

**CLASSIFICATION OF WINTER IMPACTION OF  
MANDIBLE THIRD MOLAR ON THE DISTANCE OF  
THE MANDIBULAR CANALS ON PANORAMIC  
RADIOGRAPHS AT RSGMP UNJANI**  
*(KLASIFIKASI IMPAKSI MOLAR TIGA MANDIBULA  
TERHADAP JARAK KANAL MANDIBULAR PADA  
RADIOGRAFI PANORAMIK DI RSGMP UNJANI)*

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**ABSTRACT**

Impacted teeth are teeth obstructed during the eruption process; the high prevalence of impacted teeth, especially third molars, accompanied by complaints that arise, requires omentectomy. Winter's classification shows various positions of impacted third molars based on angulation. This classification is judged to be describe the relationship of the apical position of the mandibular third molar tooth to the mandibular canal more clearly. The odontectomy procedure requires an excellent preoperative approach to consider the structures around the mandibular third molar, one of which is the mandibular canal, because the canal's proximity to the third molar root can increase the risk of nerve injury during the odontectomy procedure. This study aims to determine the relationship between the third mandibular impaction Winter classification and the mandibular canal distance on panoramic

radiographs. The samples of this study were 53 and were grouped according to the position of the impaction vertically, mesioangularly, horizontally, and distoangularly. The study was conducted cross-sectionally by measuring the apical distance of the mandibular third molar to the upper border of the canal on a panoramic radiograph using a manual caliper. The space obtained was statistically analyzed using the eta correlation test. The results showed that 38 and 48 impactions were found to have the most mesioangular impaction, followed by horizontal, vertical, and distoangular paping the least. The mesioangular position measured the distance from the apical third molar of the impacted mandible to the closest distance to the mandibular canal, followed by the horizontal and the longest distance in the vertical position. Statistical tests were conducted to determine the relationship between the mandibular third molars and the mandibular canal. In the test results, the calculated F value on tooth 38 (2.64) and tooth 48 (0.507) was smaller than the F table value (2.794); this indicates there is no significant relationship between the two variables. The absence of a close relationship between the mandibular third molar distance and the mandibular canal indicates the possible low risk of complications in paresthesia after the odontectomy procedure.

**Keywords:** impaction; mandibular canal; Winter's classification

### **ABSTRAK**

*Gigi impaksi merupakan gigi yang terhambat pada saat proses erupsi, tingginya prevalensi gigi impaksi terutama gigi geraham ketiga disertai dengan keluhan yang timbul memerlukan odontektomi. Klasifikasi Winter menunjukkan berbagai posisi gigi molar ketiga yang impaksi berdasarkan angulasinya, klasifikasi ini dinilai dapat menggambarkan hubungan posisi apikal gigi molar tiga mandibula dengan kanal mandibula dengan lebih jelas. Prosedur odontektomi memerlukan prosedur pra operasi yang baik untuk mempertimbangkan struktur di sekitar mandibular molar tiga, salah satunya adalah kanalis mandibula,*

*karena kedekatan kanalis dengan akar molar tiga dapat meningkatkan risiko cedera saraf selama prosedur odontektomi. Penelitian ini bertujuan untuk mengetahui hubungan antara klasifikasi Winter impaksi molar tiga mandibula dengan jarak kanal mandibula pada radiografi panoramik. Sampel penelitian ini berjumlah 53 orang dan dikelompokkan menurut posisi impaksi secara vertikal, mesioangular, horizontal, dan distoangular. Penelitian dilakukan secara potong lintang dengan mengukur jarak apikal molar tiga mandibula ke batas atas kanal pada radiografi panoramik menggunakan jangka sorong manual, kemudian jarak yang diperoleh dianalisis secara statistik menggunakan uji korelasi eta. Hasil penelitian menunjukkan bahwa impaksi 38 dan 48 ditemukan impaksi mesioangular paling banyak, diikuti papung horizontal, vertikal, dan distoangular paling sedikit. Pengukuran jarak dari apikal molar tiga mandibula impaksi hingga jarak terdekat dengan kanalis mandibula adalah posisi mesioangular, diikuti horizontal, dan jarak terjauh pada posisi vertikal. Uji statistik dilakukan untuk mengetahui hubungan antara gigi molar tiga rahang bawah dengan kanalis mandibula, pada hasil pengujian nilai F hitung pada gigi 38 (2,64) dan gigi 48 (0,507) lebih kecil dari nilai F tabel (2,794), hal ini menunjukkan tidak ada hubungan yang signifikan antara kedua variabel tersebut. Tidak adanya hubungan yang erat antara jarak molar tiga mandibula dengan kanalis mandibula menunjukkan kemungkinan rendahnya risiko komplikasi berupa parestesia setelah prosedur odontektomi.*

