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Various patterns of extraction in patients with crowding

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Abstract

Introduction: Crowding is the unesthetic feature of permanent dentition leading to malalignment of the teeth and one of the prime reasons for seeking orthodontic treatment. Extraction is one of the most common methods used for creation of space for aligning teeth in order to achieve an attractive smile. Hence, this study was conducted to determine the prevalence of crowding in maxillary and mandibular arches in cases reporting to Islamabad Dental Hospital and the extraction patterns carried out for its resolution.

Material and Methods: This descriptive retrospective cross-sectional study was conducted at The Department of Orthodontics, Islamabad Dental Hospital. Data of 916 patients was collected from patient record files for demographic variables (Age, Gender), degree of crowding, pattern and frequency of extractions.

Results: Crowding was more in mandible as compared to maxilla. According to the pattern of extraction, first premolars were the teeth most extracted followed by single lower incisor.

Conclusions: Extractions of teeth is often the most favored treatment choice for patients reporting with a chief complaint of crowding. This poses more diligence towards safer mechanics in order to avoid the detrimental effects of this method of treatment.

Keywords: Arch length discrepancy; camouflage; fixed appliance treatment, anchorage

Introduction

Prevalence of crowding is very common in population nowadays. Crowding is the discrepancy between tooth size and jaw size that results in malalignment of the teeth.[1] Many factors can lead to crowding that can include disproportion between arch size and tooth size, prolonged retention of deciduous teeth, altered path of eruption, premature loss of deciduous teeth, delayed eruption of permanent teeth, presence of supernumerary teeth, trauma, localized abnormal size and shape of teeth, late horizontal growth of mandible and mesial migration of the buccal segments.[2] Crowding can be divided in to various grades: mild crowding (space deficiency <4 mm), moderate crowding (space deficiency = 4-5 mm) and severe crowding (space deficiency >5 mm).[3]

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Several complications are associated with crowding which include enhanced risk of gum diseases and dental decay due to improper oral hygiene, compromised esthetics and function.[2] Therefore, it is very important to overcome crowding in order to address all of the above mentioned complications.

Methods to relieve crowding include extractions, inter proximal reduction, proclination, distalization, derotation, uprighting and arch expansion etc.[3] It has been observed that post retention alignment was more stable in single-incisor (71%) and two-incisors (44%) extractions as compared to premolar extraction cases (30%).[4]

Material and Methods

The study was conducted at Department of Orthodontics, Islamabad Medical and Dental College, Islamabad. Patients with moderate to severe crowding, referred to the Department were included in the sample. Patients who had missing teeth or had extractions done for any reasons other than crowding were excluded from the study. Data of 916 patients was collected through patient record files for

demographic variables (Age, Gender), presence of moderate crowding (space deficiency 4-5mm), severe (space deficiency >5mm) in maxilla and mandible, pattern and frequency of extraction. The demographic variables such as age were further divided into five groups 10-15, 16-20, 21-25, 26-30 and 31-35 years. The study was descriptive, retrospective and cross-sectional. The software used for analysis was SPSS version 20.0.

Results

The mean age of patients in this study were 25 years (10-35). There were 129 females and 85 males showing a ratio of almost 2:1. The total sample consisted of 916 patients, out of which 214 showed moderate to severe crowding (23.36%). According to gender, a higher frequency of crowding can be observed in females (60.3%) as compared to males (39.7%). By de-segregating data according to the five target age groups, crowding was more prevalent in age group between 10-15 years of age (36%). According to grade of crowding, the frequency of moderate crowding was higher in mandible (24.8%) than in maxilla (22.95%), whereas, frequency of severe crowding was equal for both arches (10.3%). According to the pattern of extraction, the most frequent teeth found to be extracted were bilateral first premolars in maxilla (36.0%) and mandible (26.2%). This was followed by lower single incisor extraction (15%).

