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Case Study

Innovative Approach in Dental Implantology: A Case Study of Abutment Bending Verification Guide for One-Piece Compressive Implants

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Abstract

A one-piece dental implant has become preferable due to the incorporation of the abutment in the dental implant. It also decreases the risk for micro-movement and micro-leakage of the abutments of the conventional two-piece implants. This study aims to show a new technique of bending the one-piece implant abutments in a predictable digitally guided surgical technique. Using (RealGuide.5) digital software in designing a Novel Abutment Bending Verification (ABVG) Guide which was accompanied by conventional implant placement surgical guide and guided implant surgical kit (NeoBiotech NEO NAVIGUIDE KIT). The Novel (ABVG) showed accurate predictable results in bending the one-piece implant abutments in an accurate path of insertion of the predesigned crown. The usage Novel (ABVG) can be a reliable and reproducible method in guiding the abutment bending to an accurate pre-designed prosthetic position.

Keywords: *Dental Implantology; Abutment Bending; (RealGuide.5); Novel Abutment Bending Verification (ABVG); (NeoBiotech NEO NAVIGUIDE KIT)*

Introduction

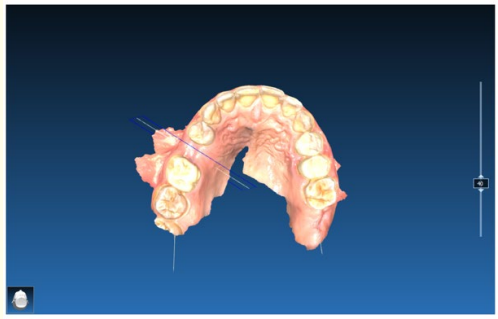
The modern dental approaches consider dental implants as the gold standard treatment for the replacement of missing teeth [1]. A diversity of implants design is now to be found in the market to solve any encountered obstacle; one of which is screw loosening. Why use screws at all when we can skip their hustle? one-piece implants were an amazing solution to such a problem presenting similar survival rates and incidences of complication in comparison with two-piece implants [2]. One-piece dental implants also decrease the number of surgical procedures needed due to the incorporation of the abutment in the implant system. Moreover, they also presented less induced stress compared to the two-piece dental implants when used in the All-on-4 implant-supported prosthesis in the different lateral occlusal schemes [3]. Unfortunately, the pre-surgical digital design for immediately loading the implant was yet a vague procedure.

In this article, a case supporting not only the digitally guided implant placement but also digitally tilting the abutment to accept a digitally pre-fabricated immediately loaded prosthesis, to have a customized control over the bending angle providing more predictable results, as well as reducing the incidence of fractured fixture and restoration [4]. This all raises the question; Among the use of single-piece implants does digitally guided tilting compared to manual tilting provide a standardized control over the bending angle for immediate temporization?

