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Case Report
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A Novel Digital Approach to Dental Aesthetics: A Case Report

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Abstract

Background: The concept of digital dentistry has become more popular, and it has been possible to obtain both aesthetic and functional results with a wide range of indications. One of the areas where virtual designs are used most frequently is smile design. By using smile design software or systems, it is possible to obtain optimum aesthetic results, especially in patients with high aesthetic expectations.

Case Report: A 31-year-old female patient applied to the clinic complaining of diastemas and deformities between her maxillary anterior and lateral incisors. After her intraoral and extraoral photographs were taken, digital smile design was applied. A laser assisted gingivectomy was performed with a gingivectomy guide that was designed digitally.

Conclusion: In aesthetic treatment applications, digital tools are used in the planning, design and production of both predictable and more harmonious restorations.

Introduction

With the development of technology, there have been many developments in the field of dentistry. The concept of digital dentistry has become more popular, and it has been possible to obtain both aesthetic and functional results with a wide range of indications [1-3]. Along with all these developments, the expectations of the patients have also increased, and they have into not only functional but also aesthetic restoration expectations. In addition, they demand digital tools to be used while performing aesthetic restorations.

In this context, digital systems are used both as tools that increase patient communication, and also make it possible to produce more compatible restorations by minimizing the errors that may occur in the design and production stages of restorations [4-7].

Digital workflow can start with traditional impression methods and continue with indirect digitalization, or it can be completed by direct digitalization using intraoral scanners. After the digitalization of the oral environment, the restoration or appliance to be made using three-dimensional design programs is designed and produced with three-dimensional production methods (milling/3D print). Making these designs virtually enables to obtain predictable results while strengthening patient communication [8,9]. One of the areas where virtual designs are used most frequently is smile design. By using smile design software or systems, it is possible to obtain optimum aesthetic results, especially in patients with high aesthetic expectations. By using the algorithms of these software, ideal smile designs are made in accordance with the golden ratio rules, which are compatible with the facial features of the patients [10,11].

The main purpose of digital smile design is to simplify communication, transfer that important information from the patient's face to the working group and transform it into final restoration [12-14]. The digital smile design protocol provides effective communication between interdisciplinary team members, including the dental technician. Team members can identify and highlight discrepancies in soft or hard tissue morphology, easily email images to the lab to discuss high-quality images on the computer screen, identify the best possible solutions to the situation, thanks to the virtual world, 3D modeling and Computer-Aided Design/Computer with the help of software such as Assisted Manufacturing (CADCAM), detailed planning can be made from surgery to restorative procedures [15,16]. In this case report, the digital evaluation of the smile design of the patient who applied with aesthetic expectation and the stages of aesthetic restorations will be explained.

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Case Presentation

A 31-year-old female patient applied to the clinic complaining of diastemas and deformities between her maxillary anterior and lateral incisors. In the detailed anamnesis, no systemic diseases were noted. Intraoral examination and X-ray evaluation were made; no caries or periodontal problems were detected in the aesthetic zone. Intraoral and full-face frontal photographs of the patient were taken (Figure 1A, 1B) and a smile design was made using these photographs in a three-dimensional smile design software (Smiledesigner.app, Turkey), in line with the patient's demands (Figure 2A, 2B). After the smile design, leveling need of the patient's zenith points was determined and therefore gingivectomy application was decided.

Preparing a guide plate in order to be compatible with the chosen smile design for the gingivectomy procedure was decided. For this purpose, the oral environment of the patient was digitized using an intraoral scanning device (Trios 3, 3Shape, Denmark) and the obtained digital data was sent to the laboratory. The virtual model obtained from the digital impression was opened on the three-dimensional design software (exocad Dental Design, exocad GmbH, USA) (Figure 3) and the template taken from the smile design software was overlapped with the virtual model in this software, then the gingival levels of the teeth were determined. A gingivectomy plate was designed (Figure 3) to be compatible with the design and produced with the three-dimensional printing method (Figure 4A).

