THE ELABORATIVE PANORAMA OF PANORAMIC RADIOGRAPHY: AWARENESS AMONG BUDDING DENTISTs

[1]Dr Ravinder Singh, [2]Dr Amit Aggarwal, [3]Dr Deepak Gupta, [4]Dr Rakashree Chakraborty, [5]Dr Taruna Mahant, [6]Dr. Preeti Garg Mittal

ABSTRACT

Background: Panoramic radiography is one of the most widely accepted and familiar extra-oral radiographic examination techniques and Increasing numbers of panoramic radiographs are been taken every year worldwide. The faculty of dental colleges educates students about panoramic radiography. The purpose of this study was to assess the capability of undergraduate dental students whether they are able to interpret normal anatomical landmarks, technique errors or any pathology on panoramic radiographs.

Material and Methods: A cross-sectional prospective study was done in which a self-rectified questionnaire that was divided under four headings was prepared by the faculty of oral medicine and radiology department to be filled by students who entered in their internship for the year 2019-20 and were examined. The data collected was statistically analyzed with pie charts and graphs.

Results: The answers collected showed the correct answers with the average mean rate is 55% ± 5%. Interns performed well and correctly identified in errors and artifacts (65%- 81%), followed by the anatomical landmarks (56% - 62%), and followed by the basic principles (49%-63%). Mean of 43% students were able to rule out the pathological changes.

Conclusion: The final outcome of dental education, the dentist, must be a competent clinician in all aspects of dentistry. Therefore to improve the ability of the practicing dentist to effectively use panoramic

[1] Professor Department Of Oral Medicine And Radiology, Maharishi Markandeshwar College Of Dental Sciences And Research, Maharishi Markandeshwar(Deemed To Be University), Mullana Ambala Haryana India
[2] Professor Department Of Oral Medicine And Radiology, Maharishi Markandeshwar College Of Dental Sciences And Research, Maharishi Markandeshwar(Deemed To Be University), Mullana Ambala Haryana India
[3] Reader Department Of Oral Medicine And Radiology, Maharishi Markandeshwar College Of Dental Sciences And Research, Maharishi Markandeshwar(Deemed To Be University), Mullana Ambala Haryana India
[4] Senior lecturer Department Of Oral Medicine And Radiology, Maharishi Markandeshwar College Of Dental Sciences And Research, Maharishi Markandeshwar(Deemed To Be University), Mullana Ambala Haryana India
[5] Post Graduate Department Of Oral Medicine And Radiology, Maharishi Markandeshwar College Of Dental Sciences And Research, Maharishi Markandeshwar(Deemed To Be University), Mullana Ambala Haryana India
[6] Senior lecturer Department Of Oral Medicine And Radiology, Maharishi Markandeshwar College Of Dental Sciences And Research, Maharishi Markandeshwar(Deemed To Be University), Mullana Ambala Haryana India

radiography, we should expand the curricular time devoted to panoramic radiography, both in the class and in the clinic.

I. INTRODUCTION

Panoramic radiography is one of the most widely accepted and familiar extra-oral radiographic examination technique.[1,2] It is the beneficial diagnostic tool in the dentist's apparatus.[3,4] The intensity of the panoramic radiography is that it is a complex projection of jaws and dentition on a single film. Apart from dentition, it also displays numerous anatomic structures such as TMJ's (Temporomandibular joints), the maxillary sinuses, the pharyngeal airway and many more.[2,3]

With the advancement in the use of panoramic radiography in dentistry, it is one of the necessity of the clinician to access and interpret the images accurately.[1] It works on ALARA (as low as reasonably achievable) principle which must be justified clinically and should be prescribed on individual basis.[5] The knowledge regarding the normal anatomical landmarks displayed in the panoramic image is necessary for the detection of the abnormality and for further determination of the normal variant or a pathology.[2]

Sometimes image degradation occurs due to ghost images, distortion of the film, magnification, blurring or superimposition. Due to this, interpretations of image become complicated in the area of interest. But correct technique used during the exposure can minimize these artifacts and positioning errors.[2]

After obtaining the radiograph of acceptable quality, evaluation must be done of all the regions displayed on the image. In case of detection of any abnormality, the principal investigator should have appropriate knowledge regarding the pathology for further relevant course of action.[2]

Using PRs to interpret whether an alteration in the appearance of a structure constitutes pathology is complicated by the potential for image degradation from ghost images, blurring, magnification, distortion or superimposition. While these effects are sometimes unavoidable, they can often be minimised through the application of correct technique during the exposure of the radiograph. Studies have shown that this can be difficult to achieve as errors in positioning are common and often impact significantly on the diagnostic quality of the image.[6, 7,8] Having obtained a radiograph of satisfactory quality, all regions displayed on the PR must then be evaluated. If an abnormality is detected, the person reporting the image is required to apply their knowledge of pathology to determine the significance of the finding and the appropriate course of action. With the increasing utilisation of PRs in dental practice, it is essential that graduates are adequately trained in making and interpreting PRs.

The faculty of dentistry in various dental colleges in India educate students of BDS about panoramic radiography basic principles and interpretation of anatomical landmarks, artifacts and positioning errors and pathological changes on the OPG. When observing the knowledge of undergraduates it may be difficult for students to understand and remember some aspects of panoramic radiography

The aim of this study was to assess the effectiveness of the graduating students whether they were able to interpret the normal anatomical landmarks and to ascertain whether it symbolizes the normal variant and pathology and any other artifacts or positioning errors if present and to identify needs for future undergraduate curriculum changes regarding the teaching of extra-oral radiography at undergraduate level.

II. AIMS AND OBJECTIVES

AIMS: To assess the capability of undergraduate dental students whether they are able to interpret normal anatomical landmarks, technique errors or any pathology on panoramic radiographs.

OBJECTIVES: To assemble data for the judgments and to address shortcomings for improvement in the area of concern or interest.

III. MATERIALS AND METHODS

A Cross-sectional prospective study was conducted on students, who entered in their internship period after clearing final year examination in the respected Departments of MMCDSR, MM (DU), Mullana, Ambala. A self-rectified questionnaire was prepared and verified by the faculty of oral medicine department to be filled by students who entered in their internship for the year 2019-20 and were examined. Questions asked were mixed questions, both closed ended and open ended based on their learning abilities and to remember how to interpret the panoramic radiograph. Questionnaire was divided under four headings regarding- knowledge on basic principles, normal anatomical landmarks, artifacts and positioning errors and pathological changes on the OPG and were explored. OPG was displayed with 6 marked points for identification of normal anatomical landmarks and 2 OPG's were displayed for identifications of pathological changes. Questions on basic principles and artifacts were close ended. Statistical analysis was done with the help of pie charts and graphs.

