Published in final edited form as:

J Oral Maxillofac Surg. 2009 December ; 67(12): 2592–2598. doi:10.1016/j.joms.2009.04.046.

Third Molars and Periodontal Pathology in Middle Aged and Older Americans

Kevin L. Moss,

Research Specialist, Department of Dental Ecology, School of Dentistry, University of North Carolina, Chapel Hill, NC 27599-7450

Esther S. Oh, DDS, MD,

Resident, Oral and Maxillofacial Surgery, School of Dentistry, University of North Carolina, Chapel Hill, NC 27599-7450

Elda Fisher, DMD,

Resident, Oral and Maxillofacial Surgery, School of Dentistry, University of North Carolina, Chapel Hill, NC 27599-7450

James D. Beck, PhD,

Kenan Distinguished Professor, Associate Dean for Research, Department of Dental Ecology, School of Dentistry, University of North Carolina, Chapel Hill, NC 27599-7450

Steven Offenbacher, DDS, PhD, and

OraPharma Distinguished Professor, Department of Periodontology, School of Dentistry, University of North Carolina, Chapel Hill, NC 27599-7450

Raymond P. White Jr., DDS, PhD

Dalton L. McMichael Distinguished Professor, Department of Oral and Maxillofacial Surgery, School of Dentistry, University of North Carolina, Chapel Hill, NC 27599-7450

Abstract

Purpose—Assess the association between the visible presence of 3rd molars and the severity of periodontal pathology on teeth more anterior in the mouth.

Subjects and Methods—This analysis included dentate participants 52 to 74 years old from the Dental Atherosclerosis Risk in Communities (DARIC) Study who underwent an oral examination which included periodontal probing depths (PD) on all visible teeth including 3rd molars.

PD 4mm and clinical attachment level (CAL) 3mm were indicator variables for periodontal pathology. Explanatory variables were the presence or absence of visible 3rd molars. Covariates included: gender, ethnicity, age, income level, education, and smoking status.

Outcome variables for periodontal pathology were: mean PD, the extent (% probing sites) PD 4mm, and the extent (% probing sites) CAL>3mm. Outcomes between subjects with visible 3rd molars and no visible 3rd molars were compared by descriptive statistics and Chi-square tests with significance set at 0.05. Multivariable modeling was performed using SAS Proc GLM to calculate least squared means adjusting for study outcome variables and covariates.

Address correspondence to Dr White, (919) 966-1126, FAX (919)966-6019, ray_white@dentistry.unc.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Results—The DARIC sample consisted of 6,793 subjects; 80% were Caucasian and 19% African American. Most subjects (53%) were 62 to 74 years old and female (54%). Thirty percent of ARIC subjects, 2,035, had at least one visible 3rd molar. Having a visible 3rd molar was significantly associated with being: male, African American, less than the mean age of 62.4 years, and higher income or never smoking (all $P < 0.01$).

Greater mean PD on 1st/2nd molars, the extent PD 4mm on 1st/2nd molars, and the extent CAL 3mm on 1st/2nd molars, were all significantly associated with having a visible 3rd molar in unadjusted and adjusted models.

Conclusions—In these middle-aged and older Americans, having a visible 3rd molar was significantly associated with more severe periodontal disease on teeth more anterior in the mouth as compared to subjects with no visible 3rd molars

Clinicians are hampered in providing advice to their patients about management of 3rd molars because few population data exist from the United States on the presence or absence of 3rd molars, and 3rd molars are often not included in clinical studies of periodontal inflammatory disease. Elter et al did report a significant association between identifying a visible 3rd molar or not and the periodontal health of an adjacent 2nd molar in the dentate subjects with an average age of 62 years from the Dental Atherosclerosis Risk in Communities (DARIC) study.(1) A visible third molar was associated with one and a half times the odds of detecting at least one periodontal probing depth (PD) 5 mm or bleeding on probing on the adjacent 2nd molar, while controlling for other factors associated with the visible presence of 3rd molars and periodontal disease. This report did not assess periodontal disease affecting 3rd molars nor the severity of periodontal disease of DARIC subjects on teeth anterior to 2nd molars.

