PREVALENCE OF ANTERIOR CROSSBITE AND ITS RELEVANCE IN CLASS I AND III MALOCCLUSIONS

Erum Amin, Rozina Nazir*, Azhar Ali Bangash

Armed Forces Institute of Dentistry/National University of Medical Sciences (NUMS) Rawalpindi Pakistan, *Foundation University, Islamabad Pakistan

ABSTRACT

Objective: To determine the prevalence of anterior crossbite in Class I and III malocclusion.
Study Design: Cross sectional study.
Place and Duration of Study: Orthodontic Department at Armed Forces Institute of Dentistry, Rawalpindi, Pakistan, from Jan 2017 to Dec 2017.
Methodology: Six hundred patients including 190 males and 410 females with the age range of 6-25 years were included in study. Study was conducted on the pretreatment dental casts. A proforma indicating the biodata, presence or absence of anterior crossbite, number of teeth in anterior crossbite, most common tooth involved in anterior corssbite and presence of anterior crossbite either in Class I or III malocclusion was filled for each patient. Data was entered into SPSS version 24, frequencies and percentages were calculated for quantitative analysis.
Results: One hundred thirty seven patients (22.8%) out of 600 were found to have anterior crossbite out of that 54 (39.42%) were males and 83 (60.58%) were females. Upper left lateral incisor was found to be most commonly involved tooth (15.8%) in anterior corssbite, and anterior crossbite was found in 71 (11.8%) patients with Class I, and 66 (11%) patients with Class III malocclusions.
Conclusion: The results of this study reveal that anterior cross bite was commonly encountered problem in orthodontic patients; it should not be left untreated, and must be diagnosed at the earliest and be corrected so as benefit the orthodontic patients maximally.

Keywords: Incisors, Malocclusion, Overbite.

INTRODUCTION

Overjet is the horizontal overlap of the upper incisors to the lower incisors ideally it is 2-3 mm. The amount of overjet has significant influence on the health of anterior teeth, it provide enough space for mandible to move forward without causing any injury to the periodontal apparatus, and anterior guidance sets the limits of protrusive mandibular movements[1].

Anterior crossbite is defined as a malocclusion in the sagittal dimension in which the maxillary anterior teeth are in lingual relationship to the mandibular anterior teeth[2]. Anterior crossbite if seen in one or two teeth reflects severe crowding and is may occur when maxillary incisors that were somewhat lingually positioned before their eruption, are forced even more lingually primarily due to lack of space[3]. It can be found in permanent, mixed or even deciduous dentitions and is classified as dentoalveolar, skeletal and functional[3].

The possible causes of anterior crossbite include; retained deciduous teeth, trauma to deciduous teeth resulting in displacement of permanent tooth germs from its ideal position, supernumery teeth, odontomes and pathological conditions[4]. Generally the greater the number of teeth engaged in the crossbite, the greater is the skeletal component responsible for its etiology[1].

Anterior crossbite can be seen in dental Class I malocclusion or may be associated with Class III dental and skeletal patterns[5]. Class III malocclusion is a combination of skeletal and dentoalveolar components and may be due to mandibular prognathism and/or maxillary deficiency[6], and Class III molar relationship and reverse overlap of mandibular anterior teeth to the maxillary

Correspondence: Dr Erum Amin, Department of Orthodontics, Armed Forces Institute of Dentistry, Rawalpindi Pakistan
Received: 27 May 2018; revised received: 06 Jul 2019; accepted: 16 Jul 2019

anterior teeth. The characteristic features of skeletal Class III were established before pre-pubertal growth[1,7]. Though there is individual variation, clinical experience suggests that, during growth, the mandible has tendency to become more prognathic than maxilla, and in some Class III malocclusion cases this horizontal mandibular growth was very marked[7]. Anterior crossbite should not be left untreated to avoid any dental problems, and an early orthodontic intervention is indicated[8] a traumatic occlusion may arise due to premature contacts resulting in attrition of anterior teeth, tooth mobility and recession of labial gingivae. A functional crossbite can also develop resulting in a mandibular shift due to cuspal interference that may lead to mandibular asymmetry, strain on orofacial structures and may cause temporomandibular joint dysfunction. The reported prevalence of anterior crossbite is 34.4% in various malocclusions[5], and it has a great significance both esthetically and clinically, all types of anterior crossbite varies from 2.2% to 11.9%[2].

