



Original Article

Assessment of Supraeruption of Teeth Affecting Prosthodontic Rehabilitation in Different Segments of Opposing Arch

Muhammad Sartaj Khan^{*}, Muhammad Raza¹, Hassan Khan¹, Naila Zubair¹, Ejaz urrehman¹ and Saima Afridi¹¹Department of Prosthodontics, Peshawar Dental College, Peshawar, Pakistan

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*Corresponding Author:

Muhammad Sartaj Khan
Department of Prosthodontics, Peshawar Dental College, Prosthodontics, Pakistan
sartajkhan06@hotmail.comReceived Date: 15th September, 2022Acceptance Date: 22nd September, 2022Published Date: 30th September, 2022

ABSTRACT

Loss of vertical space due to supraeruption of teeth in opposing arch can make it difficult to replace missing teeth with implants, removable or fixed partial dentures. **Objective:** In the current study, we sought to evaluate and quantify the quantity of supraeruption of teeth in different segments of arch during prosthodontics rehabilitation with different prostheses. **Methods:** This cross-sectional study included 140 subjects with unopposed teeth from prosthodontics department. Data were collected by pre-structured proforma. Amount of supraeruption were recorded in millimeters on dental casts after obtaining impressions. Teeth involved in supraeruption like molars and others on right/ left side in either maxillary / mandibular arch, were noted from study casts and were assessed. Data were analyzed using (SPSS version 20). **Results:** For the study, 140 individuals in total were selected (54 males and 86 females). This study observed dental caries as the main cause of tooth loss. Mean age of patients were 43 years. Mean super-eruption values for subjects were 2.22mm with standard deviation of 0.66mm. More number of supraerupted teeth were found in unopposed maxillary arch than the mandibular. Highest frequency of super-eruption was found in molars areas and on right side of the arch. **Conclusions:** It was concluded that unopposed teeth lead to over-eruption of antagonists. Differences were recorded between sites, type and status of supraeruption. Current study observed that highest ratio of super-eruption recorded in maxillary arch, in molar region and on the right side of arch.

INTRODUCTION

Prosthodontics rehabilitation of partially edentulous arches is sometimes complicated by supraeruption of opposing teeth. This physiological movement of a tooth by passing the occlusal plane due to lacking of an opposing partner in the dental occlusion is termed supraeruption. It is considered as one of the most commonly occurring and observed clinical phenomena in routine dental clinical practice, especially in posterior segments of the arches[1]. More people are keeping their natural teeth into old age as a result of increased oral health knowledge, which is seen in the decline in edentulism, but never the less, growing partial edentulism and prosthodontically non-restoration of these arches, has its own cumulative issues and complications[2]. These include periodontal health problems, occlusal plane disruption, proximal

caries, unwanted movement in nearby teeth and etc[3-6]. After extraction, replacing lost teeth with a fixed partial denture, removable partial denture or an implant is a very common procedure[7]. Apart from these, delaying replacing of missing teeth may have unfavorable consequences on patient budget (e.g. elective endodontics followed by crown), patient health issue (e.g. surgical procedures for teeth correction and associated morbidities) and time (extra appointments and treatment completion time). When over eruption of the involved teeth is not severe enameloplasty will suffice, however, in other situations endodontics therapy, surgical crown lengthening and orthodontics intrusion will be required [8]. Comprehensive search of literature reveals lower first molars as the most frequently lost teeth due to caries,

whereas the upper second molars and lower incisors were the teeth most frequently lost due to periodontal diseases. A high prevalence of supraeruption ranging from 70% to 83% was observed in different studies[9,10].The first permanent molars in either the maxillary or mandibular arch, along with maxillary premolars, are the most commonly missing teeth. If these teeth are not replaced well in time, it can be anticipated that supraeruption will occur mostly in the opposing arches. Based on the extent that a tooth passes across the occlusal plane, supraeruption of teeth were classified as mild, moderate, and severe[1]. It can also be divided into conservative, semi-conservative, and non conservative procedures depending on the degree of reduction needed for a supraerupted tooth[11]. Most often the problems associated with supraeruption go unnoticed from patient perspective, until patient seeks replacement of missing teeth in opposing arch. Treatment depends upon observed amount of supra-eruption. Such interventions/treatment procedures may broadly be divided into conservative and non-conservative approaches. The need for a reduction in an occlusal surface with/ without elective endodontics and intrusion by orthodontics means are some treatment options and, in more severe cases, posterior segmental osteotomies are used to treat supraeruption. Studies have suggested clinical and radiographic assessment of supraeruption in the opposing arch. AlMoaleem and others observed an average of 0.7 to 1.2 mm of super-eruption in his study. Another study done by Craddock et al[12], supraeruption ranging from 1.68 to 3.99mm was observed. Several other studies noticed supraeruption ranging from a minimum of 0.91 mm to a maximum of 2.26mm [1-4,13]. The goal of our study was to assess and compare the amount of super-eruption among the target population's teeth with respect to the type of involved teeth such as front/ back teeth on either right/left side of the maxillary/mandibular arch, along with the reason for the tooth loss. Relevant local studies are scarce regarding the subject matter; therefore, the present study will be valuable in estimating the data prevalent in local circumstances along with documentation of the associated problems complicating prosthesis replacement in such situations. The obtained data may also assist in understanding the attitude of the patients in terms of replacement for their missing teeth and useful for practitioners in treatment planning while dealing such cases.

METHODS

This cross-sectional study was conducted at Peshawar Dental College and Hospital, Peshawar. The study was carried out after obtaining an ethical approval from Institution Review Board. A total of 140 patients registered

from March to June, 2022 in Outpatient Department of Prosthodontics were recruited in the study. Patients having age between 20 to 60 years and having partially edentulous arches with unopposed posterior or anterior teeth were recruited in the study. Only those patients were recruited who sought treatment for prosthodontics rehabilitation for their missing either one or more than one teeth, but not all teeth. Patients having missing third molars, history of maxillofacial trauma and dentofacial deformities were excluded from the study. An informed verbal consent was obtained from the participants before inviting them for the study, and then only willful participants were recruited in the study. A convenient sampling technique was used for the study. Data were collected using self-structured proforma. In this clinical study information pertaining to patient demographic and personal information, including age groupings and cause of tooth loss were obtained and recorded. It also included recording of details about the involved supraerupted teeth (premolars, molars and incisors), side of the dental arch (right or left) and arch (maxilla or mandible). In the last occlusal analysis of study casts of each participant was carried out. All study casts were prepared from alginate impression material (Happy Buy, China) manipulated according to manufacturer's instruction. The impression was poured with type-2 dental plaster (Kopo Hard, CKH-52, China). It was made sure that all impression and casts to be defect free and where necessary the procedures were repeated. All study casts were mounted on semi adjustable articulator with the help of interocclusal record. From the buccal tips of the last tooth to the canine in the supraerupted arch, a line was drawn. The degree of supraeruption was measured as the amount of tooth structure above or below the line. According to the observed measurements the involved teeth were divided in three groups. Group-1(0.1-0.6mm), group-2(0.7-1.2mm), group-3(>1.3mm). Amount of supraeruption was measured with Vernier caliper. Measurement was taken at mesiobuccal, center and distobuccal aspect of tooth. The collected data were analyzed using statistical package for social sciences (SPSS version 20). Descriptive statistics were computed for both qualitative and quantitative variables. Mean and standard deviation was calculated for quantitative variables like age of patients. Qualitative variables like gender, arch type, side of jaw and types of supraerupted tooth were presented as frequency and percentage. Association between study variables were analyzed via Chi-square test with a 95% confidence level with $p < 0.05$.

RESULTS

According to the inclusion and exclusion criteria a total of 140 patients were selected in the study. Among these

patients 54(35%) were male and 86(61%) were female. The age of these patients ranged from 20 years to 60 years with a mean age of 43 years (standard deviation= 12) as given in Table 1. Male to female ratio was 0.62. The table also shows distribution of observed supraeruption in either maxillary or mandibular arch along with the side of the arch involved. Maxillary arch had more cases of supraeruption as compared to mandibular arch

Minimum age (yr)	Maximum age yr)	Male (n=54)	Female (n=86)	Maxilla (n=73)	Mandible (n=67)
20	60	39%	61%	52%	48%
Age (Mean + SD)		43 + 12			
Affiliation with Arch Side					
Right side	n=73(52%)		Left side	n=67(48%)	

Table 1: Frequency of supraeruption according to arch, gender and side of arch

It was observed in our study that in maximum number of cases i.e. nearly 71% of cases (n=99), dental caries was the main reason for tooth loss followed by periodontal diseases 19% (n=26) and other diseases 11% (n=16) as given in Table 2. The table also shows the type of teeth involved in supraeruption. Amongst these molars accounted for 44% of supraerupted teeth, followed by premolars and incisors.