From an older population in North Carolina with an average age of 73 years, Moss et al reported that 42% of dentate subjects had at least one 3rd molar and 14% subjects had four 3rd molars.(2) Periodontal disease was not exclusive to 3rd molars in this population of senior adults. If teeth more anterior to 3rd molars were not affected, less than 1% subjects had at least one 3rd molar clinical attachment level (CAL) 3mm and only 8% subjects had at least one 3rd molar PD 4mm. The relationship between the visible presence of 3rd molars or no visible 3rd molars and subjects' periodontal disease level was not reported.

This study was designed to further our understanding of the association between retained 3rd molars and periodontal inflammatory disease by studying the population of DARIC subjects to document the presence or absence of visible 3rd molars, and assess the association between the visible presence of 3rd molars and the severity of periodontal pathology on teeth more anterior than 3rd molars by commonly applied measures of periodontal inflammatory disease, mean PD, extent (% sites) PD 4mm, and extent (% sites) CAL 3mm.

SUBJECTS and METHODS

The DARIC Study, an IRB approved sub-study of the Atherosclerosis Risk in Communities Study, targeted four sites in the United States; Forsyth County North Carolina, Jackson Mississippi, Suburbs of Minneapolis Minnesota, and Washington County Maryland.(3) The oral examination involved participants at ARIC visit 4 with data collected from 1996 – 1998. The cross-sectional study included all dentate ARIC participants aged 52–74 years who underwent a periodontal examination. Subjects with a medical contraindication to periodontal probing were excluded.

The DARIC oral examination conducted by trained, calibrated examiners included periodontal probing depths, six sites per tooth on all visible teeth including 3rd molars. No

radiographs were available to complement the clinical exams. For additional details of the DARIC study please see Beck et al. (4) Subjects' mean PD, and PD ≥ 4 mm or CAL ≥ 3 mm on 3rd molars and more anterior teeth were considered indicator variables for periodontal pathology.

For our analyses DARIC subjects were divided into two groups based on the visible presence of at least one 3rd molar or no visible 3rd molars, the main explanatory variables. Covariates included: gender, ethnicity/race (African-American or Caucasian), age in years, income level per year grouped as less than \$25K, \$25–50K, or \$50+K, level of education grouped as basic (less than high school), intermediate (high school graduate), and advanced (more than high school), and smoking status (current, former or never).

Outcome variables for subjects' level of periodontal pathology were: mean periodontal probing depths, the mean extent (% probing sites) with PD ≥ 4 mm, and the mean extent (% probing sites) with CAL ≥ 3 mm. Outcomes between subjects with visible 3rd molars and non-3rd molars were compared by descriptive statistics and Chi-square or t-tests with statistical significance set at 0.05.

Potential confounders, ethnicity by study center, gender, smoking, age, education and income, were added to adjusted models based on being associated with the visible presence or absence of 3rd molars. Multivariable modeling was performed using SAS Proc GLM to calculate least squared means adjusting for outcome variables and covariates.

RESULTS

Mean age of the 6,793 DARIC subjects was 62.4 years (SD 5.6y). More subjects were female (54%); 80% were Caucasian and 19% were African American. Eighty-six percent had at least a high school education; 43% were educated beyond high school. More than half the subjects were current (12%) or former smokers (39%). Fourteen percent had been diagnosed as having diabetes mellitus. Most subjects had seen a dentist within the past year (78%) for a regular check-up (73%).

Thirty percent of the study population, 2035 DARIC subjects, had at least one visible 3rd molar. (Table 1) Most, 970 subjects (14%) had only one visible 3rd molar; 490 (7%) subjects had at least three visible 3rd molars and 262 (4%) four 3rd molars. Having a visible 3rd molar was significantly associated with: being African American, being male, being less than the mean age of 62.4 years, having higher income, never using tobacco, all $P < 0.01$, and having less education, $P = 0.04$. (Table 1) Having a visible 3rd molar was not significantly associated with a diagnosis of diabetes mellitus.

Subjects with a visible 3rd molar had a significantly greater overall mean PD calculated from all teeth present except 3rd molars as compared to subjects with no visible 3rd molar, $P < 0.001$. Mean probing depths were greatest on visible 3rd molars and incrementally less on 2nd and 1st molars, and teeth more anterior. (Figure 1) Having a visible 3rd molar was significantly associated with increased mean PD on 2nd and 1st molars as compared to no visible 3rd molars, $P < 0.0001$ and $P = 0.008$ respectively. Mean PD were lowest on anterior teeth, canines and incisors, and no significant differences in mean PD were found whether a 3rd molar was visible or not.

