

Treatment Planning for a Patient with Peg-Shaped Lateral Incisors using a Mockup

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Abstract:- The comprehensive management of peg-shaped teeth demands a tailored multidisciplinary approach, integrating orthodontics, prosthodontics, and periodontics based on the clinical context. The pursuit of an aesthetic outcome often involves leveraging the diagnostic capabilities of a mock-up. This clinical case study extensively explores the application of mock-up techniques within aesthetic dental treatments, with a particular focus on instances featuring peg-shaped lateral incisors. The investigation delves into the seamless integration of Digital Smile Design (DSD) for meticulous treatment planning. The outlined step-by-step process encompasses the initial analysis, creation of wax-ups, and realization of intraoral mock-ups. Functioning as a diagnostic tool, the mock-up plays a pivotal role by consistently aligning the treatment trajectory with the envisioned end result. It serves as a linchpin, offering assurance for the treatment's longevity, functional efficacy (facilitated by minimal invasive preparation), and aesthetic success. The mock-up fosters a harmonized agreement between the patient and the dental team even before the commencement of the actual tooth preparation. Throughout the discourse, various methods for preparing the mock-up are explored, emphasizing the versatility and adaptability of this diagnostic tool in the context of aesthetic dental interventions.

Keywords:- Aesthetics, Minimally Invasive, Mock-Up, Peg-Shaped Lateral Incisors, Digital Smile Design (DSD), Case Study.

I. INTRODUCTION

Teeth characterized by a smaller-than-usual size are clinically termed as microdontia. Among the common manifestations of this condition, peg laterals, localized microdontia in the lateral incisors of the upper arch, stand out prominently. [1] An undersized maxillary lateral incisor represents a developmental anomaly marked by distinct changes in crown morphology. These teeth typically exhibit a reduced incisal dimension and a diminished mesial-distal diameter, accompanied by a sharp convergence of proximal surfaces. The term is often specifically applied to second incisors, where calcification of the middle lobe occurs during development. [2]

The size of teeth is predominantly influenced by genetic factors, displaying variations across different racial groups. Endocrine disorders can also contribute to alterations in tooth size. The prevalence of microdontia in the population has been reported in studies, ranging from 0.8% to 8.4%. [3] While it is reasonable to attribute changes in crown shape or size to endocrine disorders during morpho-differentiation in utero or during the first year of life, later disruptions may primarily affect the root's size and shape. [4]

It is crucial to note that morpho-differentiation disturbances can result in peg-shaped or otherwise deformed teeth, with the first two layers of the tooth structure remaining normal. Importantly, such disturbances may impact the tooth's size and shape without compromising its function or the functioning of ameloblasts and odontoblasts. [3]

When formulating treatment plans for individuals with microdontia, it is crucial to consider various factors, including function, aesthetics, the potential need for extractions, the position of canines, and the feasibility of coordinating restorative and orthodontic interventions. A comprehensive approach is essential to address these multifaceted aspects and ensure a well-informed and tailored treatment strategy. [5]

In the context of aesthetic dental treatment, the use of dental mock-up is paramount. This preparatory technique serves as a visual guide, offering an anticipated preview of the outcome on unprepared teeth. It plays a pivotal role in prosthodontic treatment, particularly in aesthetic procedures, known by different names such as Mock-up, Bonded Functional Esthetic Prototype (BFEP) (McLaren - 2013), and Aesthetic Pre-evaluative Temporary (APT) (Gurel, 2003). [3]

Therefore, the primary objective of this article is to practically illustrate, step by step, the realization of the mock-up in Aesthetic Dentistry through a clinical case. This approach is demonstrated in the comprehensive care of a patient with a rhiziform tooth, showcasing the practical application of these techniques in real-world scenarios.

II. CASE STUDY

A 30-year-old female sought treatment in the Department of Prosthodontics, expressing concerns about an esthetic disharmony in her smile.

A. Clinical Examination:

The extraoral examination revealed no anomalies. Her facial features displayed symmetry, with competent lips and an ordinary grin line. The patient had no reported systemic illnesses in her medical history. Upon dental examination, bilateral peg-shaped lateral incisors were identified. Fig. [1,2]



Fig 1 Initial Situation at the Consultation



Fig 2 Occlusal View of the Maxillary Teeth

B. Aesthetic Analysis :

We initiated the process by conducting an aesthetic analysis using Digital Smile Design (DSD) to establish the treatment plan.

