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ORIGINAL ARTICLE

# Association between the eruption of the third molar and caries and periodontitis distal to the second molars in elderly patients



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## KEYWORDS

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Periodontitis;  
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**Abstract** The objective of this study was to verify whether caries and periodontal diseases, when present on the distal surface of the second molars (M2s), are associated with the eruption of the third molars (M3s). In this split-mouth study, we evaluated 70 elderly patients with unilateral maxillary or mandibular M3s who presented to the outpatient clinics of two hospitals. Patients underwent comprehensive oral examinations and radiographical measurements, and we assessed the outcomes of periodontal disease and caries. Periodontal measurements included plaque index, bleeding on probing, and periodontal probing pocket depth (PD). Moreover, caries were assessed through visual–tactile examination and radiography. We performed the  $\chi^2$  test to determine factors associated with M3 and non-M3 outcomes. Eighty-one unilateral erupted M3s were observed in the study patients. Both the distobuccal region ( $p < 0.0001$ ) and the distolingual region ( $p = 0.006$ ) had a higher PD on the nonextraction side than the extraction side, and the caries rate was significantly higher on the nonextraction side than on the extraction side ( $p < 0.0001$  on M2 with caries and  $p = 0.003$  on M2 with distal caries). M3 eruption, at the same or different occlusal plane levels of M2, is a risk factor for periodontal diseases and caries in M2s in elderly patients. M3s may continue to negatively impact dental health well into later life.

Conflicts of interest: All authors declare no conflicts of interests.

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## Introduction

Eruption of the third molar (M3) is common in adults, and on exposure to the oral environment, M3s are more susceptible to periodontal infection, leading to greater periodontal tissue breakdown. Maintaining appropriate oral hygiene in the posterior areas of the arch is relatively difficult, and plaque accumulation causes diseases of the second molar (M2). Patients often develop deep periodontal pockets or decay on M2s. Previous studies have revealed that retained asymptomatic M3s are risk factors for diseases of M2s [1]. In a clinical study involving patients with a mean age of 28 years that was designed to monitor asymptomatic M3s over time, the prevalence of periodontal inflammation in the M3 region was high at enrollment at six periodontal probing sites around M3s and at probing depths (PDs) at distal M2s [2]. Moreover, 41% of patients had at least one PD  $\geq 4$  mm on the distal side of M2s.

Elter et al [3] studied M3-related oral health data in patients aged 18–34 years (mean, 26 years) enrolled in the Third National Health and Nutrition Examination Survey. No radiographs were available, and 40% of patients were current or former smokers. Furthermore, a  $\geq 5$ -mm PD on an M2 was twice as likely when an adjacent M3 was present. The odds of detecting a  $\geq 5$ -mm PD on an M2 were similar if an M3 was present or if the patient was a current or former smoker. Falci et al [4] observed that the prevalence rate of caries on the distal surface of M2s was 13.4% in patients with a mean age of 24.17 years.

Previous studies [5–7] have revealed that an M2 adjacent to malpositioned M3 increases the risk of distal caries, and carious lesions form on the distal cervical root surface of M2s. Retaining M3s promotes the formation of distal caries in M2s. In a previous longitudinal study, the lowest prevalence and incidence of M2 diseases occurred in the absence of an adjacent M3 [8].

Most studies were conducted in young patients. Limited evidence is available regarding the risk of caries and periodontitis in M2s adjacent to retained M3s, particularly in elderly patients. The objective of this split-mouth study was to verify whether caries and periodontal diseases, when present on the distal surface of M2s, are associated with the presence of erupted M3s.

## Methods

This study was designed to evaluate patients with unilateral maxillary or mandibular M3s in the outpatient clinic of the Department of Periodontology, Kaohsiung Medical University Chung-Ho Memorial Hospital and Department of Dentistry, Kaohsiung Municipal Ta-Tung Hospital, Kaohsiung, Taiwan. The exclusion criteria were age  $< 25$  years, pregnancy, symptomatic M3s, active periodontal treatment

or M3 extraction in the preceding 6 months, a history of smoking, and a systemic condition (uncontrolled diabetes mellitus and using  $\text{Ca}^{2+}$  channel blockers and immunosuppressive medications) that may affect gingival enlargement. Patients underwent comprehensive oral examinations by a trained, calibrated periodontist. Both clinical and radiographical measurements were performed by a single, trained investigator for eliminating interexaminer variability. The protocol was approved by the Institutional Review Board of Kaohsiung Medical University Chung-Ho Memorial Hospital.

## Clinical examinations

Clinical measurements were performed at distobuccal and distolingual sites around M2s in test and control patients. The following factors were examined:

- (1) Plaque index (PLQ) [9]: presence or absence
- (2) Bleeding on probing (BOP) [10]: presence or absence
- (3) Periodontal PD: measured using a manual periodontal probe
- (4) Caries, as assessed by visual–tactile examination [11], and radiographic detection: presence or absence
- (5) M3 position:
  - Group A: the occlusal plane of M3 is at the level the same as that of the adjacent tooth (Figure 1)
  - Group B: the occlusal plane of M3 is at a level different from that of the adjacent tooth (Figure 2)

## Radiological examinations

High-quality periapical or bitewing radiographs of bilateral M2s were obtained using a parallel long-cone technique for detecting proximal caries (Figures 1 and 2).

## Statistical analysis

The collected data were recorded and organized in a database using SPSS, Version 19.0 (SPSS, Chicago, IL, USA). The paired *t* test was used to compare the clinical index at extraction and nonextraction sides. The  $\chi^2$  test was used to compare the distribution of related factors in different groups. A *p* value  $< 0.05$  was considered significant for all analyses.

## Results

This study examined 70 patients with 81 unilaterally erupted M3s. Table 1 shows patient characteristics and the M3

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