Subjects with a visible 3rd molar had a significantly greater mean extent of PD ≥ 4 mm calculated from all non-3rd molar teeth present as compared to subjects with no visible 3rd molar, 8.6 (SD 12.4) vs. 6.8 (SD 11.3) $P < 0.0001$, respectively. The mean extent of PD ≥ 4 mm was greatest on 3rd molars and incrementally less on teeth more anterior in the mouth whether a 3rd molar was visible or not. The mean extent of PD ≥ 4 mm on 1st/2nd molars was

significantly greater if a 3rd molar was detected as compared to no visible 3rd molar, 17.9 (SD 19.9) vs. 15.3 (SD 18.6) respectively, $P<0.0001$. (Table 2, Figure 2)) The mean extent of PD ≥ 4 mm was low for teeth more anterior in the mouth, less than 10% for premolars and less than 7% for canines and incisors, and not significantly different whether a 3rd molar was visible or not.

Results for the mean extent of PD ≥ 4 mm were similar for 1st/2nd molars in the model adjusted for covariates. The mean extent of PD ≥ 4 mm on 1st/2nd molars was significantly greater if a 3rd molar was detected as compared to no visible 3rd molar, 17.6 (SE 0.4) vs. 15.5 (SE 0.3), respectively $P<0.0001$. (Table 2A, Figure 2A) The mean extent of PD ≥ 4 mm for anterior teeth was significantly greater if a 3rd molar was not visible, $P=0.03$.

The mean extent of CAL ≥ 3 mm on 1st/2nd molars was significantly greater in subjects if a 3rd molar was detected compared to subjects with no visible 3rd molar, 20.7 (SD 24.6) vs. 18.4 (SD 24.2) respectively, $P<0.0006$. (Table 3, Figure 3) The mean extent of CAL ≥ 3 mm was less than 11% on premolars and less than 8% on more anterior teeth. Mean extent of CAL ≥ 3 mm for premolars tended to be greater with a visible 3rd molar, $P=0.052$. However, the mean extent of CAL ≥ 3 mm was significantly greater for canines and incisors if no 3rd molar was visible, $P<0.0001$.

Results were similar for combined 1st/2nd molars for subjects in the adjusted model; the mean extent of CAL ≥ 3 mm was significantly greater if a 3rd molar was detected compared to no visible 3rd molar, 20.2 (SE 0.5) vs. 18.6 (SE 0.4), respectively, $P=0.01$. (Table 3A) However, if the mean extent of CAL ≥ 3 are compared for individual teeth by presence or absence of a visible 3rd molar, only the mean extent CAL ≥ 3 mm on 2nd molars differed significantly. (Figure 3A). If only interproximal probing sites are included in adjusted analyses, the mean extent of CAL ≥ 3 mm was significantly greater for 1st molars and 2nd molars when subjects had a visible 3rd molar. (Figure 3B) However, in both adjusted models the mean extent of CAL ≥ 3 mm was significantly greater for premolars and for more anterior teeth if no 3rd molar was visible, $P<0.01$.

DISCUSSION

For the middle-aged and older subjects in the DARIC population, at least one visible 3rd molar detected in a third of the subjects, was significantly associated with a pattern of subjects' having more extensive periodontal disease assessed by commonly accepted measures; overall mean PD, mean extent (% of possible sites) PD at least 4mm, and mean extent (% of possible sites) CAL at least 3mm as compared with subjects with no visible 3rd molars. This pattern persisted after controlling for covariates traditionally associated with periodontal disease such as ethnicity/race or smoking. If individual teeth were considered the data suggested that the greatest impact of a visible 3rd molar was on levels of periodontal disease on 1st and 2nd molars.

These significant periodontal outcomes associated with the presence of 3rd molars did not extend to premolars, and visible 3rd molars were associated with less severe periodontal disease on anterior teeth. We cannot account for these differences. However, the level of disease detected on anterior teeth by PD or CAL was considerably lower than the level of disease detected on molar teeth, whether visible 3rd molars were present or not. For example, the mean extent PD ≥ 4 mm for 2nd molars with no visible 3rd molar was 15.8% and for 2nd molars with a visible 3rd molar was 16.8%. The mean extent PD ≥ 4 mm for central incisors with no visible 3rd molar was 2.6% and for central incisors with a visible 3rd molar was 2.7%.

The significant differences we report employing commonly accepted periodontal measures might seem small to some clinicians. For example, the adjusted mean extent PD 4mm on 2nd molars was 18.8% for 2,035 subjects with visible 3rd molars as compared to 16.0% for the 4,758 subjects with no visible 3rd molars, a significant difference, $P < 0.01$, but a numerical difference of only 2.8%. Similarly, the adjusted interproximal mean CAL 3mm was 22.1% for subjects with a visible 3rd molar compared to 17.6% for subjects with no visible 3rd molar, a significant difference, $P < 0.01$, but a numerical difference of only 4.5%. The percentage differences might appear low, but the differences represent a considerable quantitative difference in disease burden overall for the 2,035 subjects with a visible 3rd molar as compared to subjects with no visible 3rd molar.

Hugoson and Kugelberg have reported the only data on the prevalence of 3rd molars based on both clinical and radiographic exams from subjects representative of an entire population. (5) In the cohort of Swedish subjects 20 years old, 98% had at least one 3rd molar; 77% had four 3rd molars. In each cohort of older subjects, an incrementally greater number of subjects were missing all 3rd molars. No data were reported to substantiate whether 3rd molars were removed because of pathology, as part of other complex treatment such as orthognathic surgery or to prevent pathology. Data on the reasons for absent 3rd molars are often missing in population studies and clinical studies. In the Swedish cohort comparable to the ages of the DARIC subjects, 44% subjects had at least one 3rd molar and 7% of subjects had four 3rd molars. Moss et al reported similar data from the Piedmont 65+ study population; 42% had at least one visible 3rd molar and 14% four 3rd molars. (1) Fewer DARIC subjects had visible 3rd molars, 30% with at least one and 4% with four 3rd molars. From these cross-sectional analyses we cannot determine why DARIC subjects retained fewer 3rd molars nor can we assess what impact having fewer retained 3rd molars might have had on the periodontal outcomes we report.

Other recent reports from population and clinical studies also have documented an association between the presence of 3rd molars and more severe periodontal pathology on more teeth more anterior in the mouth. In 6,000 U.S. subjects 18 to 34 years old in the Third National Health and Nutrition Survey (NHANES III), a visible 3rd molar doubled the odds of finding a PD 5mm on the adjacent 2nd molar. (6) No data on subjects' overall level of periodontal disease or on the periodontal status of individual teeth more anterior were reported. In a study of 1,000 obstetric subjects enrolled in The Oral Conditions and Pregnancy Study (OCAP), those with a visible 3rd molar were significantly more likely to have moderate to severe periodontal pathology and less likely to be periodontally healthy at enrollment during the 2nd trimester and at postpartum exams. (7) In the same obstetric subjects between the 2nd trimester and the postpartum exam, periodontal progression (four or more probing sites with at least 2mm increase in probing depth, all at least 4mm in depth) was greater if at least one PD 4mm or bleeding on probing (BOP) were detected on 3rd molars as subjects were enrolled. (8) Similar to DARIC subjects periodontal pathology detected in the obstetric subjects was more likely in the molar regions of the mouth, at interproximal molar probing sites, and most likely around 3rd molars.

Is it plausible that periodontal inflammatory disease may be detected more often on 1st/2nd molars when 3rd molars are present? Our previous work has suggested that the anatomic location of 3rd molars makes these teeth more conducive to the colonization of pathogens, more likely to have at least one PD 4mm, and less amenable to mechanical debridement targeted to altering pathogen levels. (9–12) A quarter of young adults with four asymptomatic 3rd molars enrolled in a longitudinal study designed to follow subjects with four asymptomatic 3rd molars over time, had at least one periodontal probing depth PD 5mm in the 3rd molar region at baseline examinations, defined as the 2 probing sites on the distal of 2nd molars and the 6 probing sites around 3rd molars. (10) Two-thirds of the

subjects had at least one PD ≥ 4 mm in the 3rd molar region; only one third of the same subjects had a PD ≥ 4 mm on periodontal probing sites on teeth anterior to 2nd molars.(11) Over time 3rd molar periodontal pathology was associated with periodontal pathology on teeth more anterior. Six years after enrollment periodontal pathology had worsened for the 3rd molar region and non-3rd molars.(11) Having at least one 3rd molar region PD ≥ 4 mm at baseline examinations increased the odds twelve-fold of at least four PD ≥ 4 mm being detected in the 3rd molar region.(12) Having at least one 3rd molar region PD ≥ 4 mm at baseline examinations increased the odds almost four-fold of periodontal pathology being detected on non-3rd molar teeth six years later as compared to subjects with all 3rd molar region PD ≤ 4 mm at enrollment.(12)

Does a biological basis exist to explain the association between the presence of 3rd molars and periodontal pathology on 1st/2nd molars? In affected individuals the clinical signs, PD ≥ 4 mm and BOP, result from the interaction of periodontal pathogens with the immune system at the biofilm gingival interface (BGI).(13) Once teeth are exposed to the oral cavity and can be probed, oral flora colonize on the surfaces in a non-sheddable biofilm. Pathogens colonized in this non-sheddable biofilm interface with an adjacent single epithelial layer with underlying immune system cells (neutrophils, lymphocytes, and monocytes) and abundant underlying vascular tissue. The magnitude and quality of the local host inflammatory response to the presence of bacteria in the biofilm are reflected in the local production of gingival crevicular fluid (GCF) inflammatory mediators, chiefly from immune system cells. Clinically, the collective PDs at six sites per tooth offer an estimate of the total surface area of the BGI. As the total surface area increases, reflected by increasing numbers of deeper PDs, the more the anaerobic environment facilitates colonization of pathogens increasing the potential for the host to have more severe periodontal inflammatory disease. (12,13)

Probing depths at least 4mm have been detected more often around mandibular 3rd molars as compared to other exposed teeth.(15) Third molars are the most posterior teeth in each jaw erupting last, on average at age 19.4 years.(14) Mandibular 3rd molars are situated anatomically in alveolar bone at the junction of the horizontal body of the jaw and the vertical ramus. The combined impact of erupting at a later age than other teeth and anatomic location in the jaw may be why a greater prevalence of PD ≥ 4 mm are found around mandibular 3rd molars. Once established, bacteria around 3rd molars are difficult to eradicate with mechanical debridement alone, and pathogens in 3rd molar sites may serve as a potential reservoir for pathogens colonizing in other sites.(9)

How should clinicians apply these findings from population data to their individual patients? The topic of retained 3rd molars and an association with periodontal disease in young and older adults has only been studied in the last decade. We report a pattern of a significant association between visible 3rd molars and periodontal inflammatory disease. These data do not suggest "cause and effect". However, the collective data from subjects in DARIC, NHANES III and OCAP suggest that more extensive periodontal disease may be detected in the molar regions of the mouth when 3rd molars are present. These findings implying that retained 3rd molars are not always benign are not appreciated well by the general public, and may not be evident to some dentists or physicians. Further investigations are needed on this topic, but retained 3rd molars alone may be risk markers alerting clinicians to the possibility of an increased risk of periodontal pathology affecting teeth more anterior in the mouth, particularly 1st/2nd molars.

The findings we report from DARIC subjects do have limits and may not be applicable to all middle-aged and older subjects. Although our study population numbers almost 7,000 subjects, only four communities in the United States were represented. The subjects in

DARIC were enrolled for a study of cardiovascular disease, not periodontal inflammatory disease. If a representative sample of all subjects of a similar age in the United States are studied, covariates such as socioeconomic levels, health status, smoking or not, and ethnicity may or may not be as significantly associated with periodontal pathology as compared to retained 3rd molars. The number of 3rd molars in the DARIC subjects may be understated because radiographs to detect impacted teeth were not available to examiners. Few population studies document why 3rd molars are absent including the data from DARIC. As a result we do not know whether missing 3rd molars were removed to treat existing disease or to prevent future pathology. As a consequence our data on periodontal pathology with retained 3rd molars may be under or overstated. However, our data do suggest that the pattern of the association between 3rd molars and periodontal pathology on teeth more anterior in the mouth should be studied further in other populations.

Acknowledgments

The Atherosclerosis Risk in Communities Study is carried out as a collaborative study supported by National Heart, Lung, and Blood Institute contracts N01-HC-55015, N01-HC-55016, N01-HC-55018, N01-HC-55019, N01-HC-55020, N01-HC-55021, and N01-HC-55022. The authors thank the staff and participants of the ARIC study for their important contributions.

This paper has been reviewed and approved by the ARIC Coordinating Committee.

