Prevalence and Associated Factors for Arch Forms in Patients with Class IIIMalocclusion Visiting a Private Dental College in Chennai

Ilankizhai RJ[1], Ravindra Kumar Jain[1]*, Madhulaxmi M[2]

[1]Department of Orthodontics, Saveetha dental college and Hospital, Saveetha institute of medical and Technical Sciences (SIMATS), SaveethaUniversity, Chennai, India

[2]Department of Oral and Maxillofacial Surgery, Saveetha dental college and Hospital, Saveetha institute of medical and Technical Sciences (SIMATS), Saveetha University, Chennai, India

ABSTRACT

The dental arch form is defined as the curving shape formed by the configuration of the bony ridge. Arch form must be examined before the beginning of the treatment as this would give valuable information about the position into which teeth can be moved during treatment. The aim of the study is to evaluate the prevalent arch form and associated factors among patients with class III malocclusion visiting Saveetha dental college and hospitals. A retrospective study was designed using case records of patients visiting the university hospital from June 2019- February 2020. About 100 case sheets of patients visiting the Department of Orthodontics and containing information on malocclusion and arch type was retrieved and analysed. This data was then statistically analyzed using SPSS version 20.0 software. The study included 100 patients out of which 74% were males and 26% were females. 28% of the participants were adolescents (12-18 years) and 72% of the participants were adults (19-40 yrs). The results revealed that average or ovoid was the prevalent arch form (63%) followed by broad or square arch (31%) and then narrow or tapered arch form (6%). Association between arch form and age, gender was statistically not significant. (p value>0.05). Within the limits of the study, it can be concluded that most of the class III malocclusion patients have an average arch form followed by square arch form.

Keywords: Arch form, Class III malocclusion, Orthodontic treatment, Ovoid, Square

INTRODUCTION

Malocclusion can be defined as an occlusion in which there is malrelationship between the arches in any of the planes or in which there are anomalies in tooth position, number, form and developmental position of the teeth beyond normal limits [1-4]. Although malocclusion is not life threatening, it can be considered as a public health problem due to its high prevalence and prevention and treatment possible [5,6]. Malocclusion has the third highest prevalence among oral diseases second only to tooth decay and periodontal diseases, thus it can be considered as one of the most important worldwide dental health priorities [7–10].

Among the various types of malocclusion found in human population class III is one of the most least common malocclusions seen in day to day practice [11]. Even though the prevalence of class III is extremely low, the treatment planning for class III seems to be a great challenge for dentists. Class III malocclusion is found in 0 to 26.7% in different populations [12]. In class III malocclusion, there is an anteroposterior discrepancy between the maxillary and mandibular dentitions which may or may not be accompanied with skeletal discrepancy. The treatment aspect of class III malocclusion focuses on the correction of skeletal discrepancy [13–15], dentoalveolar compensation [4,16,17], reducing reverse overjet and arch forms to name a few.

Arch forms play an important role in orthodontic diagnosis and treatment plans [18]. Arch forms refer to the overall configuration of

the dental arch and is considers symmetry, roundness,elongation, and convexity [19]. Characteristics of arch form are radius of curvature of the labial segment, intercanine width and the intermolar width [20]. Different methods have been described to determine the dental arch morphology ranging from simple classification of arch shape [21] to complex mathematical linear equations [22]. In 1932, chuck classified arch forms as tapered, ovoid, and square for the first time. These can also be described as narrow, normal, and broad.

Consideration of the arch form is of utmost importance , because it is imperative that arch form should be examined before embarking upon the treatment as this gives valuable information about the position into which teeth can be moved if they are to be stable following treatment [19], and moreover, the arch form needs to be preserved as this would contribute to the stability of the orthodontic treatment that would have to be done and prevent relapse.With the availability of different preformed shapes and sizes of arch wires [23–25], different studies have highlighted the importance of selection of patient's clinical arch form and customization of arch form [19,26].

Although previous studies have been done on the evaluation of arch forms in various groups, studies investigating the differences in mandibular arch form in patients with class III malocclusion in south indian population is scarce, thus this study aims to determine the prevalent arch form in class III malocclusion patients visiting saveetha dental college.

MATERIALS AND METHODS

A retrospective observational study was conducted from the data collected from june 2019-feb 2020 on patients who were referred to the orthodontic department of Saveetha dental college and Hospitals.Prior permission to use the data for the study was obtained from the Institutional Review Board of the University (SDC/SIHEC/2020/DIASDATA/0619-0320).

A total 100 true skeletal class III patients aged 12-40 years were recruited for the study based on a non-probability sampling method. All the pretreatment data was collected from the recorded case sheets. The data collected was then subjected to photographic cross verification.

Patients with missing anteriors, unerupted canines (12 years) and patients who are undergoing treatment, patients who have previously undergone orthodontic treatment (relapse), patients with retained deciduous teeth were not included in the study.

Data tabulation and analysis was processed using a statistical program for social sciences (SPSS) version 20.0 software.Descriptive statistics were done and a chi-square test was used to find the relationship of arch forms with age and gender. A p value of less than 0.05 is statistically significant.

RESULTS AND DISCUSSION

Age and gender

In the present study, ