

Reconstruction of Bone Defect with Dental-Gingival Prosthesis over Implants: A Case Report

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Received: November 05, 2020 Published: April 06, 2021

Abstract:

The repair of anterior vertical defects has been an esthetic challenge in implant dentistry. Many types of surgical procedure have been proposed to treat these cases. Typically, it requires reconstructions and bone tissue prior prolonging the length of treatment and risk of complications. The use of dental-gingival prosthesis becomes an alternative for of therapy for such cases. However, in order achieve perfection in color and textures of the restoration it's not an easy task. Currently there are some ways to achieve better aesthetic results, including scanning of colors. This case report describes step-by-step a clinical situation where the application of gingival ceramic was used to reconstruct a bone defect effectively, including some new digital protocols for such protocol.

Keywords: Ceramic, gingival, prosthesis, implants, oral rehabilitation, digital mapping of colors

Introduction

In any prosthetic procedure the goal is to reproduce the organic nature of teeth and gingival tissues, including shapes, colors and functions of the original elements. However this is not always easy, especially in cases of vertical bone defects in the esthetic zone combine with vertical defects.¹ Some form of therapy for such areas usually involves bone grafting and soft tissue reconstruction in order to obtain alveolar ridge capable of rehabilitation.² Vertical reconstruction procedures not only increase the treatment time, morbidity of the case but also the results are usually unpredictable.^{3,4} An alternative therapy for these cases is the reconstruction with a combined dental gingival prosthesis.⁵ These restorations can correct the maxillary dimension and promote a sealing air⁶ during phonation movements.⁷

The purpose of this paper is to present a rehabilitation technique that presents a protocol that show adequate esthetic results. In addition, the prosthesis is also retrievable, ensuring that future maintenances can be performed in an uncomplicated manner. Finally, the paper demonstrates a new method of digital coloring that allows adequate characteristics tissues, including teeth and soft tissues.

Description of the Case

A 66 years old patient presented to the private practice clinic complaining of tooth mobility of the anterior teeth and poor esthetic upon smile. The initial medical screening demonstrated only history of smoking. During clinical examination, the patient was diagnosed with Periodontitis, stage IV, grade B. Teeth number 12, 11, 21 and 22 were considered hopeless due to severe periodontal loss of attachment, mobility class 2 and unaesthetic appearance. The anterior sextant of the maxilla had been splinted with non-rigid wire and orthodontic brackets (Fig 1). The patient declared history of trauma of these teeth 2 years before the initial examination. These teeth demonstrated recession Class IV Miller⁸ when there is loss of interproximal attachment with severe recession. Consequently, the interdental papillae on the anterior maxillary quadrant were lost due to the clinical conditions presented (Fig 1).

The computer tomography confirmed the clinical findings (Fig 2). No signs of external resorption were found. It was possible to evaluate that immediate implants could be inserted due to extensive bone quantity apical to the roots (Fig 2).

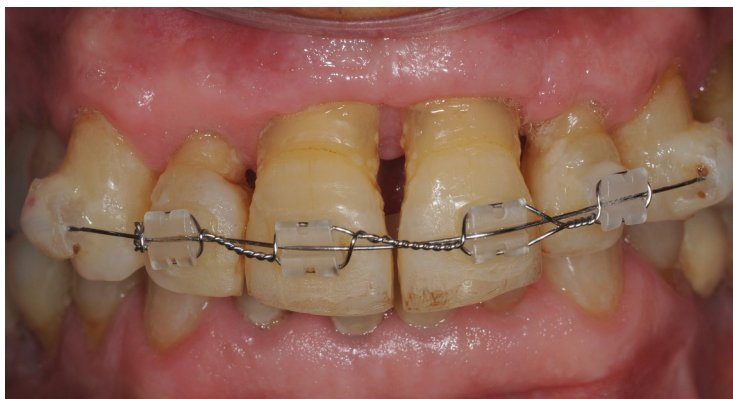


Figure 1: Baseline photography.

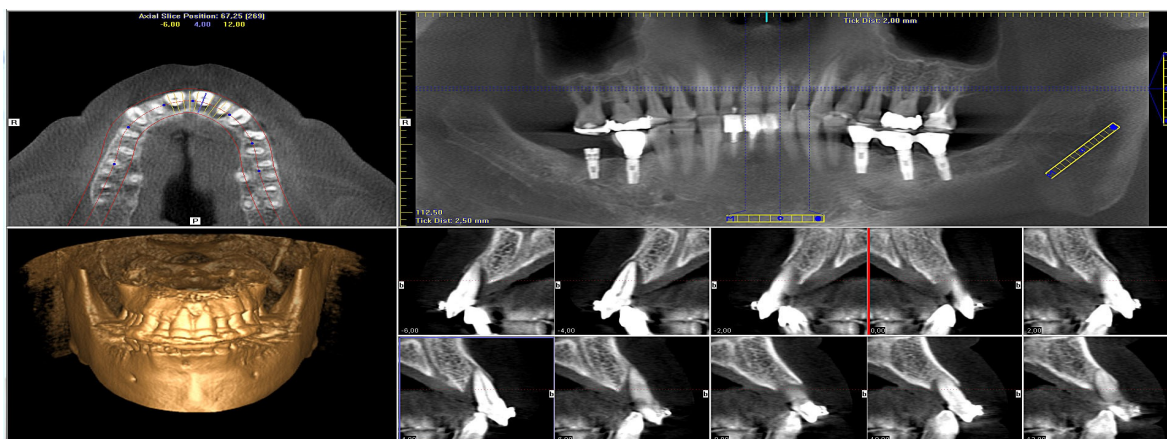


Figure 2: Pre-operative computer tomography.

