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Esthetic considerations for reshaping of autotransplanted premolars replacing maxillary central incisors: a case report

CASE REPORT

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Abstract – Autotransplantation is a safe and currently common procedure in cases of agenesis and tooth loss. Autotransplantation of premolars to replace missing maxillary central incisors has been shown to be an excellent treatment choice, especially in young patients in the 9–12-year-old age range. The choice for adequate restorative materials and techniques is also essential, direct composite resin being indicated in most cases. This paper reports the case of two premolars autotransplanted to replace both maxillary central incisors and addresses the esthetic issues involved in the reshaping of these teeth to incisor morphology.

Autogenous tooth transplantation or dental autotransplantation is defined as the transplantation of impacted or erupted teeth from their original sites into extraction sockets or surgically prepared recipient sites in the same individual (1). Autotransplantation is currently a common procedure in dentistry for replacing missing teeth when suitable donor teeth are available, and is generally indicated in cases of dental agenesis, non-treatable root fractures, and prematurely lost teeth from trauma, caries or periodontal disease. This procedure is of particular interest for children and adolescents with developing alveolar bone for whom implants and other prosthetic rehabilitations are usually contraindicated (2). Autotransplanted teeth have a lower risk of ankylosis during periodontal healing and allow for the maintenance of alveolar bone growth (3). Immature teeth have the best prognosis for autotransplantation because they have a greater chance of pulp and periodontal ligament regeneration (4).

In some cases, the transplanted tooth should be reshaped to reproduce the size, shape and color of the missing tooth and match the morphological features of the natural, contralateral and adjacent teeth. Due to their excellent potential to reestablish esthetics, acceptable longevity, possible use in minimally invasive preparations and lower cost, direct composite resin fillings have had an increasingly broader indication than indirect restorations.

Analysis of proportion, symmetry, alignment, shape, size, color and surface texture is extremely important in dental restorations, especially regarding the appearance of a transplanted reshaped tooth. Knowledge and perception of esthetic principles associated with good skills are mandatory for successful reshaping (5–7). This paper reports the case of two premolars that were autotransplanted to replace both maxillary central incisors and addresses the esthetic issues involved in the reshaping of these teeth to incisor morphology.

Case report

An 11-year-old female patient came to the Integrated Clinic of the Dental School of the Federal University of Ceará, Brazil, seeking for an esthetic solution for her autotransplanted premolars. In clinical interview, the patient reported that she had lost both maxillary central

incisors in a car accident at the age of seven. According to the patient, she had the maxillary first premolars autotransplanted to the region of the missing maxillary incisors some time later when the donor teeth had 2/3 of root formation.

Autotransplantation appeared successful clinically. The gingival tissue had a normal pattern with pale pink color, firm texture, tight adherence to the teeth, formation of interdental papilla and absence of mobility (Figs 1 and 2). Radiographically, it was observed full root development, formation of new periodontal ligament attachment and root canal obliteration in both premolars. Endodontic treatment was not necessary (Fig. 3).

Considering the clinical and radiographic findings and the patient's age, a choice was made for reshaping of the autotransplanted premolars with minimal reduction of enamel and direct composite resin build-up. This minimally invasive treatment approach aimed to provide provisional restorations that could be easily adjusted during eruption of the other teeth and during the course of the subsequent orthodontic treatment. Future orthodontic treatment will correct the position of the teeth and improve the periodontal tissue level, which will decrease the accentuated gingival crowing on the buccal surface.

Fig. 1. Frontal view of the patient smile.

Fig. 2. Occlusal view of the maxillary premolars transplanted to replace the missing maxillary central incisors.

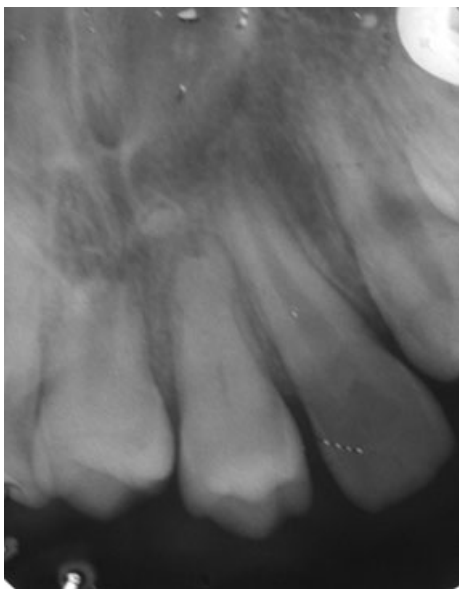

Fig. 3. Preoperative periapical radiograph.

The decision on the most indicated definitive prosthetic treatment can be made in a later moment.

Impressions of region of the transplanted teeth were made and plaster models were obtained for planning of reshaping. Diagnostic wax-up was made with a condensation silicone impression material (Silon 2 APS; Dentsply Ind. e Com. Ltda., Petrópolis, RJ, Brazil; heavy body) to provide a natural-looking three-dimensional representation of the final case, considering the relations of symmetry, proportionality, alignment and balance. The golden proportion principles were applied by the Levin's phi dental grid, which states that the visible area of a tooth should be equal to 61.8% of the visible area of the previous tooth. Plato's concept that tooth width should be 73.2% of tooth height was also used.

In the first session, pumice/rubber cup prophylaxis was performed and the composite resin (Opallis; FGM, Joinville, SC, Brazil) shades were selected using the VITA scale. A3 was chosen for the cervical and middle thirds and A2 for the incisal edge. Effective relative isolation was obtained with the placement of a barrier made with TopDam® (FGM), a ready-to-use light-cured resin material supplied in a syringe for direct application as a gingival protector, spandex lip and cheek retractor, cotton rolls and saliva ejector. A 2-mm bevel was prepared with a water-cooled high speed diamond bur to increase the enamel bonding area and mask the resin-tooth interface. The accentuated angulation of the first premolar crown was reduced to reproduce the flatter buccal surface of central incisors (Fig. 4). After 37% phosphoric acid etching (Vigodent; Rio de Janeiro, RJ, Brazil) for 30 s and water rinsing for equal time, Single Bond adhesive system (3M/ESPE; St Paul, MN, USA) was applied to the beveled area according to the manufacturer's instructions.

Using the silicone guide adjusted to the teeth, the first composite resin layer (EA2) shade was placed on the palatal surface and adapted to tooth surface. Reshaping

Fig. 4. Preparation of the 2 mm bevel on enamel surface.

continued with building of the dentinal lobules using DA3 shade in the middle third and DA2 in the incisal third approximately 1 mm short of the incisal edge. A small portion of OP shade was applied to reproduce the opaque incisal halo typical of the central incisors in children of this age (Fig. 5). The translucent appearance of the proximal and incisal surfaces was obtained using T-neutral shade. EA3 and EA2 shades were used in the middle and incisal thirds, respectively, to complete the restorations and define their final shape. A flat-bristle brush was used to add the resin increments and obtain a smooth surface, minimizing bubble entrapment and reproducing dental morphology as reliably as possible (Fig. 6). Each composite resin increment was light-cured for 40 s with a halogen light-curing unit (Dabi Atlante;

Fig. 5. Detail of the placement of the opaque composite resin (OP; opallis/FGM) during reshaping.

Fig. 6. Final aspect of the reshaped teeth.

Ribeirão Preto, SP, Brazil) following the manufacturer's instructions.

After reshaping, the occlusion was adjusted in maximum intercuspation to eliminate interferences and premature contacts. Composite resin excesses were removed with a #12 scalpel blade and interproximal finishing strips (Fig. 7). The incisal angles were rounded to reproduce the feminine and jovial characteristics of the patient's natural anterior teeth and incisal interdental spaces were created (8).

