An Alternative Approach to the Transitional Rehabilitation of Infra-Occluded Primary Second Molars

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ABSTRACT

Different approaches have been proposed for the treatment of retained infra-occluded primary molars with agenesis of permanent successors including extraction with orthodontic space closure, prosthetic replacement, or retention of the primary tooth in situ for space maintenance. The retention of primary second molars in situ represents a conservative treatment option to preserve alveolar bone at the future implant site, and it is especially indicated for young patients who have not completed skeletal growth until later reassessment can determine definitive treatment. The orthodontist and the restorative dentist must work together in the comprehensive treatment planning of these patients for optimal results. The present report describes the transitional rehabilitation of infra-occluded primary second molars for a 13-year-old patient with direct resin composite restorations. Furthermore, the report illustrates the use of an alternative technique with a clear vinyl-(poly-siloxane) matrix to facilitate the direct restorative procedures and minimize the finishing procedures involved in the placement of large composite restorations.

CLINICAL SIGNIFICANCE

A conservative approach for the transitional rehabilitation of infra-occluded primary molars is possible with direct composite restorations. Alternative techniques such as the use of a clear vinyl-(poly-siloxane) matrix that can be cured-through allow considerable simplification of the direct restorative techniques.

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INTRODUCTION

Different theories have been proposed to explain the etiology of infra-occluded primary molars including local mechanical factors,[1] alteration in the metabolism of periodontal tissues,[2] and genetic factors.[3] A strong association has also been demonstrated between infra-occlusion of primary molars and agenesis of the permanent successors.[4,5] Excluding third molars, mandibular second premolars are the most commonly missing teeth and can be observed in 2.4 to 4.3% of the population.[6] Infra-occluded primary molars have also been reported to have a high incidence of ankylosis, but this is not a constant finding and it may occur in 1.5 to 9.9% of the population.[7]

A number of aspects must be considered in the treatment planning of infra-occluded primary molars including: (1) integrity of the crown, root, and bone of the primary molar; (2) its vertical position relative to the occlusion; (3) the patient's antero-posterior skeletal and dental relationships; (4) dental crowding; (5) the patient's chronologic and dental

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age; and (6) the patient's treatment preference.[8] Different treatment options have been proposed with the debate fluctuating between the extraction and nonextraction of the retained primary molar. An option may involve the extraction of the retained primary molar with either prosthetic replacement or orthodontic space closure, eliminating the need for prosthetic intervention. Another option is to preserve the retained primary molar in situ. This may be the option of choice when the definitive treatment plan does not involve space closure, but instead space maintenance is desired.

Because of the alveolar bone growth known to occur in association with natural dentition, it is vital that the primary tooth is retained as long as possible. It has been demonstrated that retaining intact primary second molars in the absence of permanent successors can be a reasonable alternative for space maintenance. A significant delay on the exfoliation times of primary retained teeth has been demonstrated in agenesis of the permanent successor.[9] A study demonstrated unaltered degree of root resorption in 20 of the 26 primary second molars over a 15-year period and retention rates of the primary teeth up to 15 years beyond normal exfoliation times.[10] Other studies have shown that most retained primary molars can be maintained until adult age without significant exfoliation.[8,11]

The available evidence appears to suggest that retaining intact primary molars may not only represent a conservative approach to the transitional space maintenance, but it may also play a significant role in the preservation of alveolar bone. The present report describes the use of direct resin composite restorations for the transitional rehabilitation of infra-occluded primary second molars in a young patient with incomplete skeletal growth. Furthermore, the case describes the use of a clear vinyl-(poly-siloxane) matrix to facilitate placement and finishing of the large composite restorations.

