

Original Research Article

ACCURACY IN THE DIMENSION OF EXTRACTED TOOTH WITH INTRAORAL PERIAPICAL RADIOGRAPH: A COMPARATIVE STUDY

ABSTRACT

Introduction - Intraoral periapical radiographs (IOPAR) are widely used for the preoperative planning and evaluation for most minor oral surgical procedures owing to its simplicity, significantly lower cost, less radiation exposure and easy availability in a dental clinical set-up. **Aim** – The Aim of this study is to Assess the Accuracy and Reliability of Intraoral Periapical Radiograph with the extracted teeth. **Methodology** – The study is comprised of 54 patients. For each extracted tooth, the actual measurements for tooth length, crown length, and root length will measured with a Vernier caliper with a least count of 0.01mm. After obtaining the actual length of the tooth with the Vernier Caliper, the Length of the tooth is measured from the Intraoral Periapical Radiograph using a Vernier caliper. **Result** – By comparing the length of the actual tooth with that of an IOPAR, it was found out that the difference that was obtained is statistically significant.

Keywords: Intraoral Periapical Radiograph, Reliability of IOPA, Dimension of Tooth, Extraction of tooth, Paralleling Technique

1. INTRODUCTION

The ability to recognize tooth length measurement is critical in dentistry, particularly in Oral and Maxillofacial surgery and Endodontics. Modern diagnostic imaging techniques are many, but pricing, availability, and radiation exposure remain issues. Because of their simplicity, low cost, low radiation dose, and availability in a dental clinical setting, intraoral periapical radiographs are frequently utilized for preoperative planning and evaluation for most minor oral surgical procedures [1]

According to Mah and Hatcher, if the goal is to increase the quality, efficiency, and accessibility of craniofacial treatment, accurate and effective imaging techniques are critical. The clinical gold standard for determining tooth length is a periapical radiograph utilizing the paralleling technique [2]

The quality and accuracy of a radiograph determine its value in dental practice. The degree of precision varies depending on the radiography projection. Radiographs taken for dental measurements must be more precise than those taken for diagnostic purposes. The ability to determine tooth length from a radiograph is very useful in extraction instances and localization procedures [3]

2. MATERIAL AND METHODS

The study is being carried out in the Department of Oral and Maxillofacial Surgery of Yenepoya Dental College, Mangalore. The study is being conducted on patients who has a tooth/teeth that is indicated for extraction.

5% level of significance and 80% power and effect size of 0.5, Time bound study with an estimated sample size of 54.

Inclusion Criteria

Patients between the age group of 18 to 60 years.

Patients willing to participate in the study.

Patients with tooth/teeth that is indicated for extraction with Intraoral Periapical Radiograph.

Population of Karnataka and Kerala.

Exclusion Criteria

Grossly decayed tooth.

Root Stumps.

Procedure An Intraoral Periapical radiograph of the tooth that is indicated for extraction is taken using a RINN XCP film holder by means of the Paralleling technique (figure 1)



Figure 1: The IOPAR of left Central Incisor (21).

After Extraction of the indicated tooth, it will be cleaned of any adherent soft tissue, bone. These teeth will be placed in a container with 5% sodium hypochlorite solution. The cleaned tooth will be collected and stored. The tooth length from the Incisal/Occlusal edge till the root tip is measured with a Vernier caliper with a least count of 0.01mm (Figure 2)



Figure 2: Measurement of the extracted 22 using a Verner calliper

The following landmarks will be used to make the measurements:

Root apex: is the most apical portion of the root

Cusp tip: It is the most occlusal point of cusp.

Total tooth length will be measured from the Root Apex to cusp tip.

After obtaining the actual length of the tooth with the Vernier Caliper, the Length of the tooth is measured in the Intraoral Periapical Radiograph using a Vernier caliper with a least count of 0.01mm (Figure 3).

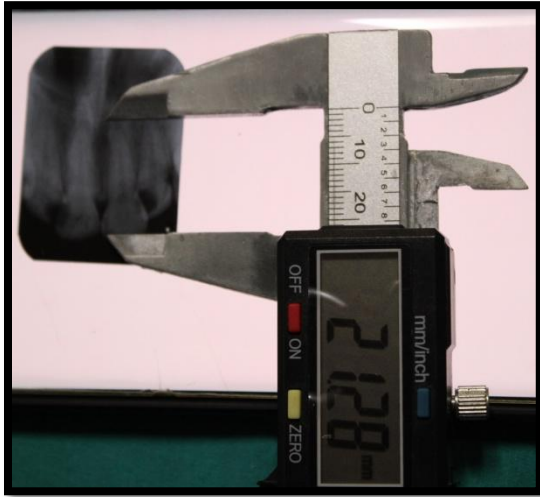


Figure 3: Measuring the length of 22 from the IOPAR using a Verner calliper.

