

ORIGINAL ARTICLE

Inter-Rater Reliability among Dentists for Assessment of Depth of Impacted Third Molars on OrthopantomogramsFATIMA LIAQAT¹, AREEJ GAKHAR², ZIYAB WAJID SIDDIQUI³, MARIA JABBAR⁴, SAMAN FATIMA⁵, HIRA BUTT⁶¹General dental practitioner, Lahore^{2,3}House officer, College of Dentistry, Sharif Medical and Dental College, Lahore⁴Postgraduate resident, Oral and Maxillofacial Surgery, College of Dentistry, Sharif Medical and Dental College, Lahore⁵General dental practitioner, Karachi⁶Demonstrator, Oral Pathology department, College of Dentistry, Sharif Medical and Dental College, LahoreCorresponding author: Hira Butt, Email: hira.ah.butt@gmail.com, Cell: 0336-7160357**ABSTRACT****Objective:** To assess the inter-rater reliability of dentists regarding assessment of depth of impacted third molars on the Orthopantomograms**Methods:** A cross sectional comparative study was conducted in College of Dentistry, Sharif Medical and Dental College, Lahore 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 classification¹. The raters were provided with the OPGs and a proforma for recording their observations.**Results:** The level of agreement regarding the depth of impacted third molars observed on the Orthopantomograms between rater 1 with rater 2 ($\kappa=.692$, $p\leq 0.001$) and rater 1 with rater 3 ($\kappa=.639$, $p\leq 0.001$) was very strong but was moderate with rater 4 ($\kappa=.538$, $p=0.001$).**Conclusion:** There was an excellent agreement regarding the depth of impacted third molars of rater 1 (Oral and maxillofacial surgeon) with rater 2 (oral pathologist) and rater 3 (Prosthodontist) but a moderate agreement with rater 4 (Endodontist).**Keywords:** Depth of impaction, Third molars, Inter-rater reliability, Orthopantomograms**INTRODUCTION**

When teeth don't emerge into their proper working positions and don't eventually acquire a regular arch contact with all the other teeth & tissue, these are said to be impacted. Third molars in the mandible are indeed the teeth that experience impaction development the most frequently. The incidence of impacted third molars has been observed in numerous researches from throughout the globe, varying from 27 to 76%¹. One of the most frequent oral surgical operations is the surgical removal of the impacted lower third molars, and it is frequently accompanied by a range of difficulties that can be connected to preoperative conditions².

The most significant aspect that needs to be taken into account is the preoperative appraisal of the lower third molar surgery's difficulties³. The impaction has been categorized in a number of ways. The degree of impaction, the angles of the third molars, and the connection towards the anterior aspect of the ramus of mandible are just a few of the elements that go into this categorization⁴. The Pell and Gregory classification method can be used to categorize the depth or degree of maxillary as well as mandibular 3rd molars, in which the impacted tooth are evaluated in reference to the occlusal plane of the neighboring second molar⁵.

To study the link between impacted teeth and the surrounding vital structures, an OPG remains a common investigation⁶. OPG continues to be one of the most effective diagnostic methods for determining impacted lower third molar, according to publications⁷. There are still many people who utilise the Rood and Shehab guidelines, which depend on traditional radiographs, to determine the relationship of lower third molar with its surroundings⁸. There are differences in how surgeons and some other professionals perceive OPG. The extent of the differences has a direct impact on how accurate OPG is at, determining the relation of lower third molar, its depth of impaction, relation with ramus, adjacent tooth, measuring the difficulty index, complications that can cause per-operatively and forecasting IAN injury⁹.

There is a paucity of data in the research literature on the inter rater reliability analysis for measuring the depth of 3rd molar impactions using OPG and the correlation between various characteristics of the impacted lower third molars as well as the difficulty score. The aim of this study was to assess the inter-rater

reliability of dentists regarding assessment of depth of impacted third molars on the Orthopantomograms.

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 classification¹⁰. 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 2 were in agreement regarding the class A depth of impaction. It also shows that there was a disagreement regarding class B and C depth of impaction.

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

		Depth of Impaction Rater 1 (OMFS)			
		Class A	Class B	Class C	Not Impacted
Depth of Impaction Rater 2 (Oral Pathologist)	CLASS A	8 (40%)	0 (0%)	0 (0%)	1 (5%)
	Class B	0 (0%)	2 (10%)	2 (10%)	0 (0%)
	Class C	0 (0%)	1 (5%)	6 (30%)	0 (0%)

Table 2 shows that there was a statistically significant and excellent agreement between rater 1 and rater 2 regarding the depth of impacted third molars.

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

Symmetric Measures					
		Value	Asymptotic Standardized Error ^a	Approximate T ^b	Approximate Significance
Measure of Agreement	Kappa	.692	.128	4.456	≤.001
N of Valid Cases		20			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					

Table 3 shows that rater 1 and rater 3 were in complete agreement regarding class A depth of impacted third molars and both the raters also identified the teeth which were not impacted as well. The difference in the observations in both the raters was seen in class B and class C as shown in table 3

Table 3: The level of agreement between rater 1 and 3 regarding the depth of impaction of impacted third molars

		Depth of Impaction Rater 1 (OMFS)			
		Class A	Class B	Class C	Not Impacted
Depth of Impaction Rater 3 (Prosthodontist)	Class A	7 (35%)	0 (0%)	0 (0%)	0 (0%)
	Class B	1 (5%)	2 (10%)	3 (15%)	0 (0%)
	Class C	0 (0%)	1 (5%)	5 (25%)	0 (0%)
	Not Impacted	0 (0%)	0 (0%)	0 (0%)	1 (5%)

Table 4 a statistically significant excellent agreement regarding impacted third molars between rater 1 and rater 3.

