Multidisciplinary planning on smile reconstruction

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Introduction: Aesthetic treatment of teeth have been incorporated in various specialties. The multidisciplinary aesthetic treatment in Dentistry has the advantage of reestablishing the smile and function, promoting healthy teeth and their surrounding tissues. **Objective:** The objective of this study was to present the case report of a patient with aesthetic and functional alterations. **Case report:** 40 year-old patient, who showed root fracture of the tooth #21, anterior and posterior restorations with superficial staining and darkened teeth. It was performed the extraction of the root, immediate implant, subepithelial graft, ceramic prosthesis cemented on the implant and rehabilitation of the smile area with lithium dissilicate veneers. **Results:** The treatment was performed without complications. **Conclusion:** Multidisciplinary treatment is critical to reestablish function and aesthetics, improving patient quality of life. **Keywords:** Dental implants. Dental prosthesis. Aesthetics.

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» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

INTRODUCTION

The idea that dentistry is a healthcare specialty restricted to the treatment of conditions confined to the mouth is inaccurate. This millennium-old science went through several periods, accompanying human evolution, and today dental treatments focus not only on the mouth, but also on the psychic and physical well-being of the person.

According to Bertolini et al,[1] when the harmony of the smile is affected by dental and periodontal changes, multidisciplinary procedures should be integrated to obtain the desired aesthetic results.

Dental implants are artificial devices whose function is to replace the dental root and provide support for the bite force and stability to the prosthetic crown.[2,3] Currently, dental implants are the first option for the treatment of teeth compromised by extensive crown-root fractures.[4,5]

In many cases, tooth extractions generate resorption of the remaining supporting tissues. According to Botticelli et al,[6] buccal cortical bone undergoes remodeling, initiated soon after an extraction and loses 56% of its size. Therefore, complementary care should be provided to repair or minimize damage to the bone and to correct gingival defects, which justifies the increase of clinical approaches that adopt surgical techniques for periodontal reconstruction.

The shape and color of maxillary anterior teeth, which, in conjunction with a healthy gingiva, provide harmony to the smile, should also be appropriate for the face shape of each patient.[7,8]

Currently, there is a growing demand for aesthetic dental treatments to change color and dental morphology. Ceramics represent a good option for these purposes, and their use in indirect restorations are based on their structural properties. The types of materials for facets used in smile reconstruction in the aesthetic zone are feldspathic ceramics, which confer an excellent aesthetic result, leucite crystals and lithium disilicate.[9,10,11]

The use of an excellent ceramic material in the presence of healthy adjacent tissues predicts a successful rehabilitation.[1] This case report demonstrates the importance of integrating planning and procedures in the areas of implantology, periodontics and prosthesis to achieve successful smile rehabilitations.

MATERIAL AND METHODS

This report describes the case of a 40-year-old woman awho attended the dental clinic of a University in the state of Paraná, Brazil, for a routine evaluation. She also complained of dissatisfaction with her dental aesthetics.

Intraoral clinical examination showed marginal gingival inflammation in tooth #21, which had a metalloceramic crown (Fig 1). Additional investigation was requested, consisting of periapical and panoramic radiographs and cone-beam computed tomography (CBCT) scans. The CBCT scans suggested the diagnosis of tooth fracture and periapical lesion.

Integrated planning was conducted based on the information provided by the clinical examination and imaging tests, as well as intra- and extraoral photographs obtained during the first examination. The treatment suggested was to place an implant in the region of the fractured tooth, as there was good bone remaining, and subsequently reconstruct smile aesthetics using lithium disilicate ceramics for the anterior teeth and premolars.

After the presentation of the integrated treatment plan, previously evaluated and approved by the Ethics in Research Committee of the institution where this study was conducted, the patient signed an informed consent form and the treatment was started.

First, tooth #21 was extracted and a cone-morse implant (Neodent Alvin 4.3 x 16 mm) was immediately placed at a primary implant stability of 60 Ncm (Fig 2), and a provisional crown was prepared for immediate loading. Following the principles of post-extraction alveolar remodeling, discussed by Botticelli,[6] the space between the implant and the buccal cortical bone, known as GAP, was filled with a biomaterial (Bone ceramic, TM Straumman, Sweden). Still during the same visit, a subepithelial graft of palatal connective tissue was sutured with 5-0 Vicryl to improve soft tissue in the region.

