ABSTRACT
Background: Intraoral periapical radiographs are reported to show the incisive foramen as a typical anatomical landmark. In order to assess the visibility of the incisive foramen in the bisecting angle and paralleling angle approaches, as well as how visible it is in routine periapical radiographs, the current study was conducted.

Methods: This descriptive cross-sectional study evaluated 90 intraoral periapical radiographs of maxillary central incisors. These were scored for visibility of incisive foramen by a radiographic expert using two intraoral radiographic techniques. The data was entered in Microsoft Office Excel sheet 2007 and calculated using SPSS version 20.

Results: In both the paralleling and bisecting radiographs, the incisive foramen could be seen in a total of 63.8% and 36.2% of the images, respectively.

Conclusions: The dentist must have a thorough awareness of how the incisive foramen appears on standard intraoral radiographs. Our research demonstrates that when compared to the bisecting angle technique, the paralleling technique delivers superior visibility of the incisive foramen. Therefore, it is recommended to use the paralleling technique approach to see the foramen.

INTRODUCTION
Incisive foramen also referred as nasopalatine foramen is the opening of the incisive canal on the hard palate immediately behind two central incisor teeth. Incisive foramen can be seen on radiographic images as a radiolucency located behind the roots of the central incisors.1 The incisive foramen appears long and oval on radiographs, and its diameter ranges from 2 mm to 1 cm.2

Visibility of incisive foramen is important for any surgical procedure in that site and to differentiate it from the nasopalatine canal cyst. The incisive foramen is said to be a normal anatomical landmark seen in intraoral periapical radiographs (IOPAR).2 However, it is not visible in every two-dimensional radiographs. Most frequently used two-dimensional radiograph to image the tooth and its surrounding structure is IOPAR.3 IOPARs can be taken by two methods: bisecting-angle technique and the paralleling technique. With practice, one can make radiographs of respectable quality using either technique, as each has advantages and disadvantages.4

The study is essential as there is lack of research available on identifying incisive foramen on an intraoral periapical radiograph involving the Nepalese population. The aim of the current research was to appreciate the presence of incisive foramen on routine periapical radiographs and to compare it using the bisecting angle and paralleling angle techniques among patients visiting Peoples’ Dental College and Hospital in Kathmandu, Nepal.

METHODS
A descriptive cross-sectional study was performed after obtaining the approval of the Institutional Review Committee of Peoples Dental College and Hospital Kathmandu, Nepal (IRC PDCH 2022 24). IOPA radiograph of patients aged between 18 -72 years visiting the department of Oral Medicine and Radiology, PDCH, Kathmandu, Nepal for their routine radiographs of maxillary central incisors from October 2022 to March 2023 were included in the study. Any faulty radiographs, radiographs with pathol ogy of central incisors and of individuals with developmental anomalies, such as cleft palate, missing central incisors etc. were excluded from the study.
This study evaluated 90 periapical radiographs of upper central incisors taken using bisecting angle technique and paralleling technique (45 in each group) after obtaining written consent from the patients calculated by using the following formula,

\[ n = \left( \frac{Z_{\alpha/2} + Z_p}{\chi^2} \right)^2 \times \left( \frac{P_1(1-P_1) + P_2(1-P_2)}{P_1 - P_2} \right)^2 \]

Keeping 95% confidence interval and 80% of Power, the sample size obtained was 45 in each group.1 Convenience sampling method was used. The radiographs were then coded as 1 for visibility and coded as 0 for no visibility of incisive foramen by a maxillofacial radiologist.

The data was entered in Microsoft Office Excel sheet 2007 and calculated using SPSS version 20. Descriptive statistics was done for gender, age and visibility of Incisive foramen. Chi square test was used for comparison between the two techniques.

RESULTS

This study included 90 patients of which 45 were males and 45 were females. The frequency of patients between age group of 18-30 years were 38, between 31-40 years were 22, between 41-50 years were 14, between 51-60 years were 7 and 60 years and above were 9 (Table 1).

Table 1: Demographic variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Categories</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>45 (50%)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>45 (50%)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>18-30</td>
<td>38 (42.2%)</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>22 (24.4%)</td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>14 (15.6%)</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>7 (7.8%)</td>
</tr>
<tr>
<td></td>
<td>60 and above</td>
<td>9 (10.0%)</td>
</tr>
</tbody>
</table>

Table 2: Comparison of paralleling and bisecting angle technique for visibility of incisive foramen

<table>
<thead>
<tr>
<th>Technique</th>
<th>Visible frequency (%)</th>
<th>Not visible frequency (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paralleling technique</td>
<td>30 (63.8%)</td>
<td>15 (34.9%)</td>
<td>0.006</td>
</tr>
<tr>
<td>Bisecting angle technique</td>
<td>17 (36.2%)</td>
<td>28 (65.1%)</td>
<td></td>
</tr>
</tbody>
</table>

The study included 45 IOPA radiographs taken using the paralleling method and 45 IOPA radiographs taken using the bisecting angle technique. 30 of the 45 paralleling radiographs showed the incisive foramen, and the foramen was not evident in the remaining 15 radiographs. The incisive foramen, however, was only visible in 17 of the 45 bisecting radiographs and was not visible in 28 of them. In both the paralleling and bisecting radiographs, the incisive foramen could be seen in a total of 63.8% and 36.2% of the images, respectively. The Chi-squared test revealed a statistically significant difference between the two techniques (p=0.006) (Table 2).

DISCUSSION

Radiographic imaging is the integral part of dentistry. Intraoral radiographs form the backbone of imaging modality.5 To know certain pathologies in the jaw it is utmost important to know about normal anatomical landmarks present on it and recognize them accurately. Incisive foramen is such normal anatomical landmarks present between the two maxillary central incisors. This foramen leads to nasopalatine canal that consists of very important neurovascular structures.6 Although the nasopalatine duct cyst is uncommon and most of the time asymptomatic, one of the differential diagnosis for such cyst if present is the large incisive foramen.7

In this study, we compared two easier techniques used for intraoral periapical radiographs i.e. bisecting and paralleling technique. This study showed statistically significant visibility of incisive foramen via paralleling technique than by bisecting angle technique. Our findings are in accordance with various textbooks which had highlighted the importance of paralleling technique due to less image distortion and nearly accurate images as the object.1,3,8 In the study conducted by Mourshed and McKinney, paralleling technique showed less error than bisecting angle technique.4 But being said that paralleling technique have some limitations that it is more difficult and painful for the patient as compared to bisecting angle technique.8 Also, paralleling technique cannot be performed when patient has shallow or flat palate.9

A similar study was conducted by Veena et al.1 which included 120 IOPAR (60 bisecting and 60 paralleling radiographs). The total percentage of the incisive foramen visible in the bisecting and paralleling radiographs was 40% and 76.7%, respectively which is consistent with our study.

In another study done by Basappa et al.10 they found the visibility of this foramen to be 25% in panoramic images which is lesser compared to our study using both the techniques. So for academic purpose to show the incisive foramen to students we can rely on intraoral periapical radiographs (paralleling over bisecting) rather than to opt for an OPG or a CBCT which are more expensive than cheaper intraoral radiographs. Though these intraoral radiographs do not give accurate measurement of the extension and dimension of the foramen at least they reveal the normal anatomic structure of the foramen. The result of our study could not be compared to other similar studies because there lack of such studies done for the visibility of the foramen using the two intraoral periapical radiograph techniques.

The limitation of this study is that we can only see the presence of the foramen but could not see the dimension and extent of the foramen and its relation to other surrounding structure for that more advanced imaging technique like Cone Beam Computed Tomography should be used.11-13 Furthermore, more samples should be included to generalize the visibility of the foramen.
CONCLUSION

Despite being a typical anatomical landmark on an IOPA radiographs, the incisive foramen is frequently not visible. The clinician must have a thorough awareness of the incisive foramen visibility on standard intraoral radiographs. According to our research, the paralleling technique provides superior visibility over bisecting angle technique. Therefore, it is recommended to use the paralleling technique to see the incisive foramen.

ACKNOWLEDGEMENT

We would like to express our gratitude to Dr. Sijan Poudyal (Department of Community Dentistry) for her guidance in statistical analysis. Also we are thankful to our resident Dr. Mahesh Khadka (Department of Oral Medicine and Radiology) for his valuable feedback.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

REFERENCES:


