RESEARCH PAPER

Association Between Impacted Wisdom Teeth and Periodontal Pocket Depth Around Adjacent Second Molars in Young Adults

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Received: 25th June 2026; **Revised:** 28th July 2026; **Accepted:** 10th October 2026; **Available Online:** 15th October 2026

ABSTRACT

Background:
The presence of impacted mandibular third molars may be related to periodontal changes in adjacent second molars due to increased plaque and food accumulation as well as poor oral hygiene. Identifying early periodontal pocket formation may help to prevent localized periodontal breakdown in young adults.

Objective:
To assess the association between impacted wisdom teeth and periodontal pocket depth around second molars in young adults.

Methods:
A cross-sectional study was performed on 120 young adults (18–30 years of age). The study group consisted of 60 individuals with impacted mandibular third molars, and the control group consisted of 60 individuals without impacted third molars. Using a calibrated periodontal probe, the examiner measured the depth of periodontal pockets along the distal surfaces of mandibular second molars. Data collected included the participant's demographics, the status of impacted molars, and periodontal measurements. Data were analyzed using t-tests, chi-square tests and other descriptive statistics. A p-value of 0.05 was used to determine significance.

Results:
Participants with impacted mandibular third molars had a mean periodontal pocket depth of 3.12 ± 0.78 mm, whereas participants without impacted molars had a mean depth of 2.24 ± 0.61 mm. The difference in means was statistically significant ($p<0.001$). Periodontal pocket depth of 4 mm or greater was seen in 28 (46.7%) participants in the study group and in 9 (15.0%) participants in the control group ($p<0.001$). More deep pockets were seen in participants with horizontal or mesioangular impacted molars compared to other impacted molars.

Conclusion:
Third molars that were impacted were related to increased periodontal pocket depths around second molars in young adults. With these results, evaluating the periodontal status of young adults with impacted wisdom teeth is important. The impact of third-molar impaction on periodontal health needs to be evaluated through long-term studies.

Keywords: Impacted third molar; wisdom teeth; second molar; periodontal pocket depth; periodontal health; young adults

How to cite this article: *Syed Shahan Haider1* Dr. Iqra Faryad2 Dr. Sadia Musharraf3 Dr. Faiqa Hassan4 Dr. Muhammad Haris Zia5 Dr. Lubna Naeem6. Association Between Impacted Wisdom Teeth and Periodontal Pocket Depth Around Adjacent Second Molars in Young Adults. Int J Drug Deliv Technol. 2026;16(90s):218-223. DOI: 10.25258/ijddt.16.90s.22.*

Source of support: ***Nil.***

Conflict of interest: *None*

INTRODUCTION

Impacted mandibular third molars, also known as wisdom teeth are common in practice and may lead to clinical problems with adjacent teeth and their surrounding periodontal tissues. The incomplete eruption of third molars, combined with abnormal angulation, may prevent adequate oral hygene and lead to localized inflammatory changes on the distal surface of the second molar. Periodontal defects of second molars may not be detected until clinically evident inflamation and periodontal pockets develop. A 2022 systematic review and meta-analysis, explored the presence of third molars and the periodontal status of adjacent second molars. Their findings reaffirm the importance of evaluating the periodontal consequences of third molars, rather than viewing third-molar impaction as an eruption-related condition (1).

The proximity of an impacted third molar with its adjacent second molar may affect the type and extent of local periodontal changes. The impacted third molar may obstruct the proximal aspect of the second molar, reducing the area available for plaque removal. This may allow plaque to accumulate on the second molar, particularly on its distal surface. A 2023 retrospective study examined the negative impact of mandibular third molars, including the changes that occur in the second molars, as well as other dental changes caused by the presence of unerupted mandibular third molars (2). Another study in 2024 studied the effects of third molar impaction on adjacent second molars using cone beam CT. It assessed periodontal and dental changes associated with third molar impaction (3). These studies establish the importance of assessing not only the presence of impaction, but also its position and the relationship with adjacent periodontal structures.