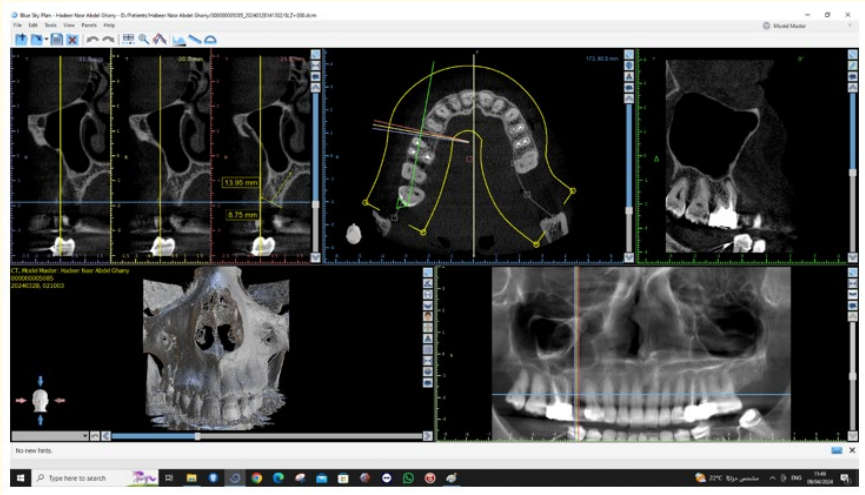
Case Study

A 24-year-old female patient is medically free complaining of missing upper right second premolar which was extracted 4 years ago because of a restorability problem (Picture 1). A digital scan of the patient's mouth using (Shinning 3D) digital scanner (Picture 2). A Cone Beam Computer Tomography (CBCT) Radiograph was done to the patient (Picture 3). The digital 3D scan and the Cone Beam Computer Tomography (CBCT) were overlapped by using (RealGuide.5) software. A 12 mm height and 4 mm width implant (IHDE KOS ROOT) (Picture 4) was chosen to accommodate the most suitable biological site to provide the most bone-to-implant contact (Picture 5). The cone Beam Computer Tomography (CBCT) Radiograph shows overlapping of the right maxillary sinus on the future implant site so the digitally guided surgical guide using (RealGuide.5) software is planned to position the implant more palatally (Picture 6). The novel technique is to design a new guide which we call Abutment Bending Verification Guide which ensures accurate bending of the abutment to accurate path of insertion of the pre-planned crown to immediate loading and immediate PMMA crown placement. Using (RealGuide.5) digital software we designed the Temporary PMMA crown in the accurate prosthetic position disregarding the implant surgical position (Picture 7). The 2 guides were 3d printed using (Anycubic Mono x 3d printer) using transparent resin to enable the visualization of the implant abutment during bending. Implant placement surgical guide (Picture 8), Abutment bending verification guide (Picture 9).

Picture 1

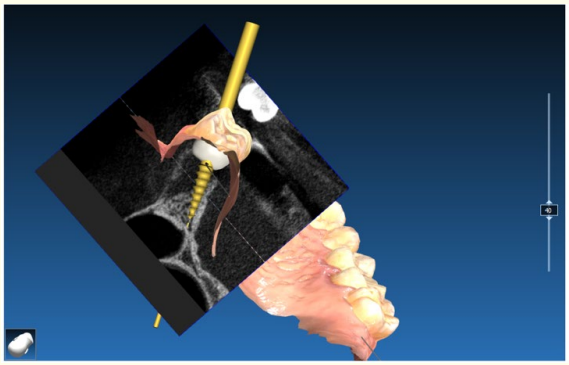


Picture 2



Picture 3

Picture 4



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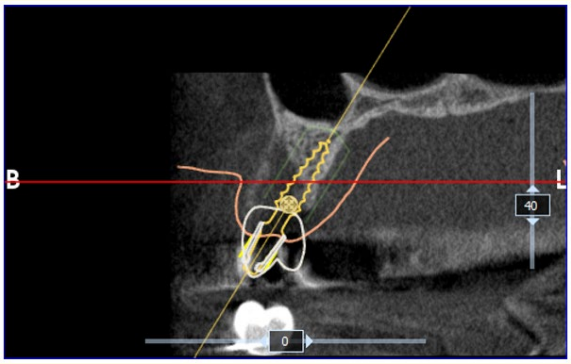
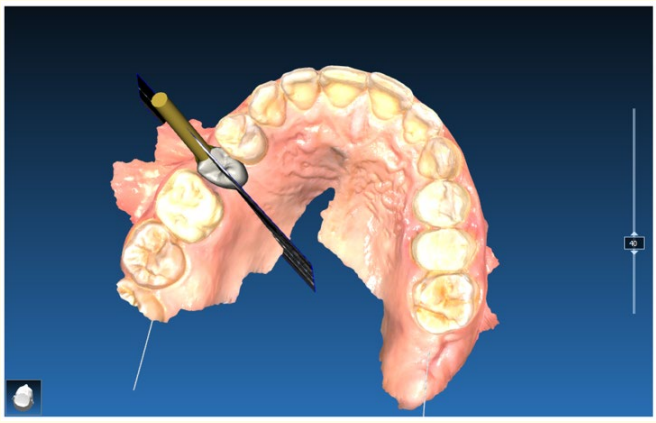
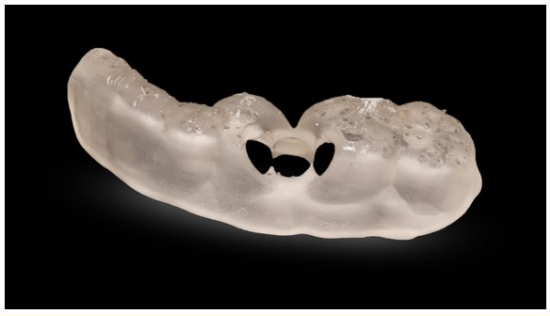