After conducting this study we will be able to determine the prevalence of patients with anterior crossbite and its relationship in Class I and III malocclusions, which can help in planning necessary intervention at appropriate time according to severity of malocclusion.

METHODOLOGY

This study was conducted at the Orthodontic department of Armed Forces Institute of Dentistry (AFID), Rawalpindi from January 2017 to December 2017. The approval of this study was taken from the ethics committee AFID. A total of 600 patients who reported to orthodontic department for correction of their malaligned teeth during study period were included in the study. An informed consent was taken from the patients prior to onset of study.

The inclusion criteria for anterior crossbite assessment set in this study was, patients who do not have any past history of orthodontic treatment, and patients who reported with complain of anterior crossbite or diagnosed with specified problem clinically in orthodontic OPD. Patients with Class I and III malocclusion having anterior crossbite irrespective of dental or skeletal causes was separated from other malocclusions clinically. Patients with cleft lip and palate, dental pathology, severe skeletal disproportions, syndromes, posterior crossbite and open bites were excluded.

Patients with age range of 6-25 years were divided into 5 equal groups with the difference of 4 years. Instrument used in this study were, Impression trays, Alginate impression material (Cavex CA 37-Cavex Holland BV), Model Trimmer (Double disc model trimmer- dimension 53x50x 40 cm. Dentaurum Germany), soft and hard dental plaster for making pretreatment dental casts and a caliper and millimeter scale for measurement of the anterior corssbite on cast. The model was labeled with the name of patient, age, gender, registration number and date of first reporting to Orthodontic department. Data was collected from dental casts was entered into specific proforma designed for study. Data was entered into SPSS version 24, frequencies and percentages were calculated for quantitative analysis.

RESULTS

This study was based on prevalence of anterior crossbite specifically in class I and III malocclusion. Six hundreds sets of dental casts of patients were analyzed. Out of 600 patients, 190 (31.7%) were males and 410 (68.4%) were females. The sample was divided into 5 age groups according to convince. Prevalence of anterior crossbite in these age groups are shown in figure and a

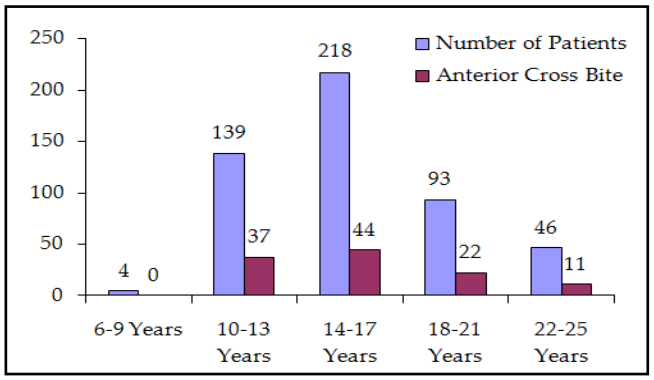

Figure: Prevalence of anterior crossbite in different age groups.

total of 137 (22.8%) patients had anterior crossbite. In 11.8% of cases (71 patients), anterior corsbite was associated with class I malocclusion, and in 11% cases (66 patients) anterior crossbite was associated with class III malocclusion (table-I).

In this study a total number of 52 (10.4%) patients had only 1 tooth in anterior crossbite, in 42 (8.4%) patients had 2 teeth in crossbite. Individually a total 278 teeth were found in anterior crossbite, among these Upper left lateral incisor was the most commonly involved tooth (table-II).

