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**AAO Foundation Final Report Form
(a/o 1/3/2018)**

Please prepare a report that addresses the following:

Type of Award: Research Aid Award

Name(s) of Principal Investigator(s): Robert Lee

Institution: UCSF

Title of Project: Accuracy and reliability of a new methodology to monitor root movement in three dimensions during orthodontic treatment

Period of AAOF Support: 7/1/17 – 1/31/19

Amount of Funding: \$5000

Summary/Abstract:

The main objective of this project was to demonstrate the accuracy, reliability, and clinical feasibility of a previously developed methodology that can potentially monitor root movement in three dimensions at any stage of orthodontic treatment. This approach isolates and superimposes the teeth of a pre-treatment cone-beam computed tomography (CBCT) scan onto a digital scan of the teeth at the stage of orthodontic treatment of interest. After this superimposition process, the roots of the pre-treatment CBCT teeth are placed in the “expected root position” (ERP) setup, an approximation of the root position at the stage of interest. Thus, the ERP setup can be generated at any stage of orthodontic providing an alternative method to monitor root position without the need to expose patients to further radiation. In addition, this methodology may improve root position leading to a more stable end result. However, this approach has only been demonstrated in a typodont model and a single patient without quantitatively comparing the mesiodistal angulation and faciolingual inclination of the ERP setup to the true position of the roots. Therefore, quantitative analysis in a larger population is needed to validate this root monitoring methodology. This study is designed to quantitatively validate the efficacy and clinical feasibility of this methodology.

Detailed results and inferences:

1. **If the work has been published please attach a pdf of manuscript**

PDF of manuscripts attached

OR

2. Describe in detail the results of your study. The intent is to share the knowledge you have generated with the AAOF and orthodontic community specifically and other who may benefit from your study. Table, Figures, Statistical Analysis and interpretation of results should be included.

Response to the following questions:

1. Were the original, specific aims of the proposal realized?

Yes, in the published manuscripts below, we showed that we were able to develop a method to quantitatively compare the ERP setup against the true root position depicted through CBCT scans.

Specific Aim 2: Demonstrate clinical feasibility and reliability of methodology at progress and post-treatment stage of orthodontic treatment.

Yes, in two of the published manuscripts below, we demonstrated the accuracy and reliability of the ERP setup at post-treatment. In one of the publications listed below, we demonstrated the clinical feasibility of the ERP setup methodology at the progress stage.

2. Were the results published?

- a. If so, cite reference/s for publication/s including titles, dates, author or co-authors, journal, issue and page numbers

Lee RJ, Pi S, Park J, Devgon D, Nelson G, Hatcher D, Oberoi S. Accuracy and reliability of the expected root position setup methodology to evaluate root position during orthodontic treatment. *American Journal of Orthodontics & Dentofacial Orthopedics*. 2018; 154(4):583-595.

Lee RJ, Pi S, Park J, Nelson G, Hatcher D, Oberoi S. Three-dimensional evaluation of root position at the reset appointment without radiographs: a proof-of-concept study. *Progress in Orthodontics*. 2018; 19(1): 15.

Lee RJ, Park J, Pi S, Nelson G, Hatcher D, Oberoi S. Accuracy of the expected root position setup to monitor root angulations and inclinations during orthodontic treatment: a pilot study. *Journal of Indian Orthodontic Society*. 2018; 52(1):44-50. **[Cover page article]**

- b. Was AAOF support acknowledged?

Yes, AAOF support was acknowledged in all publications.

- c. If not, are there plans to publish? If not, why not?

N/A

3. Have the results of this proposal been presented?

a. If so, list titles, author or co-authors of these presentation/s, year and locations

Lee RJ, Park J, Nelson G, Hatcher D, Oberoi S (October 2018). Accuracy and reliability of expected root position setup to evaluate root position in three dimensions at post-orthodontic treatment. (Poster) Pacific Coast Society of Orthodontists Annual Session. Monterey, CA.

Lee RJ, Pi S, Park J, Nelson G, Hatcher D, Oberoi S (May 2018). Accuracy and reliability of a new methodology to monitor root position in three dimensions during orthodontic treatment. (Poster) American Association of Orthodontists Annual Session. Washington, DC.

Lee RJ, Pi S, Park J, Nelson G, Hatcher D, Oberoi S (October 2017). Accuracy and reliability of a new methodology to monitor root position in three dimensions during orthodontic treatment. (Poster) Pacific Coast Society of Orthodontists Annual Session. Reno, NV.

b. Was AAOF support acknowledged?

Yes, AAOF support was acknowledged in all three presentations

c. If not, are there plans to do so? If not, why not?

N/A

4. To what extent have you used, or how do you intend to use, AAOF funding to further your career?

I am interested in pursuing a part-time academic career in orthodontics which would require research experience and successful completion of research projects. The AAOF funding allowed me to strengthen my research pedigree by providing funds to perform this project as well as to travel and present this research. This project required segmentation of numerous teeth from CBCT scans which was too time consuming to be done manually, so the only feasible way to complete this project was to outsource the segmentation process. However, outsourcing the segmentation process was costly, so this research would not have been possible without the financial support from the AAOF.