ORIGINAL ARTICLE

Association Between the Presence of Impacted Third Molars and Existence of Caries in the Distal Surface of Second Molars: A Radiographic Analysis

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ABSTRACT

Introduction: To determine the frequency and association of existence of the distal surface caries (DSC) in second molars adjacent to retained impacted third molars.

Methodology: This retrospective cohort radiographic study was performed at Fatima Jinnah Dental College & Hospital Trust. Patients of > 25 years of age, having Ortho-pantomogram (OPG) x-ray, satisfying the inclusion criteria were included in this study, Convenient sampling technique was used and informed consent was obtained after ethical committee approval. Radiographs (OPG) were assessed to diagnose DSC in second molars adjacent to ITMs. Kappa test was used with SD +/- 1. Data were analysed to calculate frequency and percentages of age, gender, and angulations of ITMs and DSC in second molars were calculated. Cross tabulation with t-test was performed to find out the relationship of frequency of ITMs and their angulations associated with DSC in second molars.

Results: Total of 92 of 621 patients fulfilling the inclusion criteria, 41 (26.83%) were males, 51 (15.69%) females with mean age of 46 +/- 5 years SD. Our findings showed that out of 140 ITMs, 23 (16.42 %) second molars had DSC adjacent to mandibular ITMs. Fourteen (60.86%) teeth were associated with right impacted mandibular third molars, 9(39.13%) with left mandibular ITMs.

Conclusion: The most common teeth associated with DSC of second molars were mesio-angular right mandibular ITMs. Active surveillance and monitoring of ITMs is highly recommended for early diagnosis and management of second molars associated disease. Most of the studies which were performed to find out the frequency of ITMs associated pathologies were retrospective studies. Therefore, prospective studies should be performed to determine the fate of retained third molars in an adult population.

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عنوان: متاثرہ تیسری داڑھ کی وجہ سے دوسری داڑھ کی سطح کے متاثر ہونے کے خدشات کے تعلق پر ایک ریڈیوگرافک تجزیہ۔

مقصد: اس مطالعہ کا مقصد مہلک حد تک متاثرہ تیسری داڑھ کی وجہ سے مسلسل دوسری داڑھ کی سطح کے متاثر ہونے کے تعداد اور تعلق کا تعین کرنا ہے.

طریقہ: یہ سابقہ ہم آہنگ ریڈیوگرافک مطالعہ فاطمہ جناح ڈینٹل کالج اینڈ ٹرسٹ میں کیا گیا۔ پچیس سال یا اس سے زائد عمر کے مریضوں کو شمولیت کے اصولوں پر اس تحقیق میں شامل کیا گیا۔ جن کے پاس Orthopentomogram(OPG) ایکسرے موجود تھے۔ تحقیق کے لیے آسان سیمپلنگ کا طریقہ کار استعمال کیا گیا اور ایتھیکل کمیٹی کی رضامندی اور اجازت سے کام شروع کیا گیا۔ دوسری داڑھ کی سطح کے مہلک حد تک متاثر ہونے کی جانچ کے لیے OPG ایکسرے کی مدد سے تشخیص کی گئی۔ شماریاتی تجزیہ کے لیے kappa ٹیسٹ کا استعمال معیاری انحراف 1-/+ پر کیا گیا۔ ڈیٹا کا تجزیہ کرتے ہوئے مریضوں کی عمر، جنس اور دوسری داڑھ میں ITMs اور DCS کی وجہ سے تکلیف کا تعداد اور فیصد ترکیب کا تجزیہ کیا گیا۔ دوسری داڑھ میں ITMs اور سے فسلک DCS کے تعلق کو معلوم کرنے کے لیے ٹی۔ ٹیسٹ کا استعمال کیا گیا۔

نتائج: مجموعی طور پر 92 مریض اس مطالعہ میں شامل ہوئے۔ جن میں (60.86%)56 خواتین اور (39.13%)36 مرد تھے۔ جن کی اوسط عمریں 3.5 -/+ 42 تھیں حاصل ہونے والے نتائج سے معلوم ہوا کہ 140ITMs میں سے (16.42%)23 دوسری داڑھ میں DCS کی مہلک حد تک نشاندہی ہوئی۔ اور (60.86%)14 دانتوں میں تیسری داڑھ کی وجہ سے متاثر تھے۔