In the lingual surfaces we did not go through slices, for the infra-occlusion situation presented by the teeth. Later, during the orthodontic treatment, occlusion adjustment will be held, according to the need and restoration using composite resin in order to avoid pulp injury by the bacteria invasion.

After 1 week, the restorations were finished and polished with fine and ultra-fine diamond burs (KG

Fig. 7. Use of interproximal finishing strips.

Sorensen; São Paulo, SP, Brazil), fine-grain multi-bladed finishing burs and polishing disks (Diamondpro; FGM) felt disks (Diamond; FGM) and diamond polishing paste (Diamondexcel; FGM) to reproduce, as reliably as possible, the shape, texture and surface gloss of the natural teeth. The mesiodistal central groove of the transplanted premolars was sealed with a flowable composite resin (Vigodent) to reduce biofilm accumulation. A good esthetic result was obtained. The 6-month and 1 year follow-up showed maintenance of esthetics and adequate function of the transplanted/reshaped teeth and radiographic evidence of perirradicular health (Figs 8–10).

Discussion

Successful autotransplantation of premolars to replace missing teeth, especially maxillary central incisors, in growing individuals has been frequently documented (4, 7, 9, 10). In addition to being a predictable method with potential for bone induction and reestablishment of a normal alveolar process, it offers good esthetic results (4). In these cases, reshaping of the autotransplanted tooth is necessary. As far as esthetics is concerned, a number of characterization features must be considered on reshaping, since the transplanted tooth should reproduce the size, shape and color of the missing tooth and match the morphologic features of the natural, contralateral and adjacent teeth. The appearance of the surrounding periodontal tissues is also important.

Fig. 8. Periapical radiograph of the reshaped teeth after 6 months.

Fig. 9. Frontal view of the patient smile after 1 year.

Fig. 10. Clinical aspect of the reshaped teeth after 1 year.

The evolution of esthetic dentistry with the development of adhesive resin materials has widened the possibilities for minimally invasive dental procedures. The most conservative restorative treatments for changing the appearance of teeth include direct composite resin veneers and porcelain veneers. Porcelain veneers require minimal dental reduction of around 0.5 mm and present high color stability, retention rate and wear resistance, which make them the ultimate option for conservative restorative dentistry. However, porcelain veneers are relatively costly, require more than one clinical session to be completed, have a laboratorial phase and cannot be repaired (10).

This paper reports a case in which reshaping of transplanted teeth was performed using direct composite build-up. This technique has a number of advantages including lower cost, preservation of dental structure, shorter clinical time (no laboratorial phase is required) and possibility of subsequent repairs or adjustments, since the procedures are reversible (11). Therefore, tooth reshaping with composite resin requires a good knowledge of dental anatomy and age- and gender-related characteristics (12).

In the present case, the color of the teeth and the width of the crown in the cervical region were the most difficult characteristics to reproduce in the reshaping procedure. The mesiodistal width in the cervix of the maxillary central incisors ranges from 5.5 to 7.5 mm, while in premolars this dimension ranges from 3.5 to 6.5 mm (13). Therefore, composite filling in this region was done with caution without leaving material excess in order to obtain a cervical crown width compatible with that of a maxillary central incisor and a cervical interdental space that provided a good gingival contouring. The visible gingival crowing on the buccal surface resulting from bone level increase due to the position of the

premolar roots interfered with esthetics, but a still good result was obtained. The subsequent orthodontic treatment will correct the position of the teeth and improve the level of the periodontal tissues.

Conclusions

Autotransplantation with subsequent reshaping offers one of the fastest and most economically feasible means for replacing accidentally lost or congenitally missing teeth, especially in young patients. With proper case indication and a well-established interdisciplinary treatment plan involving different specialties, like pediatric dentistry, surgery, orthodontics, cosmetic restorative dentistry and prosthodontics, it is possible to obtain excellent esthetics and patient satisfaction.

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