The questionnaire:

Q1. Questions to check the knowledge regarding basic principles:

1.   Which dimension of the panoramic image is unaffected by the horizontal rotation of the beam?

 A)Vertical B)Horizontal   C)Both

2.   Orthopantomograph uses which center of rotation?

 A)Three B)Two C)one   D)Multiple

3.   Objects outside the image layer will be ?

   A) Unsharp B)Magnified C)No effect

4.   The protective lead sheath is placed in which area of the cassette holder?

 A)Front of the film   B)Back of the film C)both sides
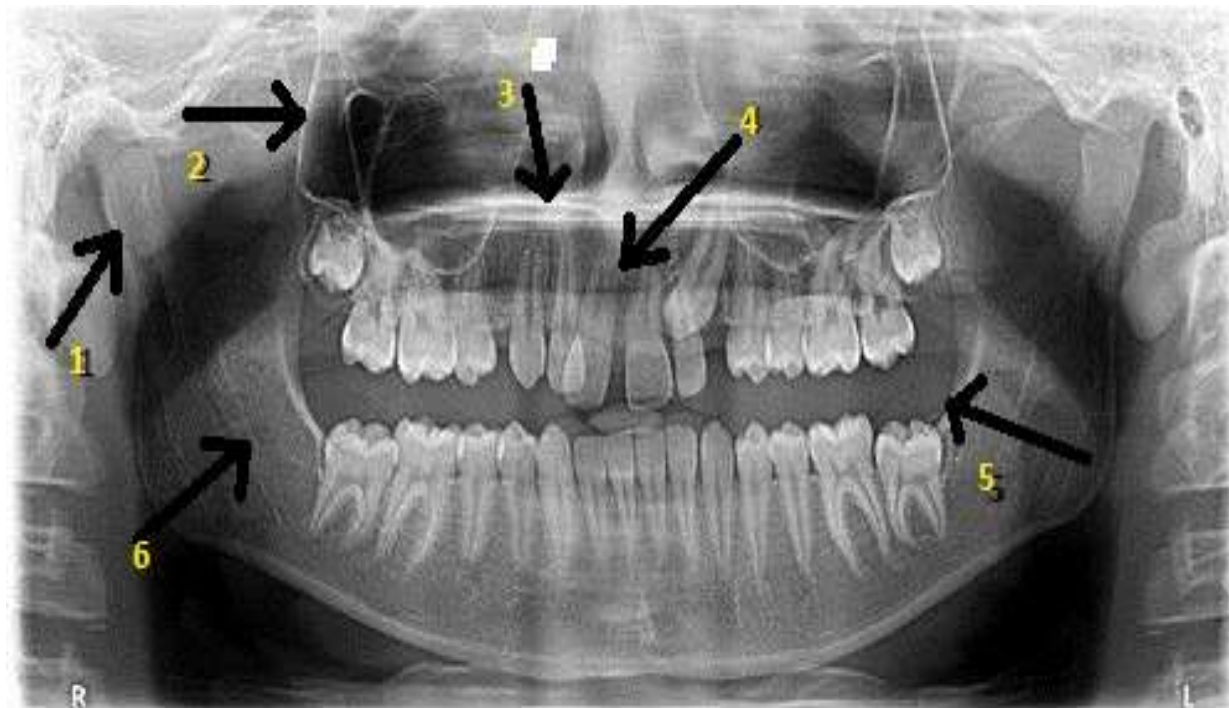
5.   In panoramic radiography, when the object is on the buccal or film side of the layer, the image is projected?

A)Downwards & narrowed   B)Upwards & widened

6.   Which parameter in panoramic image is not adjusted?

A)Time   B)Kvp   C)mA   D) none

Q2. Questions regarding normal anatomical landmarks:

Q3. Questions regarding artifacts and positioning errors:

1.   Ghost images are produced when structures lie?

A)Behind the rotation center   B)In front of the film

2.   Wide, blurred teeth results due to?

A)Patient too far back   B)patient too far forward

3.   Star burst patterns are formed due to?

A)static electricity   B)white light exposure

4.   If film is too dark, then?

A)Decrease kvp   B)Increase Kvp

5.   Dental prostheses must always be removed from the patient's mouth prior to panoramic radiographs being made?

A)True   B)False

6.   Ghost images of some anatomic structures cannot be avoided entirely during panoramic radiology?

A)True   B) False

Q4. Questions regarding the identification of pathological changes:

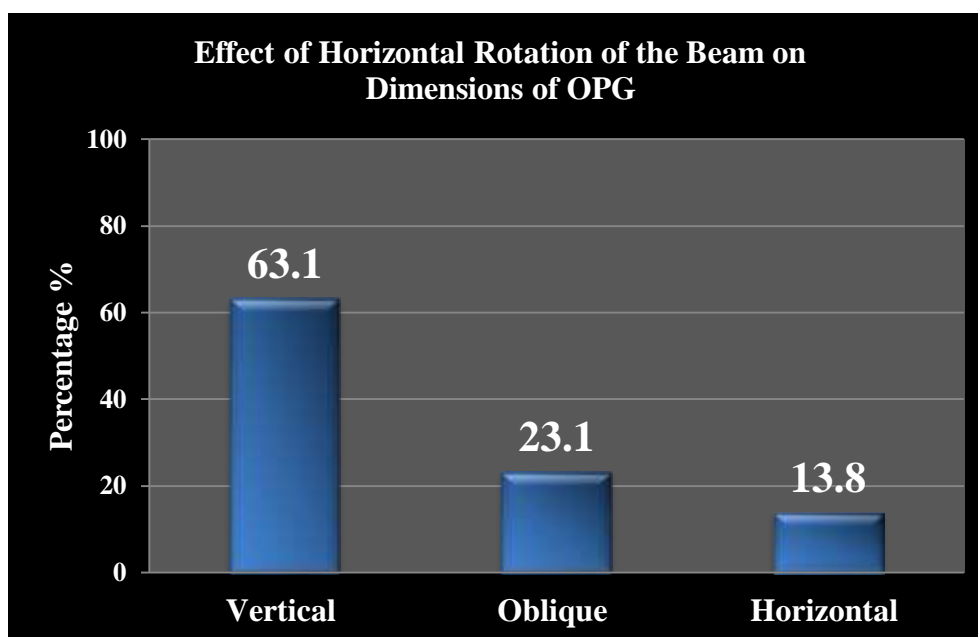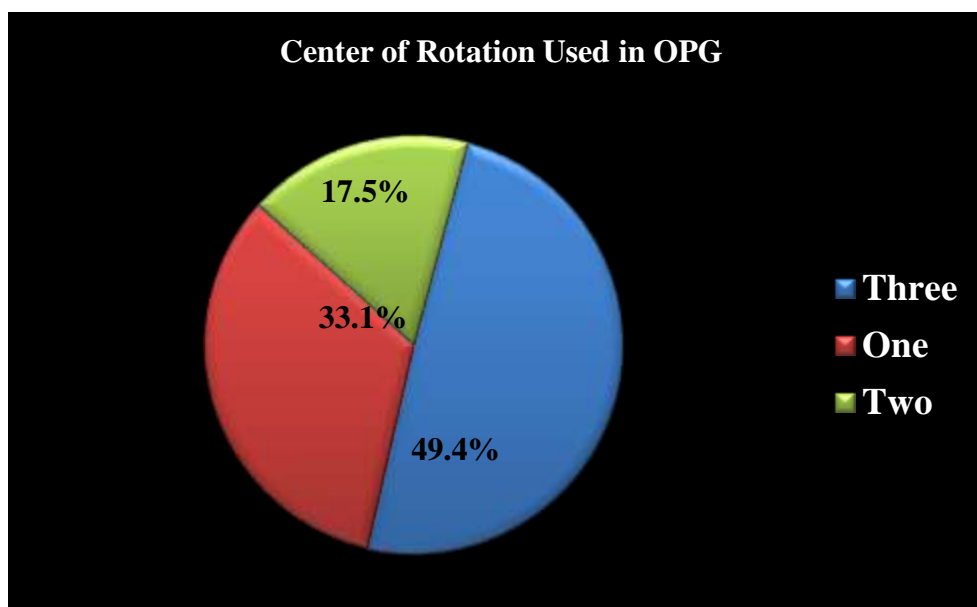**IMAGE**   **1**

