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Original Research

'One minute preceptor' a teaching-learning model for oral radiographic interpretation skill

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ABSTRACT

Radiographic interpretation skill is the most essential skill for a dental undergraduate to obtain the degree of Bachelor of Dental Surgery and also to be a competent private dental practitioner. Despite the various teaching techniques, radiographic interpretation is quite a challenging task. One minute preceptor (OMP) model is widely used for active teaching in busy clinical setting, and the same was applied for teaching radiographic interpretation skill. **Objectives:** 1) To train the III BDS students to arrive at radiographic diagnosis of periapical diseases using OMP model, 2) To assess and compare the performances of the students after OMP training using structured checklist. **Methodology:** The study involved 64 third year BDS students posted in the department of Oral medicine and radiology. After obtaining an informed consent the students were randomly divided into intervention group and comparison group with 32 students in each group. A discussion on radiographic interpretation of periapical diseases was conducted at the department and was followed by a pretest on the same day for both groups. The pretest comprised of written radiographic interpretation of periapical diseases displayed on the computer screen, which were evaluated using a 10 item checklist. Intervention group underwent training through One minute preceptor (OMP) method for radiographic interpretation wherein they were guided by the preceptor using five microskills of OMP followed by post test for both the groups. **Results:** The pre and post test scores of comparison and intervention groups were analyzed using unpaired't' test. The post test scores between the two groups were significantly different with and a p value of 0.00001, revealing the positive impact of OMP training. **Conclusion:** By using 'One minute preceptor' model, the students radiographic interpretation skill advanced from being unorganized and inconsistent to systematic and consistent with clinical diagnosis.

KEY WORDS: One minute preceptor, radiographic interpretation, periapical diseases, intraoral, skill, teaching, learning, dental, intraoral radiograph.

INTRODUCTION

In view of competency based education, the Dental Council of India (DCI) in 2007 has revised the undergraduate dental education guidelines. The revised DCI regulations foresee a dental graduate competent to investigate, diagnose, manage, and prevent oral diseases prevalent in India. The two important generic skills which a general dental practitioner must possess are clinical evaluation, diagnosis and acquisition of dental radiographic images and their interpretation[1]. To meet the global standards in dentistry, the Dental Council of India stresses the need for the acquisition of radiographic interpretation skill by the general dental practitioners. Concurrently the growing patient expectations for high quality treatment poise significant challenges to dental practitioners. Hence the training provided in all the dental institutions should be apt to convert the student into a competent dental practitioner.

Oral medicine and radiology, one amongst the nine specialties in dentistry offers training to the third year BDS and final year BDS students to make the radiographs and interpret them. Radiographs form an essential diagnostic tool for patient assessment and treatment planning and form the backbone of all clinical specialties of dentistry. Hence radiographic interpretation skill is the most important skill to be fostered amongst the dental students to be competent general dental practitioners and is mandatory for the students to pursue specialization in all the branches of dentistry as well. For the ethical and efficient practice of dentistry a thorough knowledge of various available radiographic modalities, their applications, and accurate interpretation of the images and data created is necessary[2]. A clinician must be trained with an eye to identify normal anatomical landmarks and their variations as well as variations owing to pathology in a radiograph. Radiographic examination of the periradicular tissues is important when evaluating periapical lesion and for the success and failure of root canal treatment[3]. The radiographic evaluation by dentists of the periapical area is reported to be unpredictable and inconsistent with diagnosis of pulpal and bone disease[4]. This inconsistency is attributed to elusive qualities of a radiograph and to wide variation in interpretation among different observers and within the same observers at different times [4,5,6] .

A study to evaluate ability of general dental practitioners to radiographically diagnose the case, involved 20 general dental practitioners who were given two sets of questionnaires. The first set asked them to fill out the findings they would elucidate in a diagnostic radiograph while the second

set consisted of interpretation of 30 randomly selected intraoral radiographs. The study revealed that general dental practitioners were able to detect radiographic changes when they are extensive but they missed periodontal ligament width and lamina dura changes[3].