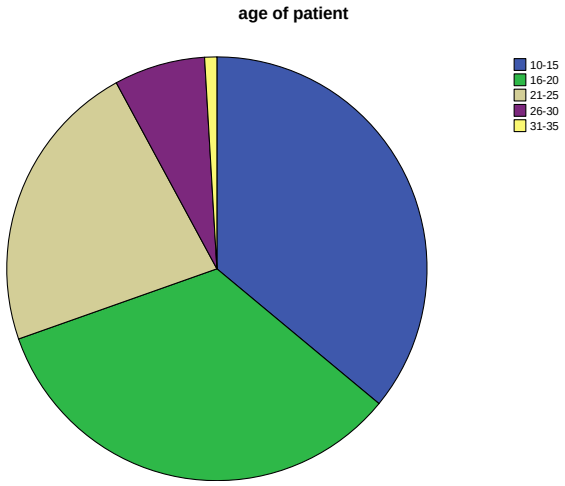

Figure 1: Age of patient

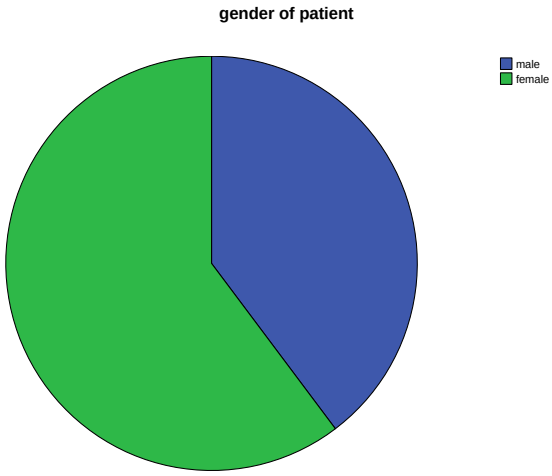

Figure 2: Gender of patient

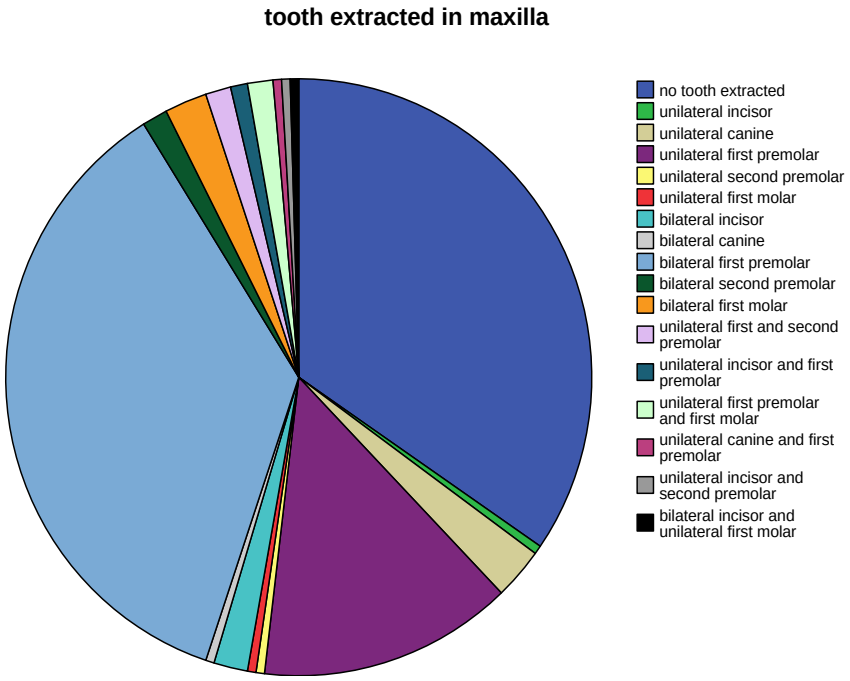

Figure 3: Tooth extracted in maxilla

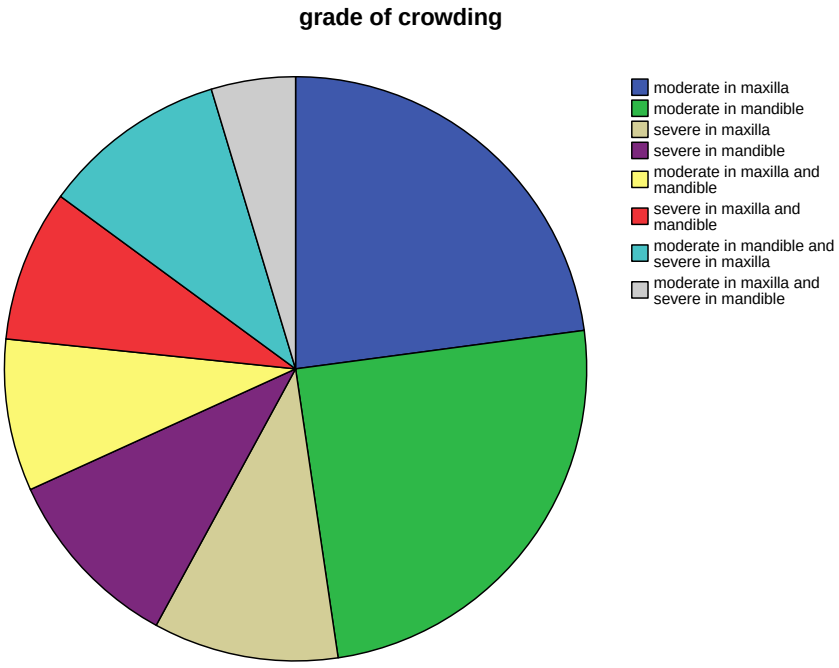

Figure 4: Grade of crowding

Table I: Age of patient

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10-15	77	36.0	36.0	36.0
	16-20	72	33.6	33.6	69.6
	21-25	48	22.4	22.4	92.1
	26-30	15	7.0	7.0	99.1
	31-35	2	.9	.9	100.0
	Total	214	100.0	100.0	

Table II: Gender of patient

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	85	39.7	39.7	39.7
	female	129	60.3	60.3	100.0
	Total	214	100.0	100.0	

Table III: Grade of crowding

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	moderate in maxilla	49	22.9	22.9	22.9
	moderate in mandible	53	24.8	24.8	47.7
	severe in maxilla	22	10.3	10.3	57.9
	severe in mandible	22	10.3	10.3	68.2
	moderate in maxilla and mandible	18	8.4	8.4	76.6
	severe in maxilla and mandible	18	8.4	8.4	85.0
	moderate in mandible and severe in maxilla	22	10.3	10.3	95.3
	moderate in maxilla and severe in mandible	10	4.7	4.7	100.0
	Total	214	100.0	100.0	

Table IV: Teeth extracted in maxilla

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no tooth extracted	74	34.6	34.6	34.6
	unilateral incisor	1	.5	.5	35.0
	unilateral canine	6	2.8	2.8	37.9
	unilateral first premolar	30	14.0	14.0	51.9
	unilateral second premolar	1	.5	.5	52.3