Six months later, the prosthetic procedures were initiated (Fig 3). Initially, silicone molds were obtained for the maxillary and mandibular arches, and photographs were taken again, followed by preparation of the study models and diagnostic wax-up. After that, three silicone condensation guides were prepared, one for the manufacture of the provisional crown and mock-up and two others to assist in the preparation of the prosthesis. The mock-up was prepared by filling the guide with a resin for provisional self-curing restorations (Protemp® color A2 3M ESPE - USA) and taken to the teeth in the area to be rehabilitated (teeth #11 to #14 and #21 to #24) (Fig 4). After polymerization of the resin, the guidewire was removed and the cervical area was finished using a#12 scalpel. This procedure showed the patient what the final result of rehabilitation would be and provided a better evaluation of the morphological characteristics of the teeth to be reconstructed. Moreover, it promoted the participation of the patient in making the decision before procedures were initiated. After patient approval, the dental preparations started. Local infiltrative anesthesia was applied, and an Ultrapak #000 retraction cord (Ultrapak #000, Ultradent, South Jordan, UT) was placed around all teeth to be treated. The central incisor (11) was prepared using the silhouette technique, in which a cervical sulcus measuring half the diameter of the drill tip was made along the buccal surface using a round diamond tip #1012 (KG Sorensen, Brazil). Dentin removal was limited by grooves made with a #4141 diamond tip (KG Sorensen, Brazil) along the cervical, middle and incisal planes of the tooth. A conical end-domed diamond tip (#4138, KG Sorensen, Brazil) was used to connect the grooves. A silicone addition guide (Express STD, 3M ESPE, St Paul, MN, USA) was used systematically to control preparation and avoid excessive dentin removal. About 1 mm was removed from the incisal edge using a #4138 diamond tip. At the end of the preparation, fine-grit diamond burs and finishing discs were used. A 3.3 mm x 4 mm impression coping was placed in the region of tooth #21 (Fig 5). Addition silicone and Ultrapak #000 and #00 double cords (Retractor Ultrapak 000 Ultradent Wire, UT) were used for simultaneous arch impression. After removal of the most superficial cord, the fluid paste was injected into the gingival sulcus using a syringe at the same time that the impression tray with the dense material was positioned. Impression and records of the opposing tooth were obtained, and occlusion was recorded using wax #7. Color was selected using the VITA color scale. After that, provisional prostheses, fabricated using silicone and bisacrylic resin guide-

Figure 1: Initial photo shows inflammation in region of tooth #21.

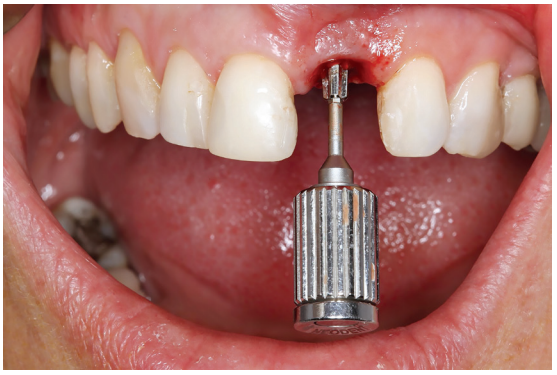

Figure 2: Implant in tooth #21.

Figure 3: Provisional crown over implant in tooth #21 6 months after immediate loading and connective tissue graft.

Figure 4: *Mock-up*: intraoral diagnostic test.

