

Orthodontic Closure of a Midline Diastema with an Infrabony Defect

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A maxillary midline diastema is a common esthetic problem, with a reported incidence of 5-20% in adults.^{1,2} A significant midline diastema is frequently associated with an alveolar bone defect, an interproximal soft-tissue defect, or both.^{3,4} To prevent further gingival recession, root exposure, and potential tooth loss, bone substitutes are often grafted,^{5,6} and orthodontic treatment is

usually required to close the space.

In such a case, the orthodontist must be concerned about whether the bone substitute or the new bone formed in the grafted area will be lost after the diastema is closed. The approach presented here can be used to correct a midline diastema with an infrabony defect using short-term force application.



Fig. 1 22-year-old female patient with 5mm maxillary midline diastema before treatment.

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Case Report

A 22-year-old female visited our orthodontic clinic for closure of her maxillary midline diastema (Fig. 1). The space was nearly 5mm wide, and the interproximal soft tissue was detached from the mesial aspect of the right central incisor.

According to the patient, the midline diastema had first appeared six years earlier and had worsened over time. One year before presenting at our clinic, she had visited a periodontist; records taken in that office showed that the upper right central incisor was tipped labially, with a probing depth of 5-7mm on the mesial side. Radiographs had revealed interproximal bone loss with a vertical defect in the mesial aspect of the right central incisor (Fig. 2A). The periodontist had implanted Bio-Oss Collagen* in the infrabony pocket (Figs. 2B,C). By the time the patient presented for treatment to close the midline diastema, new bone had formed in the pocket, and the mesial probing depth had been reduced to about

3mm (Fig. 2D).

Establishment of interproximal support through closure of the diastema was indicated to prevent alveolar bone loss, but we could not predict whether the new bone would be absorbed during orthodontic tooth movement. Our treatment plan was designed to minimize the period of force delivery to the upper right central incisor.

Initially, brackets and bands were placed on all teeth in both arches except for the upper right central incisor. After about seven months of leveling, we bonded the upper right central incisor and began retraction of the upper incisors to close the diastema. Use of the Bioprogressive technique⁷ limited active treatment time for the right central incisor to only five months; total treatment time was 11 months (Fig. 3). After three months of fixed retention, we delivered a removable retainer.

The patient's diastema was successfully

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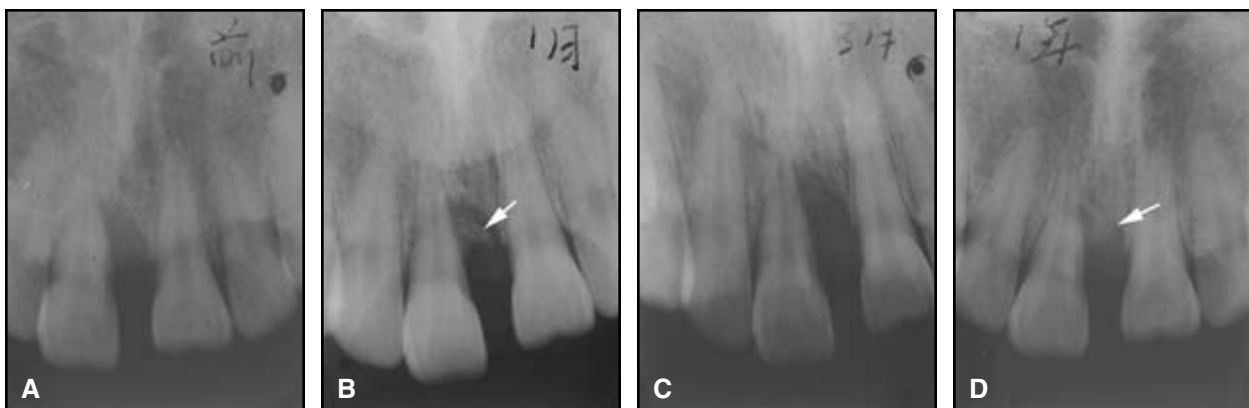


Fig. 2 Periapical radiographs taken before and after periodontal bone-substitute implantation. **A.** Before implantation. **B.** One month after implantation, showing bone-substitute material (arrow). **C.** Three months after implantation, showing implanted material being absorbed. **D.** One year after implantation, showing new bone formation (arrow).

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closed, and the interproximal soft tissue was restored, with a mesial probing depth of about 2mm at the upper right central incisor. Periapical radiographs taken during and after treatment and one year post-treatment showed no significant loss of the new bone (Fig. 4).

Discussion

A multidisciplinary approach is required in a patient with a substantial midline diastema and infrabony defect.^{4,5,8} Repair of the infrabony defect with a grafting material such as Bio-Oss Collagen is often the first step,^{5,9} followed by orthodontic

space closure. Bio-Oss Collagen contains the same grafting material as Bio-Oss—deproteinized, sterilized bovine bone—but includes 10% purified porcine collagen to make the material more pliable and easier to mold.

The forces used to close the midline diastema will exert pressure on the new bone. Few clinical studies have assessed whether the bone substitute or the new bone formed in the infrabony pocket is absorbed during tooth movement. In this patient, the new bone was still intact after active treatment, suggesting that grafting materials and regenerated new bone can indeed withstand orthodontic correction of a midline diastema.



Fig. 3 Patient after 11 months of orthodontic treatment.

REFERENCES

1. Richardson, E.R.; Malhotra, S.K.; Henry, M.; Little, R.G.; and Coleman, H.T.: Biracial study of the maxillary midline diastema, *Angle Orthod.* 43:438-443, 1973.
2. McVay, T.J. and Latta, G.J. Jr.: Incidence of the maxillary midline diastema in adults, *J. Prosth. Dent.* 52:809-811, 1984.
3. Tarnow, D.P.; Magner, A.W.; and Fletcher, P.: The effect of the distance from the contact point to the crest of bone on the presence or absence of the interproximal dental papilla, *J. Periodontol.* 63:995-996, 1992.
4. Cardaropoli, D.; Re, S.; Corrente, G.; and Abundo, R.: Reconstruction of the maxillary midline papilla following a combined orthodontic-periodontic treatment in adult periodontal patients, *J. Clin. Periodontol.* 31:79-84, 2004.
5. Cardaropoli, D.; Re, S.; Manuzzi, W.; Gaveglione, L.; and Cardaropoli, G.: Bio-Oss Collagen and orthodontic movement for the treatment of infrabony defects in the esthetic zone, *Int. J. Period. Restor. Dent.* 26:553-559, 2006.
6. Cardaropoli, D. and Re, S.: Interdental papilla augmentation procedure following orthodontic treatment in a periodontal patient, *J. Periodontol.* 76:655-661, 2005.
7. Ricketts, R.M.: Bioprogressive therapy as an answer to orthodontic needs, Part II, *Am. J. Orthod.* 70:359-397, 1976.
8. Cortellini, P.; Prato, G.P.; and Tonetti, M.S.: The simplified papilla preservation flap: A novel surgical approach for the management of soft tissues in regenerative procedures, *Int. J. Period. Restor. Dent.* 19:589-599, 1999.
9. Benke, D.; Olah, A.; and Möhler, H.: Protein-chemical analysis of Bio-Oss bone substitute and evidence on its carbonate content, *Biomater.* 22:1005-1012, 2001.



Fig. 4 A. After seven months of leveling in maxillary arch, excluding right central incisor. B. Just before removal of fixed appliances. C. One year after debonding, showing no significant loss of new bone material.