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Molar protraction into a severely destructed extraction site augmented with deproteinized bovine-bone mineral (DBBM) - a case report

KEYWORDS

Molar protraction;
Space closure;
Xenograft;
Guided bone
regeneration

Alveolar ridge atrophy always occurs after extraction, and moving the teeth into a large atrophic alveolar ridge by orthodontic method is time consuming.¹ Complete space closure is often impeded by the thick invaginated cortical bone, and the end result may be complicated by gingival recession or bone dehiscence of the adjacent teeth.²

This 11-year-old girl with her left mandibular first molar being extracted at a private dental clinic due to caries was referred to our hospital for closure of the extraction space (Fig. 1A). Her occlusion was complete Class II malocclusion with a 7 mm overjet and 6 mm deep overbite. Besides the missing left mandibular first molar, she also had a congenitally missing of the right mandibular lateral incisor and a 2.5 mm of the mandibular dental midline shift towards the right side (Fig. 1B and C). The initial panoramic radiograph showed that the left mandibular first molar was missing and the alveolar ridge was low (Fig. 1D). Thus, the treatment plan was extraction of the bilateral maxillary first bicuspids for retraction of the maxillary anterior teeth. After the mandibular dental midline was corrected, we planned to close the remaining space by protraction of the left mandibular second molar mesially. In addition, the right mandibular canine was reshaped to mimic and substitute for the right mandibular lateral incisor.

Guided bone regeneration (GBR) for the atrophic alveolar ridge was performed at the missing left mandibular first molar area before protraction of the left mandibular second molar began. Small Geistlich Bio-Oss® granules (deproteinized bovine-bone mineral, DBBM, Geistlich AG, Wolhusen Switzerland) and a Lyoplast® bioresorbable membrane (B Braun, Aesculap AG, Tuttlingen, Germany) were used for the GBR surgery (Fig. 1E and F). The fixed Class II corrector (Ormco bite fixer, Glendora, CA, USA) was placed one month after surgery (Fig. 1G) for the mandibular growth modification and to assist protraction of the left mandibular second molar mesially. The fixed Class II corrector was removed five months later as the 7 mm overjet had been reduced to an edge to edge relationship. Complete space closure (Fig. 1H and I) was attained in eight months without jeopardizing the periodontium (Fig. 1J). The cone-beam computerized tomography (CBCT) taken nine months after surgery showed abundant bone coverage on the buccal side of the left mandibular second molar at the cervical third level (Fig. 1K). The lateral cephalometric superimposition showed 10 mm of the left mandibular second molar protraction (Fig. 1L).

Choosing an appropriate bone grafting material for orthodontic treatment is important for this type of surgery.³

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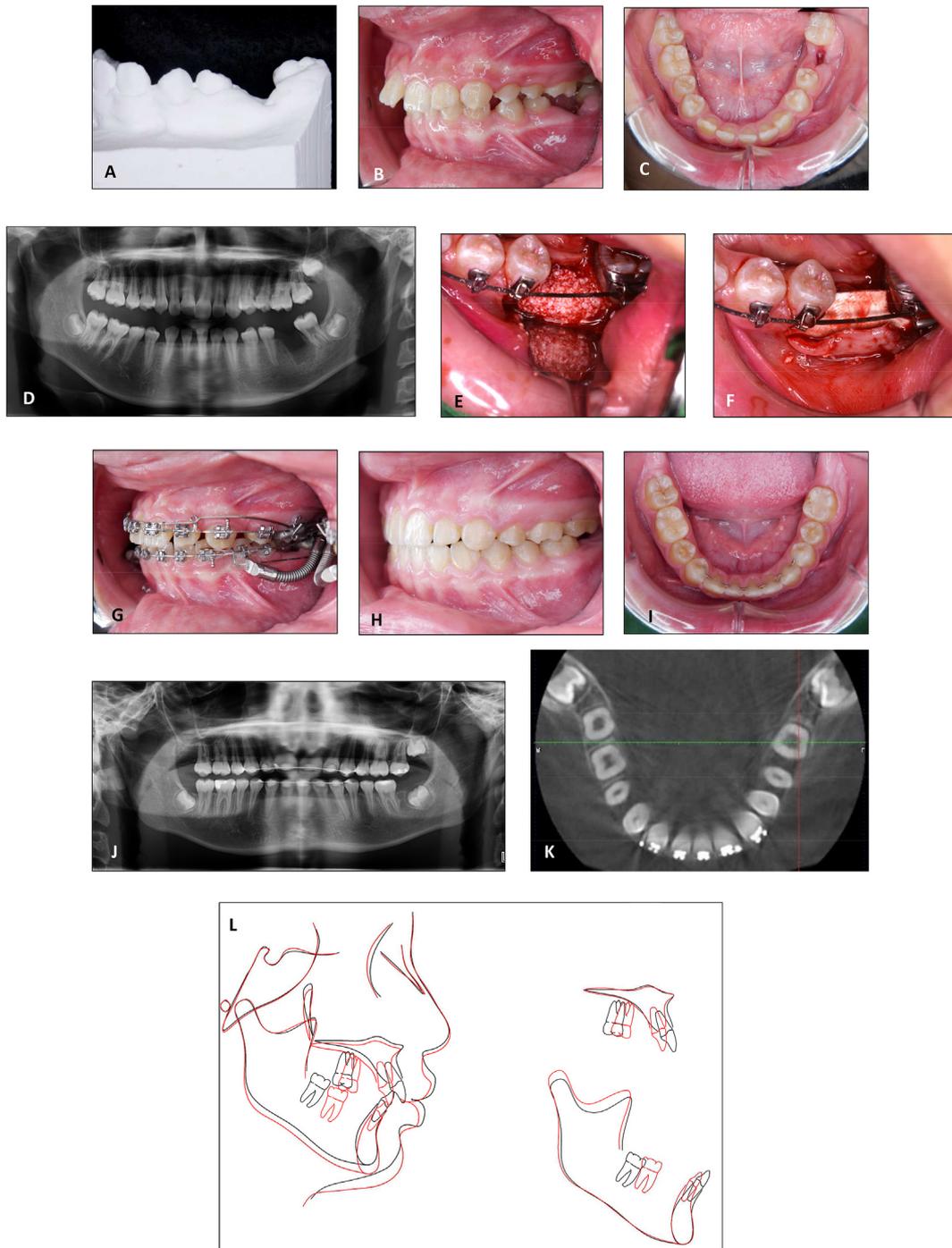


Figure 1 Clinical photographs and radiographs of our case. (A) Reduced alveolar ridge height of the left mandibular first molar area on the study model. (B) Initial intraoral left buccal view. (C) Initial intraoral mandibular occlusal view. (D) Initial panoramic radiograph. (E) Bio-Oss granules placement during surgery. (F) Bio-Gide Lyoplast® bioresorbable membrane placement before wound closure. (G) Fixed Class II corrector placement two weeks after surgery. (H) Final intraoral left buccal view. (I) Final intraoral mandibular occlusal view. (J) Final panoramic radiograph. (K) The cone-beam computerized tomography (CBCT) axial view at the cervical third of the left mandibular second molar taken nine months after surgery. (L) Superimposition of initial (black line) and final (red line) lateral cephalometric tracings, traced on the left mandibular second molar, which was protracted 10 mm mesially.

The DBBM is a xenograft with a low degradation rate, which provides a long-term volume preservation and osteoconduction. In this case, the left mandibular first molar extraction space was 10 mm mesiodistally before the GBR surgery, thus it took several months for protraction of the

left mandibular second molar mesially. The DBBM preserved the augmented alveolar ridge width while the molar moved mesially.

The timing for orthodontic tooth movement (OTM) into the augmented alveolar ridge to avoid the surgical result

being jeopardized is controversial. In the past, the interdisciplinary treatment was relatively conservative, no OTM was allowed within six months of surgery as it was believed this would affect bone regeneration.⁴ However, from the results of some animal and clinical case studies, the OTM can begin two weeks after surgery.^{4,5} In this case, we started the OTM two weeks after the GBR surgery and the left mandibular second molar moved forward smoothly with intact periodontium. The left mandibular first molar space was closed successfully and the total treatment period was 27 months.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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None.

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