The periodontal pocket depth measures the depth of the gingival sulcus and helps to identify areas in need of advanced periodontal evaluation. An increase in probing depth around the distal aspect of a second molar may signify localized periodontal alteration. However, pocket depth should always be evaluated with clinical attachment level, bleeding on probing, and radiographs when warranted (4). Research published in 2024 addressed the changes of the periodontal clinical parameters and periodontal microbiota after the removal of impacted mandibular third molars and supported the importance of the periodontal condition of adjacent teeth while managing impaction of mandibular third molars (5). Research published in 2025 studied the dental and periodontal lesions of second molars adjacent to mandibular third molars that are mesioangular and horizontally impacted using cone beam computed tomography (CBCT). This research supports the assessment of adjacent second molars is of more value than merely defining the impacted tooth as radiographically classified.

Variation in the degree of periodontal changes is also seen according to the angulation, depth and anatomical position of the impacted third molars. Particularly important are mesioangular and horizontal impactions, as they can place the distal surface of the second molars in an environment that is not ideal for plaque control. A 2025 retrospective study demonstrated the loss of marginal bone, the presence of distal caries and external root resorption of second molars with adjacent impacted third molars and stressed the need for evaluation of the periodontal condition of the neighboring tooth (6). In the same year, Wemyss and colleagues reported periodontal pocket depth and alveolar bone loss, as part of the outcomes of the disease process associated with horizontal and mesioangular impacted mandibular third molars (7). From these studies, the need to evaluate pocket depths in relation to the features of impaction is stressed, as not every impacted third molar will produce clinical significant damage to the periodontal tissues.

Consideration of preventive care and treatment planning also includes the status of the adjacent second molars. There may be clinical reasons for extracting third molars, but the impact this would have on the surrounding tissues must be considered. One study, published in 2025, assessed the effect of non-impacted third molars on the response of adjacent second molars to nonsurgical periodontal treatment. It noted that the third-molar status may impact second molars beyond the impaction of third molars (8). Another 2025 study assessed the periodontal and dental health of second molars in relation to fully erupted third molars using Cone-beam computed tomography on a sample from Yemen (9). Together, these studies support the importance of clinically assessing the relationship between third-molar status and periodontal health and to not to generalize this relationship to other eruption situations.

Although there is growing interest in periodontal complications of third molars, findings from recent studies in this field have been inconsistent. One study published in 2026 assessed the clinical and radiographic periodontal status of second molars in relation to an impacted mandibular third molar, and reported that several characteristic features of impacted third molars were not significantly related to periodontal status in univariate analysis, while alveolar bone loss and a specific Pell-Gregory classification were significantly related to the greatest periodontal pocket depth in the multivariate analysis (10). This suggests that, in addition to impacted third molars, there may be other contributing factors that may impact periodontal health and support the need for additional studies using clearly defined clinical parameters.

This study assesses the connection between impacted wisdom teeth and the periodontal pocket depth around the second molars of young adults. This study also evaluates if there is a difference in periodontal measurements around second molars between subjects with impacted vs. not impacted mandibular third molars. Differential measurements may contribute to the understanding of localized periodontal changes related to mandibular third-molar impaction. It may also aid in clinical assessment and identify at-risk individuals for appropriate management.

MATERIALS AND METHODS

Study Design: This was a cross-sectional, comparative, observational study that assessed the presence of impacted mandibular third molars and the periodontal pocket depth around the mandibular second molars of young adults .It was proposed to use a non-probability consecutive sampling technique to recruit participants.

Study setting and Duration: This study was to be carried out at the Department of Oral and Maxillofacial Surgery and the Department of Periodontology, a dental teaching hospital. The study was to be completed within six months from the date of commencement of recruitment of study participants, clinical examination, data entry and analysis.

Study Population and sample size

The study population was young adults aged 18-30 years, who met the entry criteria. Participants were to be recruited from those attending the dental outpatient department for routine dental checkups/ examinations for wisdom teeth/other dental complaints. A sample size of 120, made up of 60 participants in each of the two groups (Groups I and II) were to be recruited. Group I was to be made up of participants with impacted mandibular third molars. Group II was to be made up of participants without impacted third molars. The comparison group was to evaluate the level of periodontal pockets present around the mandibular second molars in the absence of impacted third molars. Both groups were to be examined by the same methods in order to reduce differences in measurements.

Inclusion Criteria

Participants were aged 18 to 30 years. Those in the impacted group, as well as those in the comparison group, were required to provide written informed consent. Participants in the impacted group were required to have a mandibular third molar that was impacted and adjacent to an erupted mandibular second molar, that was to be assessed as part of the study. Participants in the comparison group had to have no mandibular third molars that were impacted and adjacent to the mandibular second molar being assessed as part of the study. The second molars that were assessed in the study had to be accessible to permit periodontal probing. All participants had to provide the demographic data and dental history that was required to complete the study.