حاصل مطالعہ: عام طور پر دوسری داڑھ کی وجہ سے متاثر ہونے والے دانتوں میں mesio-Angular شامل ہیں۔ دوسری داڑھ میں پائی جانے والی بیماریوں کی جلد تشخیص کے لیے باقائدگی سے ITMs کی نگرانی ضروری ہے۔ ITMs کی وجہ سے بیماریوں کی تشخیص کی تعداد کو جاننے کے لیے کی جانے والی زیادہ تر تحقیقات گزشتہ مطالعات پر مبنی ہیں۔ جبکہ بالغ مریضوں میں تیسری داڑھ کی صحت کی تحقیق کیلئے نظریاتی مطالعہ کرنے کی ضرورت ہے۔

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INTRODUCTION

Third molars are the most common impacted teeth and can be associated with a variety of pathologies. Impacted third molars (ITMs) were found to be responsible for damage to adjacent second molars. Second molars adjacent to ITMs are at an increased risk of developing distal surface caries (DSC), periodontal pocket formation, bone loss and resorption of distal surface of second molars, especially those third molars that are not extracted and remain in the arch and are called retained ITMs[1-3]. Caries can occur on occlusal or mesial surfaces of ITMs and at the same time it can involve the distal surface of second molar.

Caries on distal surface of second molars and periodontitis proximal to impacted lower third molar is a common problem. Retrospective studies showed that horizontally placed impacted lower third molars were frequently associated with a high rate of distal surface caries and periodontitis of second molars and in light of this some authors recommend prophylactic extractions of impacted third molars based on these findings[5,6]. A prospective cohort study of 2 years follow up confirmed that extraction of third molars were associated with a high rate of temporo-mandibular joint (TMJ) problems and nerve paresthesia, whereas retention of third molars had a very low incidence of caries on the distal surface second molars and third molars, respectively[7]. Venta et al conducted a study to find out the incidence of diseases associated with retained third molars in a group of population of adults 30 year or older aged were high and 82% of erupted, 74 % of soft tissue impacted and 33% of bony impacted third molars were associated with pathologies[8].

Therefore, prophylactic extractions of asymptomatic pathology free ITMs were not recommended by most authorities; however, active surveillance should be performed for all retained ITMs by periodic follow ups as retention of ITMs can be associated with a high risk of periodontal disease and DSC in adjacent second molars[9,10].

This retrospective study was performed to determine frequency of DSC on second molars adjacent to retained ITMs in patients of 25 or older age group. Since there is limited data available determining the frequency of distal surface caries associated with impacted third molars in our population, therefore, the rationale of this study will be helpful in decision making for extraction or retention of asymptomatic, diseased free ITMs.

METHODOLOGY

This cross-sectional radiographic study was performed at Fatima Jinnah Dental College & Hospital Trust from 15th January 2017 till 15th June 2018, after approval from Ethical Review Committee. A convenient sampling technique was used to include patients of > 25 years of age, whose Ortho-pentomogram (OPG) x-rays, SOREDEX Cranex-D® were taken and had retained impacted third molars, were included in this study to diagnose distal surface caries adjacent to impacted third molar teeth. Retained third molars were those third molar teeth that were not extracted both for prophylactic or any pathological reason and were present in the arch at the time of study. In whom Patients carious lesion was detectable in the OPG x-rays were included in this study. Patients with x-rays other than OPG (peri-apical radiographs), less than 25 years and without any impacted tooth were excluded from the study. Below 25 years of age was excluded because the mean age of third molar eruption is by 25 years[11].

After explaining the rationale of the study, informed consent were taken from the patients with inclusion criteria. OPG radiographs were assessed by two researchers after satisfying the criteria of inter examiner reliability using kappa test SD +/- 1. Digora Optime® software was used, license number 27000, in a prospective manner starting from 15th January 2017.

Variables that were patients' age, number of impacted third molars, angulations of impacted third molar teeth and presence or absence of caries on distal surface of adjacent second were recorded using a proforma; angulations were recorded according to the Winter's classification system[11], and depth of impactions were recorded according to Pell and Gregory classification system[11]. Data was entered and analysed using a statistical software SPSS version 20. Frequency and percentages of age with mean age, gender, notations of ITMs, angulations of ITMs and DSC in second molars were calculated. Chi square test and t-tests were applied to find out the relationship of frequency of ITMs and their angulations associated with DSC second molars.

For Chi square test, assuming power of 80%, significance level of 5% and medium effect size (0.03) and degree of freedom=2, sample size of 61 was required. For t-test, assuming a pooled standard deviation of 3.767 units, the study would require a sample size of 51 for each group (i.e. a total sample size of 102, assuming equal group sizes), to achieve a power of 80% and a level of significance of 5% (two sided), for detecting a true difference in means between the test and the reference groups.

RESULTS

A total of 621 patients of 25 years of age or older were identified who had their OPGs performed during study period. A total of 92 (14.81%) patients fulfilling the inclusion criteria were included, 51 (15.69%) were females, 41 (26.83%) males with mean age of 46 years +/- 5 years SD. Our findings showed out of 92 ITMs, 19 (25.35 %) second molars had DSC adjacent to ITMs. 10 (28.57%) teeth were associated with right impacted mandibular third molars, 08 (39.13%) with left mandibular ITMs and 1(9.09%) had DSC in adjacent second molar. The most common tooth associated with DSC of second molars was mesio-angular right mandibular ITM.

Our results have shown that depth of impaction has statistically significant association with frequency of DSC. (P= 0.047 chi square) Table 1.

Table 1: Occlusal Depth vs Caries in 2nd Molar and Ramus Relation

Ramus Relation			Caries in 2nd Molar		X^2 (df) p-value	Total
			N	%		
Maillary Teeth	Occlusal Depth	Class A	0	0	2.390 (2) 0.303	5
		Class B	1	14.29		7
		Class C	0	0		11
	Total		1	4.35		23
Class I	Occlusal Depth	Class A	7	22.58	3.935 (2) 0.140	27
		Class B	2	18.18		4
		Class C	0	0		4
	Total		9	15.79		35
Class II	Occlusal Depth	Class A	8	34.78	2.442 (2) 0.295	22
		Class B	0	0.00		5
		Class C	1	33.33		3
	Total		9	29.03		30
Class III	Occlusal Depth	Class A	1	100.00	4.000 (2) 0.135	1
		Class B	0	0.00		2
		Class C	0	0.00		1
	Total		1	25.00		4
Total	Occlusal Depth	Class A	16	29.09	6.136 (2) 0.047	55
		Class B	2	11.11		18
		Class C	1	52.63		19
	Total		19	20.65		92

Horizontal angulations and Class A position of ITMs has statistically significant impact on frequency of DSC in second molar as shown in Table 3. Mean age does not show any statistically significant difference between the angulations of impactions and the distal surface caries as determined by t-Test in Figure 2.

DISCUSSION

According to the results of our study, we determined that the frequency of DSC in second molars in patients of 25 or older years of age with retained ITMs were most commonly seen in teeth adjacent to mesio-angular Impacted Mandibular Third Molars. A statistically significant association of DSC in second molars and depth of impaction of ITM were observed. In our study, position A was recorded as 16 ITMs (29.09%), class B 02 (11.11%), class C 01 (52.63%) with X^2 P value= 0.047. Previous data was limited regarding long term effects of retention of ITMs on adjacent second molars, as in most studies, previously incidence of DSC of mesio-angular ITMs was ranging from 0.3% to 51% and mesio-angular impacted mandibular third molars were most commonly associated with DSC[13]. Previously, most of these studies were performed on patients of a younger age group who needed extractions of ITMs and studies on the fate of retained ITMs in adult population is still lacking. Stanley et al in a radiographic study of 3702 Ortho-pentomograms (OPG) x-rays reported that 12% of neglected ITMs were associated with some pathologies[12]. Another radiographic study of 1211 ITMs showed that

Table 2: Caries in 2nd Molar vs Angulation (Mean Age)

Angulation	Distal Surface Caries in 2nd Molar		t (df) Sig.
	DSC (Yes)	DSC (No)	
	Mean Age (SD)	Mean Age (SD)	
Mesioangular	32.10 (3.542)	30.00 (3.767)	1.488 (30) 0.147
Distoangular	33.00 (0.000)	31.62 (8.057)	0.166 (12) 0.871
Horizontal	30.71 (5.936)	30.18 (6.014)	0.184 (16) 0.856
Vertical	32.00 (0.000)	31.22 (3.886)	0.197 (26) 0.846
Total	31.63 (4.310)	30.77 (5.087)	0.679 (90) 0.499

Table 3: Factors Associated with 2nd Molar Caries

Factors	Categories	N	%	Total	X^2 (df) p-value
Angulation	Mesioangular	10	31.25	32	12.391 (3) 0.006
	Distoangular	1	7.14	14	
	Horizontal	7	38.89	18	
	Vertical	1	3.57	28	
Occlusal Depth	Class A	16	29.09	55	6.136 (2) 0.047
	Class B	2	11.11	18	
	Class C	1	5.26	19	
Ramus Relation	Class I	9	33.33	27	5.481 (2) 0.140
	Class II	9	42.86	21	
	Class III	1	33.33	3	
Tooth Quadrant	Maxillary Right	1	9.09	11	5.532 (3) 0.137
	Maxillary Left	0	0.00	12	
	Mandibular Left	8	23.53	34	
	Mandibular Right	10	28.57	35	
Gender	Male	11	26.83	41	1.722 (1) 0.189
	Female	8	15.69	51	

pathological changes were present in 5.2 % of maxillary and 8 % of mandibular ITMs[12]. Whereas, our study showed that 20.6% of second molars adjacent to ITMs were carious. DSC in second molars can develop adjacent to mesioangular ITMs[4,14-16]. Presence of ITMs provide a crevice which is difficult to clean by brushing and flossing which results in increased accumulation of plaque and caries on the distal surface of second molars[4,15-18].

Most studies have shown that mesio-angular soft tissue impacted maxillary third molars with angulations of 30 to 70 degrees were more commonly associated with DSC of adjacent second molars[5,19]. However, our study is in contrast and it showed only 1(.092%) Maxillary tooth was associated with ITMs. A study conducted by Sheikh et al[4] had reported that the incidence DSC of mandibular second molar was 42.5 % and DSC was most commonly associated with mesio-angular impacted mandibular third molars and our study had almost similar findings 18 (25.35%). A longitudinal survey of 416 adult males with mean age of 45.8 +/- 7.4 year SD was conducted to find out the relationship of retained impacted third molars and pathology of second molars; results of this study have shown that retained third molars were associated with increased risk of second molar pathology including distal surface caries. Moreover, soft tissue ITMs had a 4.88 fold (95% CI, 2.62, 9.08) increased risk of second molar pathology, according to this study.

Asymptomatic pathology free ITMs were not indicated for surgical removal but some retrospective reviews recommended extraction of ITMs to prevent pathology of adjacent second molars[5,6]. Venta et al reported that current care guidelines for the management of ITMs recommended extraction of asymptomatic mandibular, partially impacted, vertical and horizontal ITMs due to high risk of pathologies[20]. However, Haung et al in a prospective cohort study determined that retention of ITMs were associated with a minimum risk DSC of adjacent second molars[21].

Detection of caries in mesioangular ITMs is difficult to evaluate and most commonly, caries remains undiagnosed in the second molars. Clinical situation can also be complicated by the presence of periodontal disease and root resorption on distal aspect of second molars[22].

After confirmation of diagnosis of DSC of second molars, decision about the treatment can be difficult. Some authors recommend extraction of third molars and restoration of second molar but others favor extraction of both ITMs and second molars, respectively[22,23] because retention of ITMs and restoration of carious second molars will render the second molar at risk of disease due to difficulty in cleaning[23].

CONCLUSION

Some researcher had identified the risk of retention of ITMs molars and they emphasized the need of prophylactic extractions because second molars adjacent to ITMs are at higher risk of developing DSC, periodontal disease and root resorption.

Partially impacted mesio-angular mandibular third molars are at the highest risk of developing DSC in second molars; however, due to lack of reliable data, prophylactic extractions of ITMs cannot be justified. Active surveillance and monitoring of ITMs is highly recommended for early diagnosis and management of second molar associated diseases. Most of the studies which were performed to find out the frequency of ITMs associated pathologies were retrospective studies. Therefore, prospective longitudinal studies should be performed to determine the fate of retained third molars in an adult population.

Authors' contribution: Dr Naveed Iqbal conceived the study, searched for literature, contributed in data collection and worked on introduction and discussion. Dr Mirza Hamid Baig and Dr Hassan Mehdi worked on literature review, analysis and review results and contributed to discussion and edited the manuscript. Dr Mirza Hamid Baig and Dr saad siddiqui contributed in data collection, results and conclusion. All authors contributed to the final manuscript.

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