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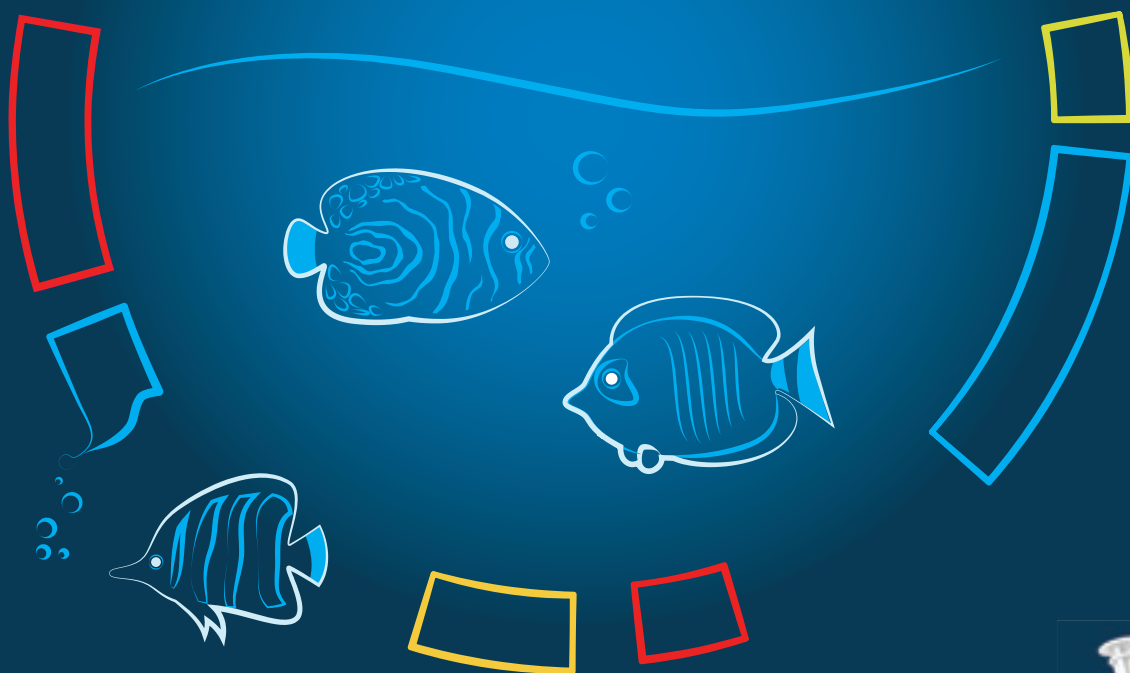
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Journal of

Oral Science & Rehabilitation

New perspectives in periapical surgery

Periapical surgery has long been performed in patients with periapical disorders. The massive introduction of dental implants in dental practice has not displaced periapical surgery, which remains the first treatment option in the case of teeth amenable to recovery and is preferable to implant placement.

A new scenario has emerged in periapical surgery with the introduction of novel retrograde filler materials, finer and more precise surgical instruments, and endoscopic and microscopic surgical field illumination and magnification. In effect, it is now possible to eliminate the periapical lesion while preserving the causal tooth, with high long-term success rates.

Despite this, however, there is a notorious lack of clinical documentation on periapical surgery presented at courses and congresses and published in scientific journals compared with the cornerstone in dental practice today: implantology.

It is worth knowing that, in many cases, teeth that are to be removed and replaced with implants could in fact be preserved. In this regard, the technical advances in periapical surgery are able to improve the quality of life of our patients and help them keep their teeth.

Dr. Miguel Peñarrocha Diago
Co-Editor

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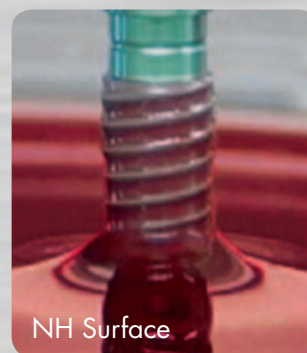
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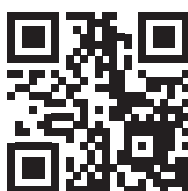
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Accuracy of computer-assisted template-based implant placement using a conventional impression and scan model or digital impression: A preliminary report from a randomized controlled trial

Abstract

Objective

The objective of this study was to compare implant survival rate, template-related complications and virtual planning accuracy of computer-assisted template-based implant placement using a conventional impression and scan model or digital impression to rehabilitate partially edentulous patients using flapless or miniflap procedures and immediate loading.

Materials and methods

Any partially edentulous patients requiring at least one implant, to be planned on the basis of cone beam computed tomography (CBCT) scans using dedicated software, were enrolled in the trial. Patients were randomized according to a parallel-group design into two arms: intraoral digital impression (fully digital group) versus conventional impression and scan model (control group). Implants were to be placed flapless and loaded immediately, if inserted with a torque over 35 N cm, with reinforced provisional prostheses. Three deviation parameters (horizontal, vertical and angular) were defined and calculated between the planned and placed implant positions and analyzed statistically. Results were compared using a mixed-design repeated-measures analysis of variance model ($\alpha = 0.05$).

Results

Twelve patients were randomized to the fully digital group (6 patients with 17 implants) and control group (6 patients with 20 implants). The mean error in angle was $2.56 \pm 1.52^\circ$ (range: 0.3 – 5.0°) in the fully digital group and $2.18 \pm 1.41^\circ$ (range: 0.3 – 5.8°) in the control group ($P = 0.519$). In the horizontal plane (mesiodistal), the mean error was 0.57 ± 0.32 mm (range: 0.1 – 1.1 mm) in the fully digital group and 0.43 ± 0.26 mm (range: 0.1 – 0.9 mm) in the control group ($P = 0.249$). In the vertical plane (apico-coronal), the mean error was 0.67 ± 0.51 mm (range: 0.0 – 1.6 mm) in the fully digital group and 0.43 ± 0.32 mm (range: 0.0 – 1.2 mm) in the control group ($P = 0.180$).

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Conclusion

Within the limitations of the present randomized controlled trial, it was found that intraoral digital impressions may be a viable alternative to conventional impressions and scan models for the rehabilitation of partially edentulous patients using computer-guided template-assisted implant placement.

Keywords

Intraoral scanner, digital impression, guided surgery, accuracy, dental implants.

Introduction

Proper implant position has a significant impact on the esthetic and functional outcomes of implant-supported restorations.^{1,2} Therefore, the implant must be placed accurately according to the treatment plan. Computer-assisted template-based implant placement (guided surgery) has become increasingly popular owing to improved planning and the higher transfer accuracy of the virtual plan to the surgical site compared with freehand insertion or freehand final drilling.³ Hence, it has undoubtedly been a major achievement to provide optimal 3-D implant positioning with respect to both anatomical and prosthetic parameters, as well as higher patient satisfaction.⁴

A recently published meta-analysis of *in vitro* and *in vivo* studies found a total mean error of 1.12 mm at the entry point and 1.39 mm at the apex.⁵ The accuracy of computer-assisted template-based implant placement depends on several factors, from data set acquisition to the surgical procedure. Originally, guided surgery protocols advocated a dual-scan protocol.⁶ In recent years, new technologies combining data from computed tomography (CT) or cone beam computed tomography (CBCT) images with information on the soft tissue and crown morphology have been developed. Dedicated software allows for accurate virtual implant planning, always based on the prosthetic volume of the teeth to be rehabilitated and making immediate loading easier.^{4,7-9} Surgical guides may be produced by computer-aided design/computer-aided manufacture technology, such as stereolithography, manually in a dental laboratory or by high-resolution 3-D printer. Finally, irrespective of the method of manufacture, the optimal fit of the surgical template and its

stabilization are essential to accurately transfer the virtual implant position to the patient's mouth.

Digital impressions replace the need for conventional materials that can be inconvenient and messy for patients. Today, there is no doubt about the potential of recent intraoral optical impression systems available on the market as regards diagnosis and the treatment plan. Particularly noteworthy is the complete integration with other digital technologies to provide for accurate and faster patient-centered health solutions.^{10,11} Nevertheless, to the best of our knowledge, at the time of writing this article, there were no other published randomized clinical trials evaluating a fully digital approach to computer-assisted template-based implant placement.

The aim of the present study was to compare implant survival rate, template-related complications and virtual planning accuracy of computer-assisted template-based implant placement using a conventional impression and scan model or digital impression. The null hypothesis was that there would be no difference between these interventions. This trial is reported in accordance with the CONSORT Statement for improving the quality of reporting of parallel-group randomized trials.¹²

Materials and methods

This study was designed as a randomized controlled trial of parallel-group design conducted at a private center in Rome, between May 2016 and March 2017. Surgical and prosthetic procedures were performed by one expert clinician (MT). To the best of our knowledge, at the time of writing this article, there were no other similar