IMAGE 2

IV. RESULTS:

The total data of 160 student's answers on the questions related to OPG were analyzed prospectively and results were established. The answers in the form of pie charts and graphs are as follows:

ON BASIC PRINCIPLES:

ANSWER 1: the correct answer is vertical and only 63.1% of students were able to give the answer correctly.
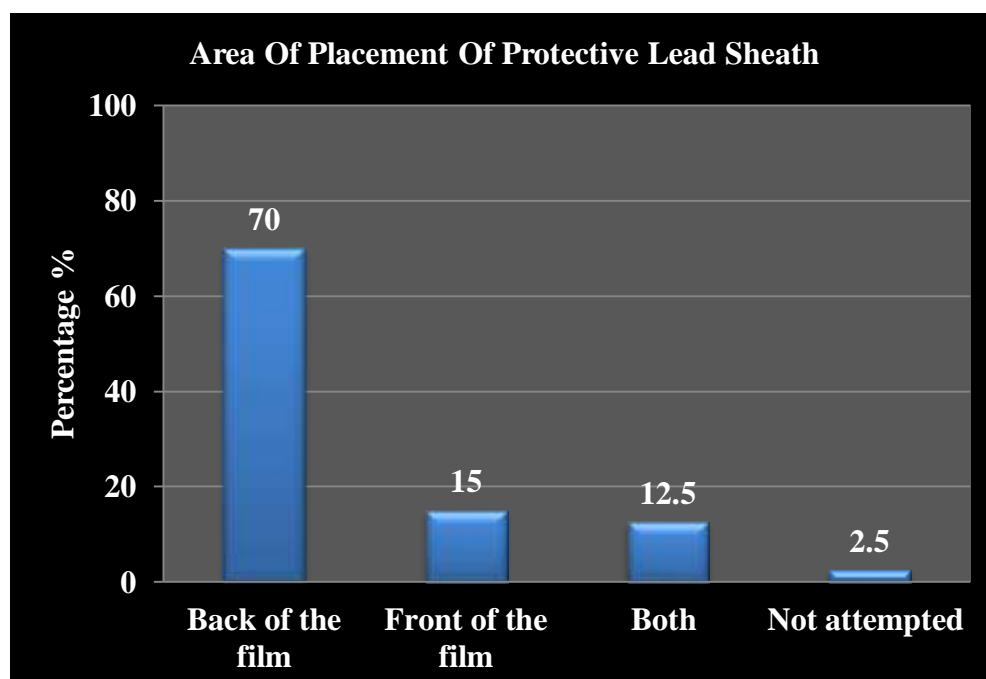

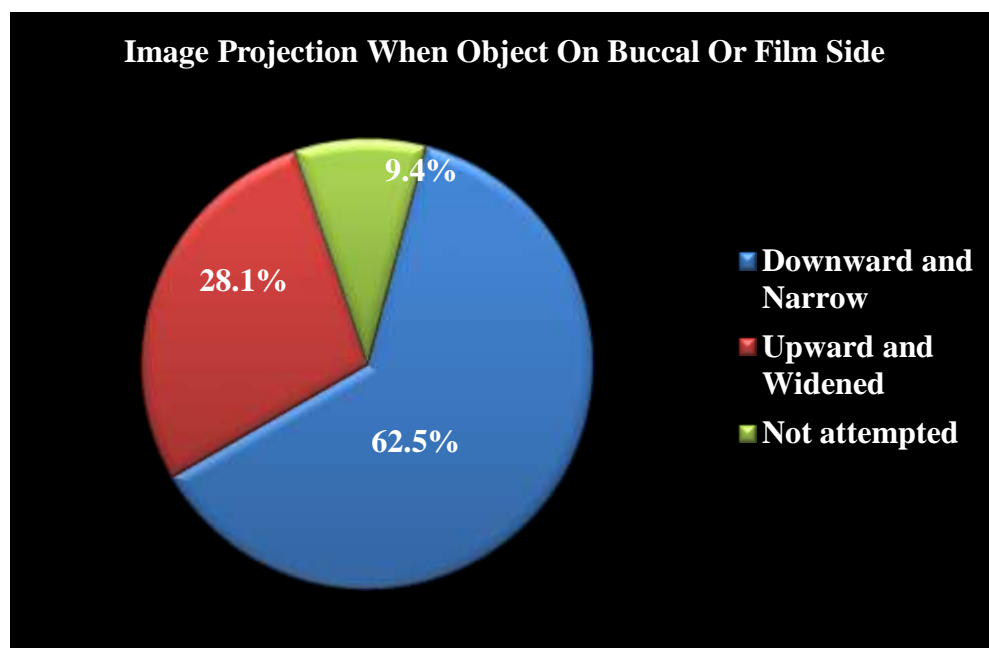ANSWER 2: The correct answer is three and only 49.4% students were correct.

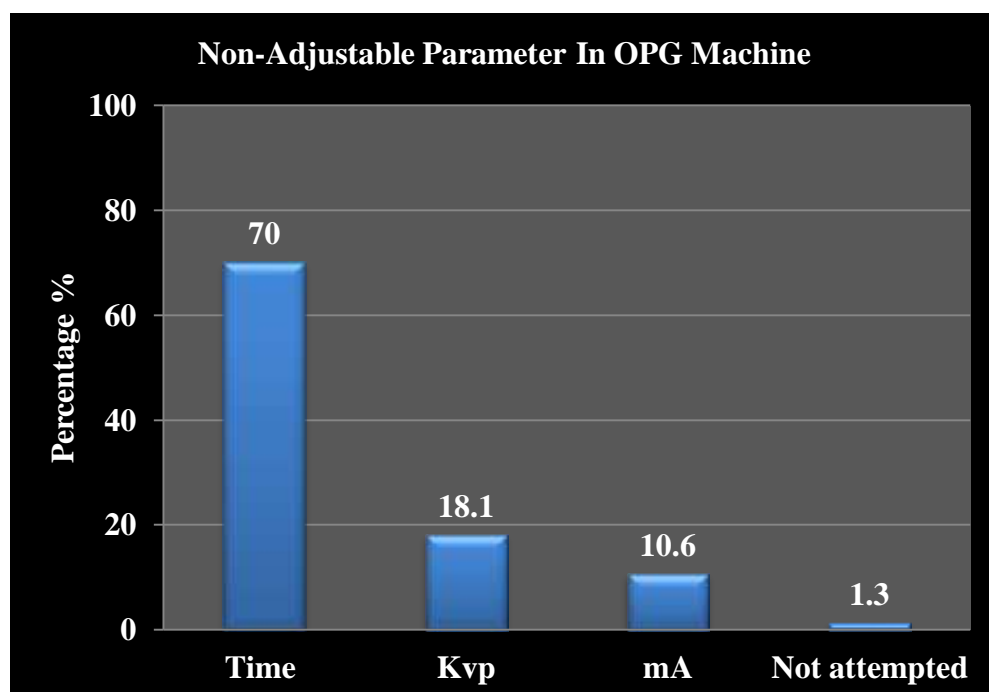ANSWER 3: the correct answer is Unsharp and 49.4% students were correct.