***Kata kunci:*** *impaksi; kanal mandibula; klasifikasi Winter*

## **INTRODUCTION**

Impacted teeth are teeth that are obstructed during the eruption process with the presence of gums, bones, or other teeth

above them; impaction usually occurs due to lack of eruption pressure, lack of space due to the jaws that tend to be narrow to large tooth sizes, mandibular growth that is

too fast and too slow, the position of the teeth in the arch or hereditary factors.<sup>1,2</sup> The most common tooth impaction frequency was mandibular third molar impaction. Generally, third molars erupt at the age of 17-21 years.<sup>1</sup> The high prevalence of impaction in research at the Dental and Oral Hospital (RSGM) Faculty of Dentistry (FKG) UNPAD in 2014, based on observations made of 100 FKG UNPAD students, Class of 2010, it was found that the number of mandibular third molars had impacted as many as 58 people. (58%).<sup>3</sup>

The impacted mandibular third molar is closely related to the mandibular canal due to its proximity to the nerve in the mandibular bone. The mandibular canal is located within the mandible, extending from the mandibular foramen to the mental foramen.<sup>4</sup> Mandibular canal contains bundles of nerves, arteries, and veins.<sup>5</sup> Surgery for impacted mandibular third molars or odontectomy often causes complications, one of which is paraesthesia. At the time of mandibular third molar surgery, the mandibular canal is the structure used as a reference to avoid injury to the inferior alveolar nerve. Third molar odontectomy is one of the most common procedures among oral surgeries and causes many complications if not correctly planned preoperatively.<sup>6</sup> To estimate the possibility that occurs during odontectomy, panoramic

radiographs are often used as an initial evaluation to provide information. Panoramic radiography is the type of radiograph often used to identify the relationship between the mandibular canal and the apical aspect of the mandibular third molars. At the time of diagnosis and surgical management, this examination is considered a practical examination in estimating damage due to complications of the mandibular canal in the form of injury to the inferior alveolar nerve.<sup>7</sup>

Several studies reported that the results of panoramic radiographs in the form of darkening of the mandibular third molar root and superimposed mandibular canal indicate that there is a relationship between the apical tooth and the mandibular canal or the risk of injury to the nerve after odontectomy procedure, this is due to the close distance between the teeth. Between the mandibular third molars and the mandibular canal.<sup>7,8</sup>

The position of impacted third molars based on Winter's classification was mesioangular, followed by vertical and horizontal, and the least was distoangular.<sup>9,1</sup> The impaction position with a horizontal inclination is the most dangerous because the tooth surface is in contact with the mandibular canal.<sup>10</sup> Meanwhile, the mesioangular impaction position was found to have a darkening of the mandibular third

molar root, which indicates the proximity of the mandibular third molar root to the mandibular canal.<sup>11</sup> The contact of the root of the third molar to the canal was more common in women than in men.<sup>7</sup> This is a concern during the odontectomy procedure with consideration of the risk of nerve injury that will arise due to the proximity of the mandibular third molar to the canal.<sup>8</sup> Identification of the relationship between the apical of the mandibular third molars and the mandibular canal needs to be done, especially before the odontectomy procedure, to accurately ascertain and assess the risk of surgery and to determine the safest surgery to avoid complications, one of which is an injury to the nerves during the odontectomy procedure using radiographic examination.<sup>11</sup>

## **METHOD**

### **Research design**

This study is a cross-sectional observational analytic study that measures the variable distance of the mandibular third molar to the mandibular canal based on Winter's classification simultaneously. Each research subject was observed only once, and the risk factors and impacts were measured according to the circumstances or status at the observation time.

### **Research subject**

The subject of this study was a panoramic radiograph of an impacted patient contained in the radiology data of RSGMP UNJANI. The research subjects were adjusted according to the inclusion criteria, Panoramic radiograph with impacted mandibular third molars visible on both sides, good quality panoramic radiograph including sufficient density, good detail, minimal distortion, appropriate contrast, and uncropped image, panoramic radiograph with male and female patients and the mandibular canal seen on panoramic radiograph. The exclusion criteria in this study were that there was a lesion in the apical part of the third molar on a panoramic radiograph, there were teeth that had been extracted starting from the midline of the face to the second molar, the patient had a fracture of the mandible or was under orthodontic treatment.

### **Number of Samples and Sampling Techniques**

Data were obtained from medical records and panoramic radiographs on a sample of preschool-aged boys and girls at RSGM Unjani. In its implementation, this research has received ethical approval from the ethics committee of Padjadjaran University Bandung, with the number 1148/UNG.KEP/EC/2020.