Moreover the physicians contract challenges whilst teaching the students in the clinical settings such as providing quality health care, maintaining efficiency, and incorporating meaningful education for learners. To surmount these challenges, numerous alternate teaching strategies have been adopted such as One Minute Preceptor (OMP), SNAPPS (abbreviated form of summarize, narrow, analyze, probe the preceptor, plan, select case for learning) and Aunt Minnie pattern recognition. OMP and SNAPPS have shown to improve educational processes and outcomes as per the literature [7].

According to OMP model, teaching- learning occurs in a short duration, in a realistic setting with patient on dental chair providing experiential learning to the students for future practice. OMP is a widely used "teaching model" that facilitates teaching and learning between learner and teacher in busy clinical setting, promotes to build the student-teacher conversations by allowing the students to demonstrate clinical knowledge and reasoning and aids the teachers to diagnose not only the case but also the learner. OMP consists of five "microskills" such as Getting a commitment, Probe for supporting evidence, Teach the general rules, Reinforce what was done right and Correct mistakes[8,9,10].

This sequence of micro skills definitely fosters learner ownership of the clinical problem at the same time learners knowledge is assessed and critical thinking is promoted.

A study in which 164 third and fourth year medical students viewed traditional and OMP teaching encounters, found that the students rated OMP encounters more effective than traditional teaching[11]. Another study, wherein 28 residents received a 1-hour training session on OMP were compared with 29 control residents. The students rated those residents trained in OMP more highly in terms of "asking for a commitment," "providing feedback," and "motivating me to do outside reading" [12].

This study was conducted with an objective of fostering radiographic interpretation skill by training the third BDS students using the OMP model for radiographic interpretation as to arrive at an accurate diagnosis. Hence a research hypothesis was formulated stating that OMP training of undergraduate students for intraoral radiographic interpretation of periapical diseases would help them learn better as compared to a traditional training.

STUDY METHODOLOGY

This study was a randomized pre-post trial (O-----X-----O) conducted in Department of Oral Medicine and Radiology. Ethical clearance was obtained from the institutional review board with IRB protocol number 766.

After obtaining a written informed consent 64 third year BDS students posted in the department of Oral medicine and radiology were involved in the study. The students were informed regarding the study design and protocol. Alternate batches of students (16 per batch) were assigned to one of the two groups, Comparison group and Intervention group thus rendering 32 students in each group.

When the students belonging to either the comparison or intervention group, were posted in the department, a discussion was conducted on radiographic interpretation of periapical diseases and the same was followed by a pretest on the same day. Pretest was in written format wherein five intraoral periapical radiographs of periapical diseases were displayed on the screen, and the students interpreted the radiographs in written format which was assessed using the structured 10 items checklist. The checklist was structured to include the must know, good to know and nice to know categories of the content and was prepared after obtaining consensus from all the teaching staff of the department.

After the pretest, the comparison group students underwent traditional training wherein the students verbally interpreted the radiographs on daily basis for a period of one week.

On the contrary, the intervention group students were divided in small groups of six to seven students and five different intraoral periapical radiographs of periapical diseases were discussed for a duration of 20 minutes. Then the students interpreted the intraoral radiographs under the guidance of OMP principles for duration of one week. Later at the end of posting after week both the groups underwent a posttest.

The same set of 5 intraoral radiographs were used to conduct the pre and post test for both the comparison and intervention groups. The tests were termed as "Objective structured radiographic Interpretation" (OSRI) and were aassessed using a structured 10 item checklist (Appendix 1).

RESULTS AND OBSERVATION

There were no differences in relation to age, level of previous training amongst the comparison and intervention groups as all the participants were students of III BDS attending the clinical postings.

The scores of both the comparison and intervention groups followed a normal distribution curve with the scores ranging from 1- 36. To compare pretest, posttest scores of the comparison and intervention group unpaired't' test was used and for intergroup comparison paired 't' test was applied.

Pretest scores which demonstrated the baseline information of the students were similar amongst the comparison and intervention groups as represented in, Table 1, Fig 1, with a mean of 5.32 ± 1.34 and 5.30 ± 2.24 respectively, with a 't' value of 0.0419 and 'p' value of 0.9667 demonstrating no statistical significant difference.