Objects Outside The Image Layer Looks

A bar chart titled "Objects Outside The Image Layer Looks" with y-axis "Percenatge %" ranging 0 to 100. Bars: Unsharp 49.4, Magnified 33.1, No effect 13.1, Not attempted 4.4.
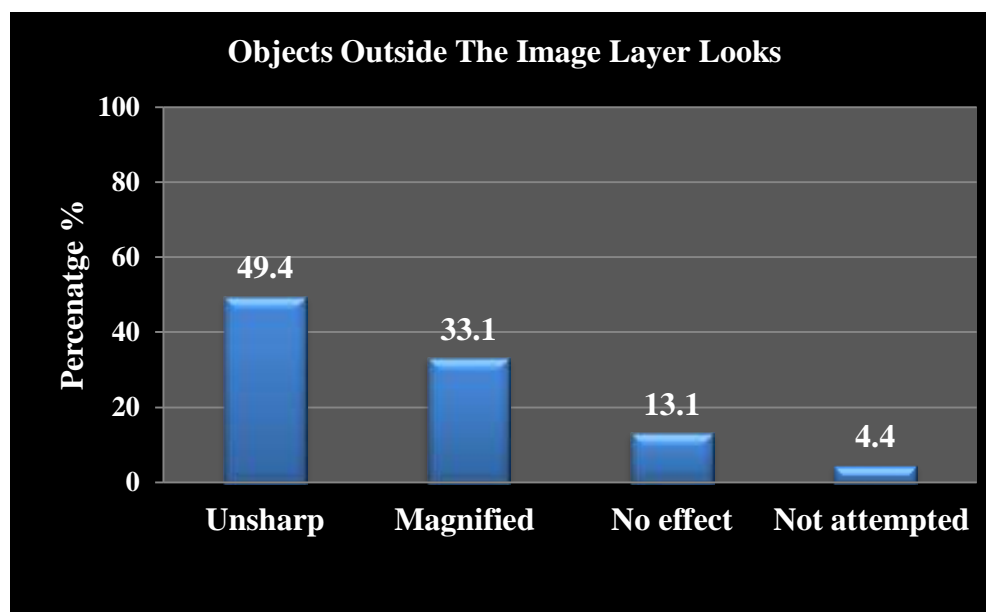
ANSWER 4: the correct answer is front of the film and 15% were correct

Area Of Placement Of Protective Lead Sheath

A bar chart titled "Area Of Placement Of Protective Lead Sheath" with y-axis "Percentage %" ranging 0 to 100. Bars: Back of the film 70, Front of the film 15, Both 12.5, Not attempted 2.5.

ANSWER 5: the correct answer is downwards and narrowed and 62.5% were correct

Image Projection When Object On Buccal Or Film Side

- Downward and Narrow
- Upward and Widened
- Not attempted

9.4%
28.1%
62.5%

ANSWER 6: the correct answer is time and 70% were correct

Non-Adjustable Parameter In OPG Machine

Time	70
Kvp	18.1
mA	10.6
Not attempted	1.3

IDENTIFICATION OF NORMAL ANATOMICAL LANDMARKS

ANSWER   1:   the   correct   answer   is   condyle   and   78.8%   were   correct

NORMAL ANATOMIC LANDMARK-1

2.5% 1.3%

17.5%

78.8%

- Codyle
- Coronoid process
- Not attempted
- Impacted tooth
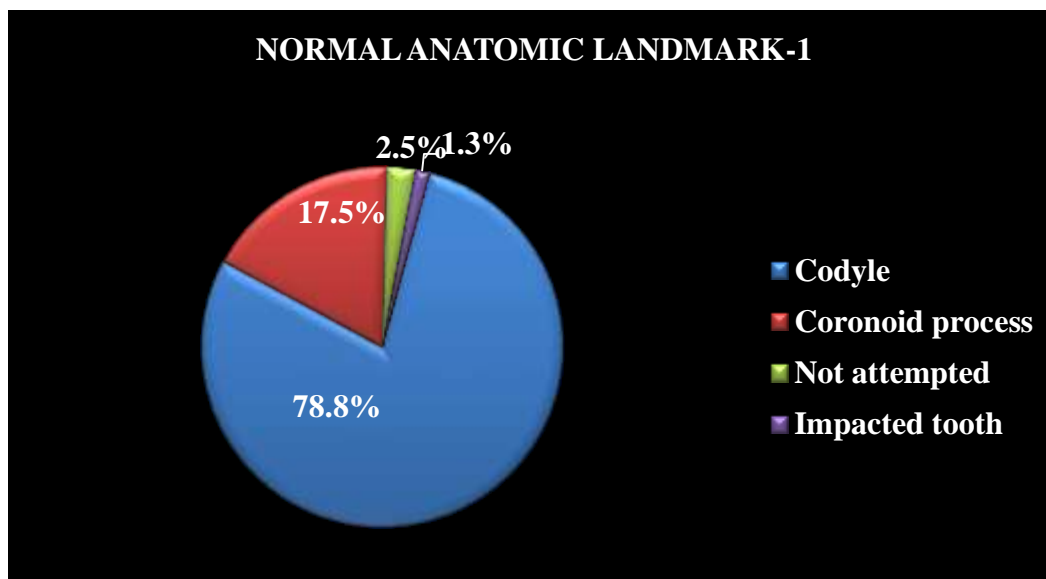
ANSWER 2: the correct answer is posterior wall of the maxillary sinus and only 21.9% were correct

NORMAL ANATOMIC LANDMARK-2

3.1%

7.5%

7.5%

2.5%   0.6%

21.9%

56.9%

- Not attempted
- Posterior Wall of Maxillary Sinus
- Condyle
- Pterygomaxillary fissure
- Floor of Nasal Cavity
- Impacted tooth
- Follicle
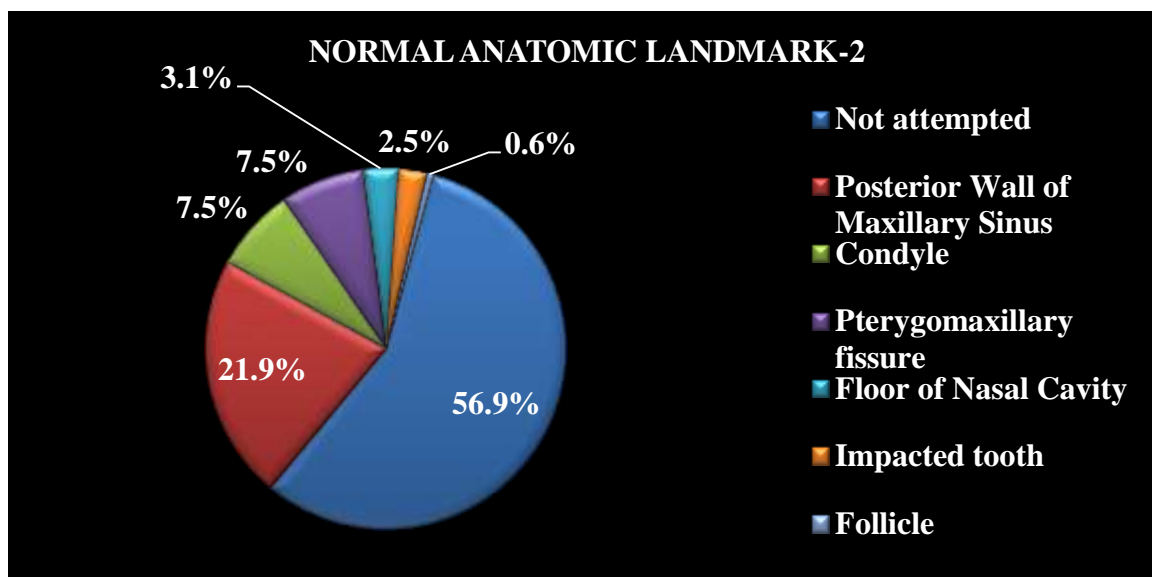
ANSWER 3: the correct answer is hard palate and 62.5% were correct

