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Bone augmentation and autogenous transplantation of premolar to the site of the fissure in a cleft palate patient

CASE REPORT

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Abstract – This article presents a case report of autogenous tooth transplantation to the site of the fissure, in addition to bone augmentation with graft of autogenous bone harvested from the iliac crest, performed in a cleft palate patient, who had insufficient bone volume. A non-syndromic 10-year-old girl, with a unilateral cleft lip and palate, incisal transforamen fissures, agenesis of the maxillary left central incisor and both maxillary lateral incisors, was treated with autogenous bone graft in the cleft area. The orthodontic treatment plan was to replace the missing lateral incisors with the maxillary canines and to extract the mandibular first premolars. One of the mandibular premolars was extracted from its site with 2/3 of its root formation completed and transplanted to the maxillary left central incisor area. After orthodontic treatment, the anatomic crowns were characterized with composite resin. Autogenous tooth transplantation can be performed in the area of the fissure in young cleft palate patients, by performing bone graft augmentation before transplantation of the tooth, to gain sufficient recipient alveolar bone volume. A multidisciplinary approach is mandatory for the success of this clinical procedure, especially in cleft palate patients.

Key words: permanent tooth; treatment; exarticulation; decidous

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Non-syndromic cleft lip and palate (NSCL/P) patients have a high rate of dental anomalies. Among these, tooth agenesis, supernumerary teeth, microdontia, fused teeth, ectopic eruption, giroversion, taurodontism, and enamel hypoplasia are the most common (1, 2). An epidemiologic study showed that Dental anomalies were identified in 39.9% of the NSCL/P patients, and tooth agenesis (47.5%), impacted teeth (13.1%), and microdontia (12.7%) were the most common anomalies (3). Furthermore, the severity of dental anomalies is directly related to the severity of the cleft (1, 2).

Several dental treatment plans may be prepared to restore the function of missing tooth structures and esthetic appearance of the cleft lip and palate patient. One of the treatment plans is to perform an autogenous tooth transplantation at the site of tooth agenesis. Literature has shown 90% success rate in cases of premolar transplantation after follow up of 269 transplants (4). As regards young patients, prosthetic options are very limited and transplantation may be the best treatment plan (5–8).

A successful treatment plan in autogenous tooth transplantation depends on periodontal ligament (PDL) and pulp healing (9). To maintain their viability, extraction should be performed with minimal mechanical force, and extraoral time of the tooth should be as short as possible to reduce damage to the

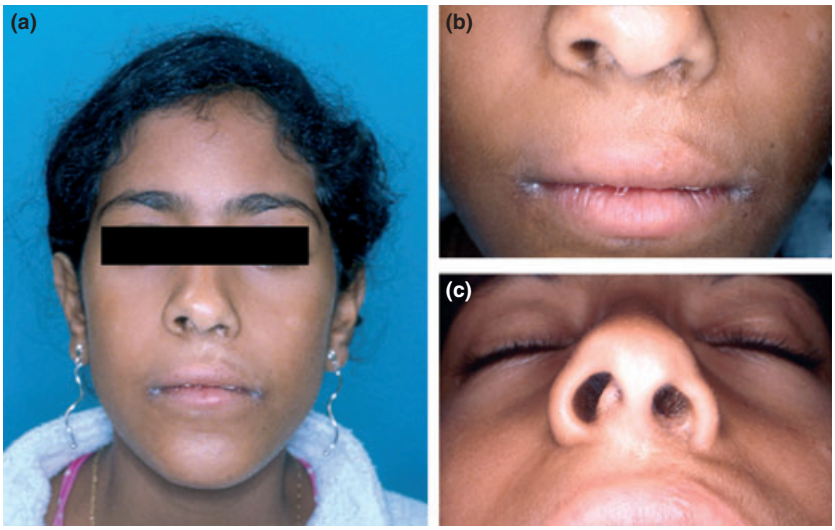

Fig. 1. Initial photography of the face of the patient with unilateral (left) cleft lip and palate, transforamen incisor.

Fig. 2. (a) Intraoral initial photography of the patient with unilateral (left) cleft lip and palate, transforamen incisor previously to the autogenous graft. (b) Intraoral photography of crowded lower teeth. (c) Intraoral photography after the secondary alveolar bone grafting surgery. (d) Frontal Intraoral photography after the secondary alveolar bone grafting surgery with mobile provisional prosthesis to replace upper left central incisor.

Fig. 3. Initial radiography.

PDL. The stage of root formation has strong influence on pulp healing (9). Andreasen et al. (10) found pulp healing in 95% and 15% of transplanted teeth with incomplete and complete root formation, respectively. Nevertheless, an adequate donor tooth and recipient bone volume are the primary requisites for successful autogenous transplantation.

Therefore, transplantation is generally contraindicated when there is insufficient recipient alveolar bone volume, such as in the area of the fissure in a cleft palate patient. However, secondary alveolar bone graft is a predictable treatment modality to correct bone defects in the cleft area and subsequently allows the placement of dental implants and autogenous tooth transplantation. There are few reports on the use of secondary alveolar bone grafting in cases of autogenous tooth transplantation. This article is a case report on autogenous tooth transplantation to the site of the fissure, with the use of a graft of autogenous bone harvested from the iliac crest, performed in a cleft palate patient, who had insufficient bone volume.

Case report

A non-syndromic 10-year-old girl, with a unilateral cleft lip and palate and incisal transforamen fissures, was attended at the Cranial Facial Anomalies Reha-

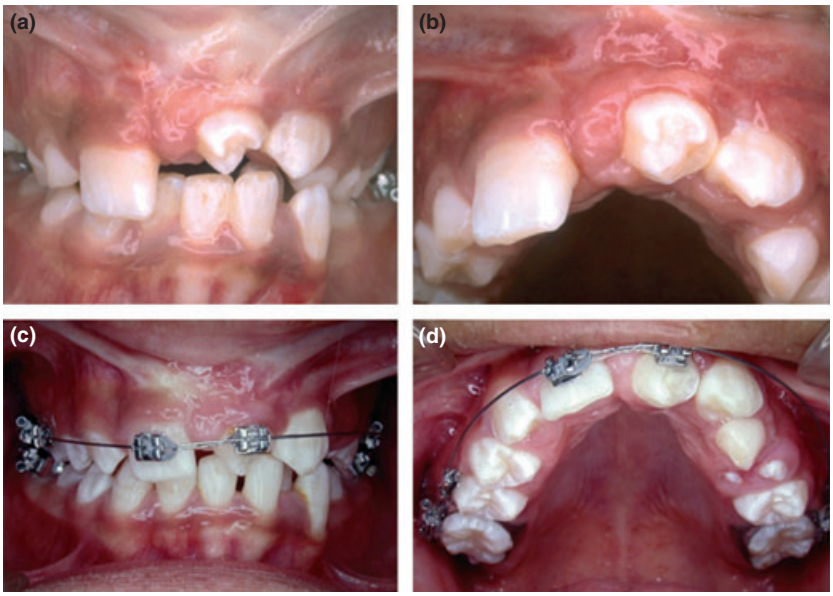

Fig. 4. (a, b) Premolar transplanted to the upper left central incisor. (c, d) Beginning of the orthodontic treatment to accomplish the torsioversion of the transplanted tooth.

bilitation Hospital of Bauru/SP/Brazil (Figs 1 and 2a, b). Clinical and radiographic examination showed agenesis of the maxillary left central incisor and both maxillary lateral incisors, presence of a supernumerary anomalous tooth with little periodontal support in the region of the maxillary left central incisor and presence of mandibular tooth crowding (Figs 2a, b and 3). The supernumerary anomalous tooth was extracted and secondary alveolar bone grafting surgery was performed to correct bone defect in the cleft area, which had insufficient recipient alveolar bone volume (Fig. 2c, d). An autogenous bone graft was harvested from the patient's iliac crest.

After a bone graft healing time of 6 months, surgery was performed to prepare a socket in the alveolar bone in the maxillary left central incisor region. After this, the mandibular left premolar was extracted from its site with 2/3 of its root formation completed and was transplanted to the maxillary left central incisor area in one-stage surgery (Fig. 4a, b). A semi-rigid splint was placed using orthodontic wire and brackets. Endodontic treatment of the transplanted tooth was performed after complete root formation 1 year later, because of the pain reported by the patient and also because of the extensive coronal wear required to transform the premolar into a central incisor. After

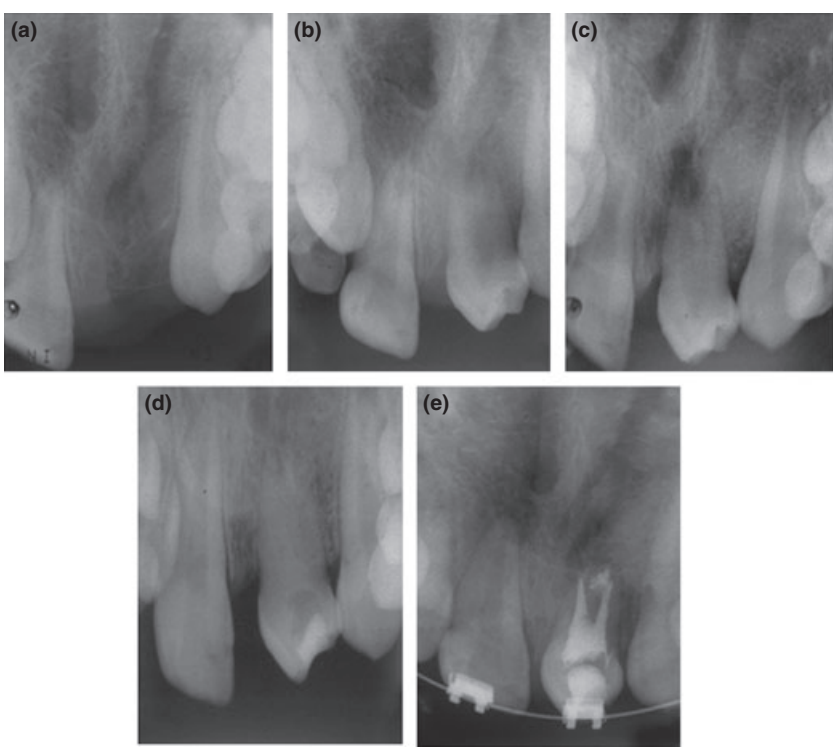

Fig. 5. (a) Radiography previously to the autotransplatation. (b) One month follow up of the autotransplated tooth. (c) Six months follow up of the autotransplated tooth. (d) Nine months follow up of the autotransplated tooth. (e) One year follow up of the autotransplated tooth.

this, orthodontic treatment began to perform torsiversion of the transplanted tooth, close diastemas in the maxillary arch, and alignment of mandibular tooth crowding (Figs 4c, d and 7a–f). During orthodontic treatment, the maxillary left deciduous canine moved to the place of the left permanent canine, while the left permanent canine was moved to the place of the missing left lateral incisor.

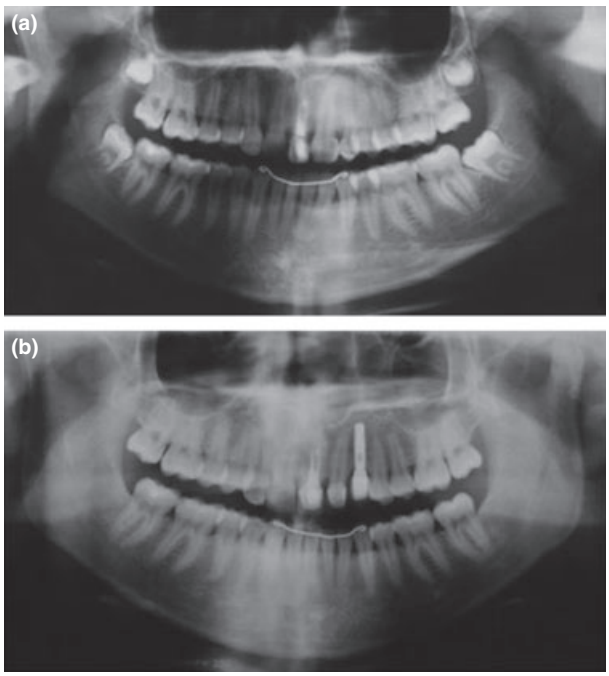

Fig. 6. (a) Final radiography with 1 years of follow up. (b) Final radiography with 5 years of follow up.

After orthodontic treatment, the anatomic crowns were characterized with composite resin. The transplanted tooth was characterized as a central incisor, canines as lateral incisors, and the maxillary right first premolar, as a canine. When the patient reached 18 years of age, the maxillary left deciduous canine was extracted and a titanium implant was placed. After 5 years of follow up, very satisfactory results were shown with regard to the esthetics and function of the transplanted tooth (Figs 5, 6, 7g–i and 8).

Discussion

The alveolar cleft is usually reconstructed at the stage of mixed dentition between 7 and 11 years of age (11). The aim of the reconstruction is to provide continuity and stabilization of the maxillary arch, bone support for the teeth adjacent to the cleft, bone support for unerupted teeth to allow their eruption, closure of the oronasal fistula, formation of a continuous alveolar ridge to facilitate orthodontic movement of teeth into the reconstructed cleft, to provide the floor of the nose and alar base to enhance nasal symmetry, and when necessary, osseointegration of dental implants (12) or

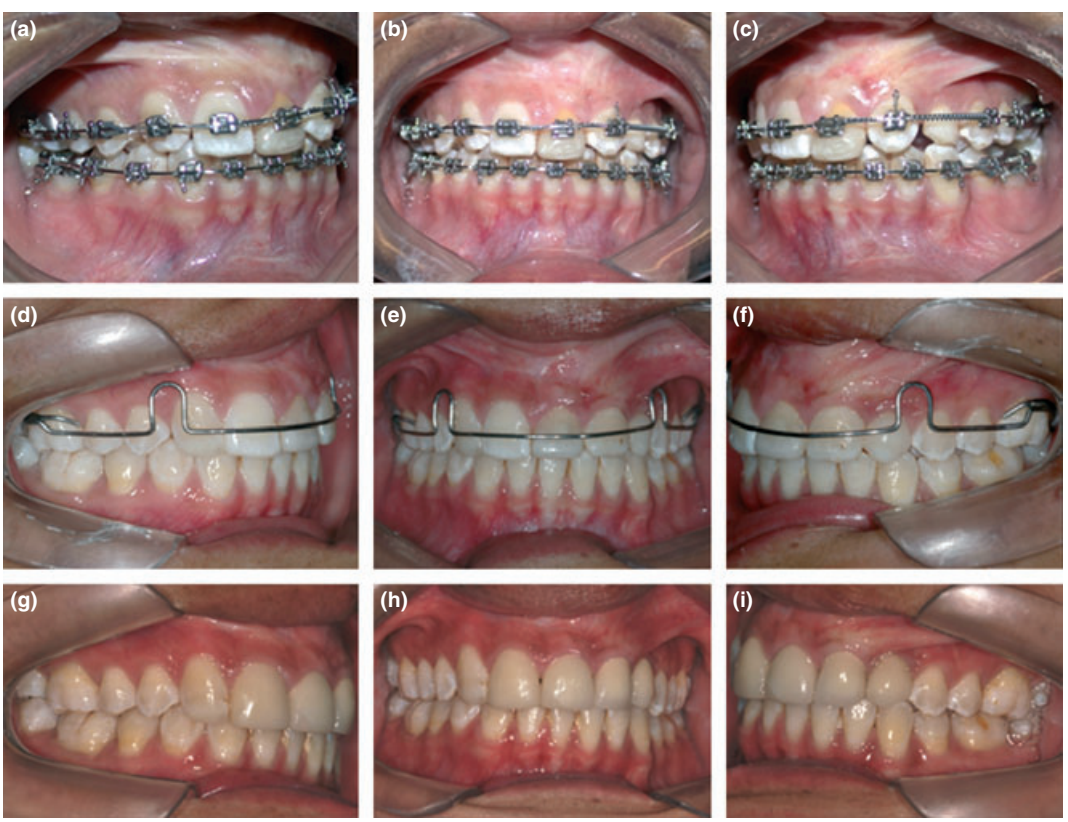

Fig. 7. (a–c) Photography in the begining of the orthodontic treatment. (d–f) Photography after orthodontic treatment with containment. (g–i) Five years follow-up.

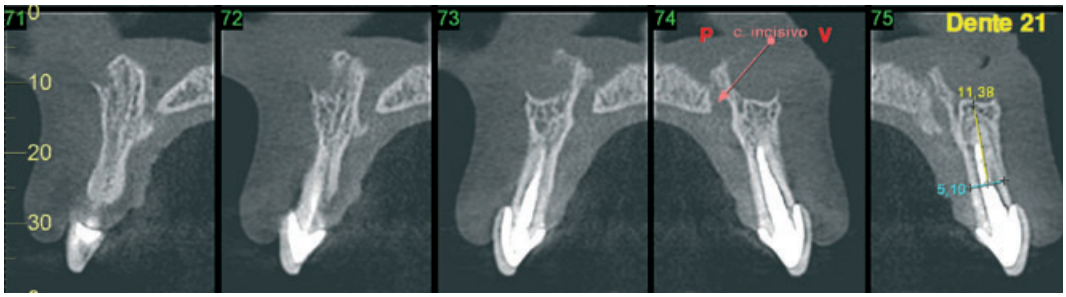

Fig. 8. Computed tomography: transaxial slices at 5 years follow-up of the autogenous tooth transplantation. Red narrow: incisive canal.

autogenous tooth transplantation. This procedure is considered a routine in cleft lip and palate rehabilitation.

Immediate tooth reimplantation is known to have good prognosis while autogenous tooth transplantation to recipient beds has shown high prevalence of root resorption (10). However, in young patients, autogenous tooth transplantation is successful by almost 100% in young patients. To reach success, authors (7, 13–17) have suggested that autogenous tooth transplantation should be performed in the sockets with regenerative tissues to improve nutrition and preserve cell activity and tissue viability, which may reduce tooth resorption. The regenerative tissues of a transplanted tooth with 2/3 of its root formation completed, contributed to the success of the clinical case presented herein. The one- and two-stage surgical technique in tooth transplantation is another controversial subject in the literature. However, studies that have compared the two techniques have shown no statistically significant difference between the results of periodontal regeneration and pulp revascularization (16, 17).

It would have been possible to place a titanium implant in the area of the missing tooth when the patient reached the end of growing stage. Considering the scarcity of prosthetic options to replace missing teeth in growing patients and the psychological factors affecting the patient, which should also be taken into consideration in cleft palate patient, the authors consider autogenous tooth transplantation a valid option to treat missing teeth in young patients. When tooth transplantation needs to be performed in the area of the cleft, secondary bone graft augmentation is mandatory.

The success of autogenous tooth transplantation will result in normal periodontal healing with normal proprioceptive function, which will allow the perception of natural chewing, natural biological responses (7, 13, 18) and behave normally in response to orthodontic treatment (5, 19). Moreover, autogenous transplantation will allow continuation of alveolar bone development, especially in young patients, by avoiding alveolar bone resorption (20).

Conclusion

Autogenous transplantation can be performed in the area of the fissure in young cleft palate patients, by performing secondary bone graft augmentation before autogenous transplantation to gain sufficient recipient alveolar bone volume. Key factor for success is always viable PDL of donor teeth and related little in recipient conditions. A multidisciplinary approach is mandatory for the success of the clinical procedure, especially with regard to cleft palate patients.

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