UNIVERSITI TEKNOLOGI MARA

EFFECTS OF REDUCING ORTHODONTIC SCANNING PARAMETERS ON IMAGE QUALITY AND CYTOTOXICITY OF NUCLEI: A RANDOMIZED CONTROLLED CLINICAL TRIAL

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PhD

September 2020

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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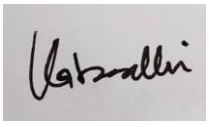
Signature of Student	:	
Date	:	September 2020

ABSTRACT

Dental panoramic tomogram (DPT) and lateral cephalogram (LC) are routinely taken to aid orthodontic diagnosis and treatment planning. The increasing needs for dental radiographs over the recent years has raised concern over the stochastic effects as this will predispose patients to radiation exposure which may cause cell damage and increase the risk of developing oral carcinoma. Every radiograph machine has different parameters of tube potential (kV) and tube current (mA) depending on to its individual type and brand. In accordance to as low as possibly achievable (ALARA) principle, it is necessary to optimize radiation dose parameters as one of the ways to reduce the radiation exposure without compromising the quality and diagnostic performance of the images. The radiographic study of this trial was conducted to investigate the effect of reducing scanning parameters of DPTs and LCs on image quality and diagnostic performance by detection of anatomical landmarks. The cytotoxicity study was conducted to evaluate the effect of dental radiation on the exfoliative buccal mucosa cells. Sample size was calculated showed that 17 participants were required in the radiographic study and 7 were required in cytotoxicity study. 38 adult orthodontic patients were randomized into two groups; the control group received dose parameters as prescribed by the manufacturer by setting the machine in automatic mode and the intervention group received reduced dose parameters of DPT (60kV, 3.2mA) and LC (85kV, 8mA). Images were analysed for image quality and diagnostic performance. In another 20 patients following the same protocol as above, exfoliative buccal mucosa smears were taken before (T0) and after radiation exposures (T0). The presence of nuclear alterations was noted and compared. All data were analysed using Mann-Whitney Test. Results showed that there was no significant difference of score image quality for between control and intervention groups with p-values of 0.058 for DPT and 0.063 for LC. The same finding was also demonstrated for diagnostic performance of the DPT and LC with p=0.797 and 0.272, respectively. There was an increase in the presence of nuclear alterations of about 60% in both groups after the radiation exposure. However, there was no statistically significant difference in the presence of nuclear alterations was found between groups (p=0.603). In conclusion, orthodontic scanning parameters can be reduced by at least 30% without compromising image quality and diagnostic value of the images. Radiation from orthodontic scanning examinations might not produce chromosomal damage but can induce cytotoxic effects by increasing rate of nuclear alterations regardless of level of radiation.

ACKNOWLEDGEMENT

Firstly, I wish to thank God for giving me the opportunity to embark on my PhD and for completing this long and challenging journey successfully. My gratitude and thanks go to my main supervisor Dr. Noraina Hafizan Norman and my co-supervisor Associate Professor Dr. Mohd Yusmiaidil Putera Mohd Yusof.

My appreciation goes to Puan Izyan Hazwani Baharuddin as the statistician that helped me throughout my study, Dr. Omar who served as the independent expert that helped me in analysing my results and Dr. Siti Balqish Oon who was the second assessor for this study. And lastly to all the staff members of Faculty of Dentistry, UiTM who provided the facilities and assistance during sampling and data collection.

Special thanks to my colleagues Dr. Nor Dayana Mohd Ali, Dr. Najiyatul Nazihah, Dr. Azaitun Akmal, Dr. Nurul Ain and all friends for helping me with this project.

Finally, this thesis is dedicated to my husband, mother, children and the entire family for the full support and sacrifice that they made for me to complete this thesis. This piece of victory is dedicated to all of you as my pillar of strength. Alhamdulilah.

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