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Original Research Article

Evaluation of radiographic interpretation skills of undergraduate dental students studying in a dental college of Punjab, India – A comparative study

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ABSTRACT

Introduction: Dental students must have enough knowledge and skills to identify anatomical structures and pathologies in radiographs so as to make better diagnosis about patient's health. Aim of this study was to evaluate on comparative basis the level of radiograph interpretation skills among final year students and interns studying in a dental college of Punjab state.

Materials and Methods: A questionnaire was prepared for this study which contained 20 questions related to radio-diagnosis of normal anatomical structures and pathologies represented by 11IOPARs, 8 OPGs and 1 extra-oral radiograph.

Results: Out of all interns and final year students- 65.1% of interns have correctly identified radiographs and 60.2% of final year students have gave correct responses.

1. Introduction

Radiographs are an important diagnostic tool in dentistry. They help to diagnose and treat various oral conditions like dental caries, periodontal conditions, evaluating bone textures, increase or decrease in bone length after periodontal surgery, and various other benign and malignant anomalies of craniofacial region.[1,2] As radiographs help to evaluate various anatomical structure and pathologies associated with whole body and also craniofacial region, so dental students in order to evaluate various pathologies and make distinction between normal and pathological conditions should be well versed with knowledge of radiology.[3,4]

The knowledge of radiographs is not acquired by some class lectures and added demonstrations, but requires thorough knowledge of basic anatomy, physiology and pathologies of human body added with knowledge of art and science of principles of radiology.[5]

Dental student should be familiar with all the radiographic projections and principles in order to make correct diagnosis. The radiographic structures are categorised according to their densities as radio-opaque, radio-lucent and mixed densities, therefore students must have enough skills so as to make out which density is showing normal anatomy and which is pathology.[6]

The knowledge of radiological interpretation skills is acquired during final year BDS course as per the schedule mentioned by Dental Council of India {BDS course regulation 2007}, this same schedule is followed by our institute. The training on evaluation of different types of radiographic projections in reaching a diagnosis for dental diseases/ailments is undertaken in the third professional year. Before the clinical training is instituted in the final year and internship, knowledge of the interpretation of

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normal vs pathological structures is needed. Earlier studies undertaken to assess the level of training and retention have shown that freshly taught curriculum is better retained by the students, while other investigators have stated that as clinical exposure increases the interpretation skills improve.[3,5] Therefore, the purpose of this study is to assess the interpretation skills of various radiographic projections, principles and pathologies by means of a questionnaire between final year students and interns.

2. Materials and Methods

A google forms based questionnaire was prepared for this study which contained 20 questions related to radio-diagnosis of normal anatomical structures and pathologies represented by 11IOPARs, 8 OPGs and 1 extra-oral radiograph.

Study setting-Epidemiological survey was planned to be conducted among all interns(2017 batch) and final year(2018 batch) students of BJS Dental College. Questionnaire consisted of 20 questions which were in mcq format. 1 mark was awarded for every correct response and no negative marking for incorrect response. Time of 1 minute was given for answering each question (20 minutes in total).

Q1 to Q4, Q8, Q9, Q10 were projection and development error of IOPARs,

Q4, Q7 were normal anatomy occlusal view,

Q5, Q6, Q11 were pathologies revealed in IOPAR

Q12-Q16 normal anatomy OPGs

Q17, Q18 pathologies in OPGs

Q19 OPG projection error

Q20 PA view (extra-oral radiograph)

Data entry- at end of each day, the data were entered to the personal computer by the investigator. It was verified and was scrutinized for any wrong entry. Data were coded and entered into excel sheets.

3. Results

Graph 1:

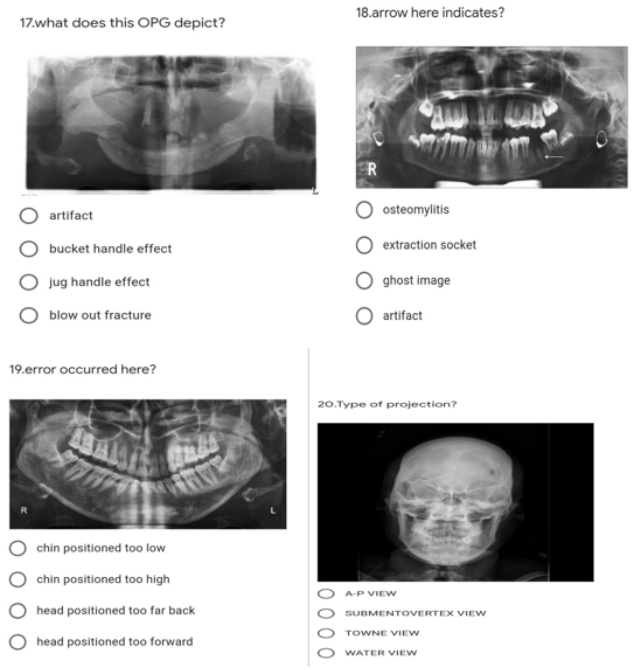
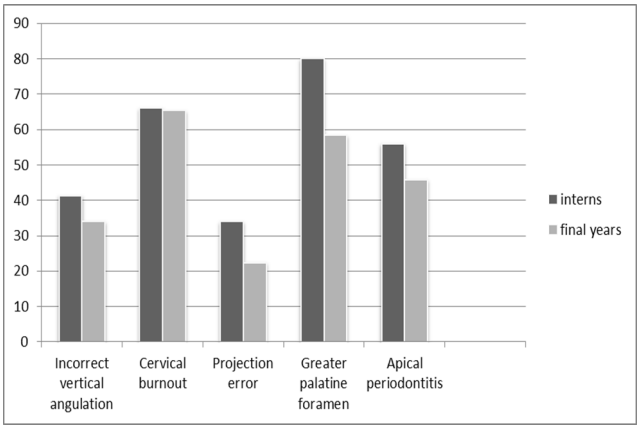
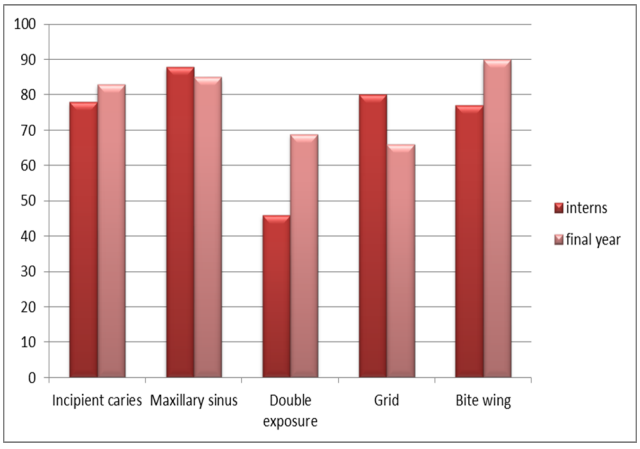


Fig. 4:

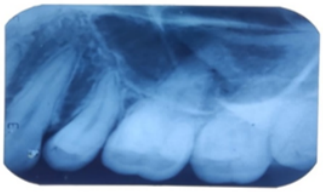


Graph 2:



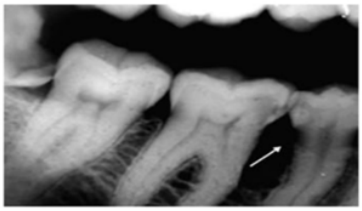
Graph 3:

1.WHAT TYPE OF ERROR IS THIS?



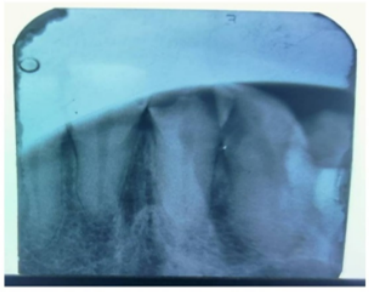
- incorrect horizontal angulation
- incorrect vertical angulation
- SLOB rule
- artifact

2.what error does the radiolucent area represent in the distal portion of mandibular premolar?



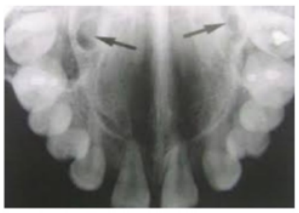
- caries
- cervical burnout
- acute abscess
- vertical root fracture

3.what error occurred here?



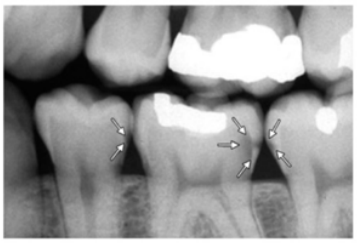
- projection error
- processing error
- tubehead error
- old radiograph

4.WHAT DOES THESE ARROWS INDICATE



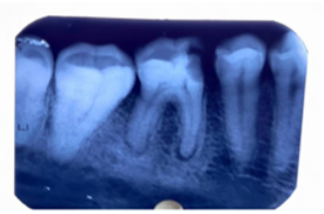
- odontome
- GP foramen
- fibrous ameloblastoma
- dentigerous cyst

6.arrowheads here indicate?



