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Re-Anatomization to Substitute Missing Maxillary Incisors: A Multidisciplinary Approach

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KEYWORDS

aesthetic rehabilitation, class III malocclusion, dental camouflage, re-anatomization, diode laser.

ABSTRACT:

Correct alignment of teeth is crucial for both oral health and an individual's self-esteem. Malocclusion, particularly Class III, can lead to significant dental and psychological challenges. Dental camouflage is a non-invasive alternative to surgery for correcting such conditions, aiming to achieve acceptable dental occlusion and aesthetic facial appearance. This case report discusses the treatment of a 24-year-old female with Class III subdivision malocclusion, missing maxillary left central and lateral incisors, and a desire for aesthetic rehabilitation. The patient underwent orthodontic treatment and re-anatomization of the right lateral incisor to mimic central incisor using composite resin. Gingival contouring was performed with diode laser to enhance aesthetics as a minimal invasive approach. The conservative approach was successful, restoring the patient's dental harmony and improving her self-confidence. Follow-up examinations confirmed the durability and aesthetics of the treatment. This case highlights the importance of careful treatment planning and execution in achieving satisfactory outcomes for patients with complex malocclusion and missing teeth following a multidisciplinary treatment involving orthodontics and restorative dentistry.

INTRODUCTION

Properly aligned teeth not only support the health of the oral cavity and the stomatognathic system, but they also play a role in shaping an individual's personality. Malocclusion can negatively impact oral tissue health and potentially lead to psychological and social issues [1]. Agenesis and anomalies of shape located in the anterior region of the upper dental arch generally lead to unappealing aesthetics and possible phonetic problems [2]. Orthodontic treatment of adult class III malocclusion patients is difficult especially if it is asymmetric. A precise diagnosis of dentoskeletal components associated with the patients' primary concern is essential for correct treatment planning. It is important to prevent the problem from worsening particularly if it appears in young age. When maxillary central incisors are compromised by extensive decay (beyond the cement-enamel junction), fracture, ankylosis, or inappropriate position, their atypical extraction is considered an acceptable alternative.

In this case, several factors were considered, such as: facial biotype, tooth size, tooth shape, type of occlusion, gap to be closed and frenum involvement. A non-invasive and effective solution for the treatment of tooth shape and size disharmony is re-anatomization using direct composite resin, which retains the dental structure, provides a short treatment time with a lower cost to the patient, is reversible and the material can be resized or reshaped at a future time if necessary [3]. The technique recommended for this procedure employs an intermediate stage which allows the patient to actively evaluate the ongoing results for their rehabilitation, and may critically evaluate the functionality and appearance with the ability to propose changes for the final step,

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improving their satisfaction [4]. The goal of dental re-anatomization is to have an acceptable dental occlusion and an aesthetic facial appearance for missing or disfigured teeth. In permanent dentition, several therapeutic options are available, ranging from complex orthodontic treatments to simple incremental additions of resin composite. In this case we used a combination of treatments as a multidisciplinary approach.

Diode laser cosmetic gum contouring is a predictable, minimally invasive procedure that can deliver results right away and is patient-friendly [5]. Use of a diode allows for repeated painless contouring and greater eyesight in a bloodless environment in less time, thereby producing outstanding outcomes in terms of the height, shape, and symmetry of the gingiva [6].

This article presents a case report of a young female patient in her early twenties with class III malocclusion, who reported with missing maxillary incisors. Management of the patient was done using multidisciplinary treatment approach to meet the patient's satisfaction and aesthetics.

CASE PRESENTATION

A 24-year-old female patient underwent treatment in collaboration with the Department of Conservative Dentistry & Endodontics and the Department of Orthodontics & Dentofacial Orthopedics, King George Medical University, Lucknow, post extraction of left maxillary incisors. The patient had class III subdivision malocclusion along with missing left maxillary central and lateral incisors, extracted due to grossly carious condition which were non salvageable (**Figure 1** A-C). The patient demanded esthetic correction for the missing front teeth. Initial photographs were taken of the patient followed by thorough radiographic as well as extraoral and intraoral clinical evaluation. No significant medical history was present. Patient's consent was taken for the treatment plan formulated by both the Orthodontist and the Restorative dentist/Endodontist. The correction of malocclusion along with space closure was done by the Orthodontist and aesthetic rehabilitation was done by the Restorative dentist/Endodontist during the orthodontic treatment.