CASE REPORT

A healthy 13-year-old Asian female patient was referred to the College of Dentistry for treatment of her infra-occluded primary mandibular second molars. Her chief complaints were food impaction in the area of the retained primary molars and dissatisfaction with the small appearance of her teeth. Medical history was unremarkable. Clinical examination revealed Class II Angle molar relationship, division 1 malocclusion with a 9-mm overjet, deep bite, and slight crowding especially in the maxillary arch. Retained infra-occluded primary mandibular second molars were present, sound and asymptomatic except from the presence of occlusal caries in both teeth K and T. The submergence of the primary molars relative to the adjacent teeth with the subsequent compromised cleansing of the area had led to the development of occlusal caries. The right molar showed moderate submergence and the left molar severe submergence relative to the occlusal plane. A simple classification by Brearley and Mc Kibben describes "Moderate infra-occlusion" to an occlusal surface that approximates the contact point with the adjacent teeth, and "Severe infra-occlusion" to an occlusal surface located below the level of the contact point with the adjacent teeth.[12] Figure 1A,B shows the preoperative clinical pictures of the patient. There was no evidence of active caries or existing restorations in other areas of the mouth except from the presence of sealants on the permanent first molars. All permanent teeth were present in the oral cavity except from the third molars. The patient exhibited excellent oral hygiene and no signs of gingivitis. Radiographic evaluation evidenced bilateral agenesis of the mandibular second premolars, with no significant root resorption of the retained primary mandibular second molars (Figure 2).

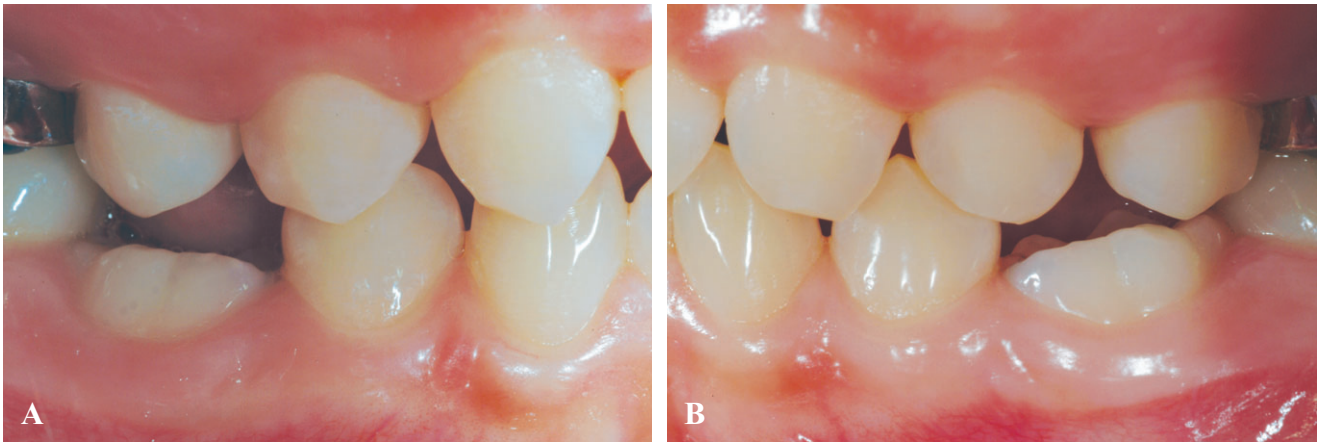

Figure 1. A, *Lateral view of left mandibular second primary molar with severe infra-occlusion.* B, *Lateral view of right mandibular second primary molar with moderate infra-occlusion.*

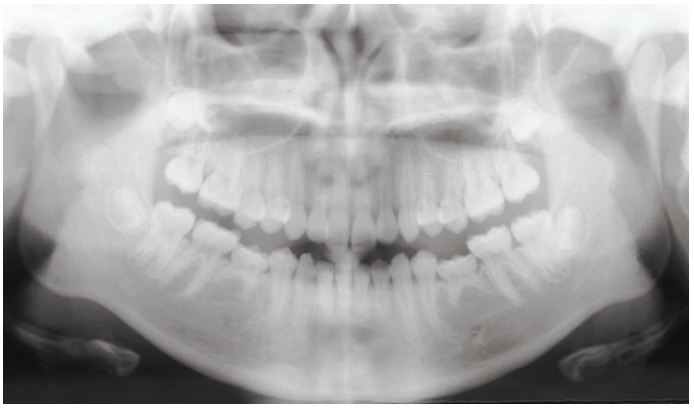

Figure 2. Orthopantomogram showing the retained infra-occluded primary molars with agenesis of the permanent successors.

