RESEARCH
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COMMON RADIOGRAPHIC ERRORS MADE BY UNDERGRADUATE DENTAL STUDENTS IN INTRAORAL PERIAPICAL RADIOGRAPHY

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Abstract

Background: Radiographs greatly aid in the diagnosis and treatment planning of dental therapy. Radiographs are important for accurate diagnosis of any underlying condition thus, any errors or discrepancies in the radiographs quality greatly impact the treatment provided. Retaking radiographs not only leads to loss of time and money but also causes unnecessary exposure of radiation ison patients, the clinician and the existing environment. Thus it is important for a clinician to take radiographs under a minimal time period, thus decreasing the harmful effects of radiation exposure to humans.

Aim: The objective of this study was to evaluate the common radiographic errors made by undergraduate dental students of pvt. dental college

Methods and Methodology: A university based setting was conducted. A sample size of 100 radiographs consisting of errors were taken in as the sample. To eliminate bias, a randomized sampling method was employed. The data was collected and Chi square test was applied to find the association of the radiographic errors made by the dental students.

Results : Results showed that the most frequently made radiographic error was conecut which was 41% (21% - anterior; 20%- posterior) followed by elongation which was the 2nd most commonly 21% (10% - anterior; 11% - posterior) encountered radiographic error by dental undergraduate students. 17% (9% - anterior; 8% - posterior) of the radiographs denoted foreshortening. The least made radiographic error was found to be overexposure with a frequency of 9% (4% - anterior; 5% - posterior). The 2nd most least encountered radiographic error was found to underexposure of 12% (6% - anterior; 6% - posterior).

Conclusion: This study showed that consideration of these factors may be
beneficial for a high-quality education and a reduction in radiography retakes throughout undergraduate dentistry students' training periods thereby reducing radiation exposure..

Keywords: Radiographs,Intra oral periapical, cone cut, Fore-Shortening, Elongation, Errors, Students

Introduction

Radiographs are essential for the accurate diagnosis of any underlying condition or disease. Not only do radiographs aid in diagnosis but also help clinicians in formulating an efficient yet effective treatment plan. Any discrepancy in the quality of the radiograph leads to reduced accuracy rate in the diagnosis and treatment planning. Retaking radiographs not only leads to loss of time and money, but also causes unnecessary exposure of radiation on patients, the clinician and the existing environment. Thus it is important for a clinician to take radiographs under a minimal time period, thus decreasing the harmful effects of radiation exposure to humans. Few potential strategies to achieve these can be done by using high speed film and digital systems that require less radiation exposure to form the diagnostic radiographic image and reducing the number of retakes Earlier studies have indicated that the number of retaken radiographs are higher among dental students when compared to that of practicing dentists. Few factors such as radiograph technique, placement of film holder, site of tooth and image processing method highly influence the quality of the diagnostic radiograph taken. Few notable common radiographic errors are cone cut, elongation, foreshortening, over exposure and under exposure. There is no sufficient data regarding the errors made by the dental undergraduate students and also to improve the efficiency of the diagnostic radiographs, the objective of this study was to evaluate the common radiographic errors made by undergraduate dental students in a Pvt. dental college and hospital.

Our team has extensive knowledge and research experience that has translate into high quality publications(Jayasree et al. 2021),(Sivakumar et al. 2021),(Uma Maheswari et al. 2020),(Avinash et al. 2020),(Chaitanya et al. 2018),(Gudipaneni et al. 2020),(Chaturvedula et al. 2021),(Patil et al. 2021),(Ezhilarasan et al. 2019; Sharma et al. 2019; Perumalsamy et al. 2018; Rajeshkumar et al. 2019; Mehta et al. 2020; Rajakumari et al. 2020),(PradeepKumar et al. 2021; R et al. 2021; Ezhilarasan et al. 2021; Sarode et al. 2021; Kavarthapu and Gurumoorthy 2021),(Preethi et al. 2021)

Materials and methods

This study was conducted in a University setting. The study group for this research comprises students who are pursuing their undergraduate study in Pvt. Dental College and Hospital. Bisecting angle technique was used. The radiographs were obtained from source to image receptor distance of 32cm with a 0.26 sec exposure time. A CCX intraoral unit was used for exposures along with an aluminum- equivalent filter for filtration. Film holders were not used during this procedure. All the radiographs were uploaded on the Digital Information Archiving System (DIAS). All errors were accessed by individually selecting the images that were directly uploaded to DIAS. The sample size of 100 radiographs, under randomized sampling method, were taken to minimize bias. Various errors such as cone cut, elongation, foreshortening, overexposure and underexposure were taken into account for this study. All the data obtained were passed through the institutional ethics committee of the institution for ethical reasoning.

Statistical analysis

Data was collected from DIAS and tabulated into excel sheets. The raw data was transferred to SPSS software after coding was done. Frequency distribution was used for definite variables. Chi square tests were done to find the association between the required parameters, thus enabling access to the common radiographic errors made by dental undergraduate students.