NORMAL ANATOMIC LANDMARK-3

- Hard Palate
- Not attempted
- Floor of Nasal Cavity
- Incisive Foramen
- Nasal Spine
- Posterior Wall of Maxillary Sinus

1.3% 1.3% 0.6% 15% 19.4% 62.5%
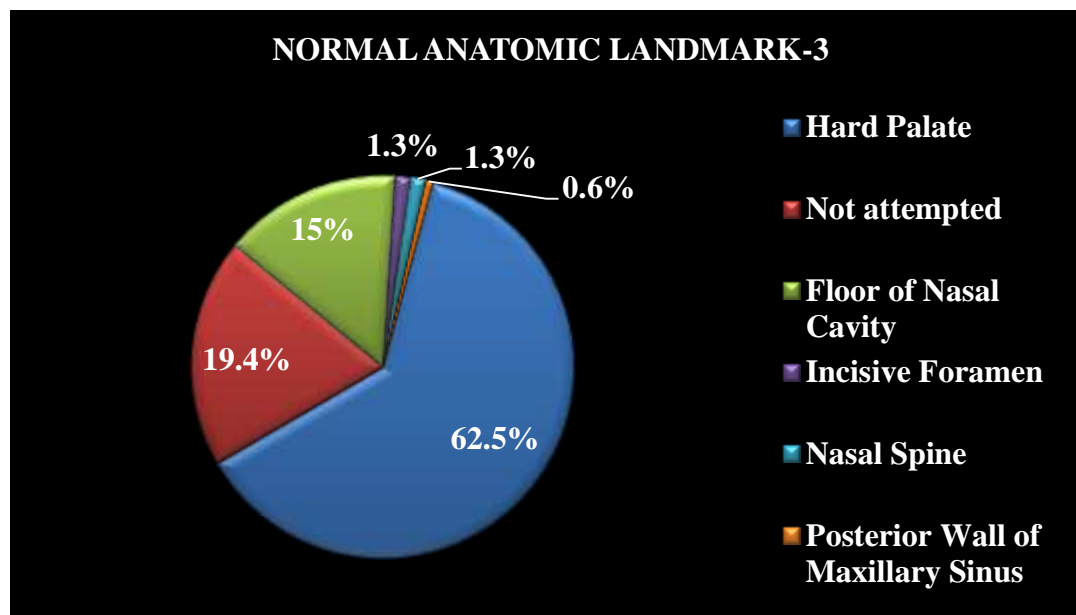
ANSWER 4: the correct answer is incisive foramen and 50% is correct

NORMAL ANATOMIC LANDMARK-4

- Incisive Foramen
- Not attempted
- Nasal Spine
- Floor of Nasal Cavity
- Impacted tooth