The Intraoral periapical radiograph will be taken using a RINN XCP film holder and the technique used is Paralleling technique. The obtained measurements will be recorded in millimeters.

3. RESULTS AND DISCUSSION

Independent t test was done for inter group comparison (Table 1) for 54 patients and the mean value obtained for length of the extracted tooth is 19.85 with a standard deviation of 3.10 and the mean value obtained for the IOPAR group is 20.77 with a standard deviation of 2.95. The *P* value obtained is 0.191 and is not statistically significant.

	N	Mean	Standard Deviation	P-value
Length of Extracted Tooth	54	19.85	3.10	0.191
Length in IOPAR	54	20.77	2.95	

P-value based on Independent-t-Test

* = Statistically Significant ($P < 0.05$)

Table 1: Intergroup Comparison using independent t Test.

In the Accuracy and reliability statistics (Table 2), the Cronbach's alpha value obtained was 0.992 and the intra class correlation coefficient is 0.985 with a *P* value of less than 0.001, hence the value obtained is statistically significant.

	Cronbach's Alpha Value	Intra-class Correlation Coefficient	<i>P</i> -value
Length of Extracted Tooth	0.992	0.985	< 0.001
Length in IOPAR			

P-value based on Two-way-mixed effects model using Intra-class Correlation Coefficient Reliability Statistics

* = Statistically Significant ($P < 0.05$)

Table 2: Accuracy and Reliability Statistics.