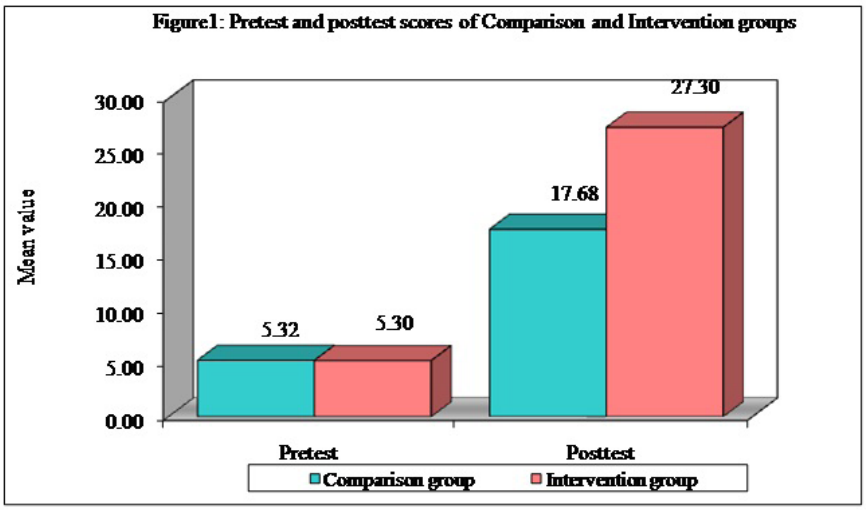

Figure 1. Pretest and posttest scores of comparison and intervention groups

Table 1. shows the magnitude of change in pre and post scores of comparison and intervention groups and difference scores as analyzed by unpaired t test.

Variable	Group	n	Mean	SD	t-value	p-value
Pretest	Comparison	32	5.32	1.34	0.0419	0.9667
	Intervention	32	5.30	2.24		
Posttest	Comparison	32	17.68	4.16	-8.4494	0.00001*
	Intervention	32	27.30	4.76		
Difference	Comparison	32	12.37	3.80	-8.1375	0.00001*
	Intervention	32	22.00	5.34		

*p<0.05

When the post test scores of both the groups were compared with the respective pretest scores, there was statistically significant difference in performance of students of both the groups with a mean of 12.37±3.80 and 22±5.34 for the comparison group and intervention group respectively with a p value of 0.00001, Table 2 and Fig 2. This demonstrates that there was a positive impact on learning of the students, by either traditional or using the OMP model.

The difference in difference scores between the comparison and intervention groups was statistically significant with a mean difference value of 9.63 and a p value of 0.00001 as shown in Table 3, thus revealing statistically significant improvement in radiographic interpretation skill of students after training using OMP model.

DISCUSSION

Radiographic interpretation is a vital part of diagnostic process. The interpretation of width of periodontal ligament and lamina dura on the radiographs is subjected to high interobserver variability since the periodontal ligament and lamina dura demonstrate variations in width physiologically in relation to the anatomy of the different teeth. Periodontal ligament space and lamina dura in premolar and canine region are often not appreciated on the radiographs due to their decreased width in these regions[13]. In view of these constraints it is extremely necessary to follow a systematic radiographic interpretation format and rigorously train the students in radiographic interpretation skill for the radiographic diagnosis.

In the present study the students in both the comparison and intervention group had same baseline information as reflected in their pretest scores as both the groups had participated in the discussion on radiographic interpretation during their clinical postings in the department.

The students in the intervention group post OMP training had demonstrated a significant improvement in radiographic interpretation skill with 't' value of -8.1375 leading to high accuracy in diagnosis of periapical diseases which is essential for successful treatment outcome. The findings are in accordance with study of Kaffe et al[4] where periodontal ligament space and lamina dura changes were evaluated more consistently by the dentists than the other features and were considered to be accurate predictors of periapical lesion, thus emphasizing the significance of evaluation of these structures. The findings are in contradiction to a study by Saunders et al[14] wherein no dentists were able to interpret periodontal ligament space and lamina dura changes thus affecting the ability of dentists to detect apical root resorption, number of roots and assessment of periapical status.

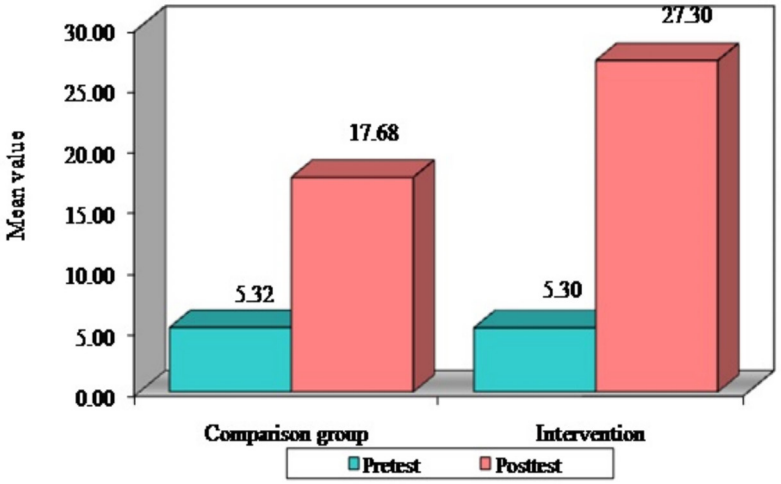

Figure 2. Comparison of pretest and posttest scores in comparison and intervention groups

Table 2. reveals Comparison of pretest and posttest scores in comparison and intervention groups by paired t test

Groups	Test	Mean	Std.Dv.	Mean diff.	SD diff.	% of change	Paired t	p-value
Comparison	Pretest	5.32	1.34					
	Posttest	17.68	4.16	-12.37	3.80	-232.60	-17.841	0.00001*
Intervention	Pretest	5.30	2.24					
	Posttest	27.30	4.76	-22.00	5.34	-415.34	-23.305	0.00001*

*p<0.05

Table 3. reveals the difference in difference scores between the comparison and intervention groups

Groups	Test	Mean difference	Difference in difference scores	p-value
Comparison	Pre and posttest	-12.37	-9.63	0.00001
Intervention	Pre and posttest	-22.00		

Aagaard et al[15] additionally found that preceptors using the one-minute preceptor approach were equally or better able to diagnose the patient's condition correctly, in comparison to those using a traditional approach, and the one-minute preceptors were better able to assess students' abilities and knowledge. The preceptors rated the one-minute preceptor approach more efficient and more effective.

Use of the one-minute preceptor as a teaching tool in the gross anatomy laboratory provided novice anatomy teachers with an efficient and effective teaching strategy, however confining the experienced teachers' teaching behaviors to the OMP structure could limit their performance[16].

The School of Dentistry at Oregon Health & Science University (OHSU)[17] has initiated an iCARE project which is based on OMP model and it is deliberately both preceptor- and student-oriented, reinforces principles of critical thinking, and places more emphasis on evidence-based decision making. Within this framework, the patient benefits from a collaborative approach to problem-solving, in which scientific evidence was integrated with clinical experience. The patient is then able to make the most informed decision for care.

The feedback obtained post study from the intervention group revealed that satisfactory learning had occurred during the training as specific feedback was provided instantly and individually to all the students. The feature of providing feedback is not strongly ingrained amongst the faculty members, and it was through OMP model that helped to train the faculty at this task.

The factors influencing the reliability of interpretation of radiographs are education, training, the viewing conditions and the examiner's knowledge of the subject. Stheeman et al[18] showed that as the diagnostic confidence of dentists increase there is an increase in diagnostic accuracy from radiograph interpretation, and they suggested that methods should be devised in order to improve the diagnostic confidence. Sample of the study was a limitation due to restricted number of students involved in specified duration, further studies with larger sample size and a follow up study to determine the retention of the radiographic interpretation skill amongst the students is the need of the hour.

APPENDIX 1

Checklist to assess the radiographic interpretation skill

S L No.	Areas to be interpreted	Marks assigned	Mentioned/ Not mentioned
1.	The tooth of interest	$^1/_2$ mark	
2.	Abnormality in the crown(enamel, dentin & pulp chamber)	1mark	
3.	Abnormality of the root/roots	$^1/_2$mark	
4.	Variation of the periodontal ligament space	1mark	
5.	Continuity/discontinuity of laminadura specifically around the root surface	1mark	
6.	Description of periapical pathology in terms of location, periphery, internal structure and effect on surrounding structures(based on the pathology)	2 marks	
7.	Alveolar bone support around the tooth of interest	1mark	
8.	Related normal anatomical landmarks	1mark	
9.	Radiographic faults in the radiograph	1mark	
10.	Radiographic diagnosis	1mark	