	unilateral first molar	1	.5	.5	52.8
	bilateral incisor	4	1.9	1.9	54.7
	bilateral canine	1	.5	.5	55.1

	bilateral first premolar	77	36.0	36.0	91.1
	bilateral second premolar	3	1.4	1.4	92.5
	bilateral first molar	5	2.3	2.3	94.9
	unilateral first and second premolar	3	1.4	1.4	96.3
	unilateral incisor and first premolar	2	.9	.9	97.2
	unilateral first premolar and first molar	3	1.4	1.4	98.6
	unilateral canine and first premolar	1	.5	.5	99.1
	unilateral incisor and second premolar	1	.5	.5	99.5
	bilateral incisor and unilateral first molar	1	.5	.5	100.0
	Total	214	100.0	100.0	

Table V: Teeth extracted in mandible

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no tooth extracted	71	33.2	33.2	33.2
	unilateral incisor	32	15.0	15.0	48.1
	unilateral canine	4	1.9	1.9	50.0
	unilateral first premolar	13	6.1	6.1	56.1
	unilateral second premolar	5	2.3	2.3	58.4
	unilateral first molar	1	.5	.5	58.9
	bilateral incisor	1	.5	.5	59.3
	bilateral first premolar	56	26.2	26.2	85.5
	bilateral second premolar	8	3.7	3.7	89.3
	bilateral first molar	7	3.3	3.3	92.5
	unilateral first and second premolar	7	3.3	3.3	95.8
	unilateral incisor and first premolar	2	.9	.9	96.7
	unilateral second premolar and first molar	1	.5	.5	97.2
	unilateral first premolar and first molar	3	1.4	1.4	98.6
	unilateral canine and first premolar	2	.9	.9	99.5
	unilateral incisor and second premolar	1	.5	.5	100.0
	Total	214	100.0	100.0	

