

# Analysis of failed sABG cases from the perspective of dentists: a case-series study

Jeffrey Lee, Jue Wang. Cincinnati Children's Hospital Medical Center, Cincinnati, OH

## Introduction

- Secondary alveolar bone grafting (sABG) has become standard of care in most centers treating patients with alveolar clefts.
- Previous pre-ABG orthodontic treatment has primarily focused on maxillary arch expansion and reestablishing the upper arch form. Orthodontic preparation to reposition teeth or to condition the site for bone grafting has not been routinely performed.
- Most existing sABG studies focus on surgical protocols: surgical technique, bone graft type/site of harvest, and size of defects.
- Dearth of evidence showing how tooth related factors – such as tooth position, angulation and pre-ABG orthodontic preparation – affect the outcomes of sABG .

## Methods

- Reviewed records of 13 failed ABG cases followed long term at CCHMC
  - Records at multiple timepoints included: orthodontic & surgical hx, clinical photos, intra-oral scans, radiographic images (CBCT, Pano, Periapical images).
- Analyzed several parameters:
  - Alveolar cleft size
  - Tooth development stage at time of sABG
  - Presence of tooth eruption through sABG site
  - Presence/position of teeth at the margin of alveolar cleft/defect area
  - Tooth overlap at suture site
  - Tooth root angulation in relation to cleft margin
  - Vertical and/or sagittal discrepancies of the alveolar segments.

## Results

- 7 female patients and 6 male patients were included. Among the 13 cases, 4 of them had bilateral cleft lip and palate, and 9 of them had unilateral cleft lip and palate. Thus, a total of 17 alveolar cleft sites were studied.
- Average age at which sABG was done was  $8.38 \pm 1.8$  years old.
- **Alveolar cleft size:** most of the failure cases included in this study involved moderately sized alveolar defects, with a mean labial defect width of  $7.37 \pm 2.55$  mm and a mean lingual defect width of  $6.91 \pm 3.48$ mm.
- **Tooth development stage:** 4 cases had less than 1/3 root formation observed in cleft-associated canines, 4 cases had 1/3 root formation of the canines, 3 cases had 2/3 root formation of the canines, and 1 case had full canine root formation. One case lacked pre-ABG radiographic images to evaluate the status of root formation. 12 cases had teeth that would erupt through the ABG site.
- **Tooth position in relation to alveolar cleft area:** 9 out of 13 cases had teeth present at the alveolar cleft margin; 6 out of 14 cases had teeth present within the alveolar cleft area; 6 cases had teeth overlapping at the gingival suturing site.
- **Alveolar segment discrepancy:** 9 out of 14 cases had vertical misalignment of the alveolar segments, and 4 cases had alveolar segment misalignment on the sagittal plane.

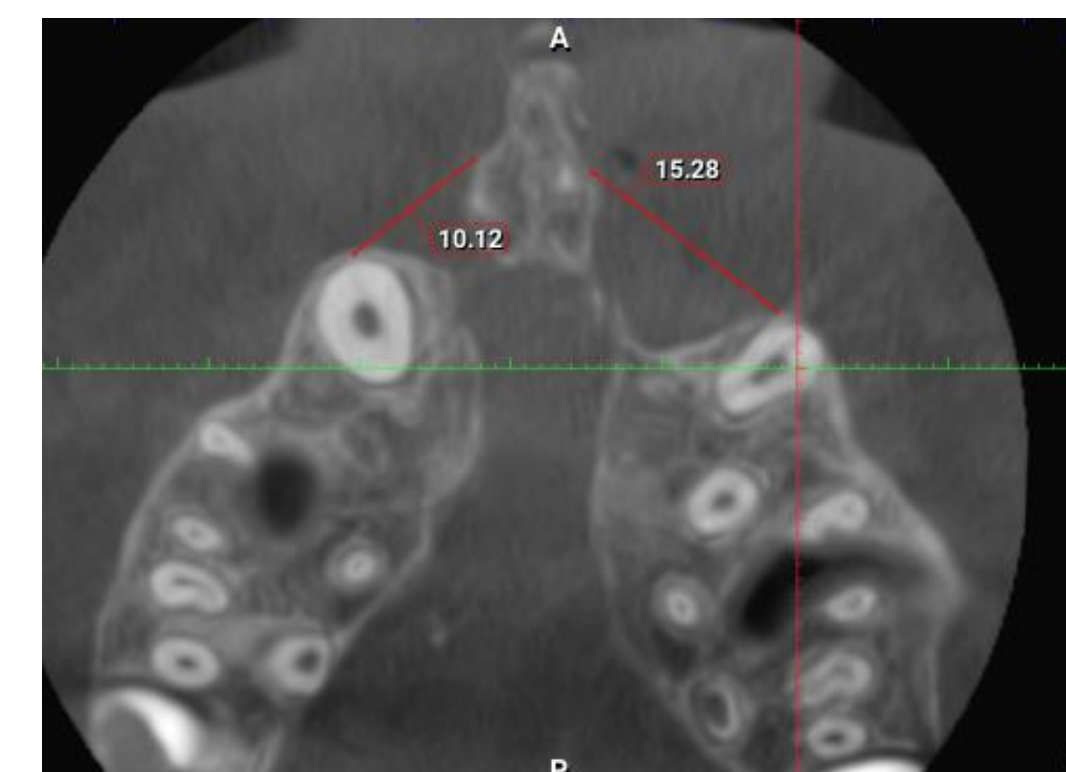


Figure 1. Example of Alveolar cleft size measurement .

