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Prevalence of Errors Present in Intra-Oral Periapical Radiographs in Patients Visiting a Private Dental College in Kanpur City

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ABSTRACT

BACKGROUND: Radiographs have become an important tool for diagnosis in dentistry as well as treatment planning. Proper techniques, safety measures and knowledge regarding taking radiographs is imperative for a dental professional.

AIM: The aim of this study was to assess the prevalence of errors present in intraoral periapical radiographs (IOPA) in patients visiting a private dental college.

MATERIALS AND METHODS: This study was conducted in the Department of Oral Medicine And Radiology. A total of 100 periapical radiographs were included in the current study. All the assessed intraoral periapical radiographs were taken using digital radiography in the bisecting angle technique.

RESULTS: A total of 100 radiographs were included in the study, out of which 66 % of the IOPAs were found to possess no error, 10 % of the IOPAs had cone cut, in 8 %, angulation defects were found, 6% had foreshortening, elongation found in 5% of the IOPAs,5%were blurred as assessed in this study. The study population showed a female predilection.

CONCLUSION: This study has classified and evaluated all the faults that can occur in recording an IOPA. Hence this will help us to overcome the faults in practicing dental radiograph by the dental students.

KEYWORDS: Faulty radiographs, Quality assurance, Radiographic errors

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INTRODUCTION

Radiographs are an integral component in the aspect of diagnosis and treatment in dentistry.[1] As a dental surgeon, one should be equipped with knowledge of taking, handling, processing and interpreting radiographs. Although there is a standard for subjective quality rating of radiographsdefined,thereisnonethelesswidespreadevidencethatmanygeneralpractitioners fail to achieve these standardized levels.[2-5] Film rejection analysis is an important tool for identification of factors associated with sub optimal radiographic images and subsequent rectification. While traditional X - rays are considered safe, digital radiographs have now taken over the era. Digital radiography (DR) is an advanced form of x - ray inspection which produces a digital radiographic image instantaneously on a computer. It uses x - ray sensitive plates to capture data during object examination, which is immediately transferred to a computer thereby eliminating the intervention of an intermediate cassette. The incident x ray radiation is converted into an equivalent electric charge and then to a digital image through a detector sensor. Digital X - rays produce 80 % less radiation than the conventional radiography methods.[6,7]Theadvantagesofdigitalradiographyoverconventionalradiographs include lesser chair side time due to immediate results, elimination of any processing or handling errors, eliminates processing chemicals hence safe for environment, digital image enhancement and data storage, higher productivity, portability, easy to transfer to clients electronically, etc.[8,9] However, even in digital radiographs, the tube head direction and receptor positioning have to be done manually, which can lead to faults sometimes. Some of the common errors include cone cuts, angulation errors, foreshortening, elongation, blurring, overlapping. Although faulty radiographs are unavoidable, better practical approaches can prevent faulty radiographs and avoid unnecessary exposure to the patient.[10–12] our team has extensive knowledge and research experience that has translate into high quality publications.[13-32] The aim of the current study was

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to perform a retrospective analysis to assess the prevalence of faults in IOPAs in the department of oral medicine and radiology taken in a Rama Dental institute.

MATERIALS AND METHODS

The study was performed as a retrospective study under a University setting. The required data was procured by reviewing patient records and analyzing data of 100 patients who visited the outpatient department of a Rama Dental College. Ethical approval was obtained from the institutional committee. The total sample size achieved after fulfilling inclusion and exclusion criteria was n = 100. Verification of the data was done with the help of additional reviewers, procedure notes and radiographs. Stratification and randomization of the data was done. All available data were included without any sorting process so as to minimize sampling error. Incomplete data, i.e. data without notes were excluded. Internal validity -yes, while external validity is not applicable. The procured data was sorted and tabulated in excel in a methodological manner and verified manually. Various parameters required for assessment pertaining to the study were sequentially entered and transferred to the IBM SPSS software analysis. The various parameters assessed include: Age,Gender,Errors-present/absent,Type of error.

The procured data was sorted in MS Excel and prevalence and association between the parameters were statistically analyzed using the IBM SPSS software version 23 and the results interpreted as graphs and tabulations.

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RESULTS

Among the analyzed radiographs, a prevalence of 34% was found for errors in IOPA's as observed in this study.

The gender distribution of the study showed a female predilection, with 64% of the study population being females.

On statistical analysis performed to find if there was any significant association between gender and the errors perceived, Chi-Square analysis revealed that there was no significant relationship between gender and type of error as observed in this study, ($p = 0.05$).

The graph depicts the association between mean age, gender and radiographic errors as observed in this study. As a dental surgeon one should be aware of the protocol of taking radiographs and deriving the diagnosis by interpreting them. Radiography serves as a key diagnostic tool in dentistry which renders good and quality radiographs as a prime requisite to attain an appropriate diagnosis.[33,34]

DISCUSSION

Radiographs with poor diagnostic value not only hinder the process of diagnosis and disease management but also creates a hazardous scenario where the patient and operator are subjected to unwanted radiation and other discomforts. Hence the X-ray unit, technique chosen, exposure parameters, skill of operating personnel, patient education is of equal importance.[35] In the present study, which included 100 IOPA's, faults such as cone cuts, elongation, foreshortening, elongation, blurring type of errors were detected. Cone cut was the most common fault perceived in this study, which accounted for about 10 % of the errors. This prevalence is in accordance with previous studies conducted.[36,37] This can be attributed to factors such as cone not covering the area of interest which can be due to minimum expertise of the operating

