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Association Between Trauma From Occlusion And Vitality Of Teeth - A Retrospective Study

Research Article

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Abstract

Trauma from occlusion can play a role in the initiation and progression of pulp and periradicular inflammation. When the intensity produced by the force of occlusion surpasses the ability of periodontium for resistance and distribution of these forces, occlusal trauma may extend and cause some changes in periodontal ligament, alveolar bone, cementum, and pulp. Therefore, it is capable of affecting the vitality of the tooth. The aim of present study was to evaluate the association of trauma from occlusion and non-vital teeth. A retrospective cross-sectional study was conducted using the patient records from the Department of Conservative Dentistry and Endodontics of a dental hospital from June 2019 until March 2020. Patients diagnosed with trauma from occlusion were chosen and evaluated for the vitality of the tooth. Data was collected and then subjected to statistical analysis. Microsoft Excel 2016 data spreadsheet was used to collect data and later exported to the SPSS software. Among 156 individuals diagnosed with trauma from occlusion, 65%of the teeth were reported to be non-vital. Based on gender, females were found to have trauma from occlusion and associated non-vital teeth when compared to males. Mandibular anteriors found to be most affected teeth in trauma from occlusion incidence. There was a declining frequency of trauma from occlusion occurrence as age increases. The highest distribution was recorded among index age group 26-35 years patients as compared to other age groups. Within the limitation of the present study it can be concluded that trauma from occlusion may or may not affect the vitality of teeth.

Keywords: Endodontic Treatment; Pulp; Periradicular, Trauma From Occlusion; Vital; Non-Vital.

Introduction

One common cause of dental problems requiring endodontic treatment is trauma from occlusion. Trauma from occlusion is defined as a condition where injury results to the supporting structures of the teeth by the act of bringing the jaws into a closed position as proposed by Stillman 1917 [20]. In this condition, periodontium attempts to accommodate forces exerted on the tooth crown. The capability of adaptation however varies in different individuals. Tissue injury occurs when the periodontal tissues are no longer able to adapt the occlusal forces. Magnitude, direction and duration are the factors that can increase the traumatic forces. When the magnitude of occlusal forces is increased, the periodontium responds with a widening of periodontal ligament space. In response to this, the width and number of periodontal ligament fibers increases and density of alveolar bone increases. When there is constant pressure acting on the bone, the injury becomes more severe than intermittent forces and as the frequency of application of an intermittent force increases the impact of injury also increases [33].

Trauma from occlusion can be divided into acute and chronic trauma and also as primary, secondary and combined trauma from occlusion. Acute trauma from occlusion results from an abrupt occlusal impact that is produced by biting on a hard object. Restorations or prosthetic appliances that interfere with the direction of occlusal forces may cause acute trauma [33]. Tooth pain, sensitivity to percussion and tooth mobility are the clinical features. In case of chronic trauma from occlusion, it usually rises from gradual changes in occlusion formed by mechanical

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tooth wear, drifting movement, and extrusion of teeth along with parafunctional habits such as bruxism and clenching. Combined trauma from occlusion is the injury that occurs to periodontium due to abnormal forces acting on a tooth or teeth with abnormal periodontal support [33].

The main reasons for pulp and periapical lesions are microorganisms. However, in some cases periapical lesions can develop due to trauma from occlusion, periodontal disease, leakage of restorations, overfilling and unusual factors such as systemic factors and sometimes unknown reasons [3]. The intensity of the force produced by occlusion leads to extension of trauma inducing changes in periodontal ligament, alveolar bone, cementum, and pulp [33]. Trauma from occlusion can be eventuated to thermal sensitivity, increased mobility, widening of periodontal ligament (PDL), loss of crestal bone height and root resorption, but no evidence was found of attachment loss [21]. Chronic occlusal trauma effects on progression of pulp and periodontal disease is unidentified. Based on animal experiments, excessive occlusal force can induce inflammatory response, blood circulation in periodontium and pulp becomes disordered and sensitization of nerves of pulp was reported [13, 15].