Therefore, it was proposed to the patient that the treatment planning involved periodontal treatment with extraction of elements 12-22 and the subsequent immediate insertion of four implants. Depending of the final torque of the implants, one fixed, splinted provisional restoration would be immediately installed. It was alerted to the patient that due to the extensive vertical bone defect and soft tissue loss, a dental-gingival prosthesis including all the elements in one piece would be constructed as the final restoration. In other words, it was clarified to the patient that single crowns would not achieve an adequate esthetic result.

After patient approval of the proposed treatment and informed consent was signed, periodontal therapy including oral hygiene instructions, scaling and root planning and surgical periodontal surgery as needed was performed. Then, a wax-up was carried out for the preparation of a surgical template (Figure 3). After that, the extractions were performed immediately followed by inserting four 3,75 x 13 mm implants. Torque over with 35N/cm was achieved during the surgery. Therefore, due to the adequate initial torque for immediate function, an open tray, platform level impression was made and acrylic prosthesis was fabricated and installed 24 hours after the surgery (Figures 4 and 5). After four months clinical stability of the implants was evaluated, and a new impression was performed to initiate the construction of the final prosthesis. Initial clinical photos were taken with a tooth scale as a guide (Vita Tooth Guide) (Figure 6). In addition, photographs with a gingival scale for the soft tissues (Amaris Gingiva, Germany) and photos were taken (Figures 6 and 7). In order to enhance the evaluation of color, value and texture of the case, a digital protocol of colors (Digital Mapping of Colors) was used through software (Photoshop) (Figure 8). Tools as “smart sharpen” and “magic wand tool” was used to facilitate the technical work in relation to color and texture of the ceramic parts (Figure 09). The digital mapping of colors demonstrates to the laboratory technician where the exact color in RGB is located in the dentition. With the purpose of better maintenance of the future prosthesis, a retrievable screwed prosthesis was fabricated. Initially screwed retained copings were separate fabricated to teeth number 11-12 and 21-22 (Figure 10). Subsequently, a screwed retained metallic coping and was fabricated. This method was selected to avoid the difficulty of removing an alternative method such as a cemented prosthesis. The application of ceramic layers was then completed following the photographs (Figure 12) and a proof of the dental ceramic was carried out in the mouth in order to delimitate the area to be applied to gingival ceramics.

An impression was used as a guide for the laboratory the structure in place to finalize the gingival application (Figure 14). Finally, the prosthesis was finished, proven, and after approval by patient, a final glaze was applied in-office. During the installation, the infra-structure was screwed with torque of 32 N/cm following the manufacturer protocol. Then, the prosthesis was installed using two palatal screws at 20N/cm of torque. Initially, the prosthesis caused a vasoconstriction of the underline soft tissue (Figure 14). After 15 minutes of installation, the soft tissue already had accommodated with almost no constriction (Figure 15), and the final smile of the patient can be observed properly well (Figures 16).

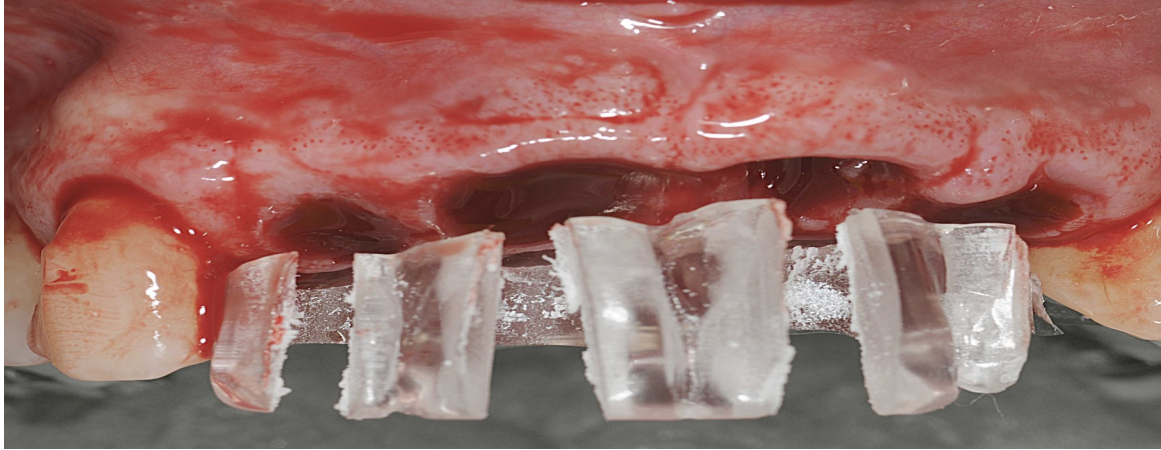


Figure 3: Extraction of 7-10 performed with surgical template in place for implant placement.