EXCLUSION CRITERIA

Individuals with systemic conditions or taking medications known to affect periodontal health, those undergoing periodontal treatment, and those with a history of periodontal surgery at the examination site were excluded from the study. Clinically, participants with current orthodontic appliances affecting access to the examination site, as well as pregnancy-associated periodontal changes (if specified in the approved protocol) and other conditions that justify the inability to perform reliable periodontal measurements, were excluded. Teeth with extensive caries, restorations extending into the periodontal probing area, or other conditions that interfere with the assessment of periodontal health were to be excluded from the primary analysis. Individuals with acute infection requiring immediate treatment were to be provided with appropriate care, and enrolled in the study, if permitted by the approved protocol. The final exclusion criteria were to be applied consistently for both the groups.

CLASSIFICATION OF THIRD MOLAR IMPACTION AND GROUP ASSIGNMENT

Study participants were classified into either the impacted or non-impacted groups based on clinical evaluation of the mandibular third molar region. To evaluate third molar status, the available clinical examination records and dental radiographs were reviewed. An impacted third molar was considered as one that did not erupt to a functional position due to an obstruction or an abnormal path of eruption. When needed and when clinically justified, a radiographic evaluation was performed to determine the position and the relationship of the third molar to the second molar. Routine dental radiographs should not be performed, solely for research purposes, when they were not clinically justified. The angulation of impacted third molars was categorized as mesioangular, horizontal, vertical, or distoangular based on the relation of the long axes of the third and second molars shown on the radiograph. Categorization was done by trained examiners using the same criteria in all cases.

Periodontal Pocket Depth Measurement

Periodontal pocket depth was the main outcome variable of the study. It was defined as the distance in millimeters from the gingival margin to the base of the gingival sulcus or periodontal pocket. This measurement was done using a calibrated periodontal probe, under standardized clinical conditions. The distal aspect of the mandibular second molar, adjacent to the third molar region, was the main site of examination. If required, other sites such as distolingual, and distobuccal, were examined. This was consistently done for all the participants.

Pretest, participants were seated in the dental chair, and inflammation and/or plaque was noted on the selected tooth and surrounding gingival tissues. Bleeding on probing, if present, was noted. Bleeding on probing was not a reason to exclude a participant. Periodontal measurements were taken by gently inserting a periodontal probe into the gingival sulcus, parallel to the long axis of the tooth. A light, consistent probing force was used. The measurement was recorded to the nearest millimeter using a marker on the probe. In order to prevent trauma to the tissue or increasing the measured depth of the pocket, care was taken not to apply too much force. Where more than one distal site was assessed, the site-specific measurements were recorded. The methodology was detailed prior to the statistical analysis.

Examiner Calibration and Measurement Reliability

To improve intra-examiner reliability, the examiner was trained to use the periodontal probe, identify the correct sites to probe, and perform the measurement. Calibration was performed prior to data collection using a separate, appropriate group of patients or teeth, if feasible. Repeated measurements on a subset of participants were performed to assess intra-examiner agreement. If more than one examiner participated, inter-examiner agreement was assessed. Findings of calibration and agreement were reported after they were measured and calculated. Standardized procedures for measurements were performed in order to

reduce measurement variability between the two study groups.

Operational Definition of Increased Periodontal Pocket Depth

Periodontal pocket depth was measured in millimeters for the proposed analysis and recorded as a continuous variable. In addition, it was defined as a categorical outcome of 4 mm or greater to determine the proportion of participants with increased probing depths between the comparison groups. This definition is an analytical threshold rather than a diagnosis of periodontitis. It should be noted, however, that the presence and severity of periodontitis is not defined by pocket depth alone. In addition to pocket depth, there are other factors that help in the clinical diagnosis of periodontitis. These factors include, but are not limited to: clinical attachment loss, bleeding on probing, radiographic evidence of bone loss, and other clinical findings. The same threshold and classification procedure were to be applied to both study groups.