2.5% 1.3% 14.4% 31.9% 50%
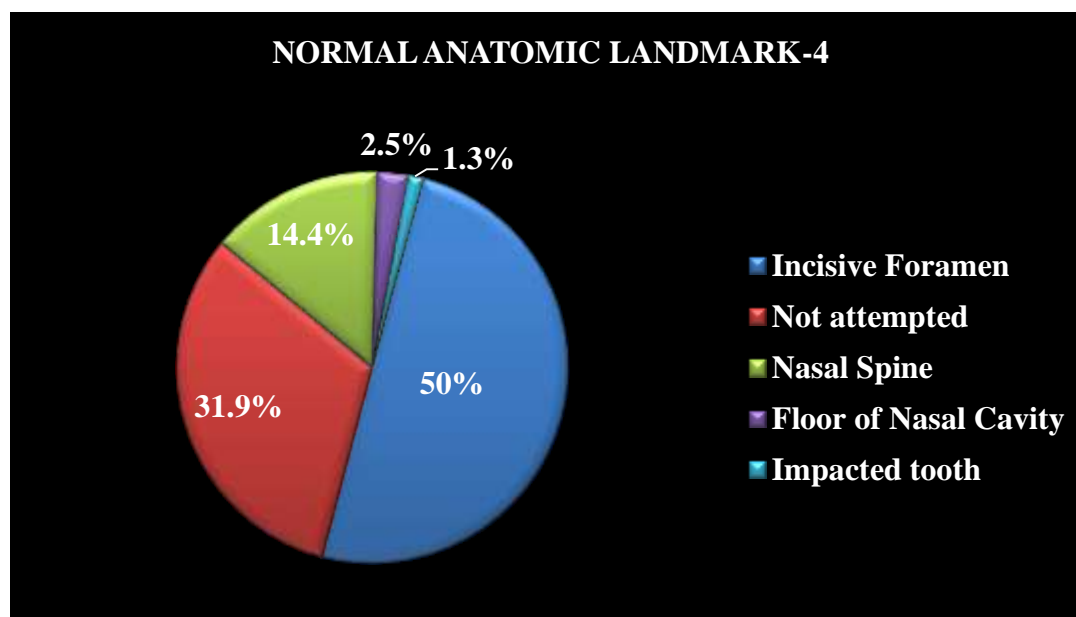
ANSWER 5: the correct answer is external oblique ridge and 67.5% were correct
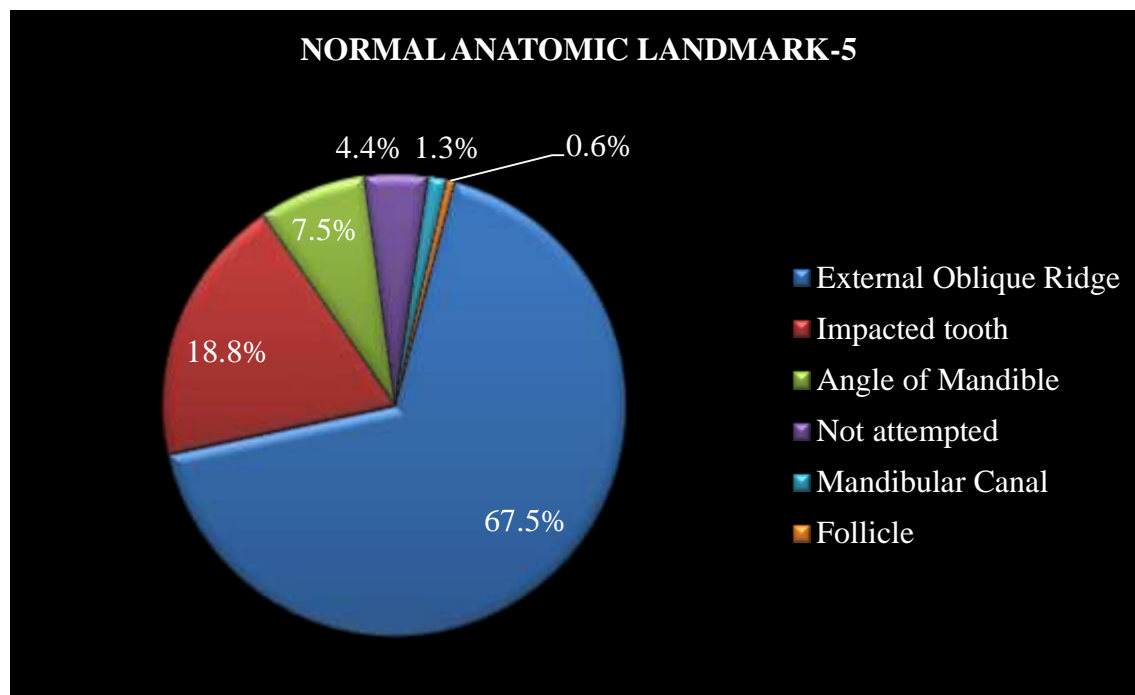
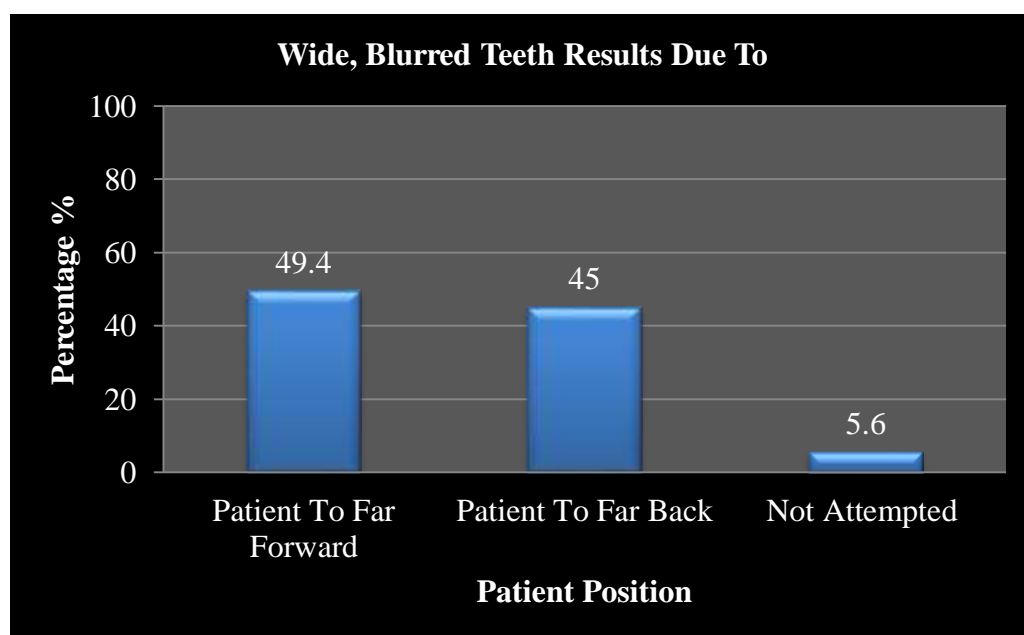ANSWER 6: the correct answer is mandibular canal and 58.8% were correct
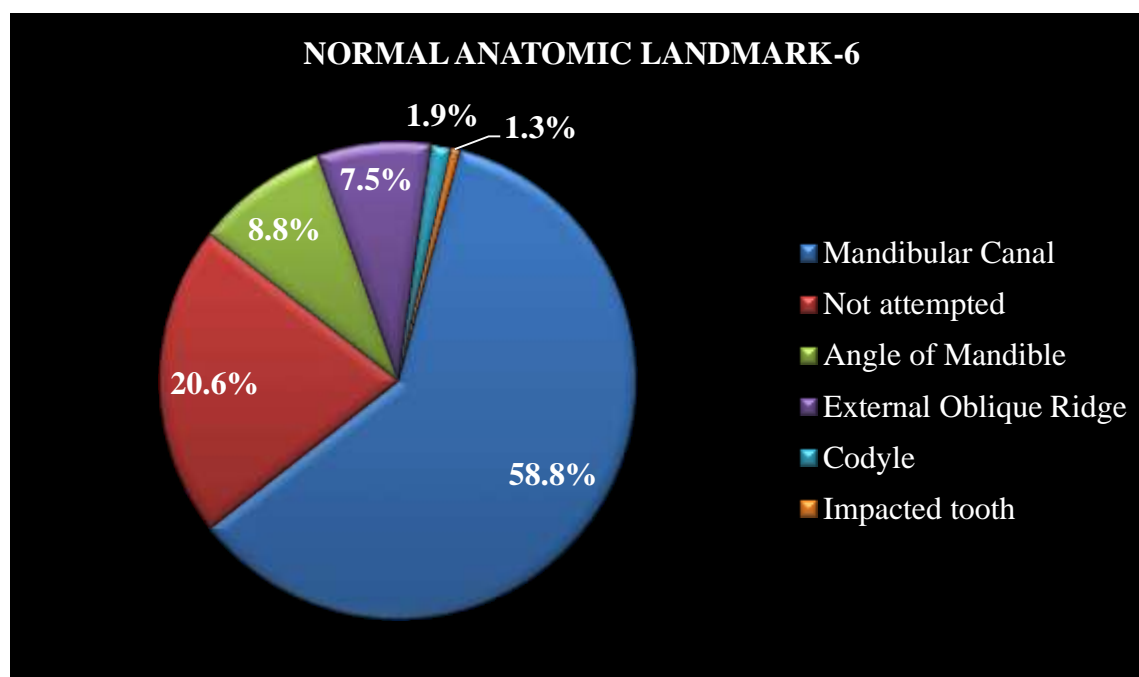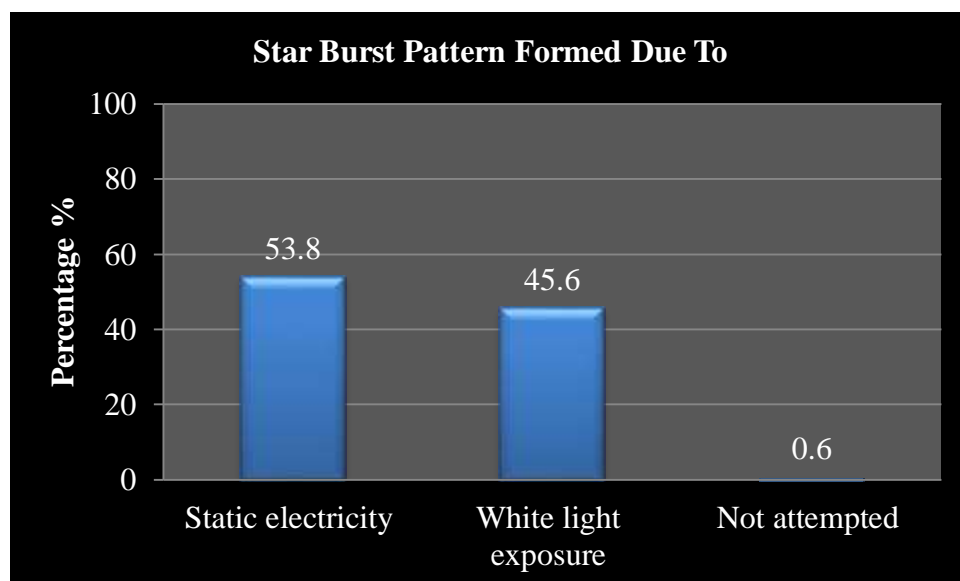

