

Interaction Between Alveolar Bone Loss and SARS-CoV-2 Infection

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INTRODUCTION

- The COVID-19 pandemic is an ongoing global pandemic that originated from the novel SARS-CoV-2 virus in China in December of 2019 (2).
- The outbreak of this virus became an official pandemic on May 11th, 2020, with more than 4.5 million people infected in the subsequent three months. COVID-19 is mainly transmitted by aerosol and respiratory droplets during close contact (1).

There have been several studies since 2020 investigating the potential synergistic relationship between periodontal disease status and COVID-19 susceptibility and severity (1,2,3).

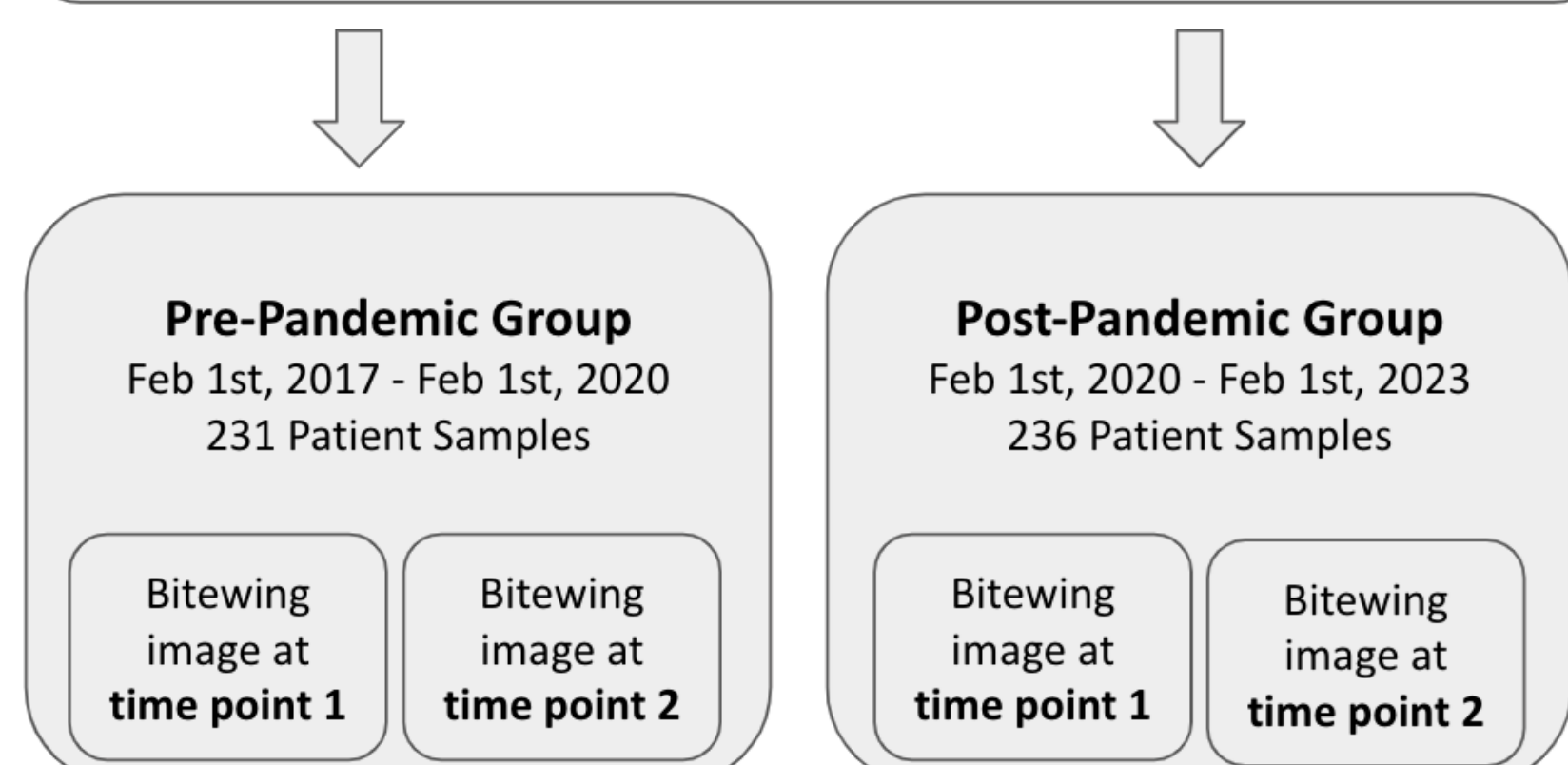
- Periodontitis is characterized by chronic inflammation which impacts the supporting structures of the tooth and leads to alveolar bone destruction, and it is this rate of alveolar bone loss that we chose to investigate in our study.