Digital Smile Design (DSD) marks a significant advancement in aesthetic planning in dentistry. This technology enables a comprehensive analysis of the facial and dental aesthetics of a patient. Following this analysis, a detailed aesthetic treatment plan is established Fig. [3]

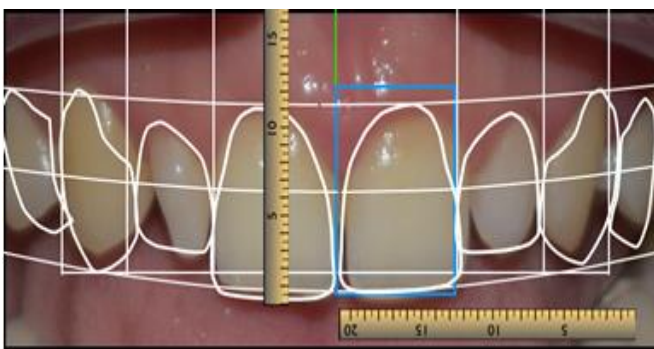


Fig 3 Digital Smile Design

The procedure commences with the capture of digital data, including images and videos of the patient's face, along with digital models of their teeth. This information is integrated into the DSD software, providing a 2D and 3D visualization of the patient's smile. Dental professionals can then analyze the relationship between the teeth, gums, and other facial elements to develop a personalized aesthetic treatment plan.

The aesthetic plan generated by DSD provides a visual preview of the expected final outcome after treatment. It allows the patient to see the proposed changes and actively participate in the planning of their aesthetic treatment. Necessary adjustments can be made to the plan collaboratively with the patient, ensuring an optimal aesthetic result and complete satisfaction.

C. Wax-up :

Following this study, we will create wax-ups to visualize the prosthetic project on plaster study models. Once approved, we will proceed to the realization of the intraoral mock-up. Fig. [4-5]



Fig 4 The Study Models without the Wax-Ups.



Fig 5 The Study Models with the Wax-Ups.

A silicone key is crafted on the study model. The key is cut at the margin, ensuring a precise fit into the embrasures. Bis-acryl resin (self-curing resin) is injected into the key, with an ample excess to minimize bubbles. Fig. [6]



Fig 6 A Silicone Key

The insertion into the mouth must be precise. After removing the key, finishing touches are applied. Fig. [7-8]



Fig 7 Intraoral Vestibular View of the Mock-Up



Fig 8 View of the Patient's Smile with the Mock-Up

III. DISCUSSION

Approximately 2% to 5% of the general population exhibits peg-shaped lateral incisors, with a slightly higher prevalence among females compared to males. Interestingly, investigations suggest that bilateral occurrences are slightly more common than unilateral instances. The distribution pattern is often symmetrical, appearing on both the right and left sides, either unilaterally or bilaterally. The eruption of peg-shaped laterals can cause concern for patients, as their teeth may deviate from the ideal or appear smaller than adjacent anterior teeth [7].

Clinical diagnosis is typically employed to identify peg laterals. Various treatment options are available to address this condition, including orthodontic treatment, direct composite bonding, indirect composite placement, porcelain bonded to metal crowns, crowns directly bonded to teeth, crown lengthening to enhance gingival heights before bonding, as well as extraction and implant procedures. In the presented case study, the focus is on demonstrating how ceramic veneers can effectively resolve the issue, incorporating a diagnostic mock-up for comprehensive assessment. [8]

The mock-up assumes a pivotal role at various stages of the aesthetic treatment process, contributing significantly to its success. The multifaceted roles of the mock-up include:

➤ *Treatment Planning:*

The mock-up serves as a crucial tool in the initial stages of treatment planning. By providing a tangible representation of the anticipated final outcome, it aids in visualizing and strategizing the comprehensive treatment plan.

➤ *Function and Aesthetic Control:*

One of its primary functions is to control both the functional aspects, such as occlusion and phonetics. Functional control includes evaluating the impact of the restoration on upper lip posture, the relationship of the smile line with the lower lip, occlusion, and phonetics. Importantly, this control is exercised without initiating the actual preparation of the teeth. It allows for a meticulous assessment of the proposed changes before committing to irreversible procedures. [9]

➤ *Communication of Dentist-Patient-Dental Technician:*

Facilitating effective communication between the dentist, patient, and dental technician is another vital role of the mock-up. It acts as a visual reference, ensuring a shared understanding of the desired outcome among all stakeholders involved in the treatment process.

It is very important that through this way, we gain the trust of the patient. This is because since at the first steps of the work, he feels being involved like a collaborator and knows that he would not have bad surprises at the end. [10]

➤ *Minimal Invasive Preparation:*

The mock-up aids in achieving minimal invasive preparation, a critical aspect for ensuring the longevity of the final result. By allowing practitioners to visualize the necessary adjustments and modifications before the actual tooth preparation begins, it promotes a conservative approach to treatment.

All these roles collectively contribute to a secure and well-informed progression through each stage of the treatment. By consistently keeping the end result in mind, the mock-up provides assurance for longevity, functional efficacy (through minimal invasive preparation), and aesthetic success (through a harmonized agreement between the patient and the dental team) even before the commencement of the actual tooth preparation. [11]

Several methods can be utilized to create the mock-up, including: a) crafting a freehand direct mock-up using composite; b) developing a mock-up based on the wax-up, employing self-curing resin; and c) designing a modern digitally generated mock-up [12-13]

- *Conflict of Interest: Authors Declare no Conflict of Interest.*

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