ON ARTIFACTS AND POSITIONING ERRORS

ANSWER 1: the correct answer is behind the rotation center and 55% were correct

Ghost Image Produced When
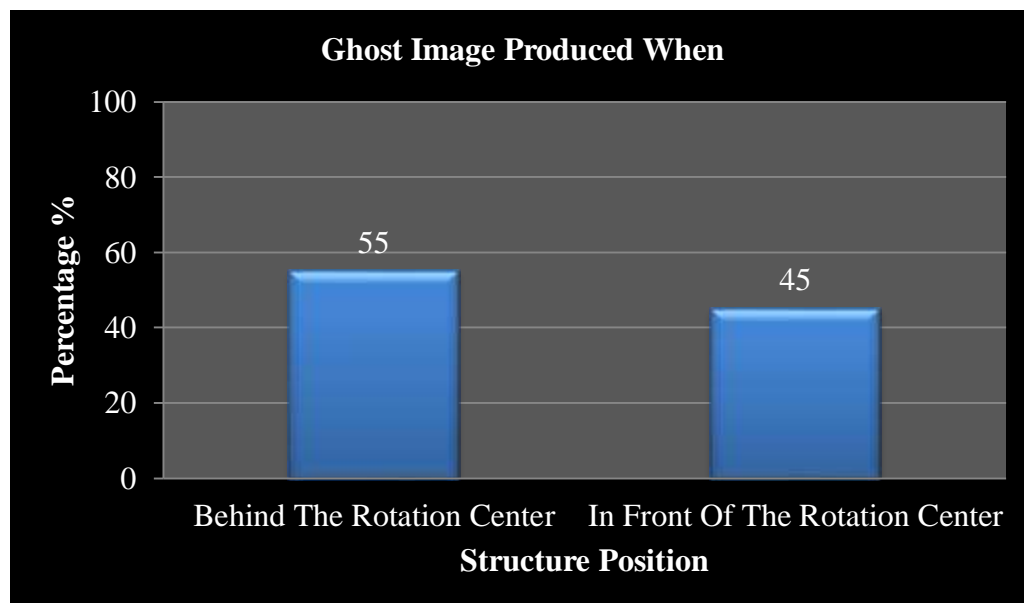
ANSWER 2: the correct answer is patient is too far back and 45% were correct

Wide, Blurred Teeth Results Due To

ANSWER 3: the correct answer is static electricity and 53.8% were correct

Star Burst Pattern Formed Due To

ANSWER 4: the correct answer is decrease Kvp and 35% were correct

If Film Exposed Is Too Dark, Then
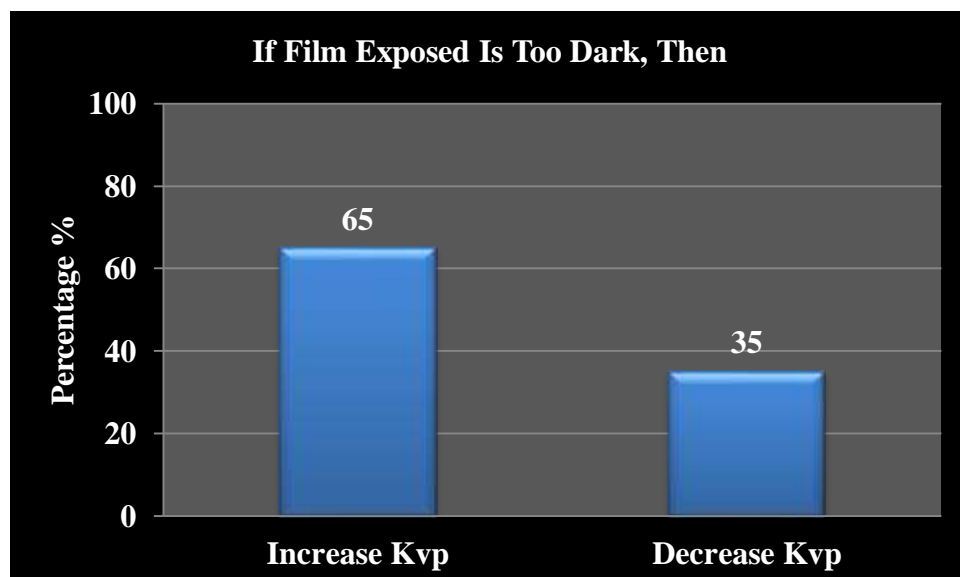
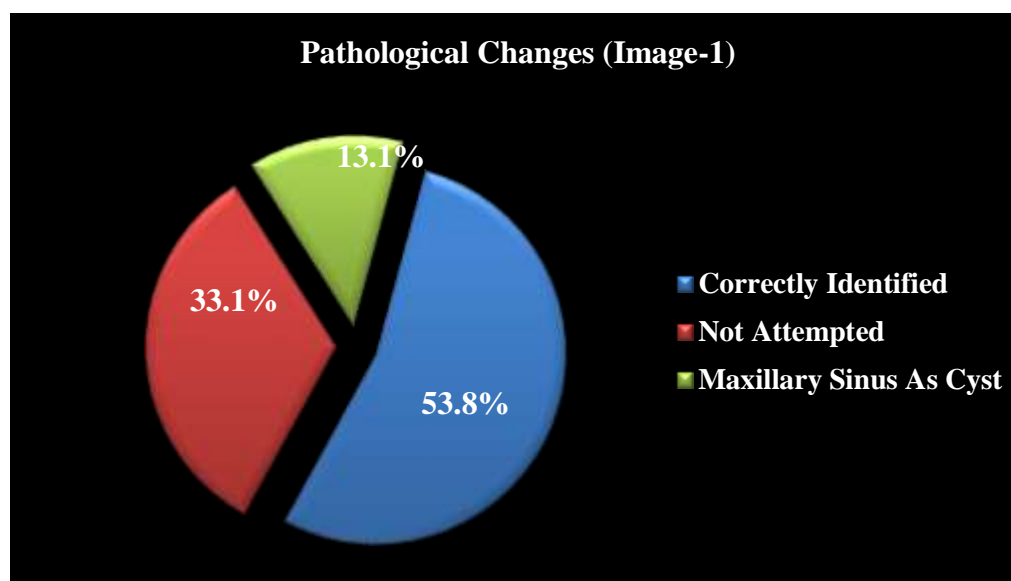ANSWER 5: the correct answer is true and 81.3% were correct
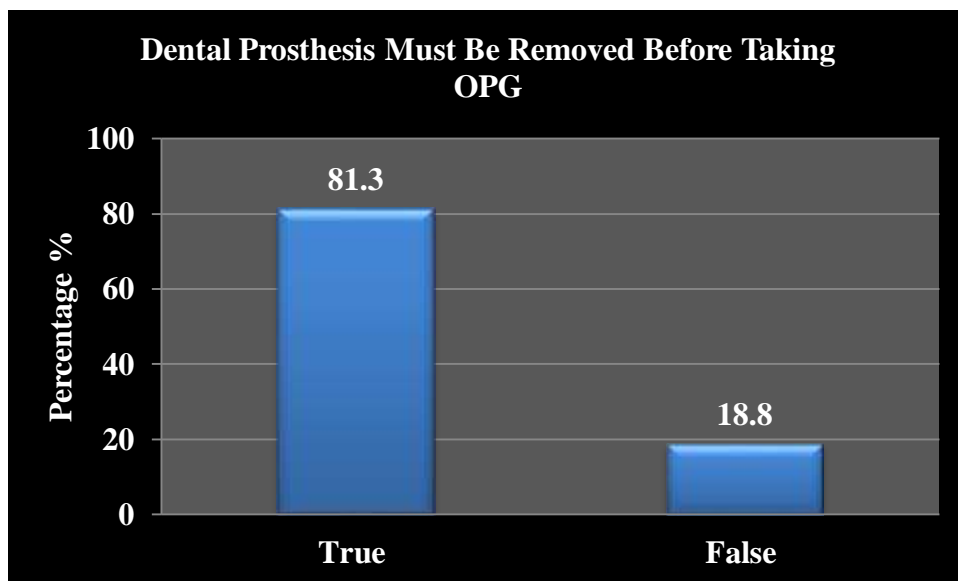
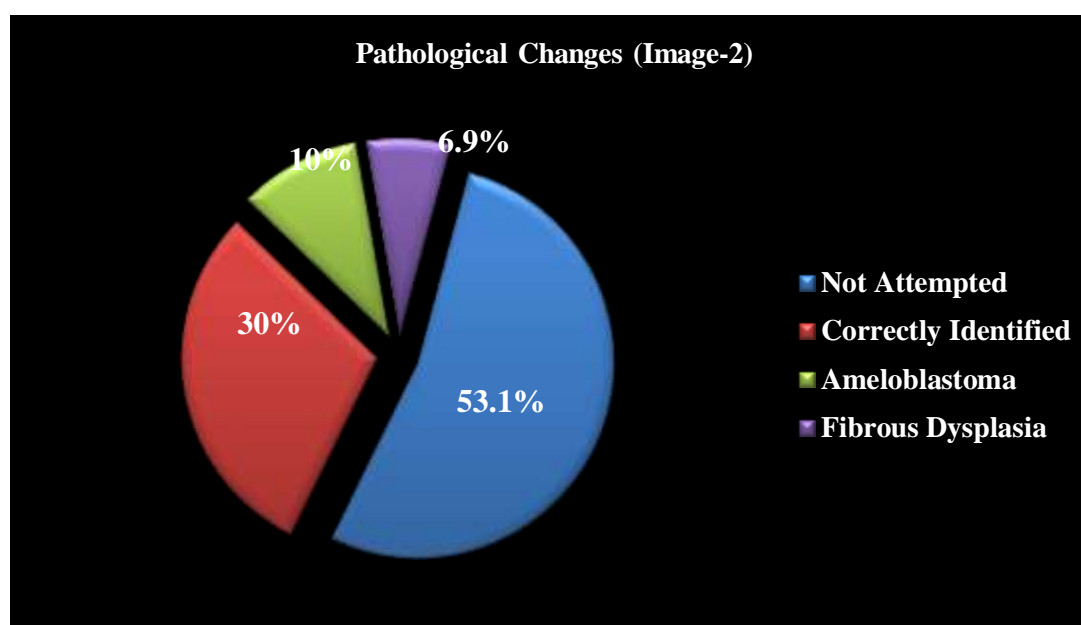ANSWER 6: the correct answer is true and 88.8% were correct
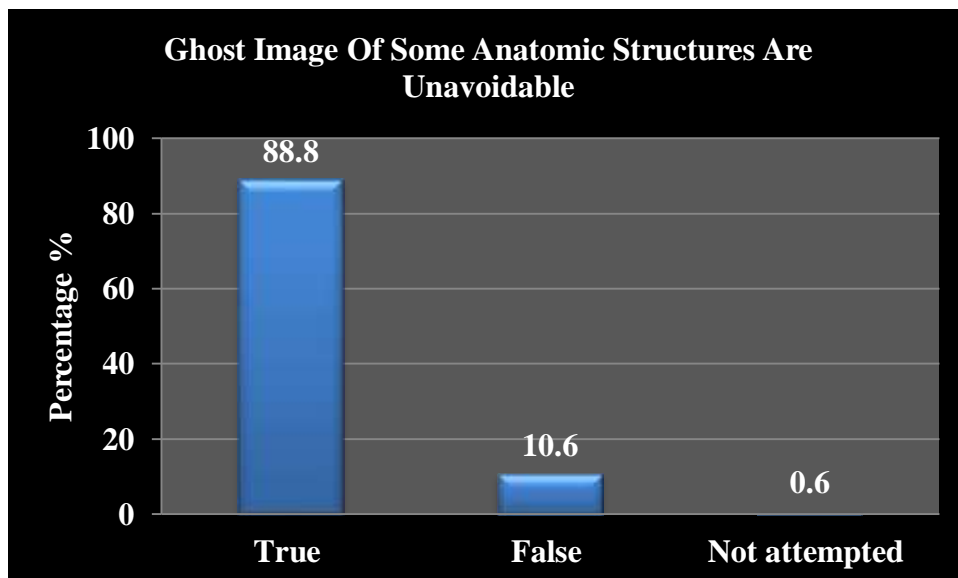
IDENTIFICATION OF PATHOLOGICAL CHANGES

