® Postepy Hig Med Dosw (online), 2021; 75: 175-182
e-ISSN 1732-2693

www.phmd.pl
Original article

Received: 03.03.2020
Accepted: 28.09.2020
Published: 04.03.2021

Radiographic pathologies associated with third molar teeth in Polish population: A retrospective study

Występowanie zmian patologicznych związanych z trzecimi zębami trzonowymi w obrazie radiologicznym w populacji Polskiej – badanie retrospektywne

Bartłomiej Górski[1,2,A,D,E,F], Daniel Poszytek[1,B,C,E], Sebastian Wojtasiak[1,B], Renata Górska[1,E], Joanna Wysokińska-Miszczuk[2,E,2]

[1]Department of Periodontal and Oral Diseases, Medical University of Warsaw, Warsaw, Poland
[2]The Chair and Department of Periodontology, Medical University of Lublin, Lublin, Poland

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

Summary

Introduction: There is a plethora of pathologies that might be associated with the presence of third molar teeth (M3s). In the following study, the impact of M3s status on the occurrence of radiographic lesions of adjacent second molars (M2s) was evaluated.

Materials/Methods: A total of 1,988 panoramic radiographs were included in the statistical analysis. M3s were categorized as non-impacted (N-M3s) or impacted (I-M3s). I-M3s were subsequently divided into partially or completely impacted. Radiographic lesions in the second molars area, such as caries, external root resorption (ERR), and alveolar bone loss (ABL) were assessed. For the purpose of statistical analysis, the level of significance was set at 0.05.

Results: Among all evaluated panoramic radiographs, 1,621 (81.13%) showed at least one N-M3, 535 (26.78%) at least one partially I-M3, and 344 (17.2%) at least one completely I-M3. In the presence of M3s, the frequency of caries, ERR and ABL was determined at 17.98%, 0.68% and 23.96%, respectively, with the odds ratio (OR) for the occurrence of the above-mentioned pathologies at the level of 1.23, 6.97 and 1.31. Notably, the presence of N-M3s particularly increased the odds of caries, while I-M3s significantly increased the odds of ERR and ABR (ORs = 1.42; 26.0; 2.36, respectively).

Conclusions: The presence of M3s, irrespective of their impacted or non-impacted status, increases the risk of pathologies in M2s. Therefore, prophylactic extraction of M3s or active surveillance of patients could be recommended.

Keywords: **alveolar bone loss, caries, external root resorption, third molar tooth, second molar tooth**

GICID 01.3001.0014.7867
DOI: 10.5604/01.3001.0014.7867
Word count: 4 844
Tables: 6
Figures: 2
References: 37

Author's address: Bartłomiej Górski, Department of Periodontal and Oral Diseases, Medical University of Warsaw, Warsaw, ul. S. Binieckiego 02-097 Warszawa, Poland; e-mail: bartek_g3@tlen.pl

INTRODUCTION

Extraction of third molar teeth (M3s) is one of the most frequently performed surgical procedures in oral surgery [27]. Impacted third molars (I-M3s) are teeth with completely formed roots, when at least 2 years have passed since the expected time of their eruption [2, 17]. The prevalence of third molar impaction ranges from 16.7% to 66.86% [14]. The majority of studies found no gender predisposition in M3s impaction, albeit some reported a higher frequency in females [15, 19]. I-M3s can be further divided into completely impacted (entirely within the bone) and partially impacted (completely below the mucous membrane). The etiology of M3s impaction is multifactorial and may be affected by numerous systemic, local and genetic factors [9]. The factor of utmost importance is the lack of space due to discrepancy between maxilla/mandible and tooth size.

M3s eruption might be associated with various complaints reported by patients, such as swelling or pain in the area of interest, trismus, bad taste and breath in the mouth. By the same token, indications for removal of M3s include possible development of diseases, such as pericoronitis, caries of the third or second molar tooth (M2s), periodontitis and alveolar bone loss (ABL), external resorption of the distant root of second molar (ERR), cysts and odontogenic tumors [22]. Some of them may be due to the inaccessibility of this area for adequate oral hygiene. Since there is a large number of feasible complications associated with the presence of M3s, these teeth might be considered to be prophylactically removed at a young age. Such an approach would significantly diminish the number of the above-mentioned complications, as well as reduce the risk of difficulties which are inextricably linked to the procedure itself and aggravate with increasing age, for example alveolar osteitis, inferior alveolar or lingual nerve injury and mandibular angle fracture [8]. All things considered, young patients would benefit from early surgical M3s removal; hence, completely grown and more angulated roots of these teeth will require more invasive surgery in adults [20]. Nevertheless, the professional decision for surgical removal of I-M3s may present a clinical challenge, especially in the case of asymptomatic teeth.

