Faulty radiographs: A cross-sectional analysis among dental college students in Namakkal District, Tamil Nadu, India

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ABSTRACT

Aim: The aim of this study was to assess the ability of taking and processing of intraoral periapical radiographs (IOPA) by the dental college undergraduate students and also to evaluate the impact of teaching on their skills. Materials and Methods: This study was conducted in the OMRD department. Final year students (52) and interns (41) of 2014 were included in this study. In this 1 year study, 13104 IOPAs were taken and manually processed by these students. These radiographs were evaluated by two senior faculties of the department separately. To check variability between two examiners, ANOVA test was performed and all data were analyzed using WINDOW’S SPSS version 12 (Microsoft, USA). Results: Of 13104 IOPAs, 3538 were considered as faulty radiographs, of this 26.1% cone cut which occupies the first position and was followed by improper vertical angulation (23.2%), film position error (10.1%), improper horizontal angulation (13.1%), processing errors (9.5%), and miscellaneous such as reversed film, film bending (2.9%). Conclusion: Considering the statistical analysis by increasing experience, students make fewer numbers of errors.

KEY WORDS: Cone cut, faulty radiographs, intraoral periapical

In modern society, institutions play a key role by inculcating knowledge in the students and have become centers of revolution. Similarly, these institutions are having responsibility of producing highly skilled, trained, and efficient personalities to fulfill the needs of the society. To fulfill this, institutions have to periodically evaluate performance level of their system and have to modify it. To avoid this, institutions have to periodically evaluate performance level of their system and have to modify it. In dental colleges, educational programs are designed such a way that the dental students to obtain both technical skills and application skills. In comparison to other fields, here, application of skill occurs on the humans and there is no room for mistakes. Because of this dental college, students have to be trained rigorously to avoid mistakes.

In dentistry, radiographs have become inseparable parts for diagnosis and treatment. As a dental surgeon, he/she should be aware of taking and processing radiographs. Even though digital revolution is going on in this field, proper positioning and angulations have to be done manually. For this, they have to be trained thoroughly in the radiographic techniques during their course itself. To improve the performance of the students and to reduce radiation exposure to the patient by reducing faulty radiographs, one cross-sectional survey was planned. By this survey, we can identify where do the students commit common mistakes and what kind of changes we have to make in our teaching pattern to improve their skill.

Materials and Methods

In this cross-sectional study, an inclusion criterion was undergraduate students of final year and interns of 2013–2014 academic years. All intraoral periapical (IOPA) radiographs were taken and processed by final year students and interns. In this 1 year study, 13104 IOPAs were taken and manually processed by these students. These radiographs were evaluated by two senior faculties of the department separately. To check variability between two examiners, ANOVA test was performed and all data were analyzed using WINDOW’S SPSS version 12 (Microsoft, USA). Results: Of 13104 IOPAs, 3538 were considered as faulty radiographs, of this 26.1% cone cut which occupies the first position and was followed by improper vertical angulation (23.2%), film position error (23.2%), improper horizontal angulation (13.1%), processing errors (9.5%), and miscellaneous such as reversed film, film bending (2.9%). Conclusion: Considering the statistical analysis by increasing experience, students make fewer numbers of errors.

KEY WORDS: Cone cut, faulty radiographs, intraoral periapical
technique and manual processing method, using Kodak-E speed films with 70 kv and 10 ma machine used. All the radiographs were examined by two senior faculty of the members OMRD department separately and faulty radiographs were collected. To rule out difference between staffs, the results were subjected to KAPPA analysis. All statistical data were analyzed using WINDOWs SPSS-12 version and Chi-square test was also performed. P value was fixed as 0.05 for statistically significant.

**Results**

The total number of radiographs taken by final year and interns were 13,104, of which 3538 [Table 1 and Chart 1] (2796 by final year and 742 by interns) were considered as faulty radiographs. Of 2796 faulty radiographs, 1049 in first posting, 956 were in second posting and 791 were in third posting were taken by the final year students [Table 2]. According to [Chart2, Tables 3-5]. Most common error committed by the final year and the interns was cone cut (26.1% and 32.2%) and followed by improper vertical angulation in final years (24.2%). In interns, it was incorrect film placement (26.7%) [Chart2, Tables 2 and 4]. P < 0.05 was considered statistically significant.