ANSWER 1: the correct answer is cyst adjacent to the left maxillary sinus and 53.8% identified it correctly

ANSWER 2: the correct answer is right condylar fracture and 30% identified it correctly

V. DISCUSSION:

In oral and maxillofacial radiology, an appropriate understanding of panoramic radiographic basic principles is essential for accurate working of machine and further to prevent the positioning errors. 49% - 63% interns were able to correctly identify the basic principles, which is fair. An understanding of normal anatomical landmarks is necessary to enhance diagnostic ability and to rule out other pathological conditions. 56% - 62% students were able to identify the anatomical landmarks, which is fair. Interpreting panoramic radiography with artifacts and positioning errors is difficult. It leads to image degradation from ghost images, blurring, magnification, distortion or superimposition. 65% - 81% were able to tell the errors and artifacts correctly, which is good. Sometimes these effects are unavoidable but can be minimized through application of correct technique during exposure of radiograph. If an abnormality is detected, the

person reporting the image is required to apply their knowledge of pathology to determine the significance of the finding and the appropriate course of action. Mean of 43% students were able to rule out the pathological changes, which is fairly poor. Razmus T.F. et al (1993) conducted a study that students were efficient in recognition of normal anatomical landmarks displayed on OPG. The correct answer mean % was 87.8%±12.6%. Further he concluded that mean of correct answers for artifact recognition and error correction was 61.7%±23.2% and 45.2%±31.2% which was relatively poor. Further conclusions were made which stated that the performance of the students were directly dependent on the number of hours devoted to the panoramic radiology discussion lectures and to practice the same on the patients in their curricular.[1] In McNab s.et al (2015) study, generally in all areas, the scores were low. The results ended on conclusion that the curriculum changes should be made in teaching methods and more focus on practical activities should be there.[2] In the study conducted by Maeda N. et al (2018), the correct answers mean rate of 53%. Further conclusions were made which stated the essentiality of improving educational approaches. More focus on the areas that were less meticulously understood.[4] The results in a retrospective study done by Kratz R.J. et al (2018) suggested that more focus should be given on positioning errors because students were able to correctly identify other radiographic findings. The extragnathic findings should not be missed and focus should made on that too.[5] In this present study, the results were quite low in identification of pathological changes, more emphasis should be given in this area of concern. Number of hours in learning OPG should be increased and more of practical knowledge should be provided to the students for better understanding. The limitations of our study were that only interns studying in the college were taken, no private practitioners were included and communication bias was present.

VI. CONCLUSION:

The final outcome of dental education, the dentist, must be a competent clinician in all aspects of dentistry. Therefore to improve the ability of the practicing dentist to effectively use panoramic radiography, the results of this study offer a suggested approach to curriculum changes in the undergraduate programs we should expand the curricular time devoted to panoramic radiography, both in the class and in the clinic.

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