Despite an impressive volume of nationwide literature on the potential for development of pathologies in the vicinity of M3s has been published, the occurrence of pathologic changes in adjacent M2s in Poles has not been evaluated so far. The aim of this study was to investigate the effect of M3s status on the occurrence of certain radiographic lesions in distal aspects of adjacent M2s, such as caries, ERR and ABL, based on panoramic radiographs.

MATERIALS AND METHODS

Selection of patients

The study protocol was approved by the Bioethics Committee of the Medical University of Warsaw (MUW). Panoramic radiographs of patients, who were referred to the Department of Periodontal and Oral Mucosa Diseases of MUW from January 2019 to September 2019, were evaluated. Panoramic radiographs were taken in the Department of Dental and Maxillofacial Radiology of MUW with a panoramic x-ray machine (Vatech Pax-i, Vatech, Prague, Czech Republic) 70-85 kVp and 4-10 mA with the exposure time of 9-19 seconds, and subsequently analyzed by means of digital viewer (MicroDicom - DICOM viewer, microdicom.com). The exclusion criteria were as follows: 1) age under 19 years; 2) intraosseous disorders; 3) craniofacial disorders; 4) craniofacial traumas (fractures of the mandible/maxilla); 5) undergoing orthodontic treatment; 6) M3 root formation below 2/3 of the expected length; 7) quadrants without M2; 8) quadrants with M2 or M3 significantly damaged by caries; 7) panoramic radiographs of insufficient quality.

After evaluation of 2500 panoramic radiographs and medical records, based on inclusion and exclusion criteria, 1998 X-rays were included in the study (853 men and 1145 women; aged ≥ 19 years, mean age: 37.5 years). Demographic data (patient's age and gender) were acquired from medical charts. The exclusion criteria were applied for the quadrants, and 7304 quadrants were qualified for the study. Among all 1998 subjects, 1621 participants (81.13%) had at least one N-M3, 535 participants (26.78%) had at least one partially I-M3, and 344 participants (17.2%) had at least one completely I-M3.

Evaluation of panoramic radiographs

Panoramic radiographs were analyzed by two experienced researchers (DP and SW) and the status of the second and third molars was assessed. The third molars were classified as absent or retained. Consequently, retained third molars were divided into N-M3s, partially I-M3s and completely I-M3s. N-M3 was defined as a fully erupted third molar that reached the occlusal plane and showed no deviation from the long axis of M2 exceeding 10 degrees in mesio-distal dimension. M3 was classified as partially I-M3 when the tooth did not reach the occlusal plane and as completely I-M3 when the tooth did not reach the occlusal plane and was entirely positioned within the bone (Figure 1).

Panoramic radiographs were also evaluated for the consecutive pathologies on distal surface of M2s: 1) caries - both primary and secondary; 2) ERR - a clear loss of substance in the root of M2s due to direct contact

Fig. 1. Position of third molar tooth (M3s) in dental arch with respect to occlusal plane: a) fully erupted, non-impacted third molar; b) partially impacted third molar; c) completely impacted third molar

Fig. 2. Radiographic lesions of second molar teeth (M2s) adjacent to third molar teeth (M3s): a – distal caries; b – external root resorption (ERR); c) alveolar bone loss (ABL)

between it and the impacted M3s, in accordance with Al-Khateeb and Bataineh criteria [1]; 3) ABL - at least 20% of bone loss recorded in relation to the root of M2s. In case of more than one radiographic lesion, they were considered separately. All three evaluated pathologies are presented in Figure 2.

DATA ANALYSIS

Statistical analyses were carried out using Statistica 13 [Dell Inc. (2016); Dell Statistica (data analysis software system), version 13; software.dell.com]. To present data frequencies and ratios were used. A multivariate logistic regression analysis was applied to evaluate the impact of M3s status on M2s pathologies. The odds ratio (OR) was calculated separately for caries, ERR and ABL, after adjusting for age and gender. The level of significance was set at 0.05. The presence of the indicated pathologies was compared in the following groups: 1) M3s absent or present; 2) M3s absent, non-impacted or impacted; 3) M3s absent, partially or completely impacted. The reference group consisted of quadrants with M3s missing.

RESULTS

Table 1 shows the prevalence of caries, ERR, and ABL in the absence or presence of a third molar tooth. All of the above-mentioned lesions were more frequent when M3s were present.

Upon categorizing M3s into non-impacted or impacted, N-M3s were more often connected with the presence of caries and ABL on the one hand, and less often with ERR on the other hand, when compared with I-M3s (Table 2).

Table 3 presents a sub-classification of the impacted M3s into complete and partial retention. In the case of completely I-M3s, caries and ABL were less frequent, while ERR of M2 was twice as prevalent.

Table 4 depicts the odds ratio for the occurrence of radiographic lesions in the presence or absence of M3s. As a result, the presence of M3s significantly increased the odds of occurrence of all of the evaluated pathologies in the mandible, whereas in the maxilla only a higher chance of ERR was observed.

Subsequently, M3s were divided into erupted teeth and impacted teeth, as presented in Table 5. The relationships of N-M3s with prevalence of evaluated radiographic lesions were assessed by means of two reference groups: M2s adjacent to absent M3s (negative controls) and M2s adjacent to I-M3s (positive controls). In maxilla, the presence of I-M3s was associated with higher chances of caries, ERR and ABL, while the presence of N-M3s increased the odds of caries alone. In mandible, N-M3s significantly increased the odds of caries, but I-M3s increased the odds of ERR and ABL. Notably, when data from maxillary and mandibular quadrants were assessed together, I-M3s significantly increased the odds of caries, ERR, and ABL, with ORs of 0.77, 26 and 2.36, respectively.

The influence of type of M3s retention on distal pathologies of M2s is shown in Table 6. Partially I-M3s in maxilla increased the odds of all three evaluated lesions, while the presence of completely I-M3s did not significantly increase the chances of caries. Similar associations could be observed in mandible. When data from both upper and lower quadrants were evaluated together, partially

Table 1. Distal pathologies in adjacent second molars (A-M2) in quadrants with or without third molars (M3)

M3 status	Caries	External root resorption (ERR)	Alveolar bone loss (ABL)
Absent, n (%)	299 (14.83)	2 (0.09)	386 (19.2)
Present, n (%)	951 (17.98)	36 (0.68)	1268 (23.96)

Table 2. Distal pathologies in adjacent second molars (A-M2) in quadrants with non-impacted third molars (N-M3) or with impacted third molars (I-M3)

M3 status	Caries	External root resorption (ERR)	Alveolar bone loss (ABL)
I-M3, n (%)	186 (12.93)	35 (2.42)	510 (35.5)
N-M3, n (%)	765 (19.9)	1 (0.03)	758 (19.72)

Table 3. Distal pathologies in adjacent second molars (A-M2) in quadrants with partially impacted third molars (I-M3) or with completely impacted third molars (I-M3)

M3 status	Caries	External root resorption (ERR)	Alveolar bone loss (ABL)
Partially I-M3, n (%)	171 (18.69)	16 (1.75)	401 (43.82)
Completely I-M3, n (%)	15 (2.81)	19 (3.57)	109 (20.49)

Table 4. Influence of third molars (M3) on prevalence of distal pathologies in adjacent second molars (A–M2) – multivariate logistic regression model

M3 status	Caries		External root resorption (ERR)		Alveolar bone loss (ABL)	
	OR (95% CI)	p value	OR (95% CI)	p value	OR (95% CI)	p value
Maxillary						
Absent†	1		1		1	
Present	1.17 (0.96–1.43)	0.13	5.43 (0.71–41.6)	0.1	1.24 (1.05–1.47)	0.01*
Mandibular						
Absent†	1		1		1	
Present	1.27 (1.04–1.55)	0.02*	8.23 (1.11–61.2)	0.04*	1.44 (1.18–1.76)	0.000*
Maxillary+ Mandibular						
Absent†	1		1		1	
Present	1.23 (1.07–1.42)	0.04*	6.97 (1.68–29.0)	0.01*	1.31 (1.15–1.49)	0.000*

OR – odds ratio; CI – confidence interval; * – significant difference ($p<0.05$); †– reference group

and completely I-M3s revealed similar influence on ERR occurrence. Partially I-M3s were associated with higher odds of ABL and caries with respect to completely I-M3s.