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personnel, displacement of the film, when a film holder is used or patient moved. 5 % of the Radiographs assessed showed elongation, which is due to increased angulation that can be attributed to the limited skill of the operating personnel. Angulation errors due to incorrect film placement or improper positioning of the tube head, accounted for 8 % of the errors as observed in this study. Our study results were found to be in concordance with previous literature.[38] Foreshortening was observed to be 6% in this study, occurring due to increased angulation which is attributed to the knowledge of operator and positioning of the tube head. The proficiency of operating personnel plays a pivotal role.[39,40] Blurring defect was observed in 5 % of the IOPA's analyzed. Blurring occurs due to movement of the patient, receptor or the tube head during thetimeofexposure.[41]66%oftheradiographswerefoundtobepresentwithoutanyfault sas observed in this study, which thorns an insight on the developing knowledge and skill of the students towards positioning of the machine and handling of the same. On association between ages, gender with the errors in radiographs, both did not yield any association which was of statistical significance. This could be attributed to factors such as study being unicentric, limited sample size, geographic trends not assessed. The intraoral dental x-ray is among the most powerful diagnostic weapons in the dentist's arsenal. The quality of any radiograph depends on accurate technique and careful processing of the image. Correct positioning of the patient is essential for a sharp, accurate, and undistorted image, which is not affected by ghost images. In addition, quality control is crucial when interpreting the image (Tables 1-4)

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	AGE	GENDER	RADIOGRAPHIC ERRORS IF ANY
N VALID	100	100	100
MISSING	0	0	0
MEAN	38.34	0.36	1.89

Table 1. Statistics

	VALUE	DF	ASYMPTOTIC SIGNIFICANCE (2-SIDED)
PEARSON CHI-SQUARE	3.984	5	0.557
LIKELIHOOD RATIO	4.049	5	0.542
LINEAR BY LINEAR ASSOCIATION	0.074	1	0.785
N OF VALID CASES	100		

Table 2. *Chi - Square* Tests

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	FREQUENCY	PERCENT	VALID PERCENT	CUMULATIVE PERCENT
VALID NO ERROR	66	66	66	66
CONE CUT	10	10	10	76
ANGULATION	8	8	8	84
FORESHORTNING	6	6	6	90
ELONGATION	5	5	5	95
BLURRING	5	5	5	100
TOTAL	100	100	100	

Table 3. Radiographic Errors If Any

	FREQUENCY	PERCENT	VALID PERCENT	CUMULATIVE PERCENT
VALID FEMALE	64	64	64	64
MALE	36	36	36	100
TOTAL	100	100	100	

Table 4. Gender

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CONCLUSION

Radiographs plays an important component in the aspect of diagnosis and treatment in the dental field. The present study aimed to identify the faults which are encountered during routine radiography and thereby understand the technical knowledge related to radiation thereby overcoming these faults and reduce the repeated exposures.[42]

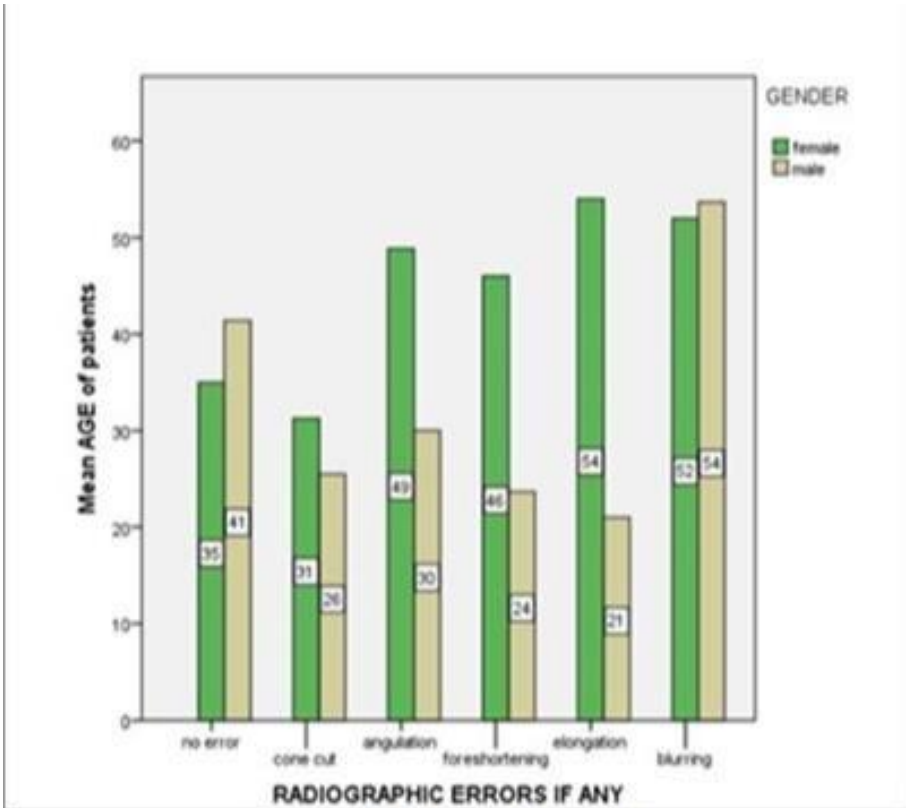

Figure 1. Radio Graphic Error if Any

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