A comprehensive caries risk assessment was completed during treatment planning. This assessment placed the patient in a "Low risk" category based on dietary habits, oral hygiene, and past dental history. Diagnostic impressions were made with irreversible hydrocolloid (Jeltrate Alginate, Dentsply Intl., York, PA, USA) and casts were mounted in a semi-adjustable articulator (Hanau, Teledyne, Colorado Springs, CO, USA) for analysis of the space available and existing inter-occlusal relations. A diagnostic wax-up was completed (Figure 3).

The following treatment goals were identified: (1) maintenance of arch length; (2) establishment of an occlusal plane for function and prevention of antagonist teeth supra-eruption; (3) preservation of alveolar bone support at the site; and (4) removal of occlusal caries and protection of noncleansable occlusal surface of retained deciduous molars. Treatment options fluctuated between the extraction and nonextraction of the retained primary molars and included: (1) extraction with prosthetic replacement by implant supported crowns, fixed partial dentures, or removable denture; (2) extraction with orthodontic space closure, eliminating further need for prosthetic rehabilitation; and (3) preservation of the retained primary molars in situ for the transitional rehabilitation until completion of growth would allow reevaluation.

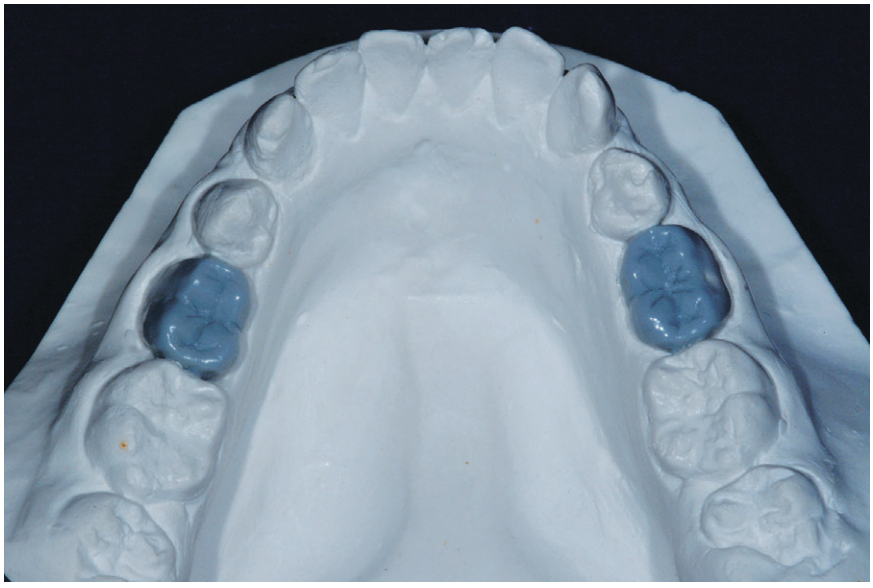

Figure 3. Diagnostic wax-up of the case.

After evaluation by the restorative dentist and orthodontist and based on the age and antero-posterior skeletal and dental relations of the patient, as well as the integrity of the crown and root of the retained molars, it was decided that the most conservative treatment approach was to preserve the primary teeth in situ, as this option would provide the space maintenance necessary while preserving alveolar bone support in the area. Following restorative procedures, fixed orthodontic appliances would be placed for the treatment of the Class II malocclusion. Future reevaluation after completion of growth and orthodontic therapy will evidence whether or not extraction of the retained teeth and replacement with implant supported crowns is indicated, or if maintaining the retained primary molars longer than anticipated is a feasible option in the absence of a natural exfoliation process.