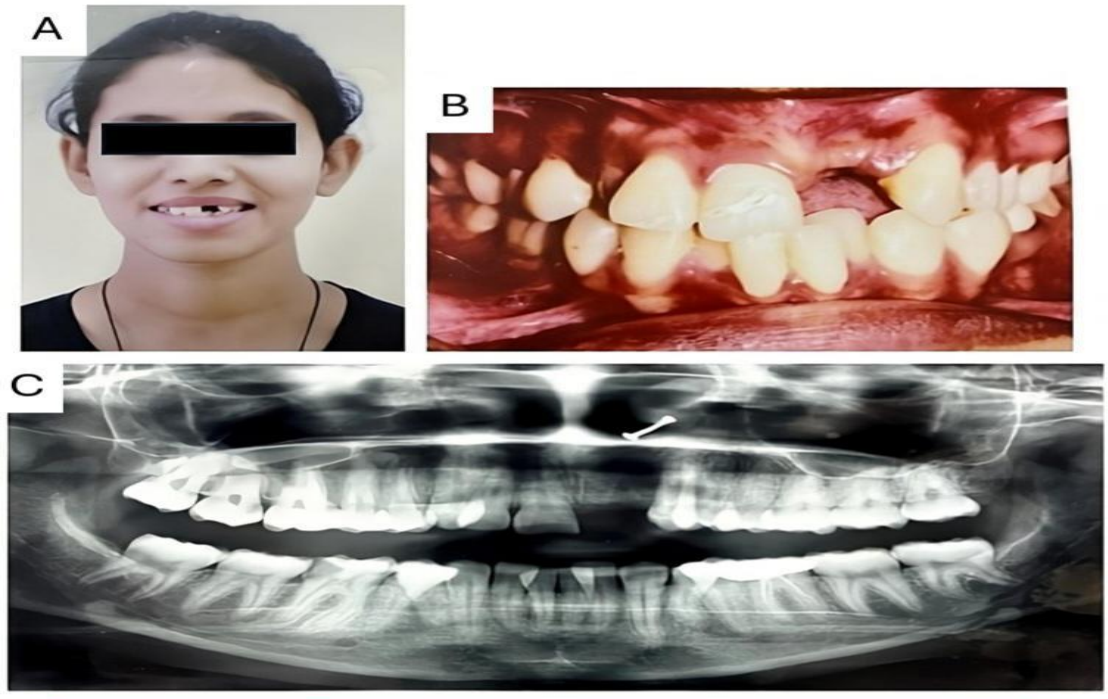

Figure 1: (A) Pretreatment extra oral picture (B) Pretreatment intra-oral picture (C) Pretreatment orthopantomogram

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Treatment plan devised was-

- Post extraction orthodontic therapy.
- Upper and lower fixed appliances.
- Leveling and aligning of the upper and lower arches.
- Shifting of the right central incisor to the left quadrant and right lateral incisor to the place of right central incisor along with closing of spaces.
- Maintaining the midline, overjet and overbite.
- Gingival re-contouring of the right lateral incisor using diode laser.
- Re-contouring and shaping the lateral incisor as central incisor (composite resin re-anatomization).
- Anterior lingual retainers for both the arches.

