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Multidisciplinary Approach in the Rehabilitation of Missing Lateral Incisors: A New Trend in Daily Practice

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Clinical Relevance

The clinical case described is a multidisciplinary clinical technique article. It showcases the need for a multidisciplinary approach to certain restorative cases and offers a number of possible options in addition to the one utilized for this patient.

SUMMARY

This article reports the case of a patient with bilateral hypodontia of the maxillary lateral incisors who was dissatisfied with the outcome of initial orthodontic treatment, highlighting the importance of a multidisciplinary interaction among Restorative Dentistry, Orthodontics, and Implantology to achieve satisfactory esthetics and functional results.

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INTRODUCTION

Several alterations may influence the establishment of occlusion during tooth development, including hypodontia, also known as tooth agenesis, partial anodontia, or oligodontia, which is characterized by one or more congenitally missing teeth.[1,2] The prevalence of permanent tooth hypodontia ranges from 3.5% to 6.5% in the general population, is more frequent among females (by a 3:2 ratio),[1,3,4] and displays no ethnic prevalence.[2]

The literature unanimously reports that this condition is caused by disturbances during the initial stages of tooth formation (initiation and proliferation),[1–3,5] is more frequent in the region of the permanent maxillary lateral incisors and mandibu-

lar second premolars,[1–3,6–11] and occurs bilaterally in most cases.[4]

The greatest challenge when treating patients with hypodontia of the maxillary lateral incisors is achieving satisfactory esthetics and function.[12–14] The first step is to establish the desired objectives and goals, considering the limitations of each individual case.

In the case of agenesis, the treatment options may include space maintenance for later rehabilitation with prostheses, dental implants, or orthodontic space closure, followed by restorative treatment when needed.[1,10,13,15–17] Space maintenance is often selected in the presence of adequate occlusal relationships, less flattened facial profile, and establishment of Class I canine relationship.[14] This treatment has often been indicated as a result of the increasing use of endosseous implants and the difficulty in achieving satisfactory esthetic outcomes by closing the edentulous space, especially in the case of unilateral hypodontia.[12]

DESCRIPTION OF THE TECHNIQUE (CASE REPORT, OPTIONS, AND GOALS)

Patient E.D., a 34-year-old male, attended the graduate clinic of the School of Dentistry for orthodontic retreatment with the chief complaint of unsatisfactory esthetics. During analysis of the patient history, the patient reported congenitally missing maxillary lateral incisors and previous orthodontic treatment with space closure by moving the canines into the edentulous space, followed by esthetic reconstruction of the maxillary anterior teeth.

Extraoral analysis indicated a relatively symmetrical face, marked nasolabial sulcus, straight profile with slight anterior maxillary deficiency, increased lower facial third, good lip sealing, and a low smile line (Figure 1.a,). Intraoral evaluation (Figure 1.b-d revealed a Class III molar relationship subdivision right; normal overjet and overbite; the absence of permanent maxillary lateral incisors and maxillary and mandibular third molars; the presence of maxillary and mandibular diastemas (positive discrepancy of 3 mm in the maxillary arch and 4.5 mm in the mandibular arch); maxillary canines positioned in the region of the maxillary lateral incisors; and a 3-mm deviation of the mandibular dental midline to the left side.

The initial panoramic radiograph revealed slightly short and parallel roots. Analysis of the lateral cephalogram demonstrated a skeletal Class III pattern with anterior maxillary deficiency, protruded maxillary incisors, and slightly retroclined mandibular incisors.

The study of the case presented different treatment options with regard to the following: 1) Space opening at the region of maxillary right and left canines for later placement of implants, prosthetic and esthetic rehabilitation of the maxillary anterior teeth; 2) Repositioning the maxillary canines to their original position and space maintenance for placement of implants at the region of maxillary lateral incisors; 3) Orthodontic closure of the maxillary and mandibular spaces by repositioning of the incisors

Figure 1. *(a) Initial smiling photograph. (b) Frontal smiling photograph. (c) Right intraoral view. (d) Left intraoral view.*

and canines, yet without midline correction; and 4) Closure of the maxillary and mandibular anterior spacing by esthetic restoration of the teeth, also without midline correction.

The treatment goals established were to achieve more favorable esthetics and functional occlusion by opening space at the region of the maxillary canines, followed by rehabilitation with implant/prosthesis for anatomic restoration of the maxillary anterior teeth. This would enhance the maxillary anterior dental proportions, improving the smile esthetics and harmony.

DESCRIPTION OF TECHNIQUE (TREATMENT PROGRESS)

First Stage: Orthodontic Treatment

The first stage of orthodontic treatment consisted of placing bands on the molars and bonding a fixed appliance to align and level with round archwires. This was followed by mesial movement of the permanent maxillary canines using elastics and open nickel-titanium (NiTi) coil springs, recreating space between the canines and the first premolars (Figure 2.a).

