Post-orthodontic restorative approach for young patients with missing anterior teeth: no-prep and ultraconservative techniques

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ABSTRACT

Aim *The early loss of permanent teeth following trauma or congenital aplasia may be corrected in young patients by orthodontics and prosthetic-implant means. The aim of the present clinical review is to show how modern restorative options, such as enamel and gingival recontouring, bleaching and composite resin bonding, may improve the final clinical result after orthodontic space closure.*
Materials and methods *The most common problems following orthodontically transposed teeth are unusual function, shape, dimension and color or deficient periodontal integration as a problematic long term maintenance of prosthetically replaced missing teeth, using or not implant supported restorations. This article presents clinical outcomes summarizing the benefits and positive impact of direct composite application to improve esthetics and function following orthodontic space closure.*
Conclusion *There are different decisional levels for the treatment of young patients with missing anterior teeth which should be carefully weighted during treatment planning to satisfy demands regarding tissue conservation, function and esthetics and offer patients the best available solution.*

Introduction

The early loss of permanent teeth following trauma or congenital aplasia may be corrected by orthodontic or prosthetic-implant means. The proper diagnosis of dental and skeletal conditions normally guides the choice between both treatment options (1, 2). The need for long term maintenance of prosthetic rehabilitations and their potentially negative influence on periodontal health (3) has always been considered as a main shortcoming favoring the orthodontic solution (4, 5). However, different anatomical, functional and esthetic anomalies may result from the orthodontic approach. The increasing concern of our patients for esthetics obliged restorative dentists to consider these deficiencies and to propose appropriate solutions. Well known treatment modalities such as bleachings and composite resin bonding have gained popularity as they improved in practicability, efficiency and predictability (6-8).

The aim of the present paper is to review and outline the interest of direct restorative modalities aimed to correct functional, anatomical and esthetic anomalies in patients with missing anterior teeth after orthodontics. The implication of this current therapeutic means in a comprehensive treatment planning will be discussed.

Treatment decision rationale

There are different decisional levels for the treatment of young patients with missing anterior teeth (Table 1). Each of them should be carefully weighted during treatment planning as both orthodontic or prosthodontic treatment options are in principle irreversible.

Essentials of orthodontic treatment strategy

Initial skeletal conditions as well as inter-arch and intra-arch dental relationships will determine the opportunity of an orthodontic space closure. In the absence of malocclusion evidence requiring mandibular tooth extractions, Class I occlusion cases usually favors treatment of the edentulous sector(s) by space maintenance or opening, followed by prosthetic replacement of the missing unit(s). Conversely, the presence of Class III malocclusion contraindicates orthodontic space closure of upper missing anterior teeth. Upper anterior spaces should be closed orthodontically in Class I extraction cases (severe crowding) or in some Class II cases where alveolar

General parameters	Skeletal conditions Dental conditions Soft tissue profile Patient's age Number and localization of missing teeth
Local parameters	Tooth forms and dimensions Conditions of the edentulous area Persistence of primary tooth/teeth Soft or hard tissue defects
Secondary parameters	Patient's motivation & understanding Patient's economical means Dental hygiene

Table 1 Decisional parameters for the treatment of patients with missing anterior teeth

and skeletal growth potential preclude an orthodontic correction of the Class II relationship. It should be stressed that in any clinical situation, a diagnostic set-up is mandatory to anticipate the influence of the orthodontic treatment on occlusion, periodontal and dental conditions.

Figure 1 depicts the most common clinical problems and their possible restorative solutions, as following orthodontic space closure.

Space maintenance or opening

Depending on the occlusion conditions and particularly on the patient's age at the moment of treatment planning, the alternative option to orthodontic space closure will be the space maintenance or opening, followed by prosthetic replacement of the missing teeth.

The three major treatment options for anterior tooth replacement are implant supported crowns, metal based of full ceramic adhesive bridges (rarely indicated in this context). Removable dentures are mostly considered for provisonalization, especially in young patients when definitive treatment has to be postponed. Since implants will not follow alveolar bone growth, fixture placement should not be used in young patients until full jaw growth is attained, from 18-20 years and even further (9, 10).

Ultraconservative restorative procedures after space closure option

The anatomical and esthetic anomalies that result from spontaneous space closure or following orthodontic procedures may be corrected by choosing the appropriate restorative modalities, including often a multidisciplinary approach (2).