Restorative Procedures

A clear silicon quick-set vinyl-(poly-siloxane) impression material (Affinity Crystal Clear, Clinician's Choice, New Milford, CT, USA) was used to make sectional impressions of the waxed teeth. Its enhanced flowability allowed excellent replication of the embrasure areas critical for accuracy of the final restorations. A rubber dam with dental floss ligatures was applied. Both teeth K and T were prepared and restored following the same procedures. The restoration of tooth T was completed first. Carious lesions on the occlusal aspect of both teeth K and T were removed. The preparation of the deciduous teeth involved only the recontouring of the marginal ridges for an improved emergence profile of the final restorations. Air particle abrasion with Al_2O_3 and nonfluoridated pumice in a rubber cup were used to roughen the occlusal surface and to remove plaque and debris. A 37.5% phosphoric acid (Gel etchant, Kerr Corporation, Orange, CA, USA) was applied, rinsed, and dried followed by a three-step etch-and-rinse adhesive system (Optibond FL, Kerr Corporation), which was applied and polymerized according to manufacturer's instructions with an LED light-curing unit.

The clear sectional matrix, which had been previously sectioned longitudinally in a mesio-distal direction, was filled with microhybrid composite (Filtek Supreme Plus, 3M ESPE, St. Paul, MN, USA) shade A2 in the area corresponding to the buccal wall first (Figure 4). By having individual buccal and lingual matrices, greater control over each of the composite layers was allowed. It has been reported that the success of this technique depends to a great extent on the application of only an adequate amount of composite material to the matrix so that overhangs and/or

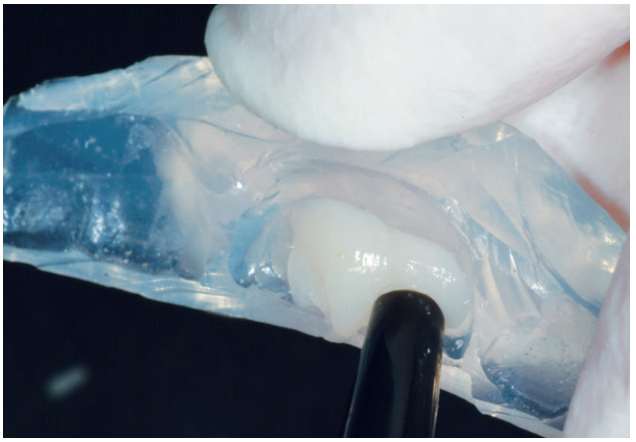

Figure 4. Application of resin composite material to the buccal aspect of clear matrix.

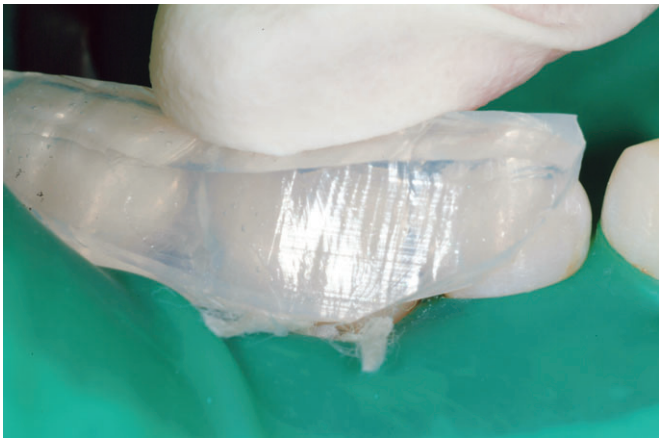

Figure 5. Clear vinyl-(poly-siloxane) matrix held in position through slight digital pressure.

voids at the cervical margins of the restoration can be avoided.[13]