DISCUSSION

The present study assessed the influence of upper and lower M3s on the occurrence of radiographic lesions, such as caries, ERR and ABL as well as on distal aspects of adjacent M2s. Based on the multivariate regression analysis model adjusted for age and gender, it was estimated that the presence of M3s increased the odds of all three evaluated distal pathologies. Be that as it may, N-M3s exerted a stronger impact on carries occurrence, whereas I-M3s were associated with much higher odds of ERR and ABL. Impacted teeth were further classified as either completely impacted or partially impacted. As a result, partially I-M3s were found to be connected with higher prevalence of caries and ABL, while completely I-M3s exhibited similar influence on ERR. There were some minute discrepancies observed between upper and lower quadrants that were depicted in designated tables.

The frequency of M2s caries due to completely or partially erupted M3s in this report (19.9% for N-M3s, 12.93% for I-M3s) is similar to that of other studies [1, 6, 7, 10, 18, 21, 29]. N-M3s and partially I-M3s increased the odds of caries (OR = 1.42 and 1.21, respectively). This pathology was very rarely observed for completely I-M3s. In a study by Li et al. [21], according to multiple logistic regression results, N-M3s and I-M3s increased the odds of caries in adjacent M2s 1.1 and 2.36 times, respectively. The prevalence of distal caries in M3s ranged from 3.2% to 52% in previous studies. Such a discrepancy might be put down to cultural differences between patients that reflected on oral hygiene habits

Table 5. Influence of third molars status (non-impacted N-M3 versus impacted I-M3) on prevalence of distal pathologies in adjacent second molars (A-M2) – multivariate logistic regression model

M3 status	Caries		External root resorption (ERR)		Alveolar bone loss (ABL)	
	OR (95% CI)	p value	OR (95% CI)	p value	OR (95% CI)	p value
Maxillary						
Absent†	1		1		1	
N-M3	1.39 (1.13–1.7)	0.002*	0	0.99	1.15 (0.95–1.37)	0.14
I-M3	0.55 (0.39–0.77)	0.000*	21.84 (2.84–168.0)	0.003*	1.59 (1.27–1.99)	0.000*
Mandibular						
Absent†	1		1		1	
N-M3	1.48 (1.2–1.82)	0.000*	0.54 (0,03–8.69)	0.67	0.81 (0.64–1.01)	0.06
I-M3	0.89 (0.69–1.18)	0.43	28.1 (3.75–211.0)	0.001*	3.51 (2.8–4.4)	0.000*
Maxillary+ Mandibular						
Absent†	1		1		1	
N-M3	1.42 (1.23–1.65)	0.000*	0.28 (0.03–3.08)	0.3	1.00 (0.99–1.01)	0.9
I-M3	0.77 (0.63–0.95)	0.013*	26.0 (6.2–108.3)	0.000*	2.36 (2.01–2.76)	0.000*

OR – odds ratio; CI – confidence interval; * – significant difference ($p<0.05$); †– reference group

and the socioeconomic status, as well as to the diagnostic methods used. An especially high prevalence of distant caries in mandibular M2s - at the level of 52% – was reported by Kang et al. [18]. This might be due to the fact that cone beam computed tomography (CBCT) was used as a diagnostic tool, which enhanced diagnostic accuracy [26]. Some researchers also emphasized the significance of M3s inclination in relation to the vertical axis, as well as impaction depth stating that the risk of caries in M2s increased with both variables. The majority of M3s associated with caries on distal root of M2s are mesio-angularly impacted, followed by horizontal impactions [6, 10, 18, 22]. When mesial angulations of lower M3s varied from 43° to 73º, M2s were more prone to develop distal caries ($p<0.0001$) [18]. Moreover, when the distance between distal cementoenamel junction (CEJ) of M2s and mesial CEJ of M3s ranged from 6 mm to 15, distal caries in M2s was more prevalent (6 to 8 mm, $p < 0.0001$; 8 to 15 mm, $p = 0.037$). Chang et al. [6] found incidence of caries highly associated with mesial angulation of 41°–80º of M3s and distance of 7 mm to 9 mm between CEJ of M2s and M3s. In our study, angulation of M3s was not assessed.