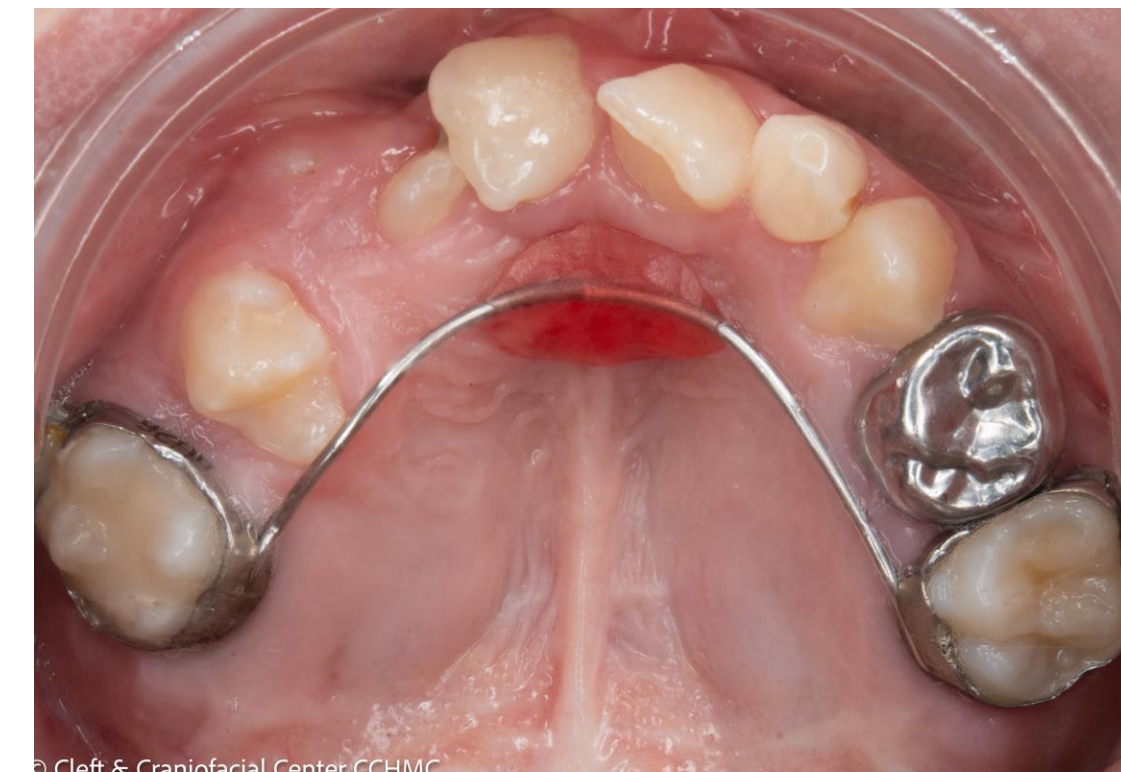


Figure 4. Example of teeth overlapping at the gingival suturing site

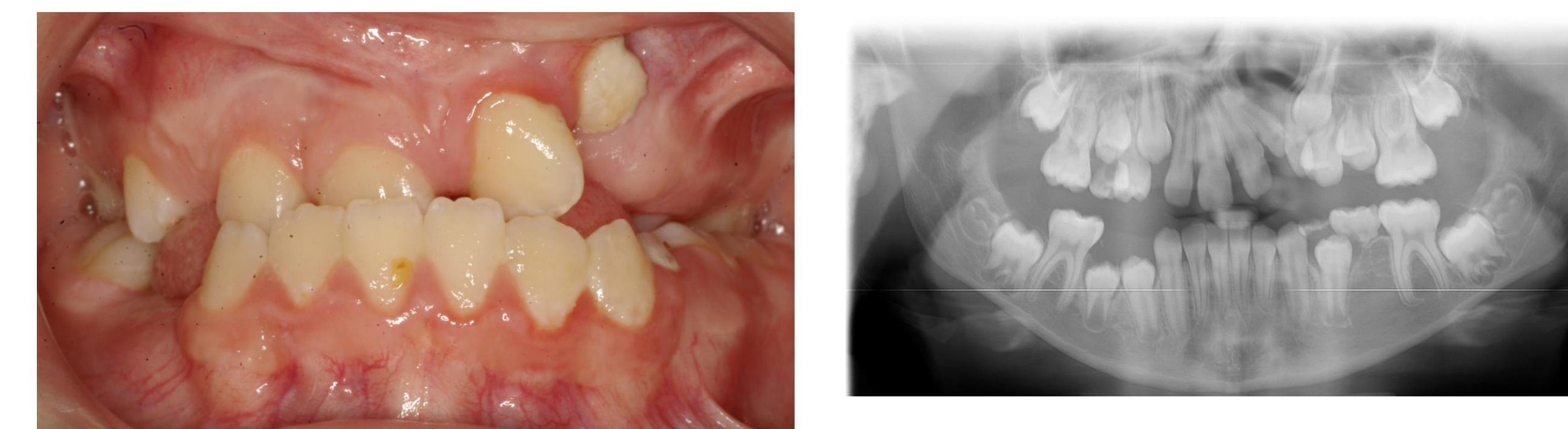


Figure 7. Example of a failed ABG case: before initial ABG



Figure 2. Example of tooth present at the alveolar cleft margin .