The buccal sectional matrix was filled with composite, carefully seated in place, and stabilized in position against the tooth coated with adhesive through slight digital pressure (Figure 5). With the matrix in place, the uncured composite paste was thinned to the desired thickness against the buccal matrix from a lingual open access. This allowed only the right amount of composite to be polymerized. The light-curing unit was activated to shine through the matrix from the buccal aspect for 10 seconds and then directly from the lingual aspect for 20 additional seconds. Upon removal of the matrix, a thin buccal shell of composite, free of overhangs or voids at the cervical margins, was obtained (Figure 6), considerably minimizing subsequent finishing procedures. The fabrication of a lingual composite shell followed the same procedures as the aforementioned for the buccal shell (Figure 7). A circumferential matrix was stabilized in place and the restoration built by the incremental layering of composite (Figure 8). The composite crowns were contoured with finishing discs (SofLex XT, 3M ESPE) and different shapes of carbide burs for placement of anatomical features. Occlusion was evaluated and adjusted. A #12 scalpel blade was used for the removal of gingival flash and interproximal strips (Epitex, GC America, Alsip, IL, USA) were used to polish interproximally. Diamond impregnated polishing cups and points (Diacomp polishing kit, Brasseler, Savannah, GA, USA) were used for polishing the restorations. The final restorations exhibited not only acceptable esthetics but also the space maintenance necessary to prevent the drifting of adjacent teeth and extrusion of antagonist teeth (Figure 9A,B). Restorations in both teeth K and T exhibited a compromised emergence profile given their submergence relative to the occlusal plane.

Orthodontic fixed appliances were placed after the restorations were completed for the treatment of Class II Angle molar relationship and other related issues. Future reassessment is required after the completion of growth and orthodontic therapy to determine a definitive course of action that may include the extraction of the primary molars with placement of implant-supported crowns; or on the contrary, the completed restorations, initially intended for the transitional rehabilitation and space maintenance, may be able to remain in clinical function longer

Figure 6. Buccal shell of composite. Note the absence of voids or overhangs at the cervical margin.

Figure 7. Buccal and lingual shell of composite prior to placement of a circumferential matrix for subsequent incremental layering techniques.

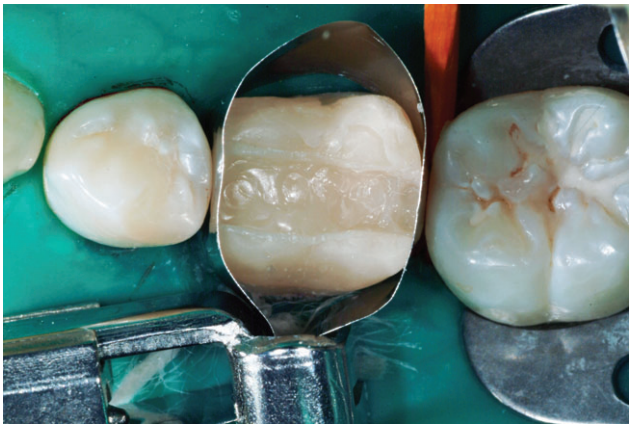

Figure 8. Incremental layering of composite with a circumferential matrix in place.

than anticipated, delaying implant placement. Outstanding oral hygiene must be maintained and the teeth must remain stable with no mobility or signs of exfoliation for this to be a viable option.

Strong emphasis was placed on the importance of maintaining an adequate oral hygiene for the integrity and longevity of the restorations. The patient was instructed on a home care regimen, including an adequate toothbrushing technique as well as the thorough flossing of the area to minimize local plaque accumulation. Initial recall visit at 3 months from the restorations placement showed excellent maintenance from the patient. Subsequent periodic recall visits took place every 6 months for the evaluation of the integrity of the restorations and surrounding structures. Three and a half years after placement, clinical and radiographic evaluations revealed that the restorations were still intact.

