CONCLUSION

The current study was designed to evaluate the possible genotoxic and cytotoxic effect of X-rays on gingival and buccal mucosa cells during full mouth IOPA surveys, panoramic radiographs, CT scans and CBCT scans for maxilla and mandible. The individuals were divided in four groups. The sample size selected for each group was minimum 30 individuals per group.

The study started with 160 individuals (40 per group) and after omitting drop outs, a total of 139 individuals exposed to full mouth IOPA radiographs (Group I, n=36), panoramic dental radiographs (Group II, n=34), CT scans (Group III, n=33) and CBCT scans (Group IV, n=36) for maxilla and mandible were included in the study. Samples were obtained from the exfoliated oral mucosa cells of gingiva and buccal mucosa before and 10 days after exposing the patients to these radiographic techniques. The results were analyzed and following conclusions were drawn.

- No positive correlation existed between age with pre and post exposure MNC and other cytotoxic abnormalities in gingival and buccal cells in all the four study groups.
- No positive correlation existed between gender and pre and post exposure frequencies of MNC and other cytotoxic abnormalities in gingival and buccal cells in all four study groups.
- The frequencies of MNC and other cytotoxic abnormalities in the gingival and buccal mucosa cells are significantly increased after exposure to full mouth IOPA radiographs, CT scans and CBCT scans.
CONCLUSION

- The frequencies of MNC and other cytotoxic abnormalities in the gingival and buccal mucosa cells are not significantly increased after exposure to panoramic radiographs. Low doses of panoramic radiographs may be reason for this result.

- As MNC index may reflect genomic instability (as proven by previous studies), the detection of an elevated frequency of micronuclei in a given population indicates an increased risk of cancer.

- The frequencies of MNC and other cytotoxic abnormalities in the gingival and buccal cells after CT scan exposure is significantly increased when compared with other radiographic techniques (Full mouth IOPA, panoramic radiograph and CBCT scan). This suggests that CT scan induces highest genotoxic and cytotoxic effects on oral epithelial cells. These results may be because of highest radiation doses of CT scan. This study data demonstrates for the first time that there is dose dependent increase in MNC in oral epithelial cells following radiation exposure.

- The comparisons of frequencies of MNC and other cytotoxic abnormalities after full mouth IOPA radiographs, panoramic radiographs and CBCT scans (intergroup comparison) are statistically insignificant.

- There is no significant difference in the frequencies of MNC and other cytotoxic abnormalities after exposure in between Panoramic (OPG) group and CBCT group. This suggests that genotoxic and cytotoxic effects induced by CBCT scans of gingival and buccal cells are not significantly high as compared with panoramic radiographs.
• Hence, we propose that by ALARA (as low as reasonably achievable) principle, panoramic radiology is the best technique but when added information is required, CBCT scan can be preferred on panoramic radiography by overlooking genotoxic and cytotoxic effects, as CBCT is known to provide accurate three-dimensional information of orofacial structures. We also suggest that CBCT can be used as screening radiographic method instead of panoramic radiography.

• The comparison of merits and demerits of all the radiographic techniques can help in deciding better radiographic methods for the patients.

• There is no marked significant difference in the frequencies of MNC and other cytotoxic abnormalities when comparison was done in between the gingival and buccal mucosa cells of three study groups (full mouth IOPA surveys, panoramic radiography and CBCT scan).

• Only CT scan group shows significant increase in MNC and other cytotoxic abnormalities in gingival cells than buccal cells. This increase may be due to higher exposure doses to the gingival cells than buccal cells due to more amount of scattered radiation from alveolar bone and/or more number of mesenchymal stem cells (which are present in gingiva) affected by the radiations.

• This is one of the proposed hypotheses by us and it is partially confirmed by our study results or this hypothesis holds true only with higher radiation exposures like CT scan.

• Further studies with larger sample sizes and varied populations are necessary to confirm these findings. Further molecular studies are advised to know exact where the genotoxic damage occurs.