In the present study, the frequency of ERR of M2s was 0.035% for N-M3s, 1.75% for partially I-M3s and 3.57% for completely I-M3s. ORs for ERR were higher for lower M3s than for upper M3s. Completely impacted lower molars were more at risk of being associated with ERR than other M3s (OR = 59.4), which underscores the theory of previous studies. This type of resorption is an insidious clinical entity that develops because of the pressure from the impacted tooth, as a result of clastic cells activity [24]. Quite similar outcomes were reported by Al-Khateeb et al. [1] and Li et al. [21]. On the other hand, this pathology was much more prevalent in studies of Schriber et al. [32], Tassoker et al. [33], and Wang et al. [34], with the values of 50%, 21%, and 20.17%, respectively. This may be related to the use of CBCT in the above-mentioned studies, which was calculated to provide 4.3 times greater detection of ERR than panoramic radiographs [25]. What is more, panoramic radiographs showed relatively high false-positive and false-negative ratios due to possible image distortions and unequal magnification. The prevalence of ERR in M2s was 5.31% detected by panoramic radiographs and 22.88% by CBCT in the same patient cohort [25]. The major risk factors identified for ERR of M2s were inclination of M3s and location of the contact between these teeth. The cervical region in mandibular M2s and the middle thirds and apical regions in maxillary M2s were most affected by ERR [32, 33]. Mesioangular and horizontal inclination of M3s posed a greater risk of ERR in adjacent M2s than other inclinations, and ORs of ERR was about 4 times greater in lower M3s than in upper M3s [33]. Patient age was a significant factor for the occurrence of ERR in some studies [32, 34].

M3s with probing pocket depth ≥ 4 mm were associated with elevated periodontal microbiota and increased concentration of gingival crevicular fluid inflammatory mediators, decidedly interleukin-1β [35, 36]. Apart from greater probing depth, M2s adjacent to M3s might present with gingival inflammation and alveolar bone resorption. In own study, ABL on distal aspects of M2s was much more prevalent when M3s were present, especially in case of partially I-M3s (43.82%), similar to previously reported data [21, 23]. In lower quadrants, partially I-M3s increased the odds of ABL 3.85 times, whereas in upper quadrants 3.15 times. Higher odds were noted for the maxillary and mandibular quadrants separately, as well as together. In a study by Chu et al. [7],

Table 6. Influence of third molars status (partially versus completely impacted I-M3) on prevalence of distal pathologies in adjacent second molars (A-M2) – multivariate logistic regression model

M3 status	Caries		External root resorption (ERR)		Alveolar bone loss (ABL)	
	OR (95% CI)	p value	OR (95% CI)	p value	OR (95% CI)	p value
Maxillary						
Absent†	1		1		1	
Partially I-M3	1.04 (0.72–1.48)	0.000*	26.3 (3.1–222.5)	0.003*	3.15 (2.4–4.1)	0.000*
Completely I-M3	0.07 (0.02–0.22)	0.84	24.2 (2.92–200.6)	0.03*	0.52 (0.35–0.77)	0.000*
Mandibular						
Absent†	1		1		1	
Partially I-M3	1.23 (0.93–1.63)	0.000*	14 (1.71–113.9)	0.01*	3.85 (3.03–4.91)	0.000*
Completely I-M3	0.22 (0.12–0.42)	0.15	59.4 (7.64–461.3)	0.000*	2.95 (2.1–4.16)	0.000*
Maxillary+ Mandibular						
Absent†	1		1		1	
Partially I-M3	1.21 (0.98–1.5)	0.000*	18.7 (4.2–83.2)	0.000*	3.28 (2.76–3.9)	0.000*
Completely I-M3	0.16 (0.09–0.27)	0.08	38.27 (8.68–168.8)	0.000*	1.23 (0.97–1.58)	0.09

OR – odds ratio; CI – confidence interval; * – significant difference ($p<0.05$); † – reference group

the occurrence of ABL was estimated at 8.87%, while Li et al. [21] showed ABL at the level of about 41%, both for N-M3s and I-M3s. The latter study reported increased odds of ABL of adjacent M2s for both N-M3s and I-M3s in maxillary and mandibular quadrants (OR = 1.77 and 3.84, respectively). Faria et al. [11] showed that periodontal defects on distal aspects of M2s stemmed from close positional relationship of I-M3s, as all impacted teeth that overlaid the distal roots of M2s in the apical third or cervical parts in panoramic radiographs had baseline mean probing depth of 5.7 mm with attachment loss > 3 mm. Blakey et al. [5] reported that 25% of patients with asymptomatic M3s had periodontal disease with probing pocket depths greater than 5 mm. Moreover, in a longitudinal study of asymptomatic M3s at baseline by Fisher et al. [12], after a 7-year follow-up, only 25% of participants were free of caries and periodontal pathology in the evaluated areas. All in all, periodontal pathologies were much more common in patients aged > 35 years [1].