### **Research Ethical Aspects**

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## RESULT

### Description of Research Subject Characteristics

To find out the description of the research subjects on panoramic radiographs at the General Achmad Yani University RSGMP using the frequency distribution and percentage described in Table 1.

**Table 1.** Characteristics of the sample by gender

Variable	F	%
Gender		
Man	19	35.8
Woman	34	64.2

To be able to find out the distribution of samples by gender, then for categorical data is indicated by the number and percentage

The data in table 1 shows the

characteristics of respondents based on gender at RSGM Universitas Jenderal Achmad Yani; of 53 patients, 19 people (35.8%) were male, and 34 (64.2%) were female.

**Table 2.** Characteristics of the sample by age

Variable	mean	Stdev	Min - Max
Age	26.75	7.64	18 - 52

To determine the characteristics of the sample based on age, numerical data is presented with the average value, minimum and maximum age, and standard deviation.

The data in table 2 shows the characteristics of respondents based on age at the General Achmad Yani University RSGMP; the average age is 26.75 years, with a minimum age of 18 years and a maximum age of 52 years.

**Table 3.** The mean value of the apical distance of tooth 38 to the mandibular canal based on Winter's classification of the mandibular canal

Classification	N	mean	Stdev	Min - Max
Vertical	1	0.416	0.79	0.00 - 2.35
Mesioangular	2	0.085	0.30	0.00 - 1.35
Horizontal	4	0.162	0.44	0.00 - 1.35
Distoangular	6	0.00		0.00 - 0.00

The average distance based on Winter's classification in the form of categorical data was presented with the amount of data. In contrast, categorical data was given with the average, minimum, maximum, and standard deviation values.

Previously, the data obtained were tested for normality using the Kolmogorov-Smirnov test because the number of samples used was more than 50. The normality test results showed that the data were not normally distributed ( $p < 0.05$ ), so the statistical test used was a non-parametric test. The apical distance of the mandibular third molars was based on the Winter classification of mandibular third molar impaction on the mandibular canal, using the eta correlation test. Eta correlation was used to determine the association or correlation between variables with nominal and interval data types.

In table 3, the results of 38 impacted teeth with the most mesioangular position were found 24 samples, followed by the horizontal position in as many as 16 samples, the vertical position in as many as 12 samples, and the distoangular position as many as one sample. The closest mean distance between the apical third molars of the mandible and the upper border of the mandibular canal was 0.08 mm in the mesioangular position, followed by 0.16 mm in the horizontal position and 0.41 mm

in the vertical position.

**Table 4.** Eta correlation test results on 38 teeth

Group	Average tooth apical distance 38(mean)±SD	r correlation	* F count	F table	Interpretation
Vertical	0.4167 ± 0.797	0.309	2.64	2.794	There is no relationship
Mesioangular	0.0854 ± 0.305				
Horizontal	0.1625 ± 0.444				
distoangular	0.000 ± 0.000				

Description \*) F count > F table (there is a significant relationship)

The data was presented with the calculated F test, the correlation r value, and the standard deviation in explaining the eta correlation test.

Based on the results of the eta correlation test, the calculated F value was 2.64, where the F value showed no significant relationship between the apical distance of the impacted mandibular third molar based on the Winter classification and the mandibular canal because F count < F table (2.64 < 2.794), and obtained the correlation value (r-value) of 0.309 which indicates the level of connection which is low

because it ranges between 0.20 – 0.399.

**Table 5.** The average value of the apical distance of tooth 48 based on the classification of Winter to the mandibular canal

Classification	N	mean	Stdev	Min - Max
Vertical	1	1.096	2.16	0.00 – 7.30
Mesioangular	2	0.557	1,36	0.00 – 6.10
Horizontal	1	0.686	1,20	0.00-2.95
distoangular	5	7	5	0.00-0.00

Finding the average distance was based on Winter's classification in the form of categorical data, which was presented with the amount of data. In contrast, categorical data was given with the average, minimum, maximum, and standard deviation values.

In table 4, impaction, the average apical distance of 48 impacted teeth to the upper border of the mandibular canal in the mesioangular position was mostly found in 26 samples, followed by 15 samples in the horizontal position and 12 samples in the vertical position. The closest mean distance between the apical of the impacted mandibular third molar and the upper limit of the mandibular canal was in the mesioangular position as far as 0.5577 mm, followed by the horizontal position as far as 0.6867 mm, and the farthest distance in the vertical position 1.096 mm.