Causes of tooth loss (n=140)	n (%)	Supraeruption-Tooth type (n=140)	n (%)
Dental caries	99(71%)	Incisors	23(16%)
Periodontal disease	26(19%)	Premolars	55(39%)
Other diseases	15(11%)	Molars	62(44%)

Table 2: Causes of tooth loss with teeth involved in supraeruption
Distribution of different groups of supraeruption cases in male and females is given in Table 3. It can be seen that a slightly higher than half cases had supraeruption belonging to group-2 (0.7mm to 1.2mm). Females had higher frequency of supraeruption than males. The observed statistical difference was insignificant.

Gender	Group1 (0.10.6mm)	Group 2 (0.7-1.2mm)	Group 3 (1.3mm or >)	Total
Male	6	26	22	54
Female	12	46	28	86
Total	18(13%)	72(51%)	50(36%)	140

Table 3: Frequency of supraeruption of different groups in males and females (p=0.60)

A total of 73(52%) of supraerupted teeth were present in maxillary arch while 67(48%) of teeth were present in mandibular arch. It was observed that more than half of the supraeruption occurred on right side of the arch as compared to left side. To observe the frequency of most supraeruption cases according to the age, participants of the study were divided in four equal groups, each group comprising of 10 years (Table 4). The groups thus made were, for example, 20 to 30 years, 31 to 40, 41 to 50 and 51 to 60 years. It can be seen that majority of cases of supraeruption were observed in third and fourth decade of

life. A statistically non significant difference was observed (p=0.22).

Age (yr)	Status of supraeruption on cast			Total n (%)
	Group1 (0.10.6mm)	Group 2 (0.7-1.2mm)	Group 3 (1.3mm or >)	
20-30	3	10	6	19(14%)
31-40	5	26	12	43(30%)
41-50	7	20	20	47(34%)
51-60	3	16	12	31(22%)
Total	18(13%)	72(51%)	50(36%)	140

Table 4: Supraeruption according different age groups (p=0.22)

DISCUSSION

The present study was carried out among 140 subjects who reported to prosthodontic department (Peshawar Dental College) for having replacement prosthesis for their missing teeth. The study investigated various parameters of super-eruption of teeth during prosthodontic rehabilitation. The absence of teeth can result in positional changes of the opposing tooth such as tipping, rotation and supraeruption. In clinical dental practice, many at times, a simple case of missing tooth/teeth replacement with implant, fixed partial denture or removable partial denture is complicated by supraeruption of teeth in opposing arch. In more severe cases loss of vertical space can practically make it impossible to restore the edentulous space. After loss of teeth, apart from good oral hygiene maintenance and awareness, never the less, replacement has also been observed to be delayed. Various types of information were obtained in this study, mainly related to patient demographic data and the measurement of supraerupted teeth along with site in the arch. The observed mean age and standard deviation of current study was 43±14.1, which was more than that in the study of Al Moaleem et al [1]. And lesser when compared to the value recorded by Craddock et al [12], where respondents' mean ages and standard deviations were 50 years and 13.9 years, respectively. The average super-eruption value among the participants in this study was 2.22mm. When compared with those recorded by Craddock et al [13] and Fagin et al [14], it was found that their observed value of supraeruption was 1.68mm to 2mm. The difference in value may be due to time passed after extraction of teeth and the time at which supraeruption was measured and recorded. It has been estimated that as more time is passed without teeth replacement, more vertical movement of the affected teeth into the opposing edentulous space can be anticipated. Delaying of missing teeth replacement by the patients can be due to various involved factors, amongst which negligence, unawareness, financial constraints and non-availability of dental health care facilities are a few to mention. A high frequency of supraeruption was observed in the current study. The possible reasons to explain this

might be the lower education levels, socioeconomic status, lack of dental health awareness and lack of access to dental care services. This might be explored in another study of this kind. This study revealed that relatively high proportion of females (n=46) had supraeruption belonging to Group-2 (0.7-1.2mm) when compared to males. It has been discussed in the literature that bone apposition in the apical area of teeth is the foundation for supraeruption. It is likely that hormonal changes brought on by an early menopause might impact the degree of supra-eruption [3]. Another possible reason observed commonly, though not investigated, might be the local tradition in which females are seen to be mostly dependent on their male family member for attending dental health care centers. Therefore, it can be assumed that their unavailability and taking no time out by the male members for pick and drop for their female family members, can indirectly delay teeth replacement treatments. Various studies have observed different reasons for loss of teeth. Our study observed dental caries (70.7%) as a common cause of tooth loss, which matched with Gossadi et al [15] and Noman et al [16] results. This might be primarily due to inadequate exposure to fluoride (in water supply and oral hygiene such as tooth paste), availability and affordability of food with higher sugar content and poor access to oral health care services in community. In relation to site, supraerupted teeth were statistically higher in mandibular arch in previous studies [1,12]. Contrary to this, the current study observed higher number of supraerupted teeth occurring in maxillary arches (52%) with a possibility of mandibular teeth extractions earlier than opposing counterpart due to various dental diseases. This result agrees with the findings of Kim et al [18] and Lindskog et al [19]. Additionally, supraeruption on right side was slightly higher than the left side as given in Table 1. Different studies have different observations regarding the type of tooth/teeth involved in supraeruption. Craddock et al [13] concluded that premolars are most supraerupted teeth however in our study supra-eruption was more common in molar regions as observed in several other studies, implicating that missing teeth were common in mandibular arch [15,17,20]. Supraeruption can be in mild, moderate and severe depending upon the vertical movement of teeth into the opposing edentulous spaces. It also depends on the time for which that particular tooth has been left without the presence of antagonist tooth. It was observed in our study that most of the cases of supraeruption belonged to group-2 (0.7-1.2mm), and this accounted for almost 51% of all total cases. Our finding is similar to a study done earlier, where most of the patients were having supraeruption in a similar range [1].

CONCLUSIONS

Within the limitation of the study, it can be concluded that the loss of teeth can result in supraeruption of antagonists. Most of the supraerupted teeth were found to be molars and most of them were observed in maxillary arch. Females were found to be having most of the supraerupted teeth when compared to males.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

- [1] Al Moaleem MM, Porwal A, Qahhar MA, Al Qatarnah FA, Areeshi SA, Aldossary MB. Clinical and Radiographical Measurements of Supraeruption and Occlusal Interferences in Unopposed Posterior Teeth. *Journal of Contemporary Dental Practice*. 2021 Jul;22(7):784-792.
- [2] Hakeem S, Mohsin A, Ahmed AR. Frequency of Overeruption in Unopposed Posterior Teeth. *Pakistan Oral & Dental Journal*. 2012 Jun; 32(1).
- [3] Lee BA, Kim B, Kim YT. Supraeruption as a consideration for implant restoration. *Journal of Periodontal and Implant Science*. 2020 Aug;50(4):260-267. doi: 10.5051/jpis.2000140007.
- [4] Basutkar N. Management of Severely Supra-Erupted Treated Teeth with Endocrown: Case Report. *Acta Scientific Dental Sciences*. 2018; 2:21-4.
- [5] Buduru S, Talmaceanu D, Ignat I, Kui A, Manziuc M, Mitariu M, et al. The consequences of reduced posterior edentulism in a group of students from Cluj- Napoca. *Romanian Journal of Oral Rehabilitation*. 2020 Oct;12(4).
- [6] Mehta S, Gupta K, Santhosh, Sonal, Lodha S. Multidisciplinary Management of Supra-Erupted Periodontally Compromised Maxillary Molar. *Scientific Archives of Dental Sciences*. 2018; 1(2): 10-13.
- [7] Matsuda K, Miyashita Y, Ikebe K, Enoki K, Kurushima Y, Mihara Y, et al. Overeruption of teeth opposing removable partial dentures: a preliminary study. *International Journal of Prosthodontics & Restorative Dentistry*. 2014 Oct;27(5):475-6. doi: 10.11607/ijp.4006.
- [8] Baeg S, On S, Lee J, Song S. Posterior maxillary segmental osteotomy for management of insufficient intermaxillary vertical space and intermolar width discrepancy: a case report. *Maxillofacial Plastic and Reconstructive*