In most of the cases, periodontal management is the primary option in management of trauma from occlusion. However, as trauma from occlusion is attributed to pulpal and periradicular findings, vitality of the tooth becomes compromised. Thus, endodontic treatment becomes an option when the tooth is no longer vital. Teeth affected by trauma from occlusion are initially subjected for periodontal therapy in conjunction endodontic treatment when there are signs of any pulpal and periradicular pathosis. The pulpal status should be evaluated and its qualitative sensory response should be recorded [28]. Previously, microorganisms have been established as the sole entity responsible for initiating pulpal and periapical pathologies. However, as trauma from occlusion may affect the tooth vitality, thus pulp vitality assessment is conducted in some cases to compare the effects of trauma from occlusion on the pulp and periradicular tissues of the teeth. The assessment can be done by pulp vitality testing and pulp sensibility testing [6].Previously our team has a rich experience in working on various research projects across multiple disciplines [19, 11, 7, 24, 31, 23, 2, 38, 16, 34, 37, 10, 30, 8]. Now the growing trend in this area motivated us to pursue this project.

This study was conducted to assess the association of trauma from occlusion with the vitality of teeth and non-vital teeth.

Materials and Methods

This retrospective study was conducted by reviewing 86,000 patient records of a dental hospital. A total of 156 case records with trauma from occlusion were sorted of which signed informed consent forms were retrieved. The data of patients' details were enumerated from the University hospital records from the month of June 2019 until March of 2020 to determine the association of trauma from occlusion and non-vital teeth. This study has been approved by the University hospital research committee with ethical approval number SDC/SIHEC/2020/DIAS-DATA/0619-0320.

The inclusion criteria were individuals above 18 years old and diagnosed with trauma from occlusion. Exclusion criteria included were individuals below 17 years, medically compromised, completely edentulous patients as well as periodontally compromised teeth. The pros of the study were cost reduction, less time consumption and automated data collection. The cons of the present study would be researcher bias and lack of time frame.

The data on patients age, gender and history of trauma from occlusion collected from the 156 case records were entered. Collected data was subjected to statistical analysis using SPSS version 20.0. Frequency distribution was performed to find the prevalence of trauma from occlusion. Chi-square association was done to find the association between trauma from occlusion and the vitality of teeth.

Results & Discussion

This study included 156 patients who were diagnosed with trauma from occlusion and the case records were reviewed. The aim of the present study was to evaluate the association of trauma from

Figure 1. shows frequency distribution of tooth vitality among patients reported with trauma from occlusion. X axis represents the vitality of teeth and Y axis shows number of patients. There were more number of patients reported with non-vital teeth (purple, 64.74%) as compared to vital teeth (blue, 35.26%) in association with trauma from occlusion.

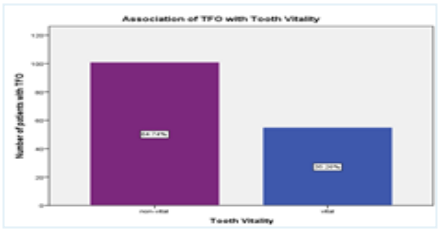

Figure 2. shows the frequency distribution among genders. X axis shows different genders. Y axis represents the number of patients in each gender. Females (pink) displayed higher incidence of TFO with 54.49% compared to males (green) with 45.51%.

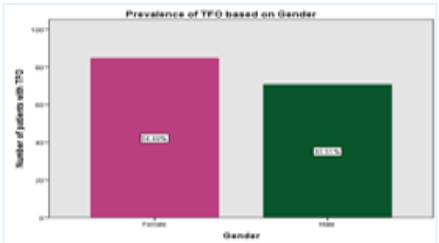

Figure 3. shows the frequency distribution among different teeth reporting with TFO. The X axis shows different teeth numbers. Y axis represents the number of patients for each tooth. Teeth number 31 (yellow) and 41 (blue) presented with greater incidence of TFO with 12.8% and 12.2% respectively.