FUNDING SOURCES – For These Analyses, NIDCR R01DE 11551, Oral and Maxillofacial Surgery Foundation, American Association of Oral and Maxillofacial Surgeons, Dental Foundation of North Carolina

References

1. Elter JR, Offenbacher S, White RP Jr. Third molars associated with periodontal pathology in older Americans. *J Oral Maxillofac Surg.* 2005; 63:179. [PubMed: 15690285]
2. Moss KL, Beck JD, Mauriello SM, Offenbacher S, White RP Jr. Third molar periodontal pathology and caries in senior adults. *J Oral Maxillofac Surg.* 2007; 65:103. [PubMed: 17174772]
3. ARIC Investigators. The Atherosclerosis Risk in Communities (ARIC) Study. design objectives. *Am J Epidemiol.* 1989; 129:687. [PubMed: 2646917]
4. Beck JD, Elter JR, Heiss G, Couper D, Mauriello SM, Offenbacher S. Relationship of periodontal disease to carotid artery intima-media wall thickness: the atherosclerosis risk in communities (ARIC) study. *Arterioscler Thromb Vasc Biol.* 2001; 21:1816. [PubMed: 11701471]
5. Hugoson A, Kugelberg CF. The prevalence of third molars in a Swedish population, an epidemiological study. *Commun Dent Health.* 1988; 5:121.
6. Elter JR, Cuomo C, Slade GD, Offenbacher S, White RP Jr. Third molars associated with periodontal pathology in the Third National Health and Nutrition Examination Survey. *J Oral Maxillofac Surg.* 2004; 62:440. [PubMed: 15085510]
7. Moss KL, Serlo AD, Offenbacher S, Beck JD, Mauriello SM, White RP Jr. The oral and systemic impact of third molar periodontal pathology. *J Oral Maxillofac Surg.* 2007; 65:1739. [PubMed: 17719391]
8. Moss KL, Ruvo AT, Offenbacher S, Beck JD, Mauriello SM, White RP Jr. Third molars and progression of periodontal pathology during pregnancy. *J Oral Maxillofac Surg.* 2007; 65:1065. [PubMed: 17517287]
9. Moss KL, Serlo AD, Offenbacher S, Beck JD, White RP Jr. Third Molars and the Efficacy of Mechanical Debridement in Reducing Pathogen Levels in Pregnant Subjects, A Pilot Study. *J Oral Maxillofac Surg.* 2008; 66:1565. [PubMed: 18634941]
10. Blakey GH, Marciani RD, Haug RH, Phillips C, Offenbacher S, Pabla T, White RP Jr. Periodontal pathology associated with asymptomatic third molars. *J Oral Maxillofac Surg.* 2002; 60:1227. [PubMed: 12420253]

11. Blakey GH, Hull D, Haug RH, Offenbacher S, Phillips C, White RP Jr. Changes in Third Molar and non-Third Molar Periodontal Pathology Over Time. *J Oral Maxillofac Surg.* 2007; 65:1577. [PubMed: 17656286]
12. White RP Jr, Phillips C, Hull DJ, Offenbacher S, Blakey GH, Haug RH. Risk Markers for Progression of Periodontal Pathology in the Third Molar and non-Third Molar Regions in Young Adults. *J Oral Maxillofac Surg.* 2008; 66:749. [PubMed: 18355600]
13. Offenbacher S, Barros SP, Singer RE, Moss K, Williams RC, Beck JD. Periodontal disease at the biofilm-gingival interface. *J Periodontol.* 2007; 78:1911. [PubMed: 18062113]
14. Rantanen AV. The age of eruption of the third molar teeth. *Acta Odontol Scand.* 1967; 25(Suppl): 48.
15. Blakey GH, Jacks MT, Offenbacher S, Nance PE, Phillips C, Haug RH, White RP Jr. Progression of periodontal disease in the second/third molar region in patients with asymptomatic third molars. *J Oral Maxillofac Surg.* 2006; 64:189. [PubMed: 16413889]

Mean Probing Depths, mm

Figure 1.
Mean Periodontal Probing Depths, Stratified by Tooth Type

% Probing Sites

Figure 2A

***Adjusted Mean % Periodontal Probing Sites with Periodontal Probing Depths at least 4mm, Stratified by Tooth Type**

% Probing Sites

***Adjusted for race/center, age, gender, smoking, education and income**

Figure 2.

Mean % Periodontal Probing Sites with Periodontal Probing Depths at least 4 mm, Stratified by Tooth Type.