Results

A total of 100 radiographs were taken. Out of these, 50 radiographs were from the anterior region and the remaining 50 were taken from the posterior region (fig 1).Out of the 100 radiographs taken, the most frequently occurred error was cone cut with a majority of 41%, of which 20% belonged to posterior radiographs and 21% to the anterior radiographs, followed by elongation of 21%,of which 11% occurred in the posterior radiographs and 10% in the anterior. A frequency of 17% of radiographs were considered to have fore shortening,8% in the posterior and 9% in the anterior region showed foreshortening . 12% of the radiographs showed under exposure (6% in the anterior and posterior region) whereas the remaining 9% of the radiographs indicated over exposure, 5% of the radiographs obtained were overexposed radiographic images in the posterior region whereas the remaining 4% in the anterior region (fig. 2, fig. **3**). Out of the 100 radiographs taken in for the study, the anterior region consisted of a majority of 21% radiographic images with conecut, 10% of the images indicating elongation as the 2nd most common radiographic error. About 9% of the radiographs indicate foreshortening as the 3rd most encountered radiographic error of the anterior region. Around 4% of the radiographic images exhibited overexposure as the least encountered radiographic error whereas 6% of the radiographic images indicated underexposure as the 2nd least encountered error while using bisecting angle technique.

GRAPHS

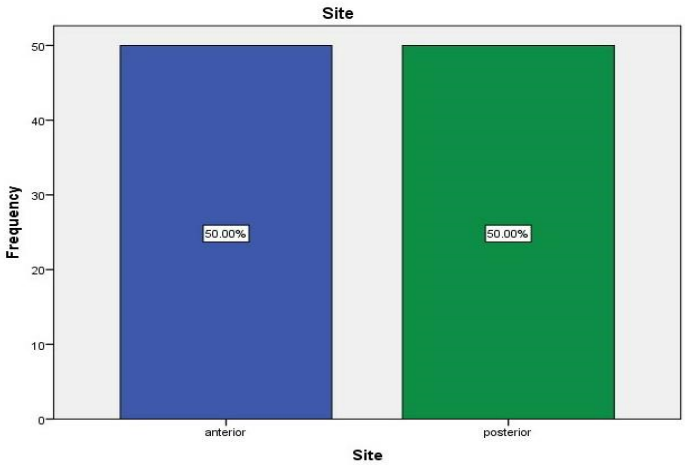

Figure 1: Graph graph indicates the association between the radiographs and the intraoral site for which the radiograph is taken. X axis represents the site of the radiograph taken and Y axis denotes the frequency of the radiographs taken. Dark blue indicates the anterior region whereas dark green indicates the posterior site. 50% of the radiographs taken are from the anterior region whereas the remaining 50% are from the posterior region.

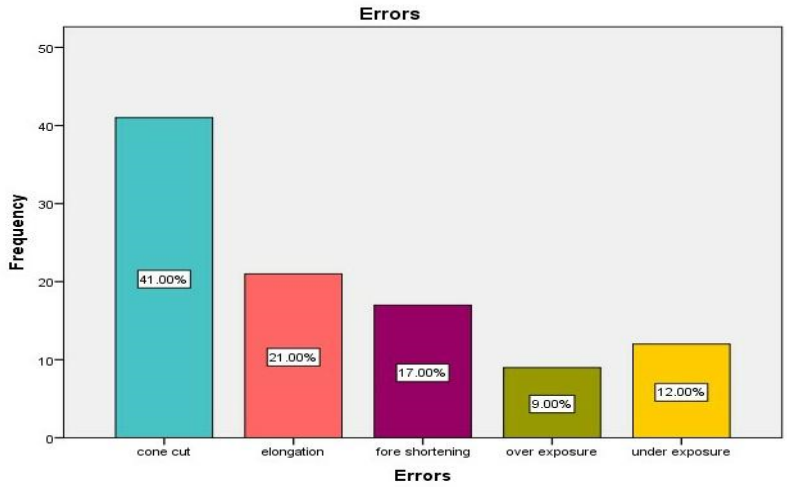

Figure 2: Graph indicates the association between the different types of radiographic errors and the frequency of errors. X axis represents the types of radiographic errors and Y axis denotes the frequency of the errors recorded in this study. Light blue indicates the conecut of 41%, pink color indicates elongation of radiograph around 21%, purple denotes 17% of the radiograph with foreshortening, olive green colour exhibits 9% of the radiograph have overexposure and yellow colour indicates that 12% of the recorded radiographs are underexposed.