Neural sensibility test was done using electric pulp testing and cold test(endo ice) of the involved teeth before undergoing any kind of treatment. Since the teeth gave a normal response, a minimal invasive approach was chosen for the right maxillary lateral incisor during the orthodontic treatment, involving re-anatomization by fabrication of direct veneers using direct composite resin restorations and gingival contouring by diode laser. Shade matching was done under natural daylight with Vita-classical shade guide (**Figure 2** A-D). After bracket removal of only the maxillary lateral incisor, first and foremost the incisal and middle 1/3rd were built using bulk fill composite resin (3M Espe Filtek) in order to prevent any kind of relapse. Steps of etching with 37% phosphoric acid and adhesive application for 20 seconds, air drying for 5 seconds and light curing for 10 seconds were employed. Further composite addition was done at the incisal and middle one third only, and cured for 40 seconds. This technique was followed at later stages as well.

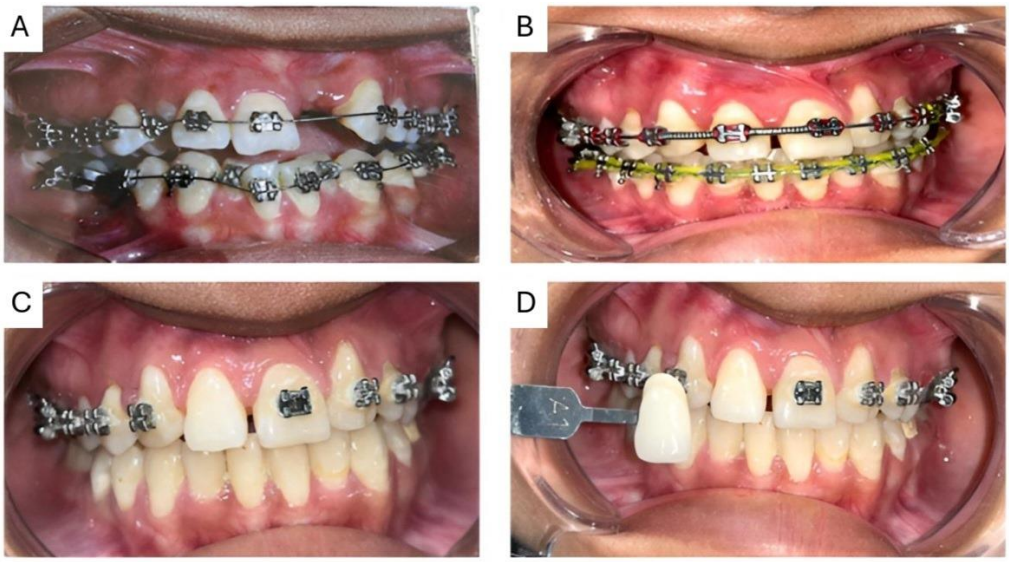

Figure 2: (A) orthodontic treatment initiated for space closure (B) stage of orthodontic treatment to initiate restorative procedure (C) bracket removal done w.r.t. 12 (D) shade matching done

The patient was recalled the next day and gingival contouring was done using Diode laser (Intense Medical & Dental system Pvt. Ltd, 980 nm) at 2.0 W and 25 Hz, (pulse duration: 25 µs, energy/pulse 50 µJ) in pulse and contact mode through a 300-µm fiber optic tip. Cervical 1/3rd was built on the same day immediately following gingival contouring using the bulk fill composite (3M Espe Filtek) in order to gain gingival approximation and healing in accordance to the re-contoured gingival margin (**Figure 3** A-B).

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Later, full mouth bracket removal was done and both arches were stabilized with anterior lingual retainer separately. Patient was advised a waiting period for adequate gingival repair and use of astringent gum paint (Stolin) for faster healing. She reported after 1 week of complete healing and final enamel veneering was done from the cervical margin to the incisal edge using a correctly matched enamel shade (Shofu, Beautifil II) after etching and adhesive application (**Figure 3**C). Finishing and occlusal adjustments were done using stone finishing burs (Dura-White Stones, Shofu Inc.) and polishing was done using composite polishing kit (Shofu). Finishing strips were used inter-proximally to eliminate the flash and obtain smooth and contoured line angles. Silicone polishing points (Enhance, Densply) were used on the lingual surface for surface adjustments. Gingival zenith comparisons were done (**Figure 4** A-C), and oral hygiene instructions were given. Post operative image and OPG were taken for future records. (**Figure 5** A-D).