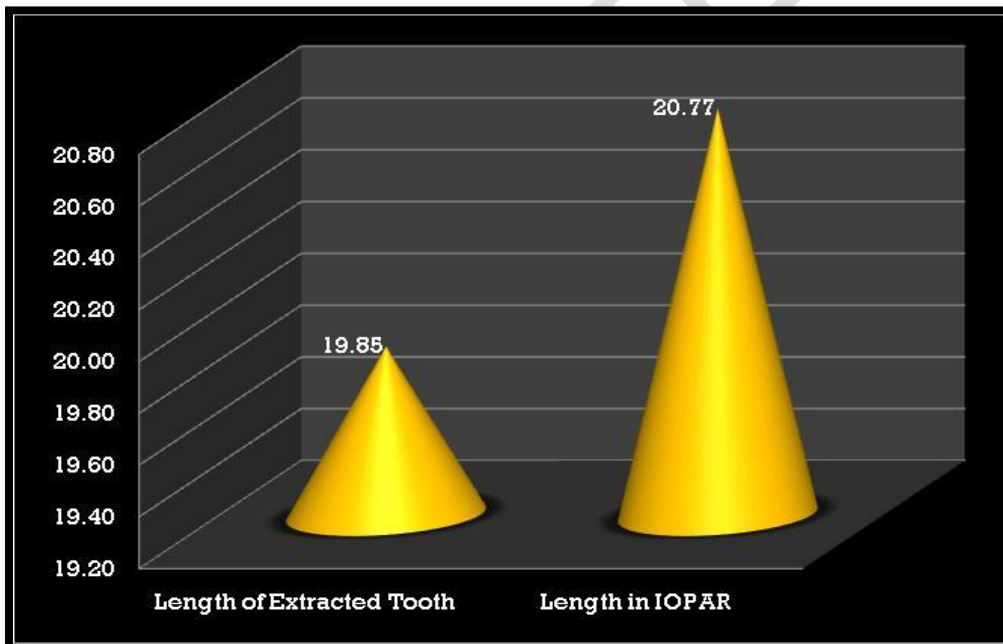


Figure 4: Mean length of tooth after extraction and in IOPAR

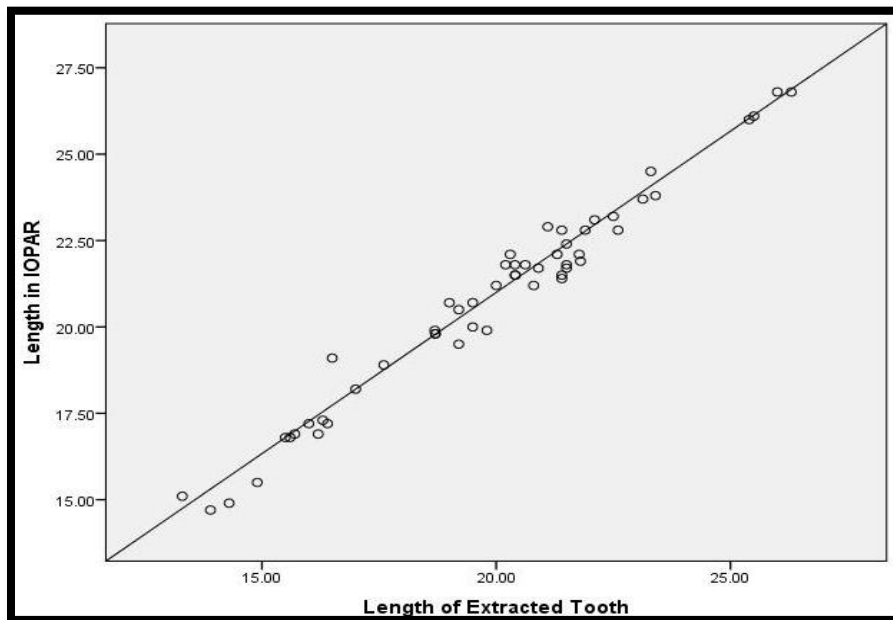


Figure 5: Accuracy and Reliability Graph (Scatter Plot)

A radiographic examination is an essential part of the diagnostic process in dentistry and it is also known that tooth length plays an important role in many branches of dentistry. Radiographic tooth length is useful in evaluating the orthodontic treatment effects such as root resorption, development and anchorage. Endodontically, it helps in assessing the working length. In prosthetics it helps in making better judgment about the selection of abutment, in periodontics it helps in comparing tooth length or root length and alveolar crestal levels and in Oral and maxillofacial surgery for determining the length of the root or sinus approximation of roots. Several methods of determining tooth length exist, but the most preferred way of determining the root canal length is by radiographs mainly by the intraoral periapical radiography [1]

Studies were carried out in literature to know the reliability of IOPAR for the other applications other than measurement of tooth length. A study conducted by R.Persson Et al [4] compared panoramic and intra-oral radiographs to assess the alveolar bone levels in a periodontal maintenance population and found that the IOPAR measurements to some extent substitute OPG.

Bassam Et al [5] investigated the reliability of periapical radiographs and orthopantomograms to determine the tooth root protrusion in the maxillary sinus by associating the outcomes with CBCT and found that periapical radiographs were slightly more dependable than panoramic radiographs in identifying this relationship.

There are studies done by Van Vorde & Bjorndahl 1969, Forsberg 1987, Gound et al. 1994 in which the use of the paralleling technique has been compared with the bisecting angle technique. Each of these studies, however, has confirmed the superiority of the paralleling technique.

Adarsh K et al [1] in 2018 conducted a study to evaluate the accuracy and reliability of tooth length measurements using conventional and cone-beam computed tomography (CBCT) imaging techniques and reported that the tooth, root, and crown lengths were found to be significantly different when measured with the Vernier caliper and on CBCT, OPG, and Intraoral periapical radiograph. The Intraoral periapical radiograph overestimated tooth length by an average of 0.8 mm and root length by 0.5 mm. OPG underestimated tooth length by about 0.8 mm and root length by 0.6 mm.

In the current study, it was noted that there was a significant difference in the length of the tooth when measured in an IOPAR and measurement of the tooth after extraction

4. CONCLUSION

The tooth length when measured after extraction is significantly different from when it is measured in an intraoral periapical radiograph. IOPA overestimated tooth length by an average of 0.9 mm.

Instead of heading towards higher conventional radiographs (RVG) and CBCT Imaging techniques for identification of length of a fractured tooth segment or a fractured implant, Intraoral periapical radiographs can be used

ETHICAL APPROVAL (WHERE EVER APPLICABLE)

Ethical Clearance obtained from Yenepoya Ethics Committee, DCGI REGISTRATION NO.: ECR/1337/INST/KA/2020. Protocol number is YEC2/703.

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