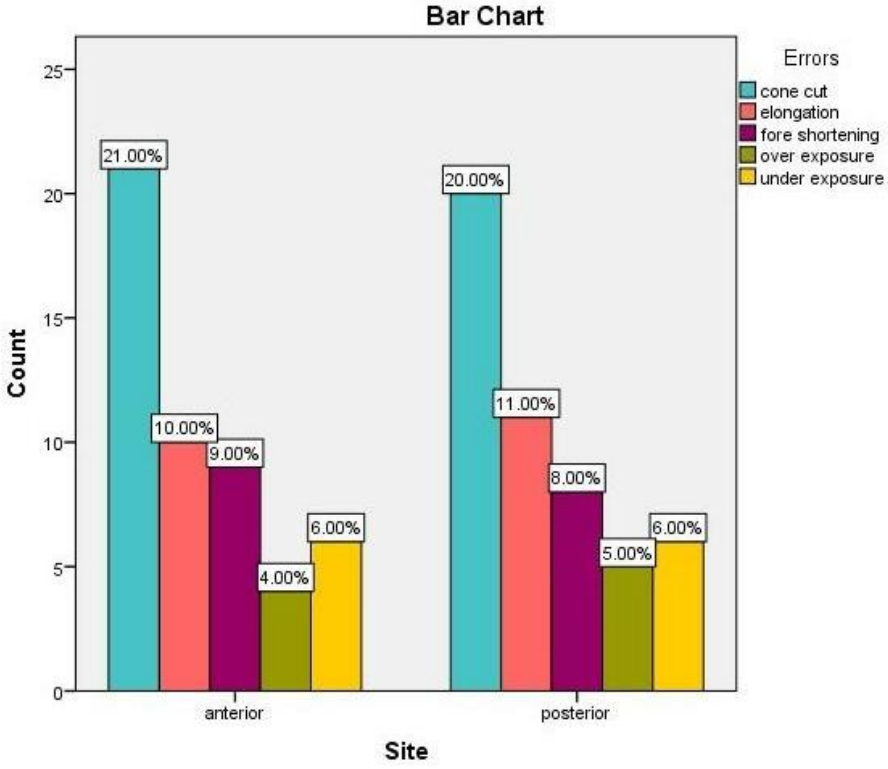

Figure 3: Graph indicates the association between the different types of radiographic errors and the frequency of errors. X axis represents the site of the radiograph taken and Y axis denotes the frequency of the different types of radiographs recorded in this study. Light blue indicates the conecut of 21% in anterior and 20% in the posterior region, pink color indicates elongation of radiograph around 10% in the anterior region and 11% in the posterior region, purple denotes 9% of the radiograph in the anterior region and 8% of the radiographs in the posterior region with foreshortening. Olive green colour exhibits 4% of the radiograph in the anterior and 5% of the remaining radiographs in the posterior region to have overexposure. Yellow colour indicates that 6% of the anterior radiographs and 6% of the posterior radiographs were recorded to have

underexposure. Chi square test was shown significant (p value- 0.049 < 0.05)

DISCUSSION:

From the results obtained, we can see that our study shows the most frequently encountered radiographic error was found to be conecut which was around 41% out of the 100 conecut out of which 21% is from anterior and 20% is from the posterior. Previous study (Patel, J. R. and Greer, D. F. (1986); Jayasree, R. et al. (2021) states that 54% of the radiographs indicating conecut as the most predominantly encountered error, in which 32% is from the anterior site and 22% is from the posterior site. The next most frequently encountered error in the radiographs was elongation which amounted upto 21% out of the 100 radiographs in which 10% is from the anterior site and the remaining 11% is from the posterior area. Comparing with previous study article (Mourshed, F. 1971) , Around 20% of the remaining radiographic images indicated elongation as the next most common radiographic error obtained by the dental undergraduate students in which 11% are from the anterior region whereas remaining 9% are from the posterior region. Around 17% of the radiographs indicated foreshortening error following elongation, in which 9% radiographs are from the anteriors and 8% radiographs are obtained from the posterior are. A previous study conducted by (Pillai, K et alet al e(2015) ;Patil, S. R. et al. (2021) shows 12% of the radiographs indicating foreshoertening out of which 7% is from the anterior site and 5% was obtained from the posterior site. The least encountered radiographic error was noted down to be overexposure showing a frequency of 9% in which 4% from anterior site and 5% from posterior site is indicated out the 100 radiographic images obtained. The previous study article indicated 5% of the radiograph images to have an error of overexposure in which 2% is from the anterior region and 3% is from the posterior region. The 2nd least encountered radiographic error was noted to be underexposure in which 12% of the radiographs, 6% from the anterior and 6% from the posterior site were indicated. Previous study article Mourshed, F. et al(1971) indicated that around 9% of the radiographic images were subjected to underexposure, in which 4% is from the anterior site whereas remaining 5% is from the posterior region

LIMITATION:

The limitation encountered in this study are the limited population involved and the geographic limitations as it was conducted in Chennai. Future prospective studies are to be done to have a wider scope and better results, thus enhancing the possibility of obtaining radiographs with least errors at a much limited time duration .

CONCLUSION:

Consideration of these factors may be beneficial for a high-quality education and a reduction in radiography retakes throughout undergraduate dentistry students' training periods. Furthermore, patient, clinician, radiology staff, and environment exposure, as well as time and money lost, could be decreased.

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