Figure 5. Example of sagittal misalignment of the alveolar segments

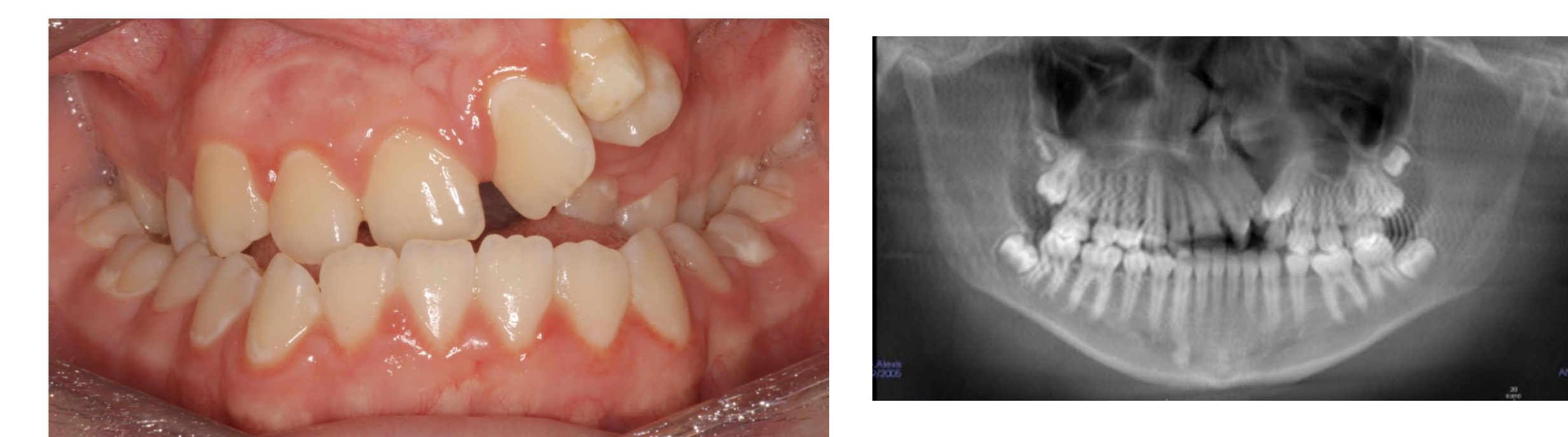


Figure 8. Example of a failed ABG case: after initial ABG

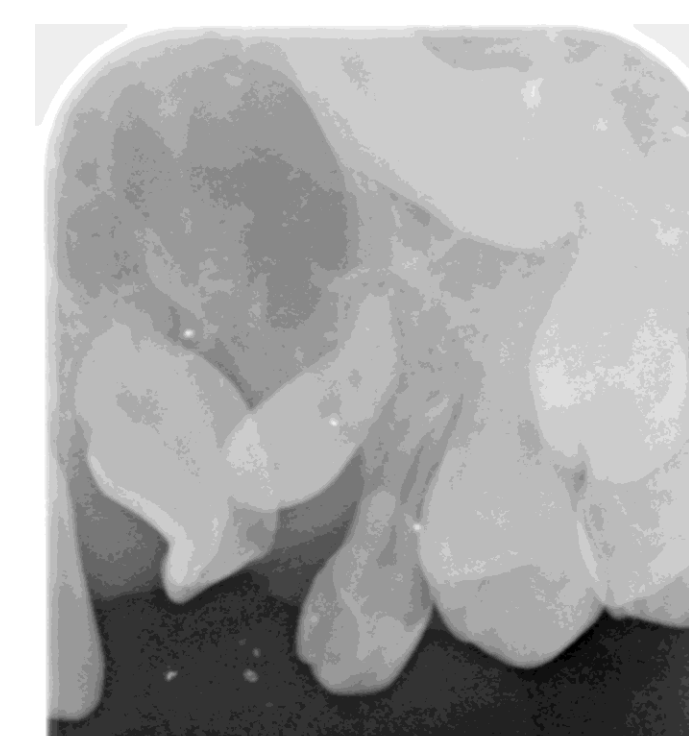


Figure 3. Example of tooth present within the alveolar cleft area.



Figure 6. Example of vertical misalignment of the alveolar segments

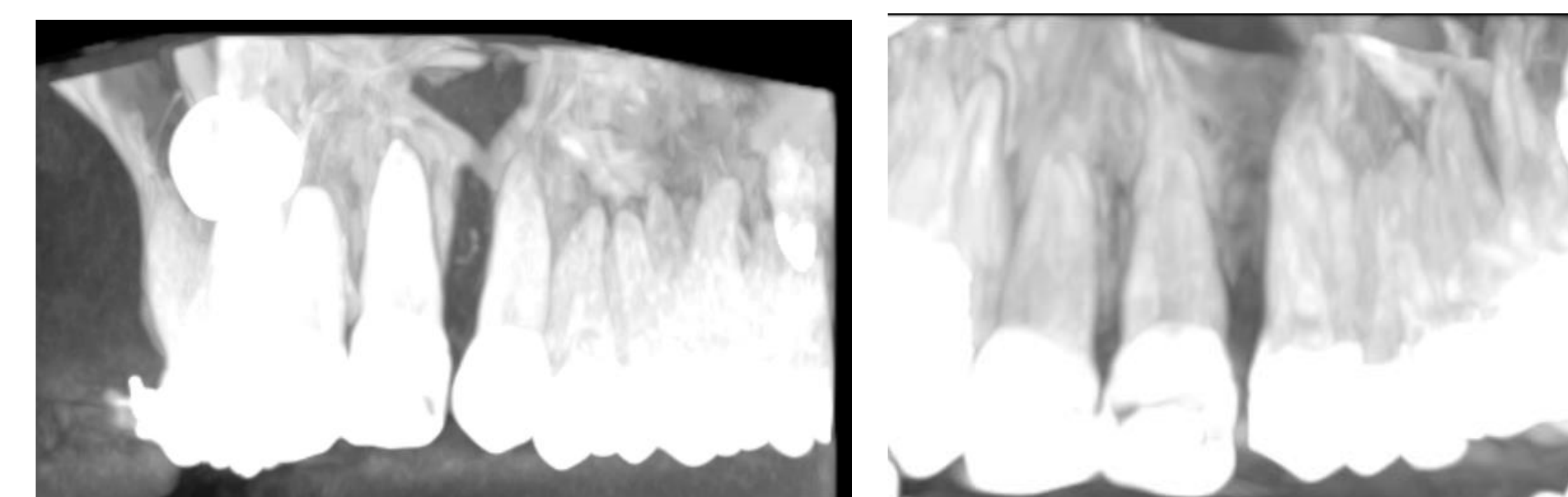


Figure 9. Example of a failed ABG case: before and after re-doing ABG

## Discussion

This 13-case series presented different scenarios and the etiologies for sABG failure may differ. Our study intended to reconstruct treatment timelines based on our records and analyze the main structural characteristics that may contribute to sABG failures.

It has been well observed that suboptimal orthodontic preparation leads to less favorable alveolar bone grafting (ABG) outcomes. Increasingly, it is recognized that pre-ABG orthodontics should involve not only maxillary expansion but also careful alignment and positioning of teeth adjacent to the cleft to optimize the cleft region for grafting. Additionally, the cleft gap should be neither excessively narrow nor excessively wide to facilitate ideal surgical closure and graft stability.

## Conclusions/ Future study

The main characteristics that presented in these failed sABG cases included tooth root or enamel being exposed in the cleft defect's lateral wall and/or positioned inside the defect area, teeth overlapping at the gingival suture site which interferes with good soft tissue closure, and misalignment of the alveolar segments. Pre-ABG orthodontic preparation to eliminate the negative influencing factors that were identified in the analysis of these failed cases may improve treatment outcomes.

## References

- Sivak, W.N., MacIsaac, Z.M., Rottgers, S.A., Losee, J.E. and Kumar, A.R., 2014. Management of failed alveolar bone grafts: improved outcomes and decreased morbidity with allograft alone. *Plastic and reconstructive surgery*, 133(2), pp.345-354.
- Padwa, B.L., Tio, P., Garkhail, P. and Nuzzi, L.C., 2024. Predictors of outcomes in 900 alveolar bone grafts. *Plastic and Reconstructive Surgery*, 154(3), pp.605-614.