Table-I: Prevalence of anterior crossbite in class I and III malocclusions.

Malocclusions	No. of Patients	Percentage (%)
Class I	71	11.8
Class III	66	11
Total	137	22.8

Table-II: Prevalence of individual anterior tooth in cross bite.

Tooth in Crossbite	No. of Patients with Crossbite	No. of Patients Without Crossbite
Upper left lateral incisor	95 (15.8%)	505 (84.16%)
Upper right lateral incisor	78 (13%)	522 (87%)
Upper left central incisor	31 (5.16%)	569 (94.8%)
Upper right canine	29 (4.8%)	571 (95.2%)
Upper left canine	23 (3.8%)	577 (96.2%)
Upper right central incisor	22 (3.6%)	578 (96.3%)

DISCUSSION

Epidemiological surveys conducted on regular basis may give significant information about changes in pattern and prevalence of malocclusion which can be helpful in planning & provision of treatment. Maxillary incisors play an important role along with esthetics they provide the anterior guiding slope for protrusive excursion of the mandible thus protecting the posterior teeth from stresses produce during protrusive and lateral movements. The position and axial inclination of the upper and lower incisors also play a major role in the rest and dynamic smile esthetics.

The prevalence of malocclusion in different populations was the focus of interest across the world as many studies have been conducted on this topic. There is a greater variability reported in the prevalence even in a population of same origin. In this study data was collected from pretreatment dental casts of all new patients reporting for orthodontic treatment. The diagnostic dental cast has been considered as an authentic method in the treatment planning of routine orthodontic cases, the use of dental casts is valuable for research purpose and it has been used as a viable tool by several research workers[3,9,10] in their study.

The anterior crossbite was noticed as one of the most common orthodontic problems in orthodontic patients[11]. The prevalence of anterior crossbite in this study was relatively high 22.8% as compared with other studies[5,9,10]. A relatively high prevalence in females in this study shows that females are more concern about their facial esthetics as compared to males. Studies showed that during the mixed dentition 12 (77.1%) subjects who had normal occlusion in the deciduous dentition developed malocclusion but there was a little evidence to indicate which treatment method was most efficient[13], in this particular age group. In our study 167 (27.8%) patients reported in an age group 10-13 years, out of which 62 had anterior crossbite. The presence of anterior crossbitein mixed dentition, alarms the orthodontist as this may adversely effects forward maxillary growth and further complicate the severity crowding of maxillary anterior teeth. Especially in pseudo Class III malocclusion with anterior crossbite early treatment is required to correct functional anterior displacement of the mandible[6] and this will also help provide a favorable environment for the growth of maxilla.

In our study we divided the sample in to 5 groups, the major age group presented between 14-17 years of age with a total number of 262 (43.6%) patients out of which 115 patients had anterior crossbite. The reason for high prevalence of patients in this age group may be that most patients visited to orthodontic clinics because of

their esthetic concerns. In 55 (9.2%) patients of age group 22-25 years only 11 patients had anterior crossbite. Persistence of anterior crossbite in the adult population severely reflects the underlying jaw discrepancy such as seen in skeletal/ true Class III malocclusion.

In this study prevalence of anterior crossbite was investigated in Class I or Class III malocclusion exclusively. Class III malocclusion and anterior crossbite are common clinical problems[14], especially in patients of Asian ancestry[15], Lew[16], reported prevalence of Class III malocclusion is approximately 12% in the Chinese and 10% was in the Japanese populations, these result were close to the results of present study, where Class III malocclusion was present in 11.0% of studied patients. The reported prevalence of Class III malocclusion in the Northern European ancestry was 0.8% to 4.2%[17]. Mills[18], reported 3.3% of males and 2.9% of females had an anterior crossbite in same population. A slightly higher prevalence was reported in Swedish men (6%)[20], and 9.4% in Saudi Arabia[19], and prevalence of Class III malocclusion in Koreans population occupies 16.7%[20], Sho[21], reported relatively high prevalence of Class I and III malocclusions in their sample as they also included orthodontic patients only, as in the present study. However in present study the presence of anterior crossbite in relation to Class I and III malocclusions was almost equal, i.e. in 11.8% cases (71 patients), and 11% cases (66 patients) respectively, one reason may be that from dental casts only dental relationship can be evaluated not the underlying skeletal disproportions for which lateral Cephalograph is required, this point should be kept in mind for the future studies. Anterior crossbite generally shows reverse overjet in anterior relationships. In our study 10.6% patients had -2mm anterior corssbite as measured in sagittal plane, these results match with the results of the Ishikawa 22 study.