OBJECTIVES

There have been many studies supporting the link between oral hygiene and subsequent COVID-19 severity. However, our study aims to investigate the reciprocal connection of COVID-19 infection with negative oral health implications and increased alveolar bone loss in this post-pandemic community.

METHODS & MATERIAL

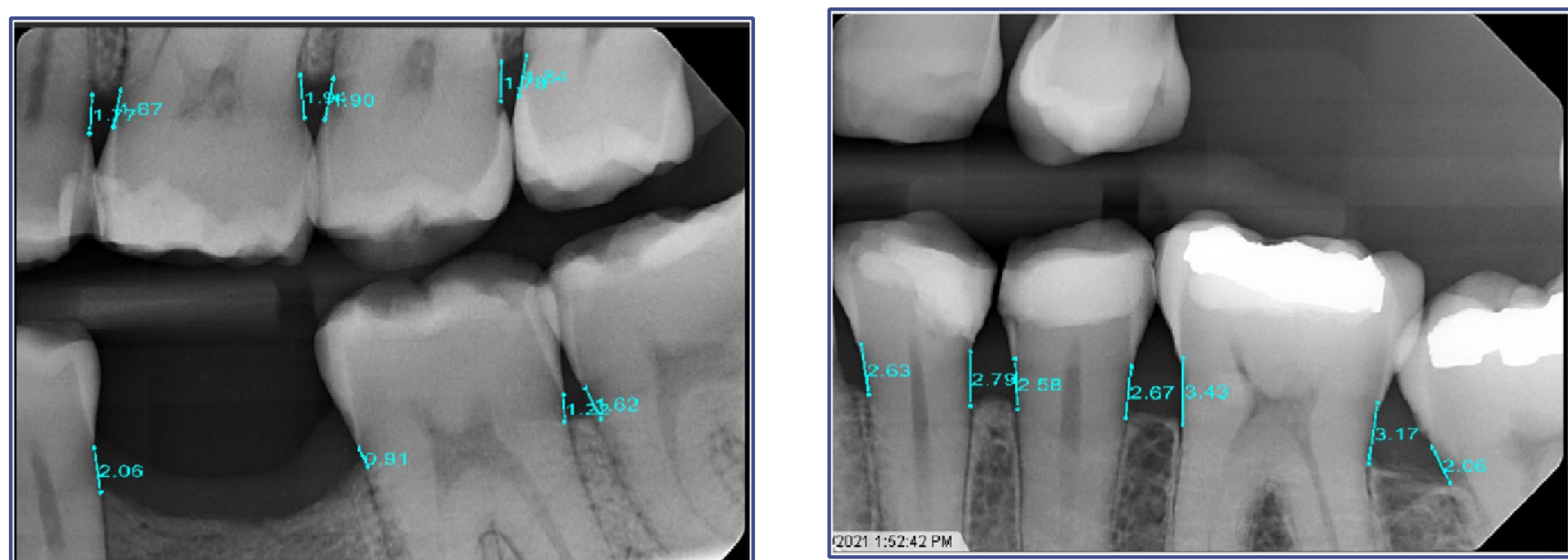
Patients from Columbia University College of Dental Medicine who were also recorded to have received either a nucleic acid amplification test (NAAT) or antigen test for the SARS-CoV-2 virus at NewYork-Presbyterian Hospital.



Alveolar Crest Heights were measured by an AI program that utilized a self identified cemento-enamel junction and alveolar crestal height for the mesial and distal of each tooth. Mean ACH and Mean ACH change were calculated.

Mean ACH change= Mean ACH later time point – Mean ACH early time point

Figure 1: Artificial Intelligence Alveolar Crest Height Measurements on Patient Bitewings



RESULTS

	Pre-Pandemic Group	Post-Pandemic Group
Number of Patients	231	236
Mean ACH Loss (mm)	-0.06597	0.02880
Standard Deviation (ACH Loss)	0.39310	0.31120
Variance (ACH Loss)	0.15450	0.09684
Average Time Between Bitewings (months)	19.92	17.83
Standard Deviation (Time Between Bitewings)	6.14	5.05
Variance (Time Between Bitewings)	37.69321	25.49635

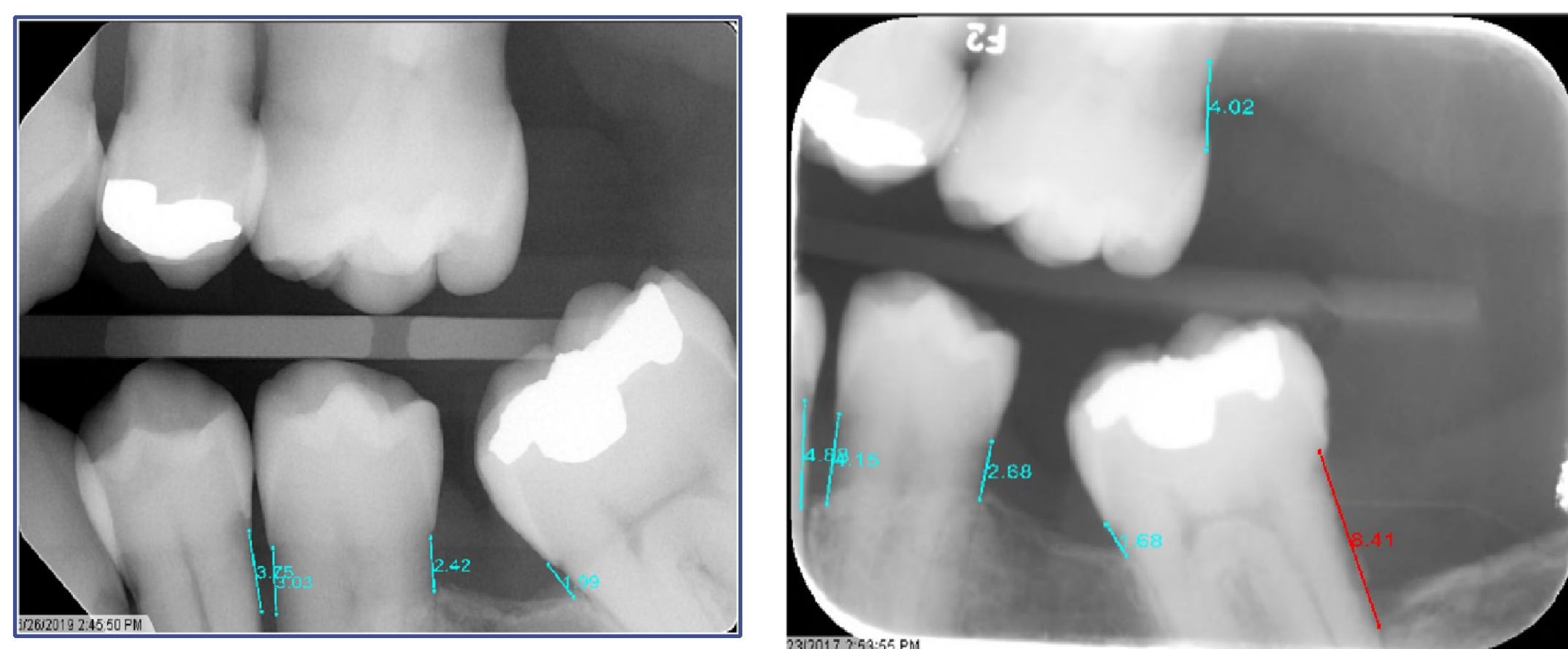
A one tailed t test with equal variance was statistically significant with a p value of 0.002

DISCUSSION

Although our preliminary results are significant, there were some limitations in our study that should be corrected in future investigations.

- In order to improve the accuracy of future results, measuring ACH levels for specific teeth that match across every bitewing would eliminate any issues related to field of view differences between the bitewing images and ACH measurement values.
- The sample size of this study was limited as several patients from the database did not have two bitewing image collection dates within the required windows for either the pre-pandemic or post-pandemic group and therefore could not be included in the study.
- Due to this limited sample size, patients in the pre-pandemic and post-pandemic groups were different in order to increase sample size and power of the study. Future analysis utilizing the same patients in both groups would more accurately standardize the comorbidities and any potential confounding factors.
- Alveolar bone loss is a late manifestation of periodontal disease and is a chronic and dynamic process that can take several months to years to occur. Therefore, repeating this study in the future utilizing larger time windows between patient bitewings may demonstrate a more accurate representation of changes in the rate of alveolar bone loss.

Figure 2: Bitewings Demonstrating Artificial Intelligence Field of View Limitation



CONCLUSION

- This study provides data to support the idea that COVID-19 infection is correlated with increased ACH loss in our patient groups. This demonstrates the oral implications of the COVID-19 pandemic and supports conclusions from previous studies linking COVID-19 infection severity, periodontal disease status, and now subsequent alveolar bone loss.
- Although our preliminary results are significant, resolution of the limitations above should be implemented in future investigations.
- AI in the dental setting illustrates an exciting new advancement in oral healthcare

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