**Discussion**

In dentistry, radiographs have become a very important diagnostic aid. Good quality radiographs without faults are required for diagnosis and treatment plan.[3] Several previous studies showed that a significant number of radiographs had faults. An IOPA with technical defects such as cone cut, elongation, or shortening is not useful in diagnosis or endodontic treatment. [4,5] Errors in taking radiographs necessitate repetition and increase patient’s radiation exposure, and also waste money and time. Inspecting the frequency and mechanism of producing errors will result in fewer retakes; however, there are very few studies to evaluate radiographic errors in dental field. [6] Patel et al. evaluated the frequency of errors necessitating retakes in paralleling intraoral radiographic technique. [7] Of 6763 exposure, 13.1% were retaken. Incorrect film placement and cone cutting were the most frequent errors, respectively. Moursheed et al. reported 47% technical errors in 5578 periapical radiographs made by dental students using the bisecting-angle technique. [8]

In this study, we analyzed 13104 IOPA radiographs of which 3538 (27%) were proved not fit for usage due to technical errors. Results of this study come nearly equal to previous studies. [9,10] In our study, we also compared among 4th year students according

| Table 1: Radiographic data |
|-----------------------------|
| Number of intraoral periapical radiographs taken | Number of faults committed | Percentage |
| Final years | 7488 | 2796 | 37.3 |
| Interns | 5616 | 742 | 13.2 |
| Total | 13,104 | 3538 | 27 |

| Table 2: Radiographic faults made by final year students |
|-----------------------------|
| Type of fault | Numbers | Percentage |
| Cone cut | 729 | 26.1 |
| Improper vertical angulation | 676 | 24.2 |
| Improper horizontal angulation | 372 | 13.3 |
| Processing error | 312 | 11.2 |
| Incorrect film placement | 621 | 22.2 |
| Miscellaneous | 86 | 3.1 |
| Total | 2796 |

| Table 3: Faults according to the posting (final year) |
|-----------------------------|
| Posting order | Number of faulty iopas taken | Percentage (%) |
| First posting | 1049 | 37.5 |
| Second posting | 956 | 34.2 |
| Third posting | 791 | 28.3 |
| Total | 2796 |

| Table 4: Radiographic faults made by interns students |
|-----------------------------|
| Type of fault | Numbers | Percentage |
| Cone cut | 174 | 23.5 |
| Improper vertical angulation | 166 | 22.4 |
| Improper horizontal angulation | 114 | 15.4 |
| Processing error | 76 | 10.2 |
| Incorrect film placement | 196 | 26.5 |
| Miscellaneous | 16 | 2.2 |
| Total | 742 |

| Table 5: Faulty radiographic distribution pattern |
|-----------------------------|
| Final years | Interns | Total | Percentage |
| Cone cut | 729 | 174 | 903 | 25.5 |
| Improper vertical angulation | 676 | 166 | 842 | 23.8 |
| Improper horizontal angulation | 372 | 114 | 486 | 13.7 |
| Processing errors | 312 | 76 | 388 | 11 |
| Incorrect film positioning | 621 | 196 | 817 | 23.1 |
| Miscellaneous | 86 | 16 | 102 | 2.9 |
| Total | 2796 | 742 | 3538 |
Elangovan, et al.: Faulty radiographs

S118

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Conflicts of interest
There are no conflicts of interest.

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to their posting (i.e., 1st, 2nd, and 3rd) to check whether there is any change in their capacity according to the posting level. Results clearly showed that there is reduction (39%, 33.4%, and 27.6%) in taking and processing errors. Similarly, we compared 4th year students with 5th year students (CRI); it also showed that 5th year students outperformed 4th year students (37.3%, 13.2%). This clearly indicates that experience reduces the error occurrence frequency among the students. In the present study, the cone cut, improper vertical angulation, and incorrect film position secured 1st, 2nd, and 3rd position successively by the percentage of 25.5%, 23.8%, and 23.1%, respectively. In 1986, Patel et al. concluded that incorrect film placement followed by incorrect vertical angulation and cone cutting were the most common errors in paralleling technique. There was the most common type of error that is in accordance with the study conducted by Mourshed et al. in which improper film placement was reported to be the most frequent error.\[1\] Our study differs from these studies.

Conclusion
Radiographs are necessary for an accurate diagnosis, performing dental procedures, in evaluating procedural success and in recording of dental and oral health status. Moreover, undergraduate dental students must realize the value of understanding the basic knowledge of periapical radiograph interpretation and its influence upon taking an accurate diagnosis. Dental radiographs are one tool and not adequate to diagnose any conditions so neglecting the clinical view and other diagnostic tools are not recommended. This study clearly states that experience reduces the chance of fault radiographs. Based on this study, to make a good outgoing dental surgeon, students have to be given more chance to take radiographs. Theoretical approach along with practical experience always yields good result.