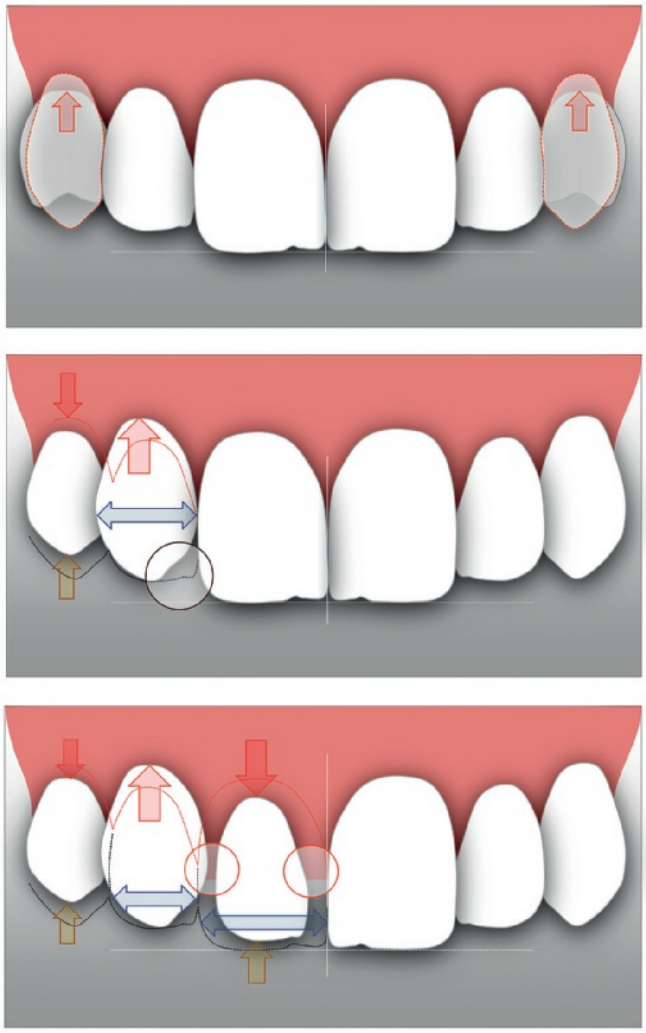

Figure 1 Upper frame: missing or impacted canines. The best option remains space maintenance or opening with implant-supported restorations. During surgery, proper soft tissue anatomy will need to be re-established.
Middle frame: missing lateral incisor. Space closure is a frequent treatment option and results in the following anatomical and aesthetic discrepancies: the canine coronal and cervical diameters are excessive (blue arrow) – the canine incisal profile is deficient (circle) – the gingival zenith is displaced apically (red arrow) – the premolar is on the contrary too short, both cervically and incisally (red and brown arrows).
Lower frame: missing central incisor. Space closure is less frequently chosen. In case, it will result in the following anatomical and esthetic discrepancies: the lateral incisor is too narrow and short both cervically and incisally (red, blue and brown arrows) – the mesial and distal papillae around the lateral incisor are flat (circles) – the canine and premolar present the same deficiencies as described for the space closure for a missing lateral

Recontouring

Recontouring or enameloplasty may be performed during or following orthodontic treatment. For instance, when cuspids have to be moved in position of the lateral incisors, there is usually a space discrepancy.

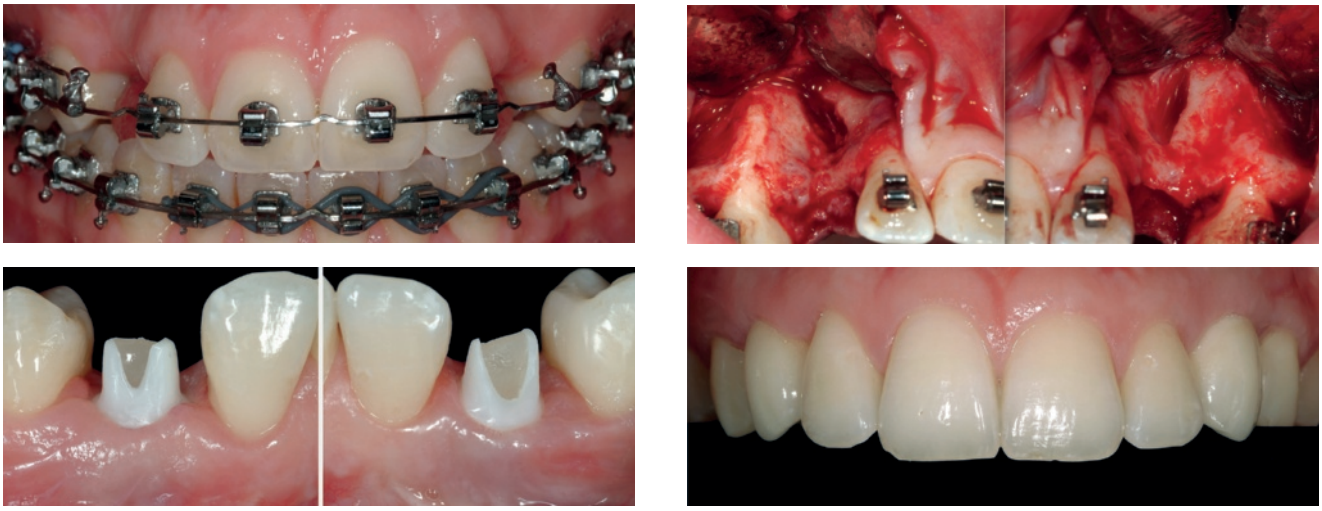

Figure 2 Canine replacement

Figure 3 Missing lateral incisor and space closure – ideal case

In this situation, the careful reduction of cuspid diameter will improve interarch relationship as well as reconstructive procedures (Fig. 4a, 4b). The ratio root diameter to crown diameter will dictate the amount of tissue that can be removed interproximally, pending that corrections can be made entirely in enamel, to avoid dentin exposition or root proximity.