**Table 6.** Results of dental eta correlation

test 48

Group	Average tooth apical distance 38(mean)±SD	r correlation	* F count	F table	Interpretation
Vertical	1.096±2.160				
Mesioangular	0.5577±		0.50	2,79	There is no relationship
Horizontal	0.6867±1.205	0.141	7	4	
distoangular					

Description \*) F count > F table (There is a significant relationship)

The data is presented with the calculated F test, the correlation r value, and the standard deviation.

Based on the eta correlation test results, the calculated F value is 0.507, where the F value shows. There is no significant relationship between the apical distance of the impacted mandibular third molar based on the Winter classification and the mandibular canal because F count < F table (0.507 < 2.794), and the value obtained is correlation (r value) of 0.141 which indicates the level of relationship that very low because it ranges between 0.00 – 0.199.

## DISCUSSION

In this study, an evaluation of the distance from the apical of the impacted mandibular third molar based on Winter's



classification to the upper limit of the mandibular canal was carried out; measurements were made by looking at the intraobserver panoramic radiograph. The study was conducted on 53 samples and samples that experienced bilateral impaction, based on gender; the model with female sex experienced more third molar impaction, as many as 34 samples (64.2%) than the male sample, as many as 19 (35.8%). It was because when the third molar erupts in women, jaw growth stops, in contrast to the male jaw growth continuing to go hand in hand with the eruption of the third molar so that it provides more space for the third molar.

In this study, the position of the most impacted teeth found in the impacted tooth 38 was the mesioangular position of 24 samples, followed by the horizontal position of 16 samples, the vertical position of 12 samples, and the distoangular position of 1 sample. In the impacted tooth 48, the mesioangular position was the most common in 26 samples, followed by the horizontal position in 15 samples and the vertical position in 12 samples, and this can be attributed to the fact that the average growth and the direction of the eruption of the mandibular third molars were antero-superior.<sup>12</sup> Following Andreasen's statement, the third molars are generally

found to be tilted to the mesial direction when viewed from the lateral aspect.<sup>3,13</sup>

According to Joudzbalys and Daugela, in the case of an impacted tooth, if the distance between the apical of the impacted mandibular third molar and the mandibular canal is  $\geq 3$ mm, then there is no possibility of injury to the mandibular canal.<sup>14</sup> In the results of this study, the impacted teeth in 38 vertical positions with an average distance of 0.41 showed that they had a longer distance than the mesioangular position with an average distance of 0.08 mm and horizontal positions with an average distance of 0.16 mm. has the longest distance with an average distance of 1.09 mm, compared to the vertical position with an average distance of 0.68 mm and the mesioangular position with the shortest average distance of 0.55 mm. It showed that the mesioangular position has a closer distance to the mandibular canal than the horizontal and vertical positions, so it has a possibility of injury to the mandibular canal during odontectomy.<sup>1,7,11,15,16</sup>

In this study, we analyzed the relationship between the position of the impacted mandibular third molar and the distance to the mandibular canal on a panoramic radiograph; statistical analysis used the eta correlation test in statistical

applications. F on the statistical table. The results of the eta correlation test on 38 impacted teeth showed the calculated F value of 2.64, where the computed F value (2.64) < F table (2.794) and the r-value which indicated the level of closeness of the relationship between the test variables, the r value (0.309) was obtained. This value indicates a low level of relationship closeness.<sup>13,12</sup>

There is a close relationship between the distance between the mandibular third molars and the mandibular canal because, with age or old age, the mandibular canal tends to be higher and closer to the third molars. In contrast, at a young age, the mandibular canal tends to be close to the marginal mandible; it also appears darkening. On the root of the third molar on a panoramic radiograph is one feature that indicates the apical entry or proximity of the third molar to the mandibular canal.<sup>8,11,17,14</sup> If there is a relationship due to the proximity of the mandibular third molar to the mandibular canal, it is advisable to do a CBCT examination first to see the bucco-lingual aspect as a consideration for further action to avoid the risk of complications after odontectomy.<sup>18,11,19</sup>

## CONCLUSION

This conclusion shows that the

position of the most impacted tooth with the closest distance to the mandibular canal is the mesioangular position. Still, there is no significant relationship between the apical distance of the impacted mandibular third molar based on Winter's classification and the mandibular canal based on the results of statistical tests.

## CONFLICT OF INTEREST

We declare no potential conflict of interest in the scientific articles we write.