After completion of treatment, the harmony and aesthetics were re-established, as well as the confidence and self esteem which led to the patient happiness and satisfaction.

Follow up was done at 1 month, 3 months and 12 months to check for composite fracturing, staining as well the periodontal health of the teeth. The patient is still under active follow up.

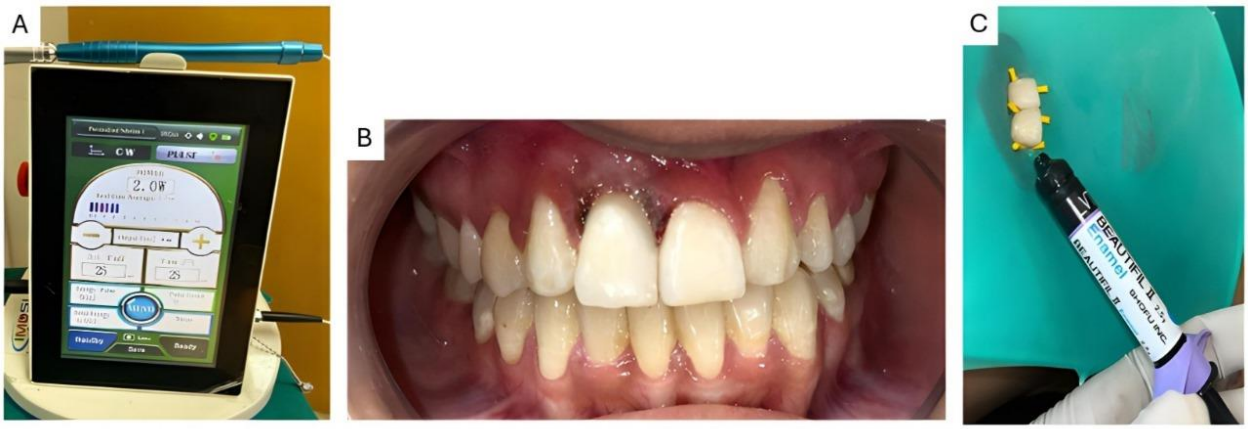

Figure 3: (A) Diode laser (B) gingival contouring done with diode laser and cervical composite build up (C) Enamel shade addition

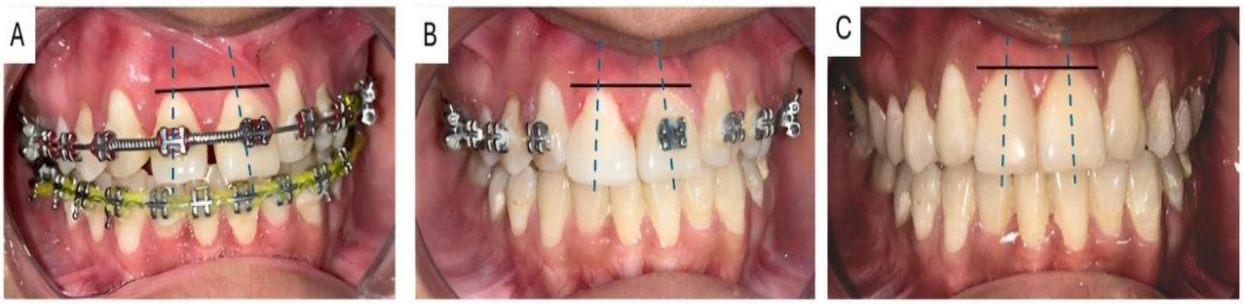

Figure 4: Gingival zenith levels (A) before treatment (B) during treatment (C) After treatment