In the case of presence of symptoms or pathologies, the decision to extract M3s is straightforward. Moreover, several studies showed that the surgical removal of M3s can result in probing pocket depth reduction on the distal root of M2s [27] and attachment gain on the distal root of M2s [31]. However, the dilemma is how to decide whether extraction of asymptomatic M3s would be beneficial. The advantages and disadvantages of prophylactic removal of asymptomatic, disease-free N-M3s or I-M3s should be weighed cautiously and pre-surgical risk assessment has to be considered. Leaving asymptomatic M3s in place and active surveillance with frequent clinical and radiological check-ups is only possible when patients' compliance is optimal [13]. In such a case, a reasonable interval between follow-ups is every 2 years, and sooner if symptoms become evident [30]. Nonetheless, longitudinal studies showed that such an approach is far from an optimal decision, as periodontal pathology worsened over time to the point of cystic lesions and other long-term complications like ERR of the distal root of adjacent M2 or root caries [3, 4, 37]. It goes without saying that not all participants developed pathology in M3s regions. This was more likely for I-M3s as compared with N-M3s, and if probing pocket depth greater than or equal to 4 mm at baseline was detected in the third molar region. What is more, it was reported that about one third of asymptomatic, unerupted M3s would change position in time, resulting in M3s that are partially erupted but non-functional or non-hygienic [28]. In accordance with results of our study, clinicians should consider the prophylactic removal of M3s, irrespective of impacted or non-impacted status, especially when problems with tooth eruption due to insufficient physiologic space for eruption might be expected and the likelihood of disease developing in the future is high [30]. It should be underlined that the frequency rate of lesions evaluated in this study was probably underrated, since the diagnosis was based on panoramic radiographs.

There are several advantages and limitations concerning our study. First, the evaluation of M3s and M2s was carried out based on the assessment of two-dimensional panoramic radiographs only. Although these radiographs might provide an overall image of the oral cavity and adjacent areas, due to their many limitations, they are not the best tools for precise diagnosis of caries or tooth resorption [6, 7, 10, 33]. CBCT images might improve the detection of both pathologies. Moreover, the rotation of M3 cannot be definitely evaluated from OPGs. In the present study, caries on M2s was identified when radiolucency had irregular morphology with

a gap between M2s and crown of M3s. By the same token, we cannot preclude the scenario of caries being mistakenly counted as ERR. However, a large number of the analyzed panoramic radiographs allows us to draw certain conclusions regarding the assessment of the risk of occurrence of specific pathologies associated with M3s, even if the study population is not representative of the general population. Accordingly, due to inclusion of only referred patients our study has some bias. Anyway, the results are useful for primary health workers because the studied patients constitute a spectrum of dental patients. Second, due to the retrospective nature of this study, clinical data (except for age and gender) were not collected. Therefore, it would be valuable to perform clinical examination of patients in future longitudinal studies and allow for acquired information in statistical analysis in order to identify possible cofactors. Another issue is the predominance of women in the study group. This was taken into account in the statistical analysis, where multivariate models were adjusted for age and gender. In our study, minimum age for inclusion was 19 years, since this is when M3s usually begin to erupt, but the upper age was not set [16]. All things considered, according to the authors' knowledge, this is the largest study of this kind that was conducted in Central Europe and in Poland. Another advantage is that not only ratios and frequencies of evaluated pathologies were assessed, but also ORs of their occurrence depending on multivariate regression analysis.

CONCLUSIONS

Within the limitations of this study, some important conclusions may be drawn. The presence of M3s, irrespective of their impacted or non-impacted status, might increase the risk of certain pathologies, such as distal caries, ERR and ABL in adjacent M2s. However, completely I-M3s do not run the same risk for pathology of M2s as partially I-M3s or N-M3s. In the light of potential therapeutic benefits, it can be estimated that patients might benefit from early removal of M3s, especially if site conditions indicate that one of the lesions described above is highly likely to occur. All things considered, the final decision for prophylactic extraction should never be made without pre-operative meticulous assessment of possible risk. Both potential consequences of surgical treatment as well as of M3s retention and the influence of age on risk should be taken into account.

REFERENCES

[1] Al-Khateeb T.H., Bataineh A.B.: Pathology associated with impacted mandibular third molars in a group of Jordanians. J. Oral. Maxillofac. Surg., 2006; 64: 1598–1602

[2] Becker A.: Early treatment for impacted maxillary incisors. Am. J. Orthod. Dentofacial. Orthop., 2002; 121: 586–587

[3] Blakey G.H., Hull D.J., Haug R.H., Offenbacher S., Phillips C., White R.P.Jr.: Changes in third molar and nonthird molar periodontal pathology over time. J. Oral Maxillofac. Surg., 2007; 65: 1577–1583

[4] Blakey G.H., Jacks M.T., Offenbacher S., Nance P.E., Phillips C., Haug R.H., White R.P.Jr.: Progression of periodontal disease in the second/third molar region in subjects with asymptomatic third molars. J. Oral Maxillofac. Surg., 2006; 64: 189–193

[5] Blakey G.H., Marciani R.D., Haug R.H., Phillips C., Offenbacher S., Pable T., White R.P.Jr.: Periodontal pathology associated with asymptomatic third molars. J. Oral Maxillofac. Surg., 2002; 60: 1227–1233

[6] Chang S.W., Shin S.Y., Kum K.Y., Hong J.: Correlation study between distal caries in the mandibular second molar and the eruption status of the mandibular third molar in the Korean population. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod., 2009: 108: 838–843

[7] Chu F.C., Li T.K., Lui V.K., Newsome P.R., Chow R.L., Cheung L.K.: Prevalence of impacted teeth and associated pathologies – a radiographic study of the Hong Kong Chinese population. Hong Kong Med. J., 2003; 9: 158–163

[8] Claudia A., Barbu H.M., Adi L., Gultekin A., Reiser V., Gultekin P., Mijiritsky E.: Relationship between third mandibular molar angulation and distal cervical caries in the second molar. J. Craniofac. Surg., 2018; 29: 2267–2271

[9] Dodson T.B., Susarla S.M.: Impacted wisdom teeth. BMJ Clin. Evid., 2014; 2014: 1302

[10] Falci S.G., de Castro C.R., Santos R.C., de Souza Lima L.D., Ramos-Jorge M.L., Botelho A.M., dos Santos C.R.: Association between the presence of a partially erupted mandibular third molar and the existence of caries in the distal of the second molars. Int. J. Oral Maxillofac. Surg., 2012: 41: 1270–1274

[11] Faria A.I., Gallas-Torreira M., López-Ratón M.: Mandibular second molar periodontal healing after impacted third molar extraction in young adults. J. Oral Maxillofac. Surg., 2012; 70: 2732–2741

[12] Fisher E., Garaas R., Blakey G.H., Offenbacher S., Shugars D.A., Phillips C., White R.P.Jr.: Changes over time in the prevalence of caries experience or periodontal pathology on third molars in young adults. J. Oral Maxillofac. Surg., 2012; 70: 1016–1022

[13] Ghaeminia H., Perry J., Nienhuijs M.E., Toedtling V., Tummers M., Hoppenreijs T.J., Van der Sanden W.J., Mettes T.G.: Surgical removal versus retention for the management of asymptomatic disease-free impacted wisdom teeth. Cochrane Database Syst. Rev., 2016; 2016: CD003879

[14] Hashemipour M.A., Tahmasbi-Arashlow M., Fahimi-Hanzaei F.: Incidence of impacted mandibular and maxillary third molars: A radiographic study in a Southeast Iran population. Med. Oral Patol. Oral Cir. Bucal., 2013; 18: e140–e145

[15] Hugoson A., Kugelberg C.F.: The prevalence of third molars in a Swedish population. An epidemiological study. Community Dent. Health, 1988; 5: 121–138

[16] Jung Y.H., Cho B.H.: Radiohraphic evaluation of third molar development in 6- to 24-year-olds. Imaging Sci. Dent., 2014; 44: 185–191

[17] Kaczor-Urbanowicz K., Zadurska M., Czochrowska E.: Impacted teeth: An interdisciplinary perspective. Adv. Clin. Exp. Med., 2016; 25: 575–585

[18] Kang F., Huang C., Sah M.K., Jiang B.: Effect of eruption status of the mandibular third molar on distal caries in the adjacent second molar. J. Oral Maxillofac. Surg., 2016; 74: 684–692

[19] Kaya G.Ş., Aslan M., Ömezli M.M., Dayi E.: Some morphological features related to mandibular third molar impaction. J. Clin. Exp. Dent., 2010; 2: e12–e17

[20] Kugelberg C.F., Ahlström U., Ericson S., Hugoson A., Kvint S.: Periodontal healing after impacted lower third molar surgery in adolescents and adults. A prospective study. Int. J. Oral Maxillofac. Surg., 1991; 20: 18–24

[21] Li Z.B., Qu H.L., Zhou L.N., Tian B.M., Chen, F.M.: Influence of non-impacted third molars on pathologies of adjacent second molars: A retrospective study. J. Periodontol., 2017; 88: 450–456

[22] McArdle L.W., Patel N., Jones J., McDonald F.: The mesially impacted mandibular third molar: The incidence and consequences of distal cervical caries in the mandibular second molar. Surgeon, 2018; 16: 67–73

[23] Nunn M.E., Fish M.D., Garcia R.I., Kaye E.K., Figueroa R., Gohel A., Ito M., Lee H.J., Williams D.E., Miyamoto T.: Retained asymptomatic third molars and risk for second molar pathology. J. Dent. Res., 2013; 92: 1095–1099

[24] Oenning A.C, Melo S.L., Groppo F.C., Haiter-Neto F.: Mesial inclination of impacted third molars and its propensity to stimulate external root resorption in second molars - a cone-beam computed tomographic evaluation. J. Oral Maxillofac. Surg., 2015; 73: 379–386

[25] Oenning A.C.., Neves F.S., Alencar P.N., Prado R.F., Groppo F.C., Haiter-Neto F.: External root resorption of the second molar associated with third molar impaction: Comparison of panoramic radiography and cone beam computed tomography. J. Oral Maxillofac. Surg., 2014; 72: 1444–1455

[26] Ozturk E., Sinanoglu A.: Histological validation of cone-beam computed tomography versus laser-fluorescence and conventional diagnostic methods for occlusal caries detection. Photomed. Laser Surg., 2015; 33:61–68

[27] Petsos H., Korte J., Eickholz P., Hoffmann T., Borchard R.: Surgical removal of third molars and periodontal tissues of adjacent second molars. J. Clin. Periodontol., 2016; 43: 453–460

[28] Phillips C., Norman J., Jaskolka M., Blakey G.H., Haug R.H., Offenbacher S., White R.P.Jr.: Changes over time in position and periodontal probing status of retained third molars. J. Oral Maxillofac. Surg., 2007; 65: 2011–2017

[29] Pogorzelska A., Regulski P.A., Gromak-Zaremba J., Mielczarek A.B., Szopiński K.T.: Wpływ położenia dolnych zębów mądrości na powstawanie próchnicy na dystalnej powierzchni drugich zębów trzonowych żuchwy – na podstawie badań pantomograficznych. Stomatol. Współcz., 2019; 26: 22–28

[30] Rafetto L.K.: Managing impacted third molars. Oral Maxillofac. Surg. Clin. North Am., 2015; 27: 363–371

[31] Sammartino G., Tia M., Bucci T., Wang H.L.: Prevention of mandibular third molars extraction-associated periodontal defects: A comparative study. J. Periodontol., 2009; 80: 389–396

[32] Schriber M., Rivola M., Leung Y.Y., Bornstein M.M., Suter V.G.: Risk factors for external root resorption of maxillary second molars due to impacted third molars as evaluated using cone beam computed tomography. Int. J. Oral Maxillofac. Surg., 2019; 49: 666–672

[33] Tassoker M.: What are the risk factors for external root resorption of second molars associated with impacted third molars? A Cone-Beam Computed Tomography Study. J. Oral Maxillofac. Surg., 2019; 77: 11–17

[34] Wang D., He X., Wang Y., Li Z., Zhu Y., Sun C., Ye J., Jiang H., Cheng J.: External root resorption of the second molar associated with mesially and horizontally impacted mandibular third molar: Evidence from cone beam computed tomography. Clin. Oral Investig., 2017; 21: 1335–1342

[35] White R.P.Jr., Madianos P.N., Offenbacher S., Phillips C., Blakey G.H., Haug R.H., Marciani R.D.: Microbial complexes detected in the second/third molar region in patients with asymptomatic third molars. J. Oral. Maxillofac. Surg., 2002; 60: 1234–1240

[36] White R.P.Jr., Offenbacher S., Phillips C., Haug R.H., Blakey G.H., Marciani R.D.: Inflammatory mediators and periodontitis in patients with asymptomatic third molars. J. Oral. Maxillofac. Surg., 2002; 60: 1241–1245

[37] Yildirim G., Ataoğlu H., Mihmanli A., Kiziloğlu D., Avunduk M.C.: Pathologic changes in soft tissues associated with asymptomatic impacted third molars. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod., 2008; 106: 14–18

The authors have no potential conflicts of interest to declare.