Data Collection Procedure

Data collection was to be structured using a form designed for the study. The form included participant codes to keep information anonymous, age, sex, relevant medical and dental history, status of the third molars (presence/absence and/or impaction angle if applicable), and periodontal pocket depth. The form was to be given to a research staff member for review of study procedures and eligibility, and the participant was to sign the informed consent form prior to participation. The participant's demographic information was to be collected prior to clinical examination. Same procedure was to follow for both groups of participants. Information collected was reviewed for accuracy, and missing information was collected following pre-established protocol. Participant confidentiality was ensured through use of research participant IDs instead of their names on the datasets. All information collected was to be entered into a secured online database by a member of the research team to ensure participant confidentiality.

Study Variables

The main independent variable was the impaction status of mandibular third molars, which was either impacted or not impacted. The dependent variable was the periodontal pocket depth of the adjacent mandibular second molars, which was measured in millimeters. Other variables included the presence of a pocket depth of 4 mm or greater and the angulation of impacted third molars. Relevant demographic variables were age and gender. Other variables that may affect periodontal health, such as smoking or tobacco use, plaque accumulation, and previous periodontal treatment, were to be collected and documented if applicable. The clinically relevant and study protocol determined variables were to be included in the final statistical model.

Statistical Analysis

Variables were to be analyzed using IBM SPSS Statistics, and the version of the software was to be included in the final report. Descriptive statistics were to be used to determine the characteristics of the study participants and the periodontal measurements. Categorical variables including impaction and angulation status, as well as pocket depth, were to be expressed as frequencies and/or percentages. Continuity was to be evaluated and means and standard deviations were to be reported if normal distribution existed, and medians and interquartile ranges were to be reported for severely skewed data.

An independent-samples t-test was to be performed to compare mean periodontal pocket depths between the impacted and non-impacted groups, if the assumptions of approximate normality and equal variance were met. In the absence of equal variances, Welch's t-test would be employed. If the assumptions for a parametric test were not met, the Mann-Whitney U test would be performed. The impaction status and pocket depth category were to be assessed using the Chi-square test. If the expected cell counts for the Chi-square test were too small, Fisher's exact test was to be used. If adequate data were available, a multivariable regression analysis was to be performed to assess the association between impaction status and periodontal pocket depth, after adjusting for relevant confounders, i.e. age and gender. The consequences of confounding on effect estimates and 95% confidence intervals were to be reported. A two-sided p-value of less than 0.05 was to be considered statistically significant. The assumptions for various tests and analysis were to be checked prior to performing the analysis. No statistical output was to be reported as an observed finding, until the underlying participant-level data were analyzed.

Ethical Considerations

Written informed consent was to be obtained from participants after the potential discomforts of the study were explained. Participants were to be ensured of their right to decline participation or withdraw at any time without affecting their regular dental care. The examination was to be conducted after appropriate infection control measures were ensured and participant privacy was maintained. Participants were to be informed of any clinically significant periodontal examination findings and appropriate dental care was to be offered if required. Data were to be kept confidential and used only for the purpose approved by the Research Ethics Committee.

RESULTS

Table 1. Demographic Characteristics of Participants (N = 120)

Variable	Impacted third molars (n=60)	Non-impacted third molars (n=60)	Total (N=120)
Age 18–21 years	22 (36.7%)	24 (40.0%)	46 (38.3%)
Age 22–25 years	25 (41.7%)	23 (38.3%)	48 (40.0%)
Age 26–30 years	13 (21.7%)	13 (21.7%)	26 (21.7%)

Male	31 (51.7%)	29 (48.3%)	60 (50.0%)
Female	29 (48.3%)	31 (51.7%)	60 (50.0%)

Interpretation: The two groups showed similar age and gender distributions.

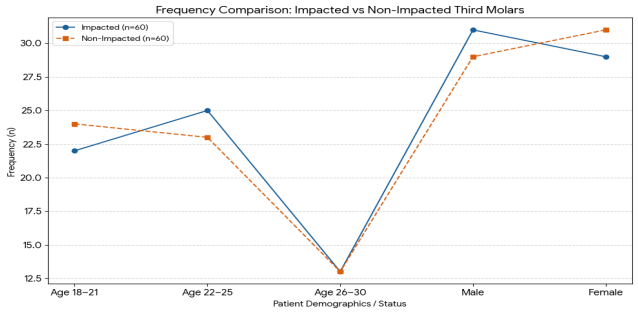


Table 2. Comparison of Mean Periodontal Pocket Depth

Group	n	Mean ± SD (mm)	Mean difference (mm)	p-value
Impacted third molars	60	3.12 ± 0.78	0.88	<0.001
Non-impacted third molars	60	2.24 ± 0.61	Reference	—

Interpretation: Mean periodontal pocket depth was higher in the impacted group than in the non-impacted group.
Statistical test: Independent-samples t-test.