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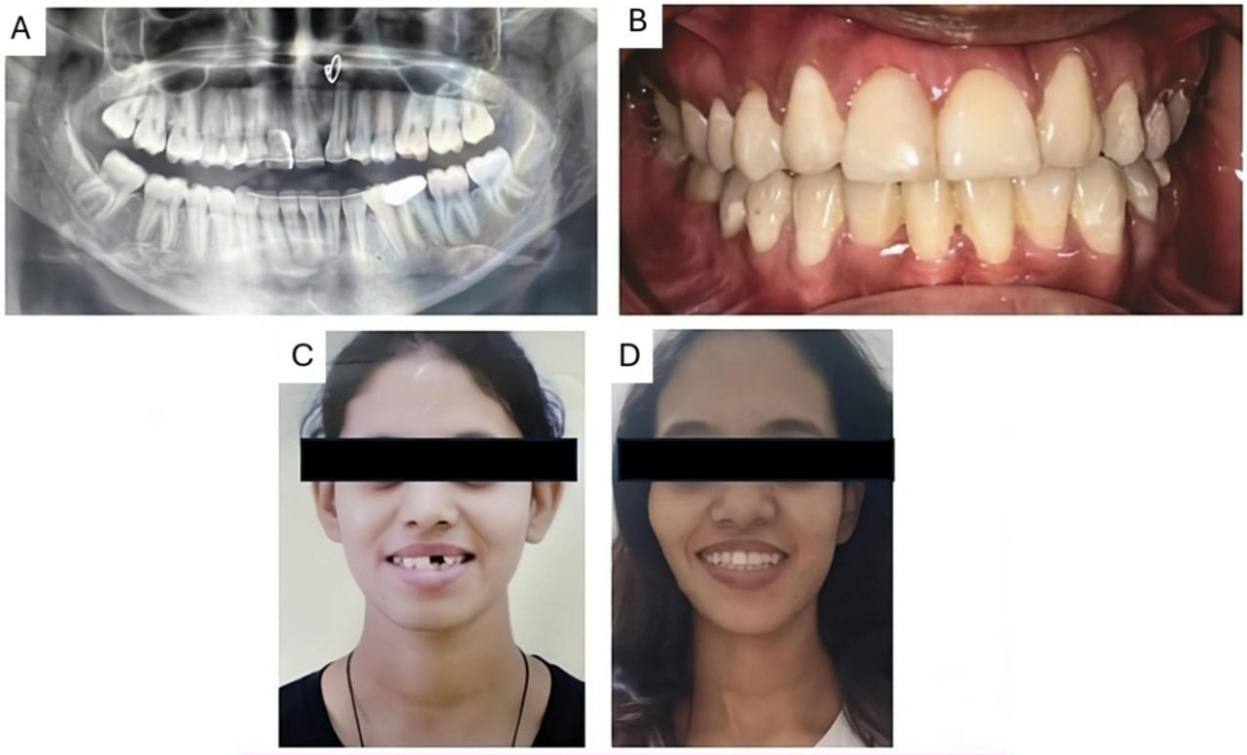

Figure 5: (A) Post operative Orthopantomogram (B) Post operative clinical picture

(C) Patient image before treatment (D) Patient image after treatment

DISCUSSION

The combination of Class III malocclusion with missing maxillary lateral incisors can be challenging to resolve satisfactorily while enhancing the facial profile of the patient given the constriction of maxilla. In patients with these characteristics, a combination of orthognathic surgery and orthodontics with a bridge or implants is often recommended [7]. Given that the patient in the following case report would not consider orthognathic surgery or placement of implants, the alternative recommended was camouflaging along with space closure using orthodontic treatment. Many Class III patients elect not to undergo invasive treatment that involves surgery, extractions, and/or implants, especially if treatment affects maxillary anterior teeth considered critical to overall smile aesthetics [8]. When such aesthetic problems are presented, it is important that dentists have adequate training, experience and awareness of facial aesthetics to be able to offer more conservative solutions because such issues, if unresolved satisfactorily, can detrimentally affect the patients' emotional state and self-esteem [8].