Table 4: Cohen Kappa demonstrating the inter-rater agreement between rater 1 and 3

Symmetric Measures					
		Value	Asymptotic Standardized Error ^a	Approximate T ^b	Approximate Significance
Measure of Agreement	Kappa	.639	.134	4.510	≤.001
N of Valid Cases		20			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					

Table 5 shows that rater 1 and 4 were in substantial agreement regarding class A depth of impacted third molars. It also shows that a disagreement in their observation was seen in class B and C depth of impaction.

Table 5: The level of agreement between rater 1 and 4 regarding the depth of impaction of impacted third molars

		Depth of Impaction Rater 1 (OMFS)			
		Class A	Class B	Class C	Not Impacted
Depth of Impaction Rater 4 (Endodontist)	Class A	8 (40%)	0 (0%)	0 (0%)	1 (5%)
	Class B	0 (0%)	1 (5%)	3 (15%)	0 (0%)
	Class C	0 (0%)	2 (10%)	5 (25%)	0 (0%)

Table 6 shows a moderate agreement between rater 1 and rater 4 which was statistically significant.

Table 6: Cohen Kappa demonstrating the inter-rater agreement between rater 1 and 4

Symmetric Measures					
		Value	Asymptotic Standardized Error ^a	Approximate T ^b	Approximate Significance
Measure of Agreement	Kappa	.538	.140	3.466	.001
N of Valid Cases		20			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					

DISCUSSION

The pre - surgical evaluation of impacted lower third molar, that comprises a thorough clinical history and pertinent examinations, is a crucial step¹¹. The clinician can forecast how tough an operation will be and uncover numerous potential concerns by interpreting radiographs of the impacted lower third molar and its surrounding structures¹². Numerous studies advice doing an intra - oral periapical (IOPA) radiographs, an OPG, a stereoscan, and a CBCT scan. OPG is adequate for assessing impacted lower third molar according to the standards of contemporary clinical practice of the Royal College of Surgeons (England)¹³. According to certain research, OPG is unreliable for determining the likelihood of nerve damage and related complications¹⁴. This can be ascribed to variations in how each investigator saw the relationships between the nerve roots, the caliber of the OPG, and additional risk variables like age, sex, and root curve. The standardization of surgical surveillance, operators expertise in patients positioning, exposures, and processing settings, and the diagnostic accuracy of OPG can all be enhanced¹⁵. According to our study rater 1 and 2 were in agreement regarding the class A depth of impaction. It also shows that there was a disagreement regarding class B and C depth of impaction. There was an excellent agreement between rater 1 and rater 2 regarding the depth of impacted third molars.

Several studies have been documented in literature in which different authors have documented the inter-rater reliability in assessing the root morphology and its relations to nerve canal. According to Muglali et al., there was less concordance among two senior surgeons from various institutions when investigating the connection between both the IAN canals and the impacted lower third molar roots than there was among the senior surgeon and trainees from the same institution¹⁶. This might be as a result of the residents being educated under the same surgeon and applying the same interpretation⁴. Vinayahalingam S concluded that for the majority of the indicators, there was generally low agreement when comparing towards the surgeons and also the radiologists¹⁷. Our study also reported that rater 1 and rater 3 were in complete agreement regarding class A depth of impacted third molars and both the raters also identified the teeth which were not impacted as well. The difference in the observations in both the raters was seen in class B and class C. There was an excellent agreement regarding impacted third molars between rater 1 and rater 2. According to our study rater 1 and 4 were in substantial agreement regarding class A depth of impacted third molars. It also shows that a disagreement in their observation was seen in class B and C depth of impaction. There was a moderate agreement between rater 1 and rater 4 which was statistically significant.

The lack of inter-observer concordance suggests that standardization is necessary to increase inter- and intra-observer concordance when looking for indicators of disease¹⁸. Advanced technologies such as deep training paired with OPG can enhance the evaluation of nerve root connection and danger of nerve damage in a repeatable manner¹⁷. First-year, second-year, and third-year residents as well as an expert oral surgeon were evaluated by Ferrus-Torres et al. to how they interpreted several characteristics pertaining to the roots of mandibular molars¹⁹. According to their findings, the root curve and the size of roots had the highest as well as lowest concordances, correspondingly¹⁹. In this investigation, the dental professional, two senior surgeons, and assessment of the morphology of the roots produced inadequate concordance with regards to the number of roots¹⁹. The reliability of panoramic radiographs in the identification of root curvature, root number, as well as if they are fused was shown to be low, according to Bell et al¹⁵. Additionally, determining the quantity and structure of roots needs lesser attention to detail than determining root curves, which calls for precise precision¹⁵.

This study will play a significant role in unravelling an important aspect of the clinical dentistry. It will help the clinicians understand and make them aware of the that disparity in reading radiographs. Radiographic interpretation is very crucial for patient

management and effective health care provision as it forms the basis of diagnosis.

Limitation: Inclusion of dental specialists from all specialties would have helped us unravel more findings.

CONCLUSION

There was an excellent agreement regarding the depth of impacted third molars of rater 1 (Oral and maxillofacial surgeon) with rater 2 (oral pathologist) and rater 3 (Prosthodontist) but a moderate agreement with rater 4 (Endodontist).

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