Bleaching

A problem of tooth color often appears when cuspids are in a more mesial position. These teeth present a more saturated color (normally, similar hue but higher chroma) when compared with incisors (Fig. 3c). After the required enameloplasty has been made, the color correction should be tried, using one of the available bleaching techniques for vital teeth, namely chair-side bleaching or home bleaching (6-8).

Direct Composite Bonding

Modern composite resin kits provide very performant restorative materials. Beside the dramatic improvements made in their physico-chemical properties, modern composites have satisfactory color stability and esthetic potential (11-13). Among the

Figure 4 Missing central and lateral incisors; space closure

various layering options, the one gaining popularity is the Natural Layering Concept (14), which corresponds to a bilaminar, anatomical application of dentin and enamel like shades which closely emulate natural hard tissues. When forms or dimensions have to be only slightly modified, a monolaminar approach can be followed, using exclusively an enamel shade. For larger corrections, the bilaminar approach with dentin and enamel masses is to be applied (Fig. 3d, 4d -4f) (i.e: inspiro, Edelweiss DR AG).

Gingival and periodontal recontouring

In many circumstances, gingival recontouring is indicated to correct minor defects of soft tissue contours or to modify the clinical crown lenght. This can be made by using electro-surgery or traditional surgery (Fig. 4b), pending the procedures respect the biological width and do not result in an excessive loss of keratinized gingiva.

Conclusion

The two basic therapeutic attitudes for the replacement of anterior teeth in young patients are space closure or maintenance, which respectively require orthodontic or prosthodontic procedures to be applied. To satisfy new demands regarding tissue preservation, function and esthetics, treatment decisional parameters have to be redefined. An extended list of general, local and secondary parameters have now to be taken into consideration in order to propose the patient the best available solution.

The most common problems following orthodontically transposed teeth are unusual function, shape, dimension and color or deficient periodontal integration as a problematic long term maintenance of prosthetically replaced missing teeth, using or not implant supported restorations. This article has presented clinical outcomes summarizing the benefists and positive impact of direct composite application to improve esthetics and function following orthodontic space closure.

References

1. Meng HP, Ingervall B, Hess D, Marmy O, Buser D. Kieferorthopädie: nichtanlangen. Schweiz Monatsschr Zahnmed 1990;100:188-199.
2. Dietschi D, Schatz JP. Current restorative modalities for young patients with missing anterior teeth. Quintessence Int 1997 Apr;28(4):231-40.
3. Rohner FG, Cimasoni G. Longitudinal radiographical study on the rate of alveolar bone loss in patients of a dental school. J Clin Periodontol 1983;10:643-651.
4. Tuverson D. Orthodontic treatment using canines in place of missing lateral incisors: treatment planning considerations. Am J Orthod 1970;58:109-127.
5. Nordquist GG, McNeill RW. Orthodontic vs. restorative treatment of the congenitally absent lateral incisor-long term periodontal and occlusal evaluation. J Periodontol 1975;46:139-143.
6. Hasson H, Ismail AI, Neiva G. Home-based chemically-induced whitening of teeth in adults. Cochrane Database Syst Rev 2006;18(4):CD006202.

7. Heintze SD, Rousson V, Hickel R. Clinical effectiveness of direct anterior restorations-a meta-analysis. Dent Mater 2015;31(5):481-95.
8. Haywood VB, Heymann HO. Night guard vital bleaching. Quintessence Int 1989;20:173-176.
9. Balshi TJ. Osseeointegration and orthodontics: modern treatment of congenitally missing teeth. Int J Perio Rest Dent 1993;13:494-505.
10. Berten JL, Neukam FW, Wichmann M, Schiephake H. Fachübergreifende Behandlungsplanung zur Implantatversorgung während der Adoleszenz bei Hypodontie oder vorzeitigem Zahnverlust. Implantologie 1994;4:301-316.
11. Ardu S, Braut V, Gutemberg D, Krejci I, Dietschi D, Feilzer AJ. A long-term laboratory test on staining susceptibility of esthetic composite resin materials. Quintessence Int 2010 Sep;41(8):695-702.
12. Dietschi D. Optimizing smile composition and esthetics with resin composites and other conservative esthetic procedures. Eur J Esthet Dent 2008;3(1):14-29.
13. Villarroel M, Fahl N, De Sousa AM, De Oliveira OB Jr. Direct esthetic restorations based on translucency and opacity of composite resins. J Esthet Restor Dent 2011;23(2):73-87.
14. Dietschi D, Ardu S, Krejci I. A new shading concept based on natural tooth color applied to direct composite restorations. Quintessence Int 2006;37:91-102.