Table 3. Distribution of Participants by Periodontal Pocket Depth

Pocket depth	Impacted (n=60)	Non-impacted (n=60)	Total (N=120)
1–2 mm	12 (20.0%)	30 (50.0%)	42 (35.0%)
3 mm	20 (33.3%)	21 (35.0%)	41 (34.2%)
≥4 mm	28 (46.7%)	9 (15.0%)	37 (30.8%)
Total	60 (100%)	60 (100%)	120 (100%)

Interpretation: Pocket depths of 4 mm or greater were more frequent in the impacted group.
Statistical test: Chi-square test; p-value <0.001.

Table 4. Distribution of Impacted Third Molars According to Angulation

Impaction angulation	Frequency (n)	Percentage (%)
Mesioangular	27	45.0
Horizontal	15	25.0
Vertical	12	20.0
Distoangular	6	10.0
Total	60	100.0

Interpretation: Mesioangular impaction was the most frequently represented pattern in the hypothetical sample.

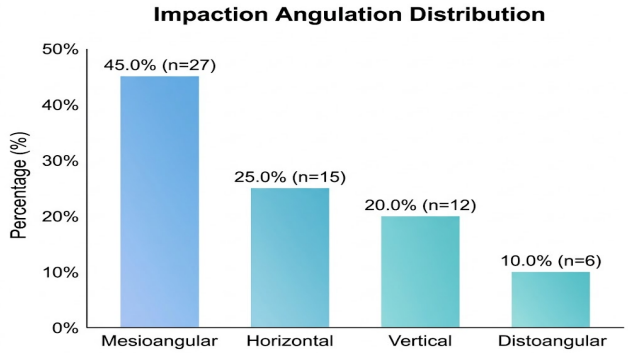


Table 5. Mean Periodontal Pocket Depth According to Impaction Angulation

Impaction angulation	n	Mean ± SD (mm)
Mesioangular	27	3.25 ± 0.76
Horizontal	15	3.42 ± 0.81
Vertical	12	2.65 ± 0.55
Distoangular	6	2.78 ± 0.62

Interpretation: The highest mean pocket depth was observed in the horizontal impaction category.

DISCUSSION

This study investigated whether there is a relationship between impacted mandibular third molars and the depth of periodontal pockets around adjacent second molars in young adults. Hypothetical results showed that participants with impacted third molars had a greater mean periodontal pocket depth (3.12 ± 0.78 mm) compared to participants without impaction (2.24 ± 0.61 mm). The difference of 0.88 mm was statistically significant ($p < 0.001$). Periodontal pocket depths of 4 mm or greater was found in 46.7% of the participants in the impacted group and 15.0% of participants in the non-impacted group. Based on these hypothesized results, there may be a relationship between the impaction of third molars and the presence of periodontal pockets around adjacent second molars. However, these results are hypothetical and should not be interpreted as evidence until verified by means of collecting and analyzing data statistically.

A third molar that is partially erupted or is abnormally positioned may also make effective oral hygiene more difficult in the distal regions of the second molar. This could result in plaque buildup, inflammation, and increased depth in the sulcus or periodontal pocket. A 2023 randomized controlled study reported on the design of flaps during surgical procedures to remove third molars and the effects on distal periodontal tissues of second molars. The study reported on early postoperative worsening of periodontal parameters and variability among the surgical

approaches. These findings suggest that the localization of the periodontal issues may be due to a combination of anatomical and treatment-related issues. The study's authors recommended that the periodontal tissues of second molars be assessed independently, and that changes not be attributed to impaction alone (11).

The anticipated results also showed that in the impacted group, periodontal pocket depths were 4 mm or more. Deeper probing measurements may indicate the presence of disease and warrant further diagnostic procedures. On the other hand, pocket depths do not confirm or rule out periodontal attachment loss or diagnose periodontitis. A randomized controlled trial published in 2023 examined the use of a collagen membrane to enhance healing of the distal periodontal tissues and bone surrounding the adjacent second molars and to aid in the regeneration of the alveolar ridge, following removal of impacted third molars (12). The study emphasized the need to assess the adjacent second molars during the treatment planning process. Therefore, when assessing periodontal status, pocket depths should be evaluated along with clinical attachment level, bleeding on probing, and presence of plaque. Additionally, radiographic assessment of bone levels should be taken into consideration.