% Probing Sites **Figure 3A**

*** Adjusted Mean % Periodontal Probing Sites with Clinical Attachment Level at least 3mm, Stratified by Tooth Type**

% Probing Sites

***Adjusted for race/center, age, gender, smoking, education and income**

Figure 3B

***Adjusted Mean % Periodontal Probing Sites with Interproximal Clinical Attachment Level at least 3mm, Stratified by Tooth Type**

***Adjusted for race/center, age, gender, smoking, education and income**

Figure 3.
Mean % Periodontal Probing Sites with Clinical Attachment Level at least 3 mm, Stratified by Tooth Type.

Table 1

Characteristics of the Dental ARIC subjects, N=6,793; 4,758 had no visible 3rd molars, 2,035 had at least one visible 3rd molar.

	No Visible Third Molars	Third Molars Visible	p-value
African American	819 (65.0%)	441 (35.0%)	<0.0001
Caucasian	3865 (70.9%)	1588 (29.1%)	
Female	2764 (75.6%)	894 (24.4%)	<0.0001
Male	1932 (62.7%)	1148 (37.3%)	
Mean Age Years (StdDev)	62.8 (5.66)	61.6 (5.47)	<0.0001
Education			
Less than High School (0-<=11yrs)	662 (73.1%)	244 (26.9%)	0.04
High School Graduate (12-16yrs)	2023 (69.8%)	877 (30.2%)	
More than High School(17yrs)	2005 (68.6%)	918 (31.4%)	
Income			
(\$0K-\$25K per yr)	1217 (74.9%)	409 (25.2%)	<0.0001
(\$25K-\$50K per yr)	1687 (70.4%)	711 (29.7%)	
(\$50K+ per yr)	1635 (66.1%)	839 (33.9%)	
Smoking			
Never	2182 (69.0%)	981 (31.0%)	<0.0001
Former Light	962 (66.0%)	495 (34.0%)	
Former Heavy	810 (83.4%)	294 (26.6%)	
Current Light	122 (74.9%)	41 (25.2%)	
Current Heavy	455 (73.9%)	161 (26.1%)	
Diabetes			
Yes	650 (69.6%)	284 (30.4%)	0.94
No	4046 (69.7%)	1758 (30.3%)	

Table 2

Mean Extent (SD), % of possible probing sites, of periodontal probing depths at least 4mm compared by Presence or Absence of 3rd Molars

	No 3 rd Molars	3 rd Molars Present	P value
Anterior Teeth	3.35 (10.17)	3.14 (10.02)	0.44
PreMolars	6.70 (12.58)	6.75 (12.75)	0.88
1st–2 nd Molars	15.28 (18.58)	17.94 (19.92)	<0.0001

Table 2A. * Mean Extent (SE), % of possible probing sites, of periodontal probing depths at least 4mm compared by Presence or Absence of 3 rd Molars			
	No 3 rd Molars	3 rd Molars Present	P value
Anterior Teeth	3.40 (0.14)	2.82 (0.22)	0.03
PreMolars	6.78 (0.18)	6.54 (0.28)	0.47
1st–2 nd Molars	15.51 (0.29)	17.57 (0.42)	<0.0001

* Adjusting for Race/Center, gender, smoking, age, education and income.

Subjects with a visible 3rd molar had a significantly greater mean extent of PD ≥4mm calculated from all remaining teeth present except 3rd molars as compared to subjects with no visible 3rd molar, 8.6 (SD 12.4) vs. 6.8 (SD 11.3) P<0.0001, respectively.

Table 3

Mean Extent (SD), % of possible probing sites, of clinical attachment level at least 3mm, compared by Presence or Absence of 3rd Molars

	No 3 rd Molars	3 rd Molars Present	P value
Anterior Teeth	8.86 (19.45)	6.53 (15.76)	<0.0001
PreMolars	10.43 (19.34)	9.51 (18.60)	0.052
1 st -2 nd Molars	18.39 (24.17)	20.68 (24.58)	0.0006

Table 3A. * Mean Extent (SE), % of possible probing sites, of clinical attachment level at least 3mm, compared by Presence or Absence of 3rd Molars

	No 3 rd Molars	3 rd Molars Present	P value
Anterior Teeth	8.78 (0.25)	6.39 (0.39)	<0.0001
PreMolars	10.47 (0.26)	9.18 (0.40)	0.007
1 st -2 nd Molars	18.58 (0.36)	20.18 (0.52)	0.01

* Adjusting for Race/Center, gender, smoking, age, education and income.