DISCUSSION

A combined approach to diagnosis from the restorative dentist and the orthodontist was critical for the successful treatment planning and outcome of the case described in the present report. A number of factors were considered in the treatment planning of this patient. Different options were considered for the treatment of her infra-occluded primary molars, including extraction to achieve space closure, prosthetic replacement, or retention of the primary

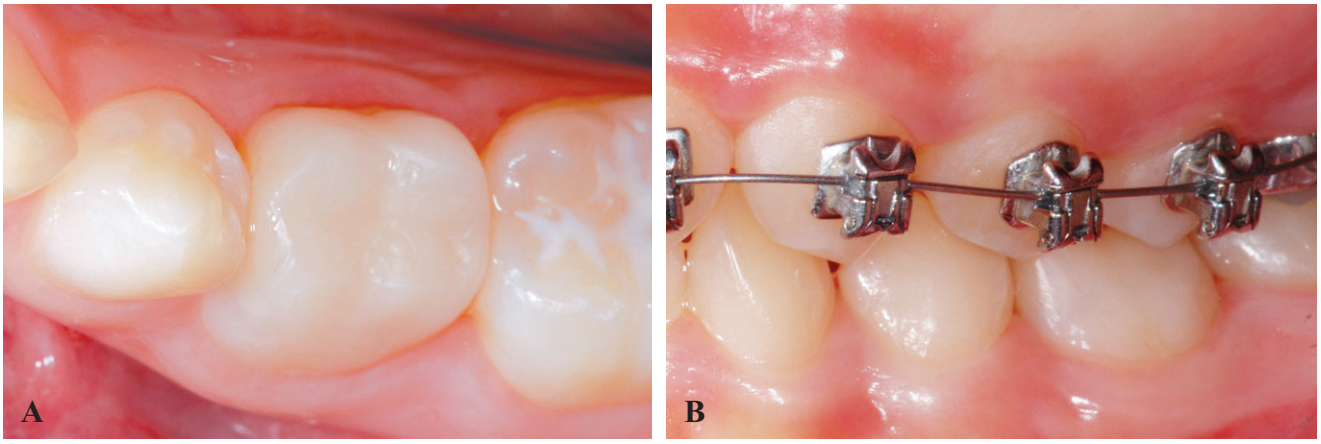

Figure 9. A, *Occlusal view of the final restoration on the right mandibular second primary molar prior to final polish.* B, *Lateral view of the final restoration on the right mandibular second primary molar prior to final polish.*

tooth in situ for space maintenance. The placement of fixed prosthesis or implants was not a feasible option because of the patient's age as well as the potential interference with further growth of the alveolar process.[14,15] For a young patient with incomplete skeletal growth such as the one described in this report, timing was a critical factor. Maintenance of the retained infra-occluded primary teeth in situ was deemed the most conservative approach to the transitional treatment, as this option also offered the advantage of preservation of alveolar bone support. A good long-term survival has been demonstrated for primary molars, and it can be expected to be more than 90% in subjects with agenesis of mandibular second premolars.[16]

Other instances, however, may dictate that the primary retained molars be extracted. For example, if the tooth appears ankylosed and the patient is still undergoing facial height growth, as in ages younger than 12, the tooth should perhaps be recommended for extraction. Maintaining it in situ may lead to a vertical alveolar defect because of continued growth of the adjacent teeth.

The restoration of retained infra-occluded primary molars to the occlusal plane, especially in cases of severe infra-occlusion such as the one described in this report, represents a challenge. Direct and indirect restorative approaches have been proposed. In the present report, a direct approach to the restoration of the deciduous molars was possible through the use of an alternative technique with a clear vinyl-(polysiloxane) matrix that significantly facilitated the layering of composite as well as minimizing subsequent finishing procedures by allowing a more accurate replication of the anatomical contours. The technique, which can be used in a number of different situations, has been previously reported to increase the speed and efficiency of the restorative procedures as well as minimize the amount of excess resin that needs to be removed at a later stage, thereby reducing the risk of overcontouring or undercontouring the final restorations.[17] No overhangs or voids at the cervical margins were evidenced upon removal of the matrix, corroborating the value of the technique in the application of only the adequate amount of composite material.