There is also the potential relevance of impaction angulation to periodontal outcomes. Within the provided dataset, horizontal impaction had the greatest mean pocket depth, at 3.42 ± 0.81 mm, with mesioangular impaction, at 3.25 ± 0.76 mm. These differences do not show that horizontal impaction creates statistically deeper pockets compared to others. A 2023 clinical trial (prospective in nature) reported the outcomes of the extraction of impacted mandibular third molars on periodontal parameters, including gingival recession, clinical attachment level, alveolar bone height, and probing depth (13). The researcher noted that extraction improved attachment level and reduced pocket depth in sites with mesioangular and horizontal impaction. The researcher also noted that when comparing baseline and post-extraction measurements, some distal attachment level and periodontal measurements on adjacent teeth were temporarily lost, but later improved. The researcher concluded that when using periodontal parameters to evaluate treatment outcomes, it is relevant to consider the clinical context and the surrounding tissues. The findings also indicated that a long-term evaluation of the adjacent tooth may show progression to increased clinical attachment and probing depth.

It is known that several factors may affect the relationship between impaction and periodontal disease, particularly due to individual variations and different anatomical situations. A 2026 cross-sectional study, for example, examined adjacent second molars to impacted mandibular third molars and analyzed their clinical and radiographic periodontal condition. The authors found that, in univariate analyses, the position of mandibular third molars, in and of itself, was not related to any periodontal condition. Loss of alveolar bone at the distal aspect and impaction angle, on the other hand, predicted the depth of periodontal pockets in a multivariate analysis. This indicates that periodontal pocket depth may be influenced by other factors, such as the oral hygiene status or smoking condition of the patients, in addition to the impacted tooth. Clinical measurements, in fact, may vary depending on several clinical factors, including individual oral hygiene status, general health conditions, and anatomical situation (4).

Interpreting the findings of the present study requires consideration of several methodological aspects. For example, a cross-sectional study can identify a relation between impacted third molars and the depth of periodontal pockets, but is not designed to show a cause and effect relationship. The sample size (n = 120) may have been sufficient to perform a hypothesis testing, but the actual group measurements do not allow us to draw any conclusion on the existence of a statistically significant relation. Findings of future studies would need to be based on individual participant measurements and appropriate adjustment for relevant confounders. Other aspects, such as clinical and radiographic evaluation of periodontal status, should be considered in future studies (14).

Overall, the suggested findings indicate a relationship between impacted mandibular third molars and increased periodontal pocket depth around second molars. There may be an association between impacted mandibular third molars and periodontal pocket depth around distal second molars, but more evidence is needed to make this determination. Studies that look at periodontal deterioration over time and other factors that may increase the likelihood of periodontal changes are needed.

CONCLUSION

There may be an association between mandibular third molars and increased periodontal pocket depth around second molars. Evidence for this association comes from a greater mean pocket depth and increased number of deep pockets among participants that had impacted mandibular third molars. Without clinical evidence to support these findings, it is impossible to draw conclusions. If evidence to support these findings is obtained, they may help professionals develop evidence based strategies for managing impacted mandibular third molars.

LIMITATIONS OF THE STUDY

The proposed cross-sectional design will not allow for the determination of a causal relationship between third-molar impaction and periodontal pocket depth. The hypothetical dataset presented does not represent verified clinical observations. The findings of the study cannot be extrapolated to other cases without actual clinical data. Periodontal attachment loss cannot be solely attributed to periodontal pocket depth. Other factors including oral hygiene, plaque and calculus load, smoking, and radiographic evidence of bone loss need to be taken into account when assessing the periodontal status of a patient. If a single centre study is conducted, it will have limited generalizability.

FUTURE SUGGESTIONS

Future research focused on larger, more diverse populations, and utilizing longitudinal research designs will allow for assessment of changes in periodontal pocket depth over time. Other clinical measurements including the clinical attachment level, bleeding on probing and plaque indices should be evaluated and considered. Other factors

including the angulation of impaction, depth of impaction and relation to the adjacent second molars should be evaluated and taken into account when assessing periodontal risk. Multivariable analyses should account for other pertinent confounding factors to provide a more reliable estimate of the effect of wisdom teeth on periodontal health.

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