- cervical burnout
- incipient caries
- incorrect projection
- artifact

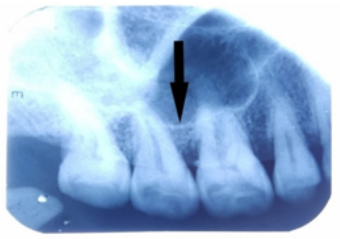
5.which disease condition of periapex does this radiograph reveal?



- apical periodontitis
- apical cyst
- dentoalveolar abscess
- periapical granuloma

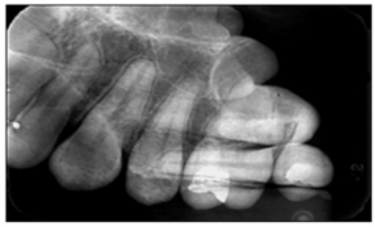
Fig. 1:

7.which structure does this arrow indicate?



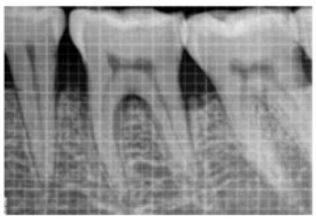
- dentigerous cyst
- OKC/KCOT
- maxillary sinus
- nasal fossa

8.IOPAR here depicts?



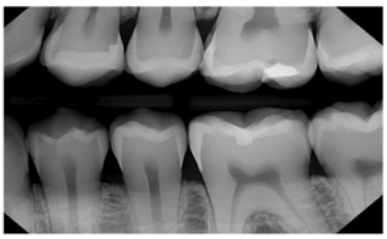
- double exposure
- incorrect projection of X-rays
- artifact
- supernumerary teeth

9.this pattern on film occurred due to?



- grid
- reverse placement of film
- over-exposure of film
- poor film quality

10.radiographic imaging technique used here is?



- paralleling angle technique
- clark's technique
- bisecting angle technique
- bitewing technique

11.what does this radio-opacity indicate?

- mandibular artery
- inferior alveolar nerve
- foreign body
- overextended obturation

12.identify anatomical landmark?

- anterior nasal spine
- nasal septum
- incisive foramen
- incisive canal

Fig. 2:

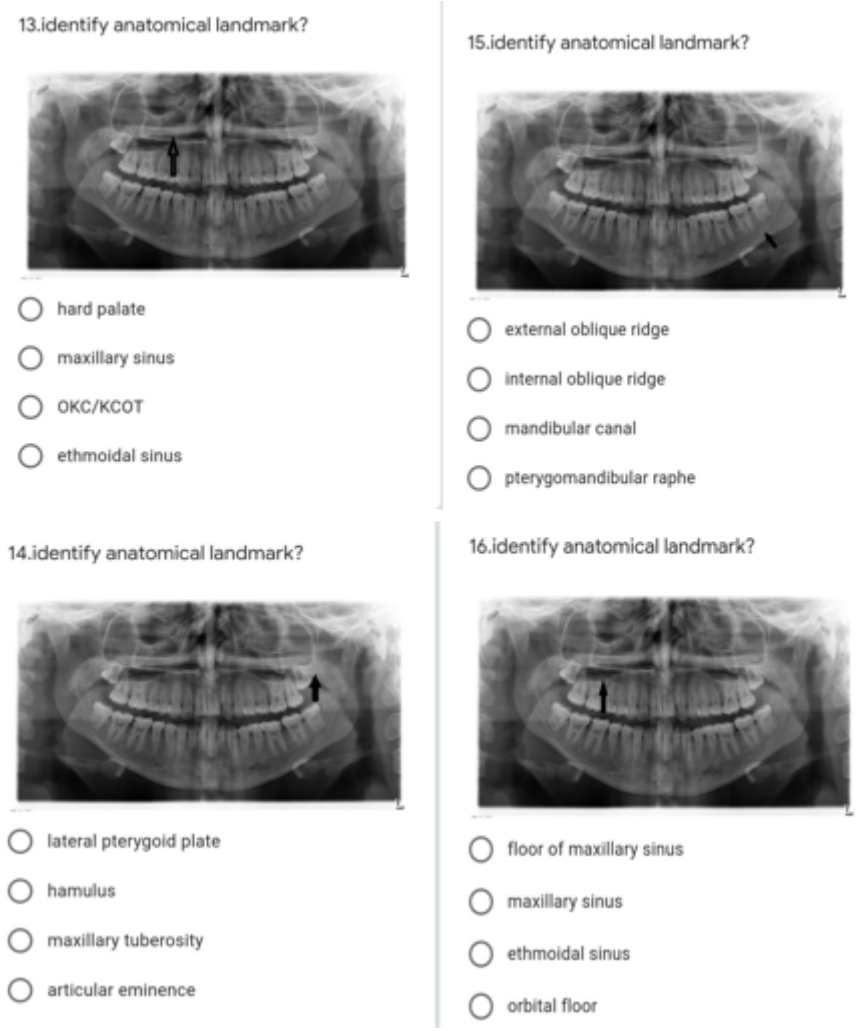
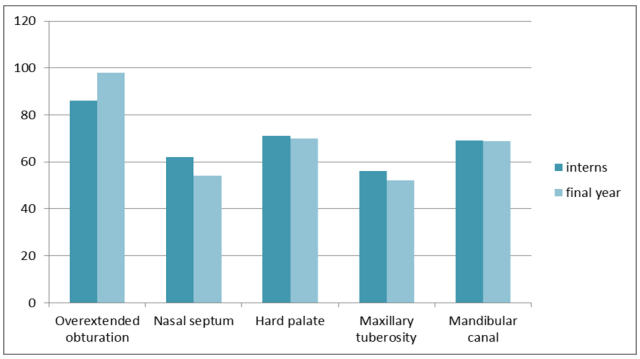
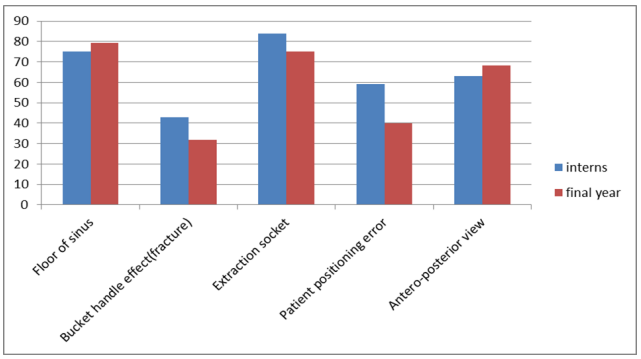


Fig. 3:



Graph 4:



Graph 5:

It has been found in the results that 43.1% of interns gave correct answers to incorrect vertical angulation whereas only 34% of final years have given correct answer to this question. For question about cervical burnout scores of final years and interns are very close that are 66% for interns and 65.3% for final years. In projection error related question performance on both interns and final years is poor i.e. 34% and 22.4%. For question about greater palatine

Table 1:

Question	Percentage of interns who gave correct response	Percentage of final years who gave correct response
Incorrect vertical angulation	41.3%	34%
Cervical burnout	66%	65.3%
Projection error	34%	22.4%
Greater palatine foramen	80%	58.3%
Apical periodontitis	56%	45.8%
Incipient caries	78%	83%
Maxillary sinus	88%	85%
Double exposure	46%	68.8%
Grid	80%	66%
Bite wing	77%	90%
Overextended obturation	86%	98%
Nasal septum	62%	54%
Hard palate	71%	70%
Maxillary tuberosity	56%	52.2%
Mandibular canal	69%	68.8%
Floor of sinus	75%	79.2%
Bucket handle effect(fracture)	43%	31.8%
Extraction socket	84%	75%
Patient positioning error	59%	40%
Antero-posterior view	63%	68.1%
Total % of correct responses	65.1%	60.2%

foramen performance of interns is significantly good that is 80% whereas among final years only 58.3% have given correct responses. In question about interpretation of apical periodontitis 56% interns have given correct answer whereas among final years 45.8% have given correct answer. In question about incipient caries final years have shown better performance as compared to interns (78% interns, 83% final years). In radiograph showing normal anatomy of maxillary sinus scores of interns and final years were not significantly different (88% interns, 85% final years). Final years have better understanding about radiographic defect of double exposure and have performed well with a score of 68.8% where interns have a score of 46% only. Interns are better versed with grid as they have score of 80% and final years have 66%. About radiographic technique for proximal caries (bitewing) final years have 90% response whereas 77% of interns gave correct answer. Final years have better judged over-extended obturation 98% and interns 86%. For nasal septum diagnosis 62% interns gave correct answer whereas only 24% final years gave correct response for this. For hard-palate question 71% interns and 70% final years have given correct responses. 56% interns have correctly identified maxillary tuberosity in OPG. Again for mandibular canal 69% interns and 68.8% final years have given correct response. For identification of floor of sinus 75% interns and 79.2% final years have correctly identified it. For fracture evaluation both have responded poorly (43% interns and 31.8% final years). In OPG showing extraction socket 84%interns and 75% final years have correctly responded. Interns have performed better in patient positioning error with 59% interns giving correct answer and only 40% final years giving correct answer. 63%Inters have correctly identifies AP view whereas 68.1% final years.