- Surgery. 2016 Jul;38(1):28. doi: 10.1186/s40902-016-0074-0.
- [9] Craddock HL, Youngson CC, Manogue M, Blance A. Occlusal changes following posterior tooth loss in adults. Part 2. Clinical parameters associated with movement of teeth adjacent to the site of posterior tooth loss. *Journal of Prosthodontic Research*. 2007 Dec;16(6):495-501. doi: 10.1111/j.1532-849X.2007.00223.x.
- [10] Kiliaridis S, Lyka I, Friede H, Carlsson GE, Ahlqwist M. Vertical position, rotation, and tipping of molars without antagonists. *International Journal of Prosthodontics*. 2000 Nov;13(6).
- [11] Al Ahmari NM, Aldhalail MA, Abidi NH, Mohamed MS, Alraawi MA, Al Moaleem MM. Techniques for management of supraerupted teeth prior to prosthetic treatment: Updated review. *Bioscience biotechnology research communications*. 2020 Jan; 13:261-73.
- [12] Craddock HL and Youngson CC. A study of the incidence of overeruption and occlusal interferences in unopposed posterior teeth. *British dental journal*. 2004 Mar;196(6):341-8; discussion 337. doi: 10.1038/sj.bdj.4811082.
- [13] Craddock HL, Youngson CC, Manogue M, Blance A. Occlusal changes following posterior tooth loss in adults. Part 1: a study of clinical parameters associated with the extent and type of supraeruption in unopposed posterior teeth. *Journal of Prosthodontic Research*. 2007 Dec;16(6):485-94. doi: 10.1111/j.1532-849X.2007.00212.x.
- [14] Faggion CM Jr, Giannakopoulos NN, Listl S. How strong is the evidence for the need to restore posterior bounded edentulous spaces in adults? Grading the quality of evidence and the strength of recommendations. *The Journal of Dentistry*. 2011 Feb;39(2):108-16. doi: 10.1016/j.jdent.2010.11.002.
- [15] Yahya I, Nahari HH, Kinani HM, Siddig I, Al Moaleem MM. Reasons for permanent teeth extraction in Jizan region of Saudi Arabia. *Journal of Dental and Medical Sciences*. 2015; 14:86-9.
- [16] Noman NA, Aladimi AA, Alkadasi BA, Alraawi MA, Al-Iryani GM, Shaabi FI, et al. Social Habits and Other Risk Factors that Cause Tooth Loss: An Associative Study Conducted in Taiz Governorate, Yemen. *Journal of Contemporary Dental Practice*. 2019 Apr;20(4):428-433.
- [17] Al Moaleem M. Patterns of partial edentulism and its relation to khat chewing in Jazan population—a survey study. *Journal of clinical and diagnostic research: JCDR*. 2017 Mar;11(3): ZC55.
- [18] Kim YK, Ahn KJ, Yun PY, Yi YJ, Kim SG. The clinical prognosis of implants that are placed against super-erupted opposing dentition. *Journal of the Korean Association of Oral and Maxillofacial Surgeons*. 2016 Jun;42(3):139-43. doi: 10.5125/jkaoms.2016.42.3.139.
- [19] Lindskog-Stokland B, Hansen K, Tomasi C, Hakeberg M, Wennström JL. Changes in molar position associated with missing opposed and/or adjacent tooth: a 12-year study in women. *Journal of oral rehabilitation*. 2012 Feb;39(2):136-43. doi: 10.1111/j.1365-2842.2011.02252.x.
- [20] Salazar G, Serrano AF, Mazzeo GO. Intrusion of an overerupted maxillary molar with orthodontic mini implants for implant restorative purposes. *Journal of International Oral Health*. 2018 Jan;10(1):44.