Total marks obtained :

Signature of the staff

CONCLUSION

This study supports the critical role of the radiographic interpretation in enhancing diagnostic accuracy in oral radiology. It also supports the use of OMP model for systematic radiographic examination as a possible explanation for significant improvement of radiographic interpretation skill in stipulated time setting. Thus by using 'One minute preceptor' model, student's radiographic interpretation skill had progressed from unorganized and inconsistent to systematic and consistent with clinical diagnosis thus achieving an important skill to be a competent general dental practitioner. Further studies can be conducted involving different faculty members trained in OMP and specifically assessing the periodontal ligament and lamina dura interpretations as to evaluate the interobserver variabilities in assessing the periodontal tissues.

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REFERENCES

1. Dental Council of India: Regulations for the degree of Bachelor of Dental Surgery, 2007. The Gazette of India Extraordinary, New Delhi, September 10, 2007.
2. Vandana Kumar, Cynthia A, Gadbury Amyot: A Case-Based and Team-Based Learning Model in Oral and Maxillofacial Radiology: Journal of Dental Education, 2012: March 1, Vol. 76 no. 3: 330-337.
3. Sherwood AI: Pre-operative diagnostic radiograph interpretation by general dental practitioners for root canal treatment: J Dentomaxillofacial Radiology : 2012: 41, 43-54.
4. 4. Kaffe I, Gratt BM : Variations in the radiographic interpretation of the periapical dental region. J Endodontics: 1988;14: 330–335.
5. Goldman M, Pearson AH, Darzenta N: Endodontic success – who's reading the radiograph? J of Oral Surg :1972;33: 342–347.
6. Brynolf I: Roentographic periapical diagnosis. I. Reproducibility of interpretation: J Sven Tandlak Tidskr :1970;63:339–344.
7. William E. Cayley: Effective Clinical Education: Strategies for Teaching Medical Students and Residents in the Office. Wisconsin Medical Journal : 2011: Vol 110, No. 4, 178-181.
8. Neher JO, Gordon KC, Meyer B, Stevens N: A five-step "microskills" model of clinical
9. teaching. J Am Board Fam Pract: 1992; 5: 419-424.
10. Jon O. Neher, MD; Nancy G. Stevens: The One-minute Preceptor: Shaping the Teaching Conversation, J Fam Med: 2003; 35(6):391-393.
11. Sarah Parrott, Alison Dobbie, Heidi Chumley, James W. Tysinger :Evidence-based Office Teaching, The Five-step Microskills Model of Clinical Teaching, J Fam Med: 2006;38(3):164-167.
12. Teherani A, O'Sullivan P, Aagaard EM, Morrison EH, Irby DM: Student perceptions
13. of the one minute preceptor and traditional preceptor models. J Med Teach: 2007; 29(4):323-327.
14. Furney SL, Orsini AN, Orsetti KE, Stern DT, Gruppen LD, Irby DM. Teaching the one-minute preceptor. a randomized controlled trial. J Gen Intern Med: 2001; 16(9):620-624.
15. White SC, Phaorah MJ: Text book of Oral Radiology: 4th edition, Mosby Health Sciences, 2000: Chapter 9, p-173.
16. Saunders MB, Gulabiwala K, Holt R, Kahan RS: Reliability of radiographic observations recorded on a proforma measured using inter and intra observer variation: a preliminary study. Int Endodontics J : 2000;33: 272–278.
17. Aagaard E, Teherani A, Irby DM: Effectiveness of the one-minute preceptor model for diagnosing the patient and the learner: proof of concept. J Acad Med: 2004; 79(1):42–49.
18. Chan LK, Sharma N: Effects of training experienced teachers in the use of the one-minute preceptor technique in the gross anatomy laboratory. J Anat Sci Edu : 2013: Jul 17.
19. Ronald L Sakaguchi: Facilitating Preceptor and Student Communication in a Dental School Teaching Clinic. J Dent Education: 2010 Jan: 74(1):36-42.
20. Stheeman SE, Mileman PA, Van't H, Van der Stelt PF: Diagnostic confidence and the accuracy of treatment decision for radiopaque periapical lesions. Int Endodontics J : 1995;28: 125–128.

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