The compatibility of the produced plaque was checked and laser assisted gingivectomy was performed with Nd:YAG laser at 140 mJ and 25 Hz (Figure 4B). After the gingivectomy procedure, healing of the tissues was waited for 3 weeks, and laminate veneer preparation was performed after the tissue healing. After the preparation, digital impression was taken using the scanner. Laminate veneer restorations made of lithium disilicate-based ceramic (emax.CAD, Ivoclar Vivadent, Germany) material were cemented and the designed smile was provided to the patient (Figure 5).

Figure 1A: Initial photos of the patient. Wide smile of the patient from the frontal view.

Figure 1B: Initial photos of the patient. Intraoral photo of the patient. Note the gingival level of the anterior teeth.

Figure 2A: Digital smile design photos of the patient with Smile Designer App. The decided template of the new design.

Figure 2B: Digital smile design photos of the patient with Smile Designer App. The visual template of the smile design.

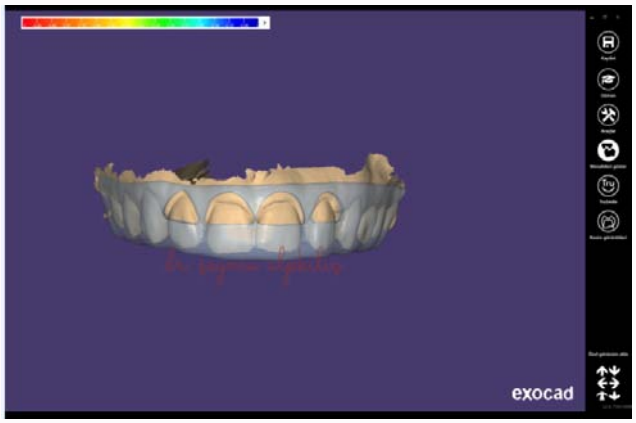

Figure 3: Gingivectomy guide design on the exocad design software.

Discussion

Digital smile design allows the patient's facial and dental features to be carefully analyzed aesthetically and gradually to discover many critical factors that may have been overlooked during the evaluation of clinical, photographic or study models. By adding critical data to the treatment planning process, the team can assess limitations and risk factors such as asymmetries, inconsistencies, and breaches of aesthetic principles [10,13]. Digital smile design software is an easy-to-use, versatile conceptual tool with significant clinical advantages: It can strengthen aesthetic diagnostic skills, improve communication

Figure 4A: Laser assisted gingivectomy procedure steps. Intraoral application of the 3D printed gingivectomy guide.

Figure 4B: Laser assisted gingivectomy procedure steps. Post-op photo right after the gingivectomy.

between team members, create predictable systems throughout treatment phases, and increase patient education and motivation. Since the use of digital smile design will make the diagnosis more effective and treatment planning more consistent, the effort required to implement it pays off, making the treatment sequence more logical and simpler, saving time, materials and reducing costs during treatment. The use of such systems in dentistry will increase in today's world where many things are digitized. Dentists need to know the aesthetic rules in order to apply digital smile design applications correctly [12-14].

It is known that digital design tools are frequently used in the literature and there are many case reports published [17-19]. In almost all of these cases, it is emphasized that patient satisfaction increases, and predictable treatments also facilitate technical sensitivity. However, the design mostly focuses on the teeth. There is limited information about gingival leveling and the production of guides that can be used in its regulation.

Laser has been shown as an alternative to the conventional method in many dental practices since 1990, and one of these methods is gingivectomy. When used in periodontal surgery, its advantages include; hemostasis, less post-operative edema, reduced bacterial population at the surgical site, less need for suturing, faster healing, and less post-operative pain [20,21].

Today, laser gingivectomy technique is used as a good alternative to conventional hand tools gingivectomy technique [21,22]. Umemoto [23] reported the use of Nd:YAG laser of 1064 nm wavelength, 1.6 W output, 20 Hz pulsed, 320 diameters in a gingivectomy operation.

Figure 5: Final photo of the patient after the laminate veneer restorations' delivery.

At the end of the operation; the gingiva has attained the targeted anatomical and aesthetic structure. In another study, it has been reported that the use of Nd:YAG laser was an effective method with rapid healing, less hemorrhage, and less inflammation in the gingiva [24].

As a result, in today's world where digitalization has become more frequent, aesthetic approaches in dentistry also take their share from these developments. In aesthetic treatment applications, digital tools are used in the planning, design and production of both predictable and more harmonious restorations.

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