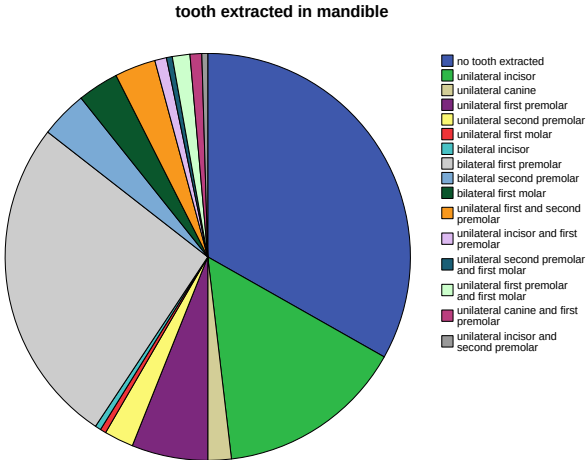

Figure 5: Tooth extracted in mandible

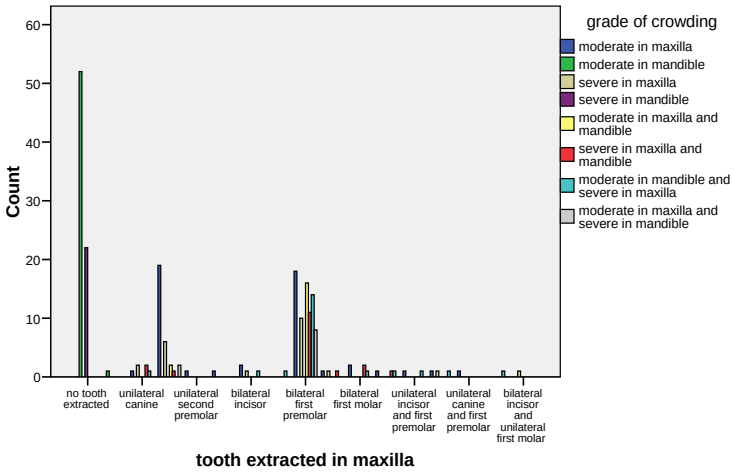

Figure 6: Tooth extracted in maxilla

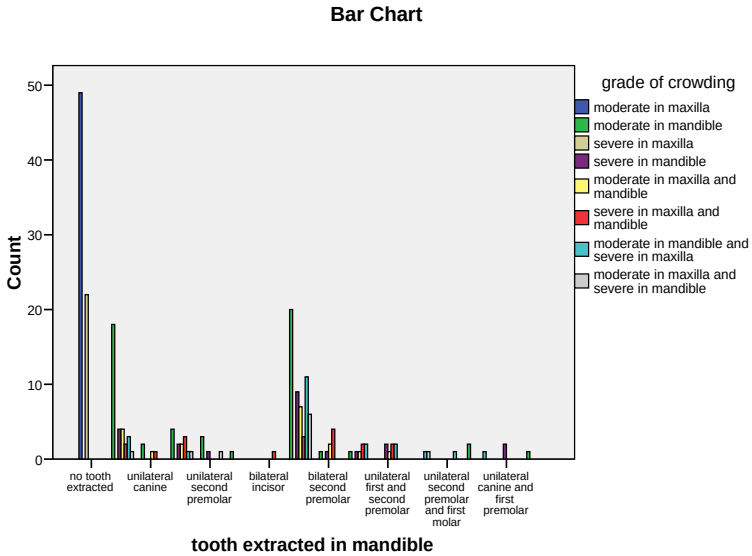

Figure 7: Tooth extracted in mandible

Discussion

This study was carried out to determine the prevalence of crowding, frequency and pattern of extraction in Department of Orthodontics, Islamabad Dental Hospital. Several complications are associated with crowding that include enhanced risk of gum diseases and dental decay due to improper oral hygiene maintenance, compromised esthetics and function.[2-3] Resolving crowding by creating space is important for proper alignment of teeth. Various approaches are used to relieve crowding such as extraction, inter proximal reduction, proclination, distalization, de-rotation, up-righting and arch expansion etc.[3]

Prevalence of crowding is different in different communities. According to results, overall crowding was 23% of the population, which is less than Colombian population (52%).[4-5] However it is more as compared to Libyian [6-5] population which has this as low as 12%.[6] According to the grade of crowding, moderate crowding is higher in mandible (24.8%) than in the maxilla(22.95%). However prevalence of severe crowding was equal in both arches (10.3%). The increased crowding in the mandibular arch might be due lack of attrition and late mandibular growth rotation.[7] Females (60.3%) tend to display a greater degree of crowding than males (39.7%). Children between the ages of 10-15 years demonstrated the highest percentage of crowding (36%), which decreased to 33% by 16 years of age suggesting that a small percentage of crowding may be transient and be resolved from mixed to permanent dentition with increased jaw size.

In the present study, according to the pattern of extraction, most frequent teeth found to be extracted were bilateral first premolars in maxilla (36.0%) and mandible (26.2%) which is in consistence with other studies that also report first premolars extraction being the most common.[11,12] The increased maxillary premolar extraction might be due to more class II skeletal patients in our population. Our study is supported by Camella de S[13] study, showing 31% of maxillary premolar extraction. However the extraction percentage in our study is 36.0% which is slightly higher when compared with the study of Jackson et al[14] that reported a 25%. According to the present results, collective percentages of upper and lower premolar extraction was 62.2% which is inconsistent with Moreiras study (68%).[13] This extraction decision may be based on factors such as posterior crowding, midline discrepancy and correction, extensive restorations, endodontic treatment and ectopic locations.[8,9] In the present study, second mandibular premolar (3.7%) extraction were more common as compared to the same extraction in the maxillary arch (1.4%), indicating the Class II camouflage extraction pattern prevailing as the preferred treatment option.

Mandibular incisors should be considered in cases with tooth size discrepancy, class III camouflage and those having periodontally compromised incisors. Although it may result in an increased overjet and overbite, but the long term results have been proven stable and results in shorter treatment duration. This study showed incisor extraction of 15% which is quite high than the studies reporting frequencies of lower incisor extractions (1-2.5%).[9] The increased extraction of lower incisors might be due to high prevalence of mandibular crowding in our study (25%), which is also supported by Afridi[7], indicating high mandibular incisors crowding in Pakistani population. In our opinion, increased incisor extraction frequency for reasons other than crowding might be, poor oral hygiene leading to recession, mobility in periodontally compromised incisors and unable to close the upper spaces after premolar

extraction due to increase overjet after stripping lower arch. The higher percentage of single mandibular incisor extraction in our sample is also supported by Reidel and Little[4] whose study revealed that the post-retention alignment was more favorable in single-incisor (71%) and two-incisor (44%) extraction cases as compared to premolar extraction cases (30%).

Conclusions

1 Moderate crowding is more common in mandible than maxilla in our population
2 Most frequent teeth extracted were maxillary first premolars followed by mandibular first premolars
3 Mandibular single incisors were the third most commonly extracted teeth. The current findings provide an insight into prevalence of crowding and will assist in achieving effective and individualized treatment plans. Many factors influence the choice of teeth for extraction and careful treatment planning in conjunction with good patient cooperation, appliance selection and management of the treatment are essential for aesthetic, functional and stable occlusion to be achieved.

References

1. Lestrel PE, Takahashi O, Kanazawa E. A quantitative approach for measuring crowding in the dental arch: Fourier descriptors. American journal of orthodontics and dentofacial orthopedics. 2004 Jun 1;125(6):716-25.
2. Moyers RE. Handbook of orthodontics. London: Yearbook medical publishers. 4th ed. 2005
3. Proffit WR, Fields Jr HW, Sarver DM. Contemporary orthodontics. Elsevier: Mosby publishers. 5th ed. 2013.
4. Riedel RA, Little RM, Bui TD. Mandibular incisor extraction—postretention evaluation of stability and relapse. The Angle Orthodontist. 1992 Jun;62(2):103-16.
5. Thilander B, Pena L, Infante C, Parada SS, Mayorga C De. Prevalence of malocclusion and orthodontic treatment need in children and adolescents in Bogota , Colombia . An epidemiological study related to different stages of dental development. 2001;23:153–67.
6. The prevalence of malocclusion in urban Libyan school children. J Orthod Sci 2013;2(2):50-4.
7. Afridi S, Pasha A, Mahmood A. Prevalence of lower incisor crowding in Pakistani population using Little's Irregularity Index. Pak Orthod J 2011;3(2):44–8.
8. Weintraub JA, Vig PS, Brown C, Kowalski CJ. The prevalence of orthodontic extractions. Am J Orthod Dentofac Orthop 1989;96(6):462–6.
9. Janson G, Maria FR, Bombonatti R. Frequency evaluation of different extraction protocols in orthodontic treatment during 35 years. Progress in orthodontics. 2014 Dec 1;15(1):51.
10. Vignesh T, Kumar KPS, Tamizharasi SK. Mandibular incisor extraction in orthodontics : A systematic review 2014;1(1):1–5.
11. Peck S. Peck H. Frequency of tooth extraction in orthodontic treatment. Am J Orthod 1979;76:491-6.
12. Salzmann JA. An evaluation of extraction in orthodontics. Am J Orthod 1965:51:928-9.
13. Camila de S. Dardengo, Luciana Q.P. Fernandes, and Jonas Capelli, Junior. Frequency of orthodontic extraction. Dental- press J Orthod 2016;21(1):54-9.
14. Tate H. Jackson, Camille Guez, Feng-Chang Lin, William R. Proffit, Ching- Chang Ko. Extraction frequencies at university Orthodontic clinic in the 21st century: Demographic and diagnostic factors affecting the likelihood of extraction. Am J Orthod Dentofacial Orthop 2017;151:456-62.