

Inter-Rater Reliability among Dentists for Assessment of Angle of Impacted Third Molars on Orthopantomograms

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ABSTRACT

Objective: To find the inter-rater reliability of dentists from various specialties regarding the observation and interpretation of angle of impacted third molars on the OPG.

Methodology: A cross sectional comparative study was conducted in College of Dentistry, Sharif Medical and Dental College, Lahore after obtaining ethical clearance from ethical committee of Sharif Medical Research Centre (SMRC) in which dentists from four different specialties namely; Oral Pathology, Endodontics, Prosthodontics and Oral and Maxillofacial surgery were included as raters. The study was conducted from December 2020 to February 2021. A total of 21 Orthopantomograms were assigned to each rater for assessing the angle of the impacted third molar. The classification for angle of impaction used was Winter's classification

Results: The level of agreement regarding the angle of impacted third molars observed on the Orthopantomograms between rater 1 and rater 2 was very strong ($\kappa=0.791, p\leq 0.001$) but was moderate between rater 2 and rater 3 ($\kappa=0.438, p\leq 0.001$) and rater 2 and rater 4 ($\kappa=0.577, p\leq 0.001$).

Conclusion: The level of agreement regarding the angle of impacted third molars observed on the Orthopantomograms between rater 1 (oral pathologist) was very strong with rater 2 (Oral and Maxillofacial surgeon) while that of rater 2 with rater 3 (endodontist) and rater 4 (Prosthodontist) was moderate.

Keywords: Inter-rater reliability, Orthopantomograms (OPG), impacted third molars, mesioangular, distoangular, vertical, horizontal

INTRODUCTION

Dental radiographs are frequently used in routine dental practice as a key investigation tool for diagnosis and treatment planning¹. Radiographic techniques have evolved over time to help the clinicians in better visualization². Imaging modality used is dependent on patient's clinical need and accuracy of information required for treatment³. Cross-sectional imaging provides high accuracy but involves a greater dose of ionizing radiation. Orthopantomogram is widely used for determination of bone pathologies, dental anomalies, tooth impactions and anatomical landmark identification due to advantages of low radiation exposure and convenience⁴.

Third molars are the most common impacted teeth followed by maxillary canine⁵. Surgical removal of third molars demands pre-surgical radiographic evaluation to classify the impacted molars on the basis of level of impaction, the angulations of the third molars and the relationship to the anterior border of the ramus to determine the difficulty index⁶. Assessing the level of surgical difficulty of impacted third molar is essential for treatment planning and minimizes postoperative complications⁷. Currently, OPG is the radiograph of choice to evaluate impacted molars⁸. It is used to classify impacted molars and determine the difficulty index but the interpretation of OPG is subjected to variation due to difference in inter-rater interpretation. Studies suggested that variability in radiographic interpretation among raters is attributed to subjective reading, insufficient experience and different professional background of the raters⁹. Inter-rater reliability is defined as the measurement of the consistency between evaluators in ratings, regardless of the absolute value of each evaluator's rating¹⁰.

Many studies have been conducted on inter-rater reliability of radiographs but no such study is conducted to evaluate inter-rater reliability of Orthopantomogram in determination of impacted third molars in our region. This will contribute to the body of research and help the clinicians to improve their interpretation of Orthopantomogram. The aim of this study was to find the inter-rater reliability of dentists from various specialties regarding the observation and interpretation of angle of impacted third molars on the OPG.

METHODOLOGY

A cross sectional comparative study was conducted in College of Dentistry, Sharif Medical and Dental College, Lahore after obtaining ethical clearance from ethical committee of Sharif Medical Research Centre (SMRC) in which dentists from four different specialties namely; Oral Pathology, Endodontics, Prosthodontics and Oral and Maxillofacial surgery were included as raters. The study was conducted from December 2020 to February 2021. A total of 21 Orthopantomograms were assigned to each rater for assessing the angle of the impacted third molar. The classification for angle of impaction used was Winter's classification¹¹. The raters were provided with the OPGs and a proforma for recording their observations.

SPSS 23 was used for statistical analysis. P values ≤ 0.05 was considered significant. Cohen kappa test was used to find the inter-rater reliability.

RESULTS

A Cross sectional comparative study was conducted in which four dental specialists evaluated 21 OPGs to determine the angles of impacted third molars. Table 1 shows that rater 1 and rater 2 were in complete agreement regarding the vertical and mesioangular angulation of impacted third molars. The difference of observation was seen by the raters regarding horizontal angle of impaction where rater 1 interpreted 2 cases as horizontal impactions which were interpreted as mesioangular by rater 2 as shown in table 1.

Table 2 shows an excellent level of agreement between the rater 1 (oral pathologist) and rater 2 (oral and maxillofacial surgeon) for assessment of angle of impacted third molar. This agreement was statistically significant.

Table 3 shows that both the raters were in complete agreement regarding the vertical and distoangular impactions but rater 3 interpreted 1 case as mesioangular impaction which was considered by rater 2 as vertical and 3 cases as horizontal impactions which rater 2 interpreted as mesioangular impactions as shown in table 3.

Table 4 shows a moderate agreement between rater 2 (oral surgeon) and rater 3 (endodontist) regarding the angle of impacted third molar. The agreement was statistically significant.

Table 5 shows that rater 2 and 4 were in complete agreement regarding the vertical angle of impaction of impacted third molars. It was also seen that rater 4 interpreted 2 cases of as mesioangular impactions which were interpreted as vertical by rater 2. It was seen that 4 cases were interpreted by rater 4 as horizontal which were mesioangular impactions according to rater 2 as shown in table 5.

Table 6 shows a moderate agreement between rater 2 (oral surgeon) and rater 4 (Prosthodontist) regarding the angle of impacted third molar. The agreement was statistically significant.

Table 1: The level of agreement between rater 1 and 2 regarding the angle of impaction of impacted third molars

	Angle of impaction	Rater 2 (Oral and Maxillofacial surgeon)		
		Vertical	Mesioangular	Horizontal
Rater1 (Oral Pathologist)	Vertical	7 (100%)	0 (0%)	0 (0%)
	Mesioangular	0 (0%)	5 (100%)	0 (0%)
	Distoangular	1 (100%)	0 (0%)	0 (0%)
	Horizontal	0 (0%)	2 (25%)	6 (75%)

Table 2: Cohen Kappa demonstrating the inter-rater agreement between rater 1 & 2

Symmetric Measures					
		Value	Asymptotic Standardized Error ^a	Approximate T ^b	Approximate Significance
Measure of Agreement	Kappa	.791	.107	5.473	≤.001
N of Valid Cases		21			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					

Table 3: The level of agreement between rater 2 and 3 regarding the angle of impaction of impacted third molars

	Angle of impaction	Rater 2 (Oral and Maxillofacial surgeon)		
		Vertical	Mesioangular	Horizontal
Rater 3 (endodontist)	Vertical	2 (100%)	0 (0%)	0 (0%)
	Mesioangular	1 (20%)	4 (80%)	0 (0%)
	Distoangular	5 (100%)	0 (0%)	0 (0%)
	Horizontal	0 (0%)	3 (33.3%)	6 (66.7%)

Table 4: Cohen Kappa demonstrating the inter-rater agreement between rater 2 (Oral surgeon) and 3 (Endodontist)

Symmetric Measures					
		Value	Asymptotic Standardized Error ^a	Approximate T ^b	Approximate Significance
Measure of Agreement	Kappa	.438	.116	4.016	≤.001
N of Valid Cases		21			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					

Table 5: The level of agreement between rater 2 and 4 regarding the angle of impaction of impacted third molars

	Angle of impaction	Rater 2 (Oral and Maxillofacial surgeon)		
		Vertical	Mesioangular	Horizontal
Rater 4 (Prosthodontist)	Vertical	6 (100%)	0 (0%)	0 (0%)
	Mesioangular	2 (40%)	3 (60%)	0 (0%)
	Horizontal	0 (0%)	4 (40%)	6 (60%)

Table 6: The level of agreement between rater 2 and 4 regarding the angle of impaction of impacted third molars

Symmetric Measures					
		Value	Asymptotic Standardized Error ^a	Approximate T ^b	Approximate Significance
Measure of Agreement	Kappa	.577	.138	3.920	≤.001
N of Valid Cases		21			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					

DISCUSSION

In dental surgery, the third molar on the mandible is frequently extracted and in order to evaluate anatomical landmarks and relationships with the environment prior to extraction of the lower third molar, orthopantomogram is the primary imaging modality utilized¹². One of the frequent dentoalveolar operations carried out in any dental setting is the surgical removal of an impacted lower third molar¹³. Orthopantomograms (OPGs) have historically been used as a standardized evaluation technique to evaluate and

arrange this surgical removal¹⁴. OPG is a common investigation to investigate to see how an impacted tooth relates with the mandible¹⁵. OPG remains among the most effective diagnostic methods for determining impacted lower third molar, according to reports. There are still many people who employ the Rood and Shehab criterion, that focus on traditional radiographs¹⁶. There are differences in how different surgeons as well as other specialists understand the OPG¹⁵. Prabakaran conducted a survey to see whether oral radiologists & oral surgeons coincide when it comes to assessing the close nerve root relationships in OPG, which are regarded as warning indications¹⁵. An essential component in the presurgical evaluation of impacted lower third molar is the incorporation of a clinical examination history as well as pertinent investigations¹⁵. The surgeons can forecast how challenging the procedure will be and detect numerous risks factors by interpreting radiographs of an impacted lower third molar as well as its surrounding tissues¹⁷.

A study was carried out by an investigator Muglali M on inter rater reliability for measuring the relation of inferior alveolar nerve with lower third molar¹⁸. According to this study while investigating the connection among the impacted lower third molar roots and the IAN canal, four expert surgeons from separate institutions agreed less than a senior surgeon as well as resident from that institution¹⁸. This might be as a result of the trainees being taught under the same surgeon and applying the very same interpretation¹⁸. In another study it was evaluated that the readings of characteristics relating to the roots of mandibular third molars made by three various trainee levels (a first-year trainee, a 2nd resident, as well as a third-year resident). According to their findings, root curve and the total number of roots had the highest and lowest concordances, correspondingly¹⁹.

There is not enough literature on assessment of inter rater reliability for measurement of angle of impacted third molars on OPGs and the inter-rater reliability. The level of agreement regarding the angle of impacted third molars observed on the Orthopantomograms between rater 1 (oral and maxillofacial surgeon) was very strong with rater 2 (Oral Pathologist) but was moderate with rater 3 (endodontist) and rater 4 (Prosthodontist).

This study will help evaluate the skills of various dental specialists regarding their knowledge and expertise of interpreting radiographs. The finding of this study will help identify the radiographic skills deficient in dental specialists and will highlight the importance of developing better skills and knowledge of radiography and to use them in effective health care provision **Limitation:** Inclusion of specialists from other dental clinical specialties would have given a broader perspective.

CONCLUSION

The level of agreement regarding the angle of impacted third molars observed on the Orthopantomograms between rater 1 (oral and maxillofacial surgeon) was very strong with rater 2 (Oral Pathologist) but was moderate with rater 3 (endodontist) and rater 4 (Prosthodontist).

Conflict of Interest: None

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