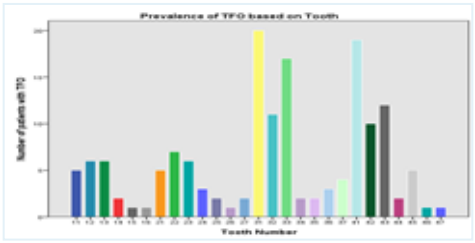

Figure 4: shows the frequency distribution among different age groups. The X axis shows the different age groups. Y axis represents the number of patients in each age group. 26-35 (blue) age group presented with more incidences of trauma from occlusion with 29.2%

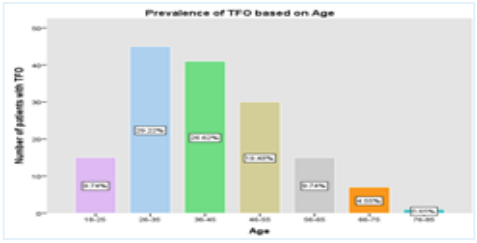

Figure 5: represents the associations between gender and teeth vitality. X axis represents the different genders and Y axis represents the number of patients with TFO. Chi-square test was done and the association between genders and teeth vitality of TFO patients was found to be statistically significant as p= 0.025(p<0.05). Females presented with higher numbers of non-vital teeth (violet) and vital teeth (blue) compared to males.

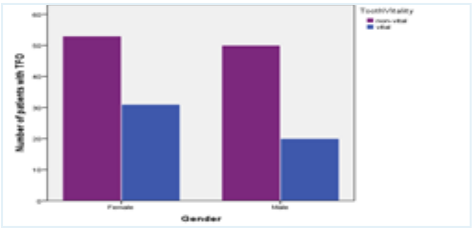

Figure 6: represents the associations between age groups and teeth vitality. X axis represents the different age groups in years and Y axis represents the number of patients with TFO. Chi-square test was done and the association between age groups and teeth vitality of TFO patients was found to be not statistically significant as p=0.39 (p>0.05). 26-55 years age group presented with higher numbers of non-vital teeth (violet) and vital teeth (blue) compared to other age groups.

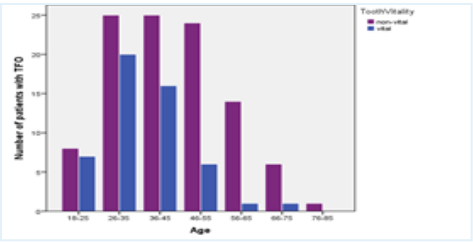

Table 1. Frequency distribution of tooth vitality among patients reporting with trauma from occlusion.

TOOTH VITALITY					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	non-vital	101	64.7	64.7	64.7
	vital	55	35.3	35.3	100
	Total	156	100	100	

Table 2. Frequency distribution of trauma from occlusion among different genders.

GENDER					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Females	85	54.5	54.5	54.5
	Males	71	45.5	45.5	100
	Total	156	100	100	

Table 3. Frequency distribution of trauma from occlusion based on teeth predilection.

TOOTH NUMBER					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11	5	3.2	3.2	3.2
	12	6	3.8	3.8	7.1
	13	6	3.8	3.8	10.9
	14	2	1.3	1.3	12.2
	15	1	0.6	0.6	12.8
	16	1	0.6	0.6	13.5
	21	5	3.2	3.2	16.7
	22	7	4.5	4.5	21.2
	23	6	3.8	3.8	25
	24	3	1.9	1.9	26.9
	25	2	1.3	1.3	28.2
	26	1	0.6	0.6	28.8
	27	2	1.3	1.3	30.1
	31	20	12.8	12.8	42.9
	32	11	7.1	7.1	50
	33	17	10.9	10.9	60.9
	34	2	1.3	1.3	62.2
	35	2	1.3	1.3	63.5
	36	3	1.9	1.9	65.4
	37	4	2.6	2.6	67.9
	41	19	12.2	12.2	80.1
	42	10	6.4	6.4	86.5
	43	12	7.7	7.7	94.2
	44	2	1.3	1.3	95.5
	45	5	3.2	3.2	98.7
	46	1	0.6	0.6	99.4
	47	1	0.6	0.6	100
	Total	**156**	**100**	**100**	

Table 4. Frequency distribution of trauma from occlusion based on different age groups.

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-25	15	9.7	9.7	9.7
	26-35	45	29.2	29.2	39
	36-45	41	26.6	26.6	65.6
	46-55	30	19.5	19.5	85.1
	56-65	15	9.7	9.7	94.8
	66-75	7	4.5	4.5	99.4
	76-85	1	0.6	0.6	100
	Total	154	100	100	

occlusion and non-vital teeth in dental patients based on dental hospital case records.

In Figure 1, there was a significant difference presented between tooth vitality associated with trauma from occlusion. The affected teeth that remain vital underwent trauma from occlusion were about 35% whereas 64.7% of the affected teeth became non-vital. In the context of our investigation, we found that in trauma from occlusion incidences, more number of the teeth were diagnosed as non-vital. Based on studies done by Jafari et al those teeth diagnosed with trauma from occlusion reported to be non-vital after vitality test performed and gave result of no response to cold, heat and electric test [14]. In a study done by Meynardi et al, teeth with trauma from occlusion were associated with non-vital teeth and the patient was subjected to occlusal table restoration as well as conservative rehabilitation [18]. Both of the studies were in line with the present study supporting the fact that pulpal responses were no longer induced in teeth undergoing trauma from occlusion.

Figure 2 shows frequency distribution of trauma from occlusion among genders. Females depicted higher prevalence with 54.5% compared to males with 45.5%. Trauma from occlusion can affect any tooth as there is no specification of any tooth mentioned in the previous literature published. Based on gender predilection, present study showed prevalence of trauma from occlusion among female patients. The case reported by Jafari et al 2016 [14] was female patients presented with radiolucent lesions along with mechanical tooth wear in affected teeth [14]. Based on a study done by Meynardi et al 2018 [18], he reported the incidence of trauma from occlusion among females [18]. Occurrence of occlusal trauma has no specific gender predilection but can affect anyone with any distributing factors that can lead to trauma from occlusion.

As shown in Figure 3, the most affected teeth were mandibular anteriors, involving canine to canine regions predominantly teeth number 31 (12.8%) and 41 (12.2%). Teeth number 15, 16, 46 and 47 were least affected in comparison to other dentitions with less than 1% incidence. In terms of affected teeth, current study showed prevalence in the region of mandibular anteriors. It has shown that most cases reported as non-vital in traumatic occlusion are due to severe malocclusion, including anterior deep bite. According to Jafari et al 2016 [14], traumatic occlusion incidence recorded in posterior teeth [14] whereas Meynardi et al 2018[18] reported maxillary anteriors involvement [18]. Occurrence of traumatic occlusion primarily involving anterior dentition as common malocclusion seen in children as well as adults are deep bite that predispose the patient to periodontal involvement, abnormal function, excessive occlusal forces and trauma [4].

As shown in Figure 4, trauma from occlusion mostly affected middle aged individuals, with highest frequency distribution owned by index age group 26-35 years individuals, nearly 30% overall. There was a drop in incidence of trauma from occlusion in older individuals. 76-85 years patients were least affected with only 0.6%. Based on age predilection, current study presented trauma from occlusion in younger individuals. A similar study by Jafari et al 2016, they recorded more cases among younger individuals below 20 years [14]. In contrast to Meynardi et al 2018 [18], they presented occurrence of trauma from occlusion in older adults [18]. Age predilection has no significant influence on the occurrence of trauma from occlusion. However, it depends on the possible factor causing trauma from occlusion. As for people having occlusion malfunction, if not treated in early ages can cause severe periodontal problems and other functional problems as time progresses.

Figure 5 shows the associations between gender and teeth vitality. Overall, the association between genders and teeth vitality of TFO patients was found to be statistically significant as $p= 0.025$($p<0.05$). Females presented with higher numbers of non-vital teeth compared to males. As displayed in Figure 6, the association between age groups and teeth vitality of TFO patients was found to be not statistically significant as $p=0.39$ ($p>0.05$). 26-55 years age group presented with higher numbers of non-vital teeth compared to other age groups. Our institution is passionate about high quality evidence based research and has excelled in various fields [22, 36, 9, 25, 32, 35, 5, 17, 27, 29]. We hope this study adds to this rich legacy.

This study had several limitations that can lead to unreliable data. Small sample size, demographic features and unequal gender distribution as well as researcher bias all contribute to bias in data analysis. As there are only few studies conducted in prevalence of traumatic occlusion and its endodontic management, further investigations should be carried out with a proper assessment on the effect of trauma from occlusion on the vitality of teeth.

Conclusion

Within the limitation of this study, it was found that trauma from occlusion may or may not have adverse effects on pulpal status of the tooth. According to our study, more numbers of the teeth diagnosed with trauma from occlusion were recorded to be non-vital. Thus, accurate treatment planning should be proposed to preserve the vitality of teeth in teeth diagnosed with trauma from occlusion.

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