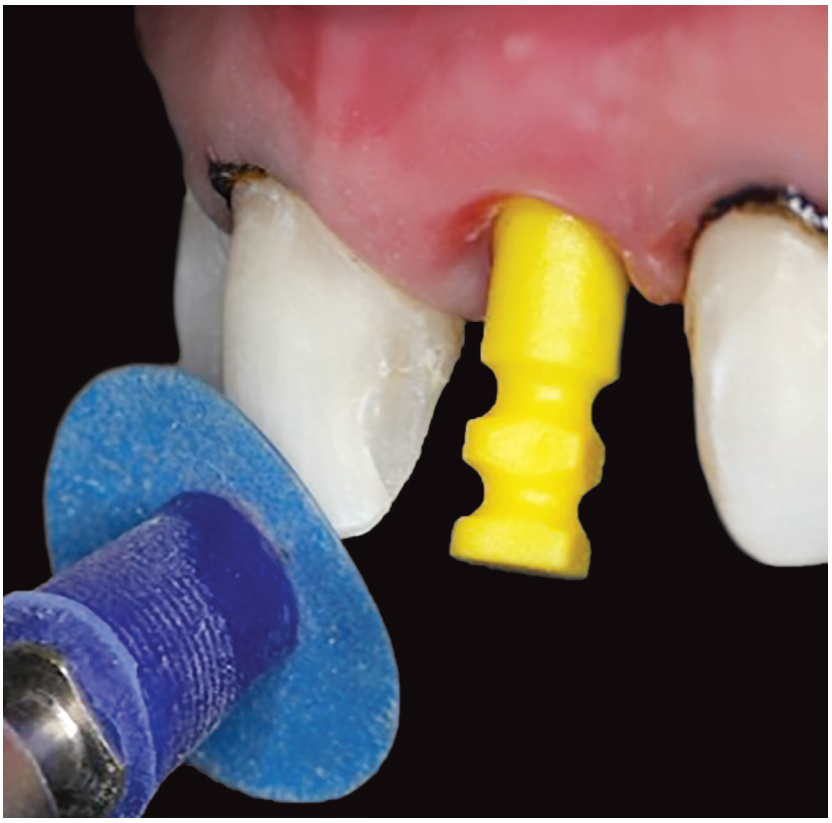

Figure 5: Finishing and polishing with abrasive discs.

wires (Protemp® color A2 3M, ESPE, St. Paul, MN), were kept in the mouth for ten days, until the ceramic prostheses returned from the laboratory. IPS E-max (lithium disilicate base) was selected because of its satisfactory aesthetics and resistance. In the next visit, the provisional crown was removed and the prostheses were tried on in the model and in the mouth. The prosthesis and teeth were prepared for cementation. Veneers were etched with 4% hydrofluoric acid (HF) (Porcelain etchant, Bisco, Schaumburg, IL) for 60 seconds and rinsed with an air-water spray. After that, 37% phosphoric acid (Scotchbond etchant 37%, 3M ESPE, St. Paul, MN) was applied for one minute and rinsed also for 60 seconds. After the recommended treatment time, the acid was rinsed, and the prosthesis received an abundant air-water jet spray to completely remove the residues resulting from surface decomposition of the leucite crystals, which may affect adhesion.

Silane (Monobond-S, Ivoclar Vivadent AG, Liechtenstein) was applied for one minute and dried with heated air to improve product activation, and Optibond® adhesive (Kerr, USA) was applied on the inside surface of the prosthesis. Retractor cord #000 (Retractor cord Ultrapak #000, Ultradent, UT) was placed on all teeth to

facilitate the visualization of preparations and the removal of the cementing material. Phosphoric acid at 37% (Scotchbond Etchant 37%, 3M ESPE, St. Paul, MN) was applied for 30 seconds in enamel and 15 seconds in dentin, followed by abundant rinsing and drying with air jets. Adjacent teeth were protected with Teflon tapes. Optibond (Kerr, West Collins Orange, CA) primer and adhesive were applied to the surface of each tooth, the prosthesis was filled with the micro-hybrid A2-dentin color composite resin Z100 (3M ESPE, St. Paul, MN) after heating to about 60º using a Calset™ device (ADdent, Danbury, CT) at about 60º C. A minimum excess amount extravasated, and slight pressure was applied to the prosthesis. A Led Demi™ device (Kerr, West Collings, Orange, CA) was used for light-curing for only 5 seconds, and the excess was remove. After that, light was applied for 40 seconds on both the buccal and lingual surfaces, and the same procedure was repeated on all teeth. A prosthesis over implant was made for tooth # 21 using the glass-ceramic IPS Empress Aesthetic (Ivoclar Vivadent AG, Liechtenstein) system according to the technique of injection followed by stratification, and cemented with RelyX™ ARC (3M ESPE, St. Paul, MN). Finally, occlusion was adjusted, and finishing and final polishing were performed using abrasive tips (DhPro®, Paranaguá, Brazil) for the cervical regions and dental floss for the proximal surfaces (Fig 6). Occlusion was checked with articulating paper (Accufilm II, Parkwell Inc., Edgewood, NY). The patient was advised to return 15 days later for cementation control and complementary occlusal adjustments (Fig 7). Clinical and radiographic follow-up was performed 6 months after the treatment was completed (Fig 8 and 9).

Figure 6: Tooth immediately after cementation.

Figure 7: Intraoral examination 15 days after ceramic prosthesis cementation.

Figure 8: Smile 6 months after ceramic prosthesis cementation.

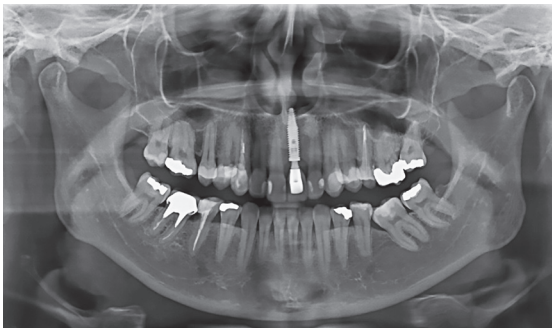

Figure 9: Panoramic radiograph 6 months after ceramic prosthesis cementation.

