

A Review of Orthodontic Considerations before and after Alveolar Bone Grafting in Patients with Cleft Lip and Palate

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Introduction

There are many factors to consider regarding the orthodontic treatment of an individual with cleft lip and palate in relation to the alveolar bone graft procedure. The objective of this article is to explain the considerations in the mixed dentition and the permanent dentition related to orthodontic treatment before and after secondary alveolar bone grafting in patients with cleft lip and palate.

Key Findings

Alveolar bone grafting establishes arch continuity, supports teeth adjacent to the cleft, closes oronasal fistulae, and improves nasal esthetics. Cancellous iliac crest bone remains the material of choice for many cleft teams due to accessibility, osteogenic potential, and rapid revascularization.

TIMING AND RADIOGRAPHIC EVALUATION

Intermediate secondary grafting during mixed dentition (ages 6–13) is preferred, allowing maxillary growth and better prognosis.¹ Because cleft patients often have delayed eruption, dental age is more reliable than chronological age. The optimal time is when the permanent canine root is one-half to two-thirds developed, though some centers graft earlier when the lateral incisor is adjacent. While occlusal and periapical radiographs have been standard, cone beam CT (CBCT) now provides more precise defect quantification before and after surgery.

PRE-GRAFT ORTHODONTIC CONSIDERATIONS

Expansion is often advocated for collapsed segments to correct arch form, increase perimeter, and improve surgical access.² Appliances include Haas, Hyrax, Quad-helix, or W-arch. To reduce graft failure risk, traumatic occlusion must be corrected; teeth may be aligned with fixed appliances or a bite plate used for vertical stop.

Methods

A selective literature search was conducted using PubMed and Google Scholar with keywords related to alveolar bone grafting, orthodontics, cleft lip and palate, maxillary expansion, and maxillary protraction.

To reduce graft failure risk, traumatic occlusion must be corrected; teeth may be aligned with fixed appliances or a bite plate used for vertical stop. Severely displaced incisors interfering with access should be corrected to permit proper flap reflection and suturing. In bilateral cases with a mobile premaxilla, orthopedic intrusion or distraction may be required for stabilization.

POST-GRAFT ORTHODONTIC CONSIDERATIONS

Tooth movement in the upper arch may begin 8 weeks after surgery if consolidation is evident, though many wait 4–6 months until radiographic bone quality is confirmed.³ Expansion not completed pre-graft can follow, via skeletal movement or limited buccal tipping to relieve crowding. For adolescents with Class III discrepancies, late maxillary protraction is viable using Alt-RAMEC⁴ or BAMP⁵. Mild skeletal discrepancies in patients who have finished growing may be managed with orthodontic camouflage by proclining maxillary anterior teeth.

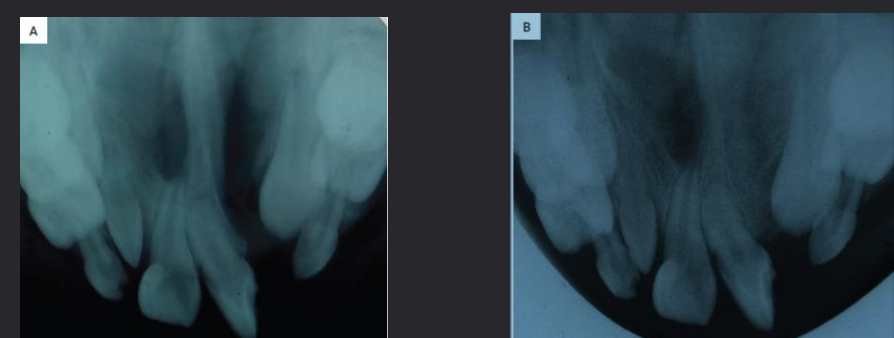


Figure 1. Occlusal radiographs of a left unilateral cleft lip and palate: (A) before alveolar bone graft and (B) after alveolar bone graft

Summary

Assessment should begin at the mixed dentition stage to determine optimal timing and sequence of grafting and related procedures. Regular clinical and radiographic evaluation is essential. Indications for pre-graft orthodontics include severe collapse of alveolar segments, traumatic occlusion near the cleft, and inadequate surgical access. Maxillary expansion may be performed before or after bone grafting. Some patients may benefit from maxillary protraction during the late mixed or early permanent dentition stage. Grafting is ideally performed when the canine root adjacent to the cleft is one-half to two-thirds developed, though some centers graft earlier when the lateral incisor is adjacent. Following graft surgery, orthodontic treatment may either proceed—depending on the case—or be paused until full skeletal maturity.

Conclusion

Orthodontic care is integral to interdisciplinary management of cleft lip and palate. Each patient presents unique needs, and collaboration among cleft team members is vital to create individualized treatment plans that optimize outcomes

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