Treatment plans for cases of maxillary hypoplasia with agenesis of the lateral incisors often call for opening space for implants. The greatest problem with such plans is that it is impossible to predict when, to what degree, or in which patients unattractive soft- and/or hard-tissue changes around implant-supported porcelain crowns, especially noticeable in the maxillary anterior teeth, will occur. Biological and technical complications are frequent and can appear even after only a few years [9]. Space closure with protraction of the maxilla and later re-anatomization of the canines to replace the congenitally missing lateral incisors can be a good alternative. Handled carefully, this option avoids gingival retraction that can accompany implant placement or metal show-through on crowns, bridges, and implants that can occur in some restorations after a period [10]. Keeping in mind the same idea we did space closure and protraction of maxilla followed by re-anatomization of lateral incisor using composite resin.

Since composites are one of the most commonly used materials for the rehabilitation of anterior teeth

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abnormalities, a physician must possess significant expertise regarding the usage of this material. Due to its various benefits, which include immediate restoration, aesthetics, minimal invasion, cost-effectiveness, adhesion to the tooth structure, and reduced chair-side time, direct anterior composite restoration has become increasingly popular. However, the success rates of direct composite restorations in permanent anterior teeth can vary, as described in the systemic review by **Heintze et al** [11]. Composite repair has an annual failure rate of 5.7% over a 4-year period of follow-up, which demonstrates good longevity [12]. Many techniques have been described in the literature for joining an aged composite to the new type. These alternatives utilize chemical and physical principles, often in combination. Various surface treatments include diamond burs, silicon carbide grinding paper, sandblasting, air abrasion with aluminum oxide, and etching with phosphoric or hydrofluoric acid (HF) as well as acidulated phosphate fluoride. The use of intermediate agents such as silane, adhesive, a combination of silane and adhesive, and low-viscosity flowable composites has also been suggested [12]. Although there is awareness of minimally invasive treatments and numerous clinical reports highlighting resin composite repairs by dental clinicians, the actual use of these repair methods in dental practice remains relatively rare.

The development of adhesive materials has enabled a more conservative treatment and improved aesthetic results. Recent advances in dental materials allow reproduction of dentin, enamel and individual tooth characteristics to an almost imperceptible degree. The putty index technique offers several advantages over freehand methods. However, its disadvantages include the need for a mock-up build-up, the likelihood of a second appointment, and the possibility of the composite build-up adhering to the adjacent tooth, particularly if it is not properly isolated **[13]**. In this case since there were chances of relapse and obstruction from the applied orthodontic wire, therefore putty index technique was omitted and a direct composite restoration without putty indexing was chosen as a better option following the chair-side bracket removal.

After the advent of laser technology, traditional methods have increasingly been replaced by lasers for minimally invasive procedures. In this particular case, smile analysis revealed issues such as irregular gingival contours after re-anatomization. It was initially noted that the tooth axis and gingival zenith contours were not ideal. Therefore, it was crucial to adjust the gingival zenith to align with the desired anatomical structure keeping in mind the biological width. For management of the improper gingival margins, diode laser was used. Lasers offer several advantages over traditional scalpel surgery, including greater precision, a relatively bloodless surgical and postoperative environment, sterilization of the surgical area, minimal swelling and scarring, effective coagulation, the elimination of the need for sutures, and reduced or no postoperative pain **[13]**. The decrease in postoperative discomfort with laser use is attributed to the formation of a protein coagulum on the wound surface, which acts as a biological dressing and seals the ends of sensory nerves **[14]**. These conservative procedures successfully achieved the patient's aesthetic goals while also considering long-term dental health.

CONCLUSION

The combination of orthodontic camouflage and conservative restorative techniques successfully addressed the aesthetic and functional challenges of a class III malocclusion with missing maxillary incisors. The minimally invasive approach, including direct composite resin build-up and diode laser gingival contouring, effectively restored the patient's smile, improving both her confidence and oral health. The patient-centered treatment plan, avoiding more invasive procedures, demonstrates the importance of tailored, interdisciplinary approaches in achieving satisfactory outcomes in complex dental cases.

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CONFLICTS OF INTEREST

The study is declared by authors to have no conflict of interest.

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