DISCUSSION

Aesthetic rehabilitations require attention to the analysis of the smile forming elements. The position of the teeth, the gingiva and their relationship to the positioning of the upper lip are responsible for smile harmony. The smile line may be classified as high, medium and low. An upper smile line is characterized by the movement of the upper lip that exposes a large part of the inserted gingiva, while a middle smile line shows 75 to 100% of the anterior maxillary teeth, interproximal gingiva and even a few millimeters of free marginal gingiva. The lower smile line shows less than 75% of the anterior maxillary teeth, and the cervical region is hidden behind the upper lip.[12,13]

Because tooth damage may negatively affect the smile, osseointegrated implants for the fresh alveolus and tissue manipulation should be used in aesthetic areas to preserve bone and gingival architecture.[6,14] However, these procedures depend on the amount of remaining bone tissue, the absence of diseases and good primary stability, of more than 32 N.cm at osseointegrated implant placement.[15,16]

Prosthetic procedures are equally important in the reconstruction of the smile. Several different materials are currently available, and ceramic materials have satisfactory clinical results.[17]

Porcelain laminate veneers provide better adhesion than composite resins, and the quality of ceramics, such as their color stability, high strength, longevity, thermal expansion and stiffness, are similar to those of dental enamel.[18]

Porcelain laminate veneers represent an advance in adhesive dentistry because they ensure good tooth adhesion to the restoration without the need of excessive removal of dental structure, preserving color and shape.[19]

The use of conservative techniques has been made possible by the evolution of the materials used for indirect restorations, especially dental ceramics. According to some authors,[20,21] the selection of the ideal ceramic should take into consideration aesthetics required, tooth position, prosthesis size and the experience and knowledge of the professional.

The use of metal-ceramic dentures in aesthetic areas is increasingly being reduced in the daily routine of dental offices. The so-called

metal-free prostheses are primarily responsible for this change, as they have satisfactory resistance, favorable aesthetics and translucency similar to natural enamel, and do not use a metallic infrastructure, which drastically determines the aesthetic result of rehabilitations.[9,21]

Undoubtedly, the most important and critical clinical step in the success of treatments with indirect restorations is cementation, because adhesive techniques are sensitive and complex. Also, the techniques used should ensure micromechanical and chemical adhesion of the prosthesis to the cementing material.[22,23,24]

Although dual resin cements are the most used materials for cementing indirect restorations, technological advances produced alternative technique due to the improved quality of the equipment used for cementation.[25,26] Preheated composite resins have been used worldwide for indirect adhesive restorations of anterior and posterior teeth because of their better mechanical properties and the possibility of cementation regardless of early polymerization, in case a dual resin cement is used.[27]

According to Conceição[28] the advantages of the heated composite resin for cementing indirect restorations are: better mechanical properties than those of resin cements; single body formation, reducing the number of interfaces; absence of tertiary amine, responsible for possible staining in the cementing line; greater color choice to obtain final aesthetics; availability and low cost.

In the case reported here, prosthesis cementation using preheated composite was chosen because the material is easy to handle, does not change tooth color and has load particles that ensure adhesion and peripheral sealing, thus reducing the chances of cementation line staining.[22,28] The heating of the composite resin for cementation makes it more fluid and consequently improves its flow. Preheating in capsules or syringes facilitates extrusion, improves marginal adaptation, decreases air bubbles and voids in the ceramic-resin interface, promotes polymerization and improves the physical and mechanical properties of the final restoration. Heated composite resin seem to be superior to resin cements, because of their high polymerization contraction and coefficient of thermal expansion, which is greater than that of enamel and dentin. This property may prevent microleakage and facet fracture.[22,23] However, Mello, Castro and Reges[29] point out that further studies about preheated composite resins should be conducted, and this material should be carefully used in teeth with a vital pulp. Moreover, the thickness of the remaining dentin after preparation, as well as the type of resin used, should always be taken into consideration.

CONCLUSION

Aesthetic treatments may involve a high degree of complexity, because, as in the case reported here, most treatments require careful multidisciplinary planning. Materials with good properties combined with scientific knowledge ensured a satisfactory final result for our patient. However, close clinical follow-up and long-term analyses should be conducted to ensure the positive results of adhesion agent used in dental rehabilitations.

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