The final restorations showed acceptable esthetics. However, final overall esthetics in cases of

infra-occlusion is often less than ideal because of the compromised emergence profile of the retained teeth. Additionally, achieving a high degree of esthetics is not the ultimate goal in the treatment of compromised cases such as the one described in this report. Instead, the maintenance of arch length while preserving alveolar bone support is a true determinant of treatment success. At age 16, three and a half years after placement of the restorations, recall examination revealed restorations with adequate function, esthetics, and retention. Exceptional oral hygiene from the patient significantly contributed to the success of treatment.

CONCLUSIONS

The preservation of retained infra-occluded primary molars in situ represents a conservative alternative to the transitional rehabilitation of a young patient with incomplete skeletal growth, as both space maintenance and preservation of alveolar bone can be achieved. The restoration of infra-occluded molars with direct composite restorations is possible if techniques such as the use of a clear vinyl-(poly-siloxane) matrix can be used to facilitate the placement of the large composite restorations.

DISCLOSURE

The authors do not have any financial interest in the companies whose materials are included in this article.

REFERENCES

1. Darling AI, Levers BG. Submerged human deciduous molars and alkylosis. Arch Oral Biol 1973;18:1021–40.
2. Biederman W. Incidence and etiology of tooth ankylosis. Am J Orthodont 1956;42:921–6.
3. Kurol J. Infraocclusion of primary molars: an epidemiologic and familial study. Community Dent Oral Epidemiol 1981;9(2):94–102.
4. Bjerklin K, Kurol J, Valentin J. Ectopic eruption of maxillary first permanent molars and association with other tooth and developmental disturbances. Eur J Orthod 1992;14(5):369–75.
5. Baccetti T. A controlled study of associated dental anomalies. Angle Orthod 1998;68(3):267–74.
6. Bergström K. An orthopantomographic study of hypodontia, supernumeraries and other anomalies in school children between the ages of 8–9 years. Swed Dent J 1977;1:145–57.
7. Albers DA. Alkylosis of teeth in the developing dentition. Quintessence Int 1986;17:303–8.
8. Rune B, Sarnäs KV. Root resorption and submergence in retained deciduous second molars. A mixed-longitudinal study of 77 children with developmental absence of second premolars. Eur J Orthod 1984;6(2):123–31.
9. Kurol J, Tilander B. Infraocclusion of primary molars with aplasia of the permanent successor. A longitudinal study. Angle Orthod 1984;54:283–94.
10. Ith-Hansen K, Kjaer I. Persistence of deciduous molars in subjects with agenesis of the second premolars. Eur J Orthod 2000;22:239–43.
11. Bjerklin K, Bennett J. The long-term survival of lower second primary molars in subjects with agenesis of the premolars. Eur J Orthod 2000;22(3):245–55.
12. Brearley LJ, Mc Kibben DH. Anlylosis of primary molar teeth 1. Prevalence and characteristics. J Dent Child 1973;40(1):54–63.
13. Sabatini C, Guzman-Armstrong S. A conservative treatment for Amelogenesis imperfecta with direct resin composite restorations: a case report. J Esthet Restor Dent 2009;21(3):161–70.
14. Odman J, Grondahl K, Lekholm U, Thilander B. The effect of osseointegrated implants on the dento-alveolar development. A clinical and radiographic study in growing pigs. Eur J Orthod 1991;13(4):279–86.
15. Zuccati G. Implant therapy in cases of agenesis. J Clin Orthod 1993;27(7):369–73.
16. Bjerklin K, Al-Najjar M, Karestedt H, Andren A. Agenesis of mandibular second premolars with retained primary molars. A longitudinal radiographic study of 99 subjects from 12 years of age to adulthood. Eur J Orthod 2008;30(3):254–61.
17. Baratieri N, Monteiro JS, Correa M, Ritter AV. Posterior resin composite restorations: A new technique. Quintessence Int 1996;27(11):733–8.

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