Picture 6



Picture 7

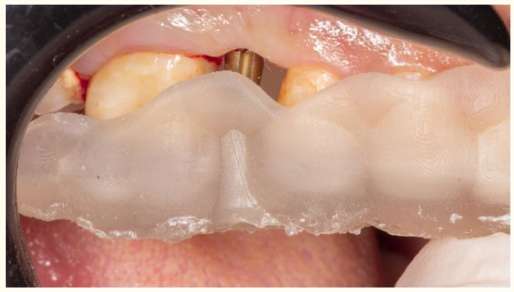


Picture 8

Picture 9

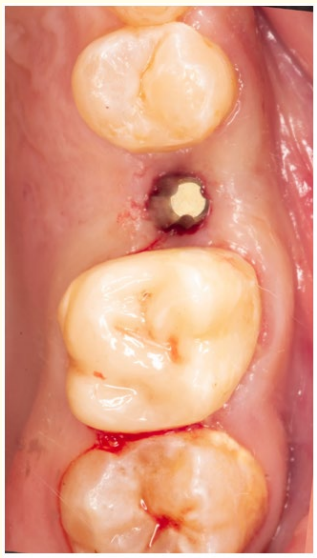
Flapless placement of the implant was done using an implant placement surgical guide (Picture 8). The implant placement surgical guide was verified and checked for stability from an occlusal view (Picture 10). Drilling for the osteotomy site was done by (NeoBiotech NEO NAVIGUIDE KIT). After osteotomy site preparation, the implant was manually inserted and a torque wrench was used to fully insert the implant in place and set the torque to 35 N/cm^2. By applying the Abutment bending verification guide it was not seated due to the position of the abutment before bending (Picture 11). The abutment was bent palatally according to the treatment plan till the guide was fully seated (Picture 12). The abutment was bent to the desired prosthetic position and verified by using the Abutment Bending Verification Guide (Picture 13a and 13b). A 3d printed digitally designed PMMA crown according to the treatment plan (Picture 14a and 14b) was accurately cemented to the abutment immediately (Picture 15-17).

Picture 10



Picture 11

Picture 12



Picture 13a

Picture 13b

Picture 14a

Picture 14b

Picture 15

Picture 16

Picture 17

Results

The digitally designed abutment bending verification guide showed an accurate bending of the one-piece implant abutment to the ideal position of the pre-planned crown path of insertion which made a precise and predictable crown insertion immediately on the day of the surgery.

Discussion

Some studies have shown the effect of preparation of one piece implant abutment on the day of the surgery in decreasing the primary stability of implants especially with low inserted torque implants [5]. So, the novel Abutment bending verification guide aims to minimize the preparations and unnecessary bending of the abutment to provide immediate restoration.

The surgical technique can affect the outcome of the final prosthesis flapless surgical technique is favorable to use with the abutment bending verification guide but accurate patient selection is recommended to obtain accurate results [6,7].

The use of (RealGuide.5) digital software due to the presence of a piece implants library. This facilitates the visualization of the future implant, abutment position, and crown design.

The use of (ABVG) facilitates the process of placement of digitally guided immediate restoration which is recommended with one-piece dental implants [8]. This would increase the patient's acceptance of the implant procedure, especially in the anterior esthetic zone, and help in the preservation of soft tissue [9].

Further studies should be made on the possibility of using (ABVG) in guiding multiple implant one-piece implant abutments in bridges and full arch restoration.

Conclusion

We conclude that using the novel digitally designed abutment verification guide accompanied by an implant placement surgical guide showed an accurate and predictable method of bending one-piece compressive implants to the pre-determined path of insertion direction of the digitally designed crown. This allows us to place the crown in an accurate prosthetic direction despite the implant position. It would also facilitate the immediate delivery of pre-fabricated temporary restoration for single-piece compressive implant patients.

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