4. Discussion

According to previous study done on dental undergraduates about their radiographic interpretation in Qassim University by Abdulrahman Abdullah and Abdulmajeed Abdullah in 2014, where there were 9 IOPARs that were given for evaluation to 3rd, 4th, 5th year students and results said that 5th year students have given highest percentage of correct answers followed by 3rd year and then 4th year who gave poorest response among all.[3]

The current study is a more descriptive study as it takes into account not only IOPARs (intraoral periapical radiographs) but also OPGs and other extra-oral radiographs too. This study extensively evaluate knowledge of students about normal anatomy and pathological findings.

Interns have performed best in questions related to maxillary sinus, over-extended obturation and extraction socket- maxillary sinus is very common anatomical landmark that is visible in most of posterior maxillary IOPARs, so most patients undergoing any sort of treatment related to maxillary arch have maxillary sinus in their radiograph this makes its interpretation easy and hence interns have performed best in this. For over-extended obturation good results might be because during period of internship they start doing root canal treatment and hence they are well versed with gutta-percha density and can easily make out, also they do a lot of extractions and are well versed with socket anatomy on radiograph post-operatively. Also root canal treatment and extractions are 2 most frequent treatment modalities for dental patients.

Most Interns and final years have given incorrect responses for projection error and incorrect vertical angulation also have given incorrect responses about patient positioning error- this might be because they do not very regularly shoot IOPARs of their patients on their own and rely on radiologist for that, so an effort should be made by authorities to set a curriculum such that interns and final years are allowed to shoot IOPARs of their patients on their own which will increase their knowledge about artifacts and hence they can better interpret lesions. Also more classes should be oriented on patient positioning and X-ray shooting technique for better understanding of radiographic

technique.

Results of study indicate that both interns and final year students have not very high evaluative skill for evaluating nasal septum that is because it is not very common for dental students to find patients with anomaly in nasal region as maximum patients with nasal deformity go to otolaryngeologist for evaluation and treatment.

Both interns and final years have failed to respond correctly in question related to fracture shown in OPG, this may be because of terminology of bucket handle that has confused both final year students and interns.

It has been found in the study that more training is required in case of OPG interpretation. Evaluation of radiograph require knowledge of anatomical landmarks and radiographic appearance of pathologies.[5,7] It should also be considered that while undertaking of this students were given limited time of 1 minute per question and for evaluation of big radiographs like OPG more time is required, however if one does good practice then assessment can be made in very less time. It must also be borne in mind of students that structure appearing bilaterally is usually anatomic and if they compare one side of OPG with other they can better evaluate the condition that too in less time. Also they must keep in mind that there are patient positioning errors that may lead to distorted image which may look like pathology.

For Q20 that was about another extra-oral radiographic technique the results are low because dental undergraduate students don't encounter these radiographs very frequently in their practice, so they are not well versed with this kind of radiographic projection.

It has also been found by comparative evaluation of the results that difference in scores of interns as compared to final year students is not significantly high, this may be because of lack regular theoretical training to interns. Interns must also be given regular training classes for better understanding of radiographic technique and more number of lectures for radiology and radio-diagnosis are required for final year students. These changes must be made in curriculum of Bachelor of Dental Surgery (BDS) by concerned authorities.

5. Conclusion

As we know that diagnosis is not the end but the beginning of the practice, so diagnosis should be as accurate as possible and radiographs are essential diagnostic tool for identifying dental pathologies. So, good interpretation of radiographs is very important. It has been found in the study that interns can better interpret radiographic findings as compared to final year students. But interns and final year students both require some-more knowledge to sharpen their radiograph evaluation skills. More number of lecture and practical training hours should be introduced into curriculum of BDS, so that better knowledge can be acquired. Also studies like this should continue in future to evaluate the progress in this context.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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