Figure 4: Immediate post-operative radiograph.



Figure 5: Provisional crowns installed 24 hours after surgery.



Figure 6: Photography with the color guide.



Figure 7: Photography with the color guide for soft tissues.



Figure 8: Digital mapping of colors.

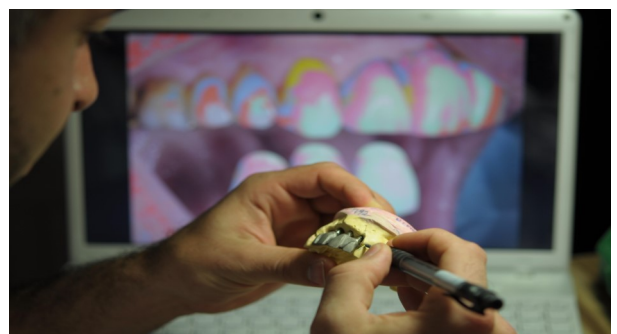


Figure 9: The utilization of the digital documentation by the laboratory prosthetic technician..

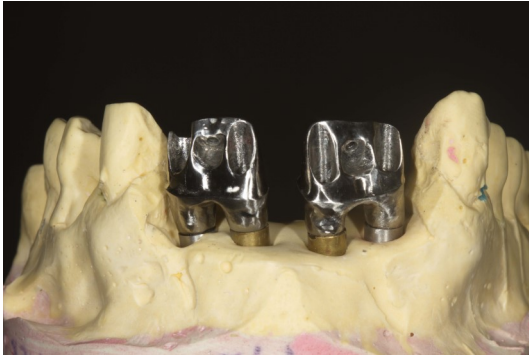


Figure 10: Customized abutment fabricated.



Figure 11: Prove of the abutment in the mouth.



Figure 12: Application of the ceramic.



Figure 13: Final restoration.



Figure 14: Final restoration installed. Note ischemia located of the underline tissues right after installation.



Figure 15: Improved Local ischemia 15 minutes after installation.



Figure 16: Final smile of the case.

Discussion

Rehabilitation of patients with partial through implant placement has become reality proven to be extremely favorable in long-term.⁹ Tooth loss or periodontal disease causes a reduction of height, thickness, and density of the alveolar ridge and collapse of soft tissues, resulting in atrophy of the edentulous regions.¹⁰ Implant positioning on anterior atrophic maxilla imposes a challenge on contemporary implant dentistry. These cases usually compromise the esthetics due to severe soft and hard tissue collapse. There are cases where these defects can be treated with previous reconstructive surgery. Another alternative technique is the appositional grafting technique using autogenous bone.¹¹ Clinical reports have shown significant reabsorption of the graft with this technique and high tissue dehiscence during healing.¹¹ There are also reports using the alveolar distraction osteogenesis technique (ADO)^{12,13}, which demonstrates natural bone formation of proper quantity and quality between the segment and basal bone, in short periods of time and with few morbidities¹². However, there is the disadvantage of using a distractor device that often causes discomfort in patients. In addition, the ADO technique has shown high rate of reabsorption of the ridge in, needing complementary grafting during implantation.¹² Finally, a few reports have reported vertical guided bone regeneration techniques using particulate bone protected by a barrier.^{3,4,14} However, this method has shown limited vertical augmentation.^{3,4,14}

This case showed a prosthetic reconstruction with a dental-gingival ceramic prosthesis instead of complex vertical bone and soft tissue augmentation. Cases with severe bone atrophy are always a challenge in rehabilitation with implants, and the alveolar reconstruction with grafts and surgical procedures always the first choice. However, there are cases where these procedures are unable both the health of the patient, and the non-acceptance of the treatment plan by the patient. In addition, postoperative results can never be an accurate result.

With technology and existing ceramic materials on the market today, the ceramic restoration of bone defects are a reality.^{1,5} Best results in the definition of colors are constantly evolving, with new techniques and mechanisms for the faithful reproduction of the patient characteristics. The technology is being increasingly employed in these cases, provided it is used effectively. The predictability of work through waxing and surgical guides should always be employed. Screw retained prosthesis should be used so proper maintenance can be done in long-term.

Conclusion

This case report demonstrated that there must always be a joint effort between the dentist and the ceramist, creating a bond capable of providing the best result as possible. Photographic protocols and management of some computer software should be employed in order to provide the dental laboratory technician the best chance of a final adequate prosthesis.

Conflict of Interest

The author declares no conflict of interest.

Acknowledgement

The author would like to thank the ceramist André Jacon for his dedication in this case.

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Citation: Ricardo Gapski. "Reconstruction of Bone Defect with Dental-Gingival Prosthesis over Implants: A Case Report" *SVOA Dentistry* 2:3(2021) Pages 103-108.

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