In the mandibular arch, alignment and leveling of teeth was achieved, and the diastemas were closed to achieve a more satisfactory position of the mandibular midline in relation to the maxillary midline, which was used as a reference. After using rectangular archwires, the fixed appliance was removed, (Figure 2.b) and the patient received maxillary (removable circumferential Hawley retainer) and mandibular (bonded wire between the mandibular right and left first premolars) retainers. The total time of orthodontic treatment was 36 months.

Second Stage: Treatment With Implant/ Prosthesis (Restorative Procedures)

After completing the orthodontic treatment, the patient was referred for restorative treatment, comprising placement of implants for teeth 13 and 23.

Tooth bleaching was performed in the lower arch to establish a gold standard for shade, as a result of the soundness of the teeth. For that purpose, an alginate impression was taken and a plaster dental cast was obtained. A vacuum-formed, custom-made tray was then fabricated and carefully trimmed to be nonirritating to the soft tissues. Tooth bleaching was performed with 10% carbamide peroxide, at home and overnight for 14 days. The patient was asked to return once a week to evaluate the bleaching effects. The patient received written instructions concerning the use of the gel, cleaning of the tray, risks of sensitivity, and dietary control to avoid highly staining foods, such as coffee and teas. Satisfactory bleaching was achieved at completion of this period; nevertheless, the treatment was continued for seven days to stabilize the outcome, avoiding early relapse of the dental shade.

During bleaching, the upper anterior teeth were prepared for placement of ceramic restorations. The upper incisors were prepared for ceramic veneers (Figure 2.c) and the upper canines for full crowns over implants. The patient presented with indirect

Figure 2. *(a) Orthodontic treatment for space reopening. (b) Final result after orthodontic treatment. (c) Anterior teeth preparation for complete crowns. (d) Temporary crowns cemented.*

restorations made with a glass polymer; therefore, there was no need for a huge change in the existing preparations, except when greater resistance and esthetics were necessary for the new ceramic restorations. Provisional acrylic crowns (Figure 2.d) were then placed and used during the period of tooth bleaching and laboratory procedures. After preparation, impressions were taken with polyvinyl siloxane in two stages: the putty material was initially used and then relieved to accommodate the light paste, allowing for an improved impression of the marginal areas (Figure 3.c).

Ceramic veneers were planned for the upper incisors. Porcelain-fused-to-metal (metal-ceramic) crowns for the upper canines were fabricated on endosseous implants.(Figure 3.a-d) After esthetic and functional adjustments, the crowns were glazed and cemented(Figure 4.a-d). The veneers were cemented using a self-etching cement, and the porcelain-fused-to-metal crowns were cemented on

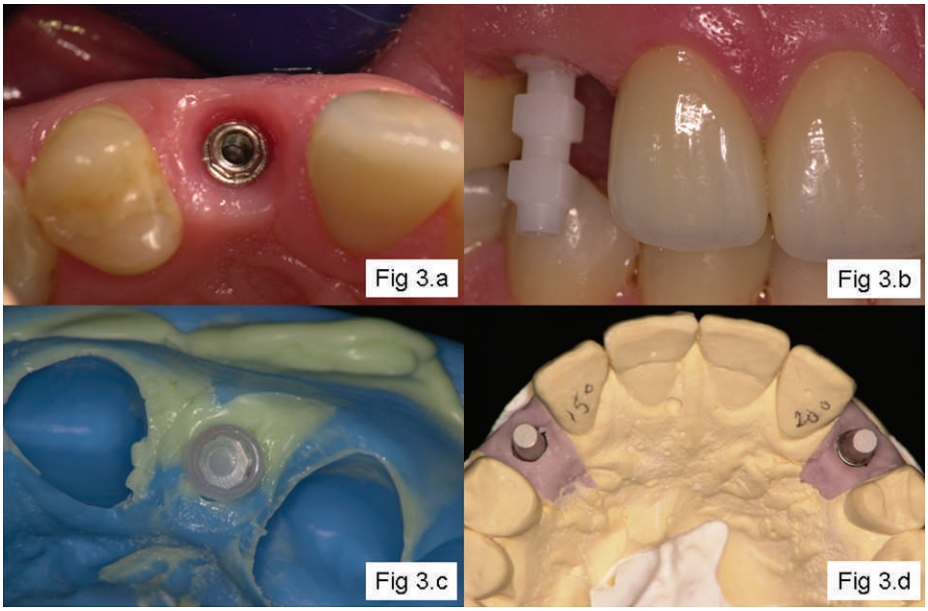

Figure 3. *(a) Occlusal view of the canine implant. (b) Impression component. (c) Impression with addition silicon. (d) Laboratory phase.*

Figure 4. *(a) Pre-cementation adjustments. (b) Crowns before cementation. (c) Close-up of cemented crowns. (d) Patient smile showing pleasant harmony.*

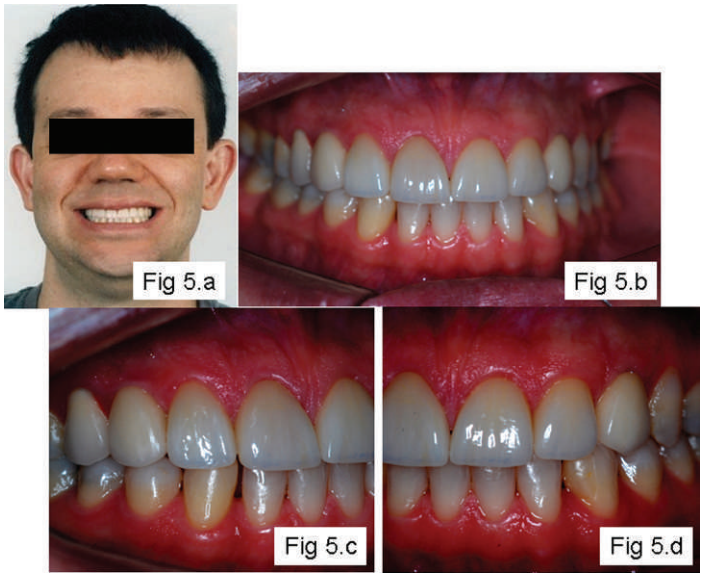

Figure 5. *(a) Twelve-month control time. (b) Gingival contour shows excellent response to ceramic contact. (c) Lateral view: Right side, at 12 months control time. (d) Lateral view: Left side, at 12 months control time.*

the metallic implant abutments using glass ionomer cement. The excess cement was carefully removed, and the patient received oral hygiene instructions. The final results present a natural smile and perfect harmony with healthy gingival tissues (Figure 5.a-d).

List of Materials

The materials utilized in treating the patient included the following:

- Brackets Roth prescription .022 × .025-inch (Ormco, Orange, CA, USA)
- Transbond XT, UNITEK (3M ESPE Dental Products, St Paul, MN, USA)
- 12-mm implants Narrow Neck (Straumann, Basel, Switzerland)
- Nite White 10% (Discus Dental, Culver City, CA, USA)
- Express (3M ESPE Dental Products)
- Empress IPV (Ivoclar Vivadent, Zurich, Switzerland)
- Rely X Unicem (3M ESPE Dental Products)
- Meron Cement (VOCO, Cuxehaven, Germany).

Potential Problems

The decision involved in re-treating a case is a difficult one, particularly when it involves changes in tooth position and structural changes of tooth morphology.

Instead of closing all of the existing spaces in the arch, the option of reopening spaces and proclining anterior teeth allowed for an improvement in facial esthetics with better lip support. On the other hand, the treatment period was extended, and there were more risks of root resorption. If space closure is indicated, the dental professionals should consider the possible adverse effects, including unfavorable achievement of canine guidance, flattened facial profile, consequent increase of the nasolabial angle, and deep bite.[3] Notwithstanding, this treatment option presents various advantages, such as immediate intervention without the need for skeletal maturation for implant placement in growing patients; improved gingival contour of the region; stability; and reduced treatment costs, because no prostheses or implants are required.[5,12]

Restorative treatment in the anterior teeth, particularly that involving implants, is a challenge. It is not only a technical issue but also a psychological matter, divided between patient's expectations and limitations in operator skill.

Retention for tooth movement should offer long-term control to avoid relapse.

Summary of Advantages and Disadvantages

The treatment outcome for this patient was very favorable, since it achieved a wider maxillary arch by opening space with placement of implant/prosthesis in the region of the maxillary canines and anatomic restoration of the maxillary right and left

central and lateral incisors. This procedure provided better proportion of the tooth crowns in the maxillary anterior region as well as enhanced gingival contour, favoring an esthetic smile.

Concerning the dental relationships between the maxillary and mandibular arches, there was a great improvement in terms of anterior tooth position and correction of the mandibular midline, highlighting the treatment benefits when considering the limitations of retreatment in an adult patient.

The overall treatment was long and dependent upon patient participation and comprehension. On the other hand, as a result of the use of this multidisciplinary approach, it was possible to create a good occlusal relationship that met with the patient's satisfaction.

CONCLUSION

The treatment, comprising an interaction between Restorative Dentistry, Orthodontics, and Implantology, allowed a favorable functional and esthetic outcome in an unfavorable skeletal Class III case with bilateral hypodontia. The treatment approach was based on the patient's expectations related to the correct morphology, esthetics, and function.

Conflict of Interest Declaration

The Authors of this manuscript certify that they have no proprietary, financial or other personal interest of any nature or kind in any product, service and/or company that is presented in this article.

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