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## REFERENCES

1. Nagaraj T, Balraj L, Iругu K, Rajashekarmurthy S, Sreelakshmi. Radiographic Assessment Of Distribution Of Mandibular Third Molar Impaction: A Retrospective Study. J Indian Acad Oral Med Radiol. 2016;28(2):145-148.
2. Santos VB, Souza AB, Sapata VM, Correa GO, Marson FC, Silva CO. Radiographic Prevalence Of Unerupted And Supernumerary Teeth. Rgo Rev Gaúcha Odontol . 2013;108.
3. Fitri AM, Kasim A, Yuza AT. Impaksi Gigi Molar Tiga Rahang Bawah Dan

- Sefalgia. *J Ked Gi Unpad* 2016; 28(3): 149.
4. Juodzbaly G, Wang HL, Sabalys G. Anatomy of Mandibular Vital Structures. Part I: Mandibular Canal and Inferior Alveolar Neurovascular Bundle in Relation with Dental Implantology. *J Oral Maxillofac Res.* 2010;1(1):2–6.
  5. Allan G Farman. *Panoramic Radiology.* Verlag Berlin Heidelberg;2007. hal 74,107-108.
  6. Lins CCS, Beltrao RLA, Gomes WFL, Ribeiro MM. Study of Morphology Of Mandibular Canal Through Computed Tomography. Vol. 33, *Int. J. Morphol.* 2015;33(2): 553-555.
  7. Yunus B, Mansur UA. Prevalensi Masuknya Akar Gigi Molar Ke Dalam Kanalis Mandibula Ditinjau dari Radiografi Panoramik Dan CBCT di Rumah Sakit Gigi Mulut Universitas Hasanuddin. *Makassar Dent J* 2018;7(3). 29:156–159.
  8. Tantanpornkul W, Okochi K, Bhakdinaronk A, Ohbayashi N, Kurabayashi T. Correlation Of Darkening Of Impacted Mandibular Third Molar Root On Digital Panoramic Images With Cone Beam Computed Tomography Findings. *Dentomaxillofac Radiol.* 2009;38:11,15.
  9. Hat M, Hamid R, Mir A. Prevalence of Impacted Teeth In Adult Patients: A Radiographic Study Of Kuwaiti Population. *Elect Proj Study.* 2013;5(703):10–1.
  10. Lins CCS, Beltrao RLA, Gomes WFL, Ribeiro MM. Study of Morphology of Mandibular Canal Through Computed Tomography. Vol. 33, *Int. J. Morphol.* 2015;33(2): 553-555.
  11. Nayak DS, Raghavan SA, Birur P, Shubha G, Keerthi G. Determination of Proximity of Mandibular Third Molar To Mandibular Canal Using Panoramic Radiography And Cone-Beam Computed Tomography. *J Indian Acad Oral Med Radiol.* 2019;31(1):274-275.
  12. Deshpande P, V. Guledgud M, Patil K. Proximity of Impacted Mandibular Third Molars to the Inferior Alveolar Canal and Its Radiographic Predictors: A Panoramic Radiographic Study. *J Maxillofac Oral Surg.* 2013;12(2):145–51.
  13. Idris AM, Al-Mashraqi AA, Abidi NH, Vani NV, Elamin EI, Khubrani YH, et al. Third Molar Impaction In The Jazan Region: Evaluation Of The Prevalence And Clinical Presentation. *Saudi Dent J.* 2020:2.
  14. Febrina S. Variasi jarak molar ketiga rahang bawah terhadap kanalis

mandibularis pada radiograf panoramik. Jakarta: Fakultas Kedokteran Gigi Universitas Trisakti. 33:30–3.

15. Elkhateeb SM, Awad SS. Accuracy Of Panoramic Radiographic Predictor Signs In The Assessment of Proximity of Impacted Third Molars With The Mandibular Canal. *J Taibah Univ Med Sci.* 2018;13(3):1-3.
16. S Ishii, S Abe, A Moro, N Yokomizo, Y Kobayashi. The Horizontal Inclination Angle Is Associated With The Risk Of Inferior Alveolar Nerve Injury Duting The Extraction Of Mandibular Third Molars. *Int J Oral Maxillofac Surg.* 2017:1-9.
17. Lita YA, Hadikrishna I. Klasifikasi Impaksi Gigi Molar Ketiga Melalui Pemeriksaan Radiografi Sebagai Penunjang Odontektomi. *JRDI* 2020;4(1):1–3.
18. Rytönen K, Ventä I. Distance Between Mandibular Canal and Third Molar Root Among 20-Year-Old Subjects. *Clin Oral Investig.* 2018;22(7):2505–9.
19. Juodzbaly G, Daugela P. Mandibular Third Molar Impaction: Review of Literature And A Proposal Of A Classification. *J Oral Maxillofac Res.* 2013;4(2):2.