantages, including high accuracy, ease of fabrication, reduced waste, and decreased laboratory working time, thereby improving the cost-effectiveness of the procedure.

Conflict of Interest
The authors declare that there is no conflict of interest.

Funding
The authors did not receive funding for the development of this article.

Peer Review
The author agrees to undergo an open peer review process. This manuscript has not been published in whole or in part, nor is it under evaluation by another journal.

Authors' Contributions
DMVY: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.
DNQC: Conceptualization, Data curation, Writing – original draft, Writing – review & editing.
WJSH: Data curation, Formal analysis, Investigation, Methodology, Software, Writing – original draft, Writing – review & editing.

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