In this study, the most common tooth found in anterior crossbite was upper left lateral incisor (15.8%) of total sample, anterior crossbite can be developed during the transitional phase of development of dentition, in particular of incisors teeth. The major reason may be that the mesiodistal crown dimensions of the primary incisors are on average 75% to the size of their permanent successors. At the time of eruption central incisor was lingual to its predecessor while the permanent lateral incisor is still more lingual to the ipsilateral permanent central incisor and canine. This leads to more chances of blocking of the lateral incisor. Crowding in the dental arches[23], seems to be another factor involved in tooth malpositioning. Class I malocclusion are mostly confined to the malpositions of individual teeth, dental crossbite are more common in such conditions. Simple lingoversion of one or more maxillary anterior teeth is an abnormal axial inclination with no real Class III features[22], In this study 13% of patients had upper right lateral incisor tooth in crossbite. In this study 5.2% cases had upper left central incisor tooth in anterior crossbite, which matches with the previous study[23]. Only 3 (0.6%) patients have all anterior teeth in crossbite. Anterior crossbite particularly of all anterior teeth seriously reflect underlying skeletal Class III jaw discrepancy and a dilemma to facial esthetics[24].

An early detection of all classes of malocclusions has been recommended[25], the main emphasis has to be placed on diagnosis and evaluation of malocclusion for optimal dental aesthetics and stability of occlusion. Despite the origin of the malocclusion either skeletal or dentoalveolar the treatment of anterior crossbite should be address at the earliest.

CONCLUSION

Early correction of anterior crossbite is recommended so as to prevent abnormal enamel abrasions, traumatic bite, fractures of anterior teeth and periodontal pathosis. Its timely rectification will produce more determinable effects on esthetic and dentofacial complex and a better functional occlusion.

Although this study was carried out in a small number of Pakistani populations and in a single setting, the outcome of the study revealed that anterior crossbite is emerging as the most

common orthodontic problem in our society. It is recommended that more extensive studies should be conducted in different cities around the country to achieve more vivid results and for the benefit of population. Moreover this study was purely based on dental relationships as study cast were used. In future studies skeletal component of malocclusion should be included with the help of lateral cephalograms.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author

REFERANCES

1. Mitchell L. An introduction to orthodontics. 4th ed. Oxford: University Press; 2013; 35(4): 551-52.
2. Miamoto CB, Marques LS, Abreu LG, Paiva SM. Comparison of two early treatment protocols for anterior dental crossbite in mixed dentition–A randomized trial. Angle Orthod 2018; 88(1): 144-50.
3. Profit WR. Contemporary orthodontics. 5th ed. St. Louis: Mosbay; 2013 [Internet]. https://www.elsevier.com/books/contemporary-orthodontics/proffit/978-0-323-08317-1.
4. Hameed MW. Cephalometric evaluation of maxillary retrognathism cases treated with FR-3 appliance. Pak Oral Dent J 2002; 22(1): 25-30.
5. Sultana N, Hassan GS, Jha D, Nashrin T, Nahar L, Naim Ma. Prevalence of cross bite among the orthodontic patients in Bangabandhu Sheikh Mujib Medical University. Bangla J Med 2015; 26(2): 9-12.
6. Tripathi T, Rai P, Singh N, Kalra S. A comparative evaluation of skeletal, dental and soft tissue changes with skeletal anchored and conventional face mask protraction therapy. J Orthod Sci 2016; 5(1): 92-99.
7. Ritter DE. Class I malocclusion with anterior crossbiteand severe crowding. Dental Press J Orthod 2014; 19(2): 115-25.
8. Vithanaarachchi SN, Nawarathna LS. Prevalence of anterior crossbite in preadolescent orthodontic patients attending an orthodontic clinic. Ceylon Med J 2017; 62(1): 189-92.
9. Pereira CP, Canto GD, Major PW, Mir CF. Variation of orthodontic treatment decision-making based on model type: A systematic review. Angle Orthod 2015; 85(1): 501-09.
10. Sakar T, Orhan K, Sinanoglu A, Tosun O, Oz U. Assessment of the accuracy of orthodontic digital models. EURASIA J Math Sci and Tech Ed 2017; 13(1): 5465-73.
11. Lopez CCR, Espinola GS. Orthopedic correction of anterior cross-bite. Rev Mex de Orthod 2015; 3(4): 238-47.
12. Zhou Z, Liu F, Shen S, Shang LV, Shang L, Wang X. Prevalence of and factors affecting malocclusion in primary to permanent dentition amiung children in Xián China. B M C Oral Health 2016; 16(1): 91-01.
13. Wiedal AP, Bondemark KL. Fixed versus removable orthodontic appliances to correct anterior crossbite in the mixed dentition-A randomized controlled trial. Eur J Orthod 2015; 37(2): 123-27.
14. Tosmos G, Ludcuing B, Grossen J, Pazera P, Gkantidis N. Objective assessment of patients compliance with removable appliances: a cross-sectional study. Angle Orthod 2014; 84(1): 56-61.
15. Wiedal AP, Bondemark L. Stability of anterior corssbite correction- a randomized controlled trial with a 2 year follow up. Angle Orthod 2015; 85(1): 189-95.
16. Lew KK, Foong WC. Horizontal skeletal typing in an ethnic Chinese population with true Class III malocclusion. Br J Orthod 1993; 20(1): 19-23.
17. Alvarado K, Lopez L, Hanke R, Picon F, Tumangan SR. Prevalence of malocclusion and distribution of occlusal characteristics in 13- to -18 year old adolescents attending selected high school in the municipality of San Jan PR (2012-2013). PR Health Sci J 2017; 36(2): 61-66.
18. Mills LF. Epidemiological studies of occlusion IV. The prevalence of malocclusion in a population of 1455 school children. J Dent Resh 1966; 45(2): 332-40.
19. Toms A P. Class III malocclusion: a cephalometric study of Saudi Arabians. Br J Orthod 1989; 16(3): 201-06.
20. Cha KS. Skeletal changes of maxillary protraction in patients exhibiting skeletal Class III malocclusion: A comparison of three skeletal maturation groups. Angle Orthod 2003; 73(1): 26-35.
21. Soh J, Sandham A, Chan YH. Malocclusion severity in Asian men in relation to malocclusion type and orthodontic treatment need. Am J Orthod Dentofacial Orthop 2005; 128(5): 648-52.
22. Ishikawa H, Nakamura S, Iwasaki H, Kitazawa S, Tsukada H, Chu S. Dentoalveolar compensation in negative overjet cases. Angle Orthod 2000; 70(1): 145-48.
23. Normando D, Quintao CCA, Santo HGA. Comparison of tooth size, dental arch dimension, tooth wear, and crowding in Amazonian indigenous people. Am J Ortho DentofacialOrthop 2016; 150(5): 839- 46.
24. Bindayal NA. Simple removable appliances to correct anterior and posterior crossbite in mixed dentition: case report. Saudi Dental J 2012; 24(2): 105-13.
25. Khan SQ, Ashraf B, Khan AQ, Mehdi H. Prevalence of malocclusion and its relation with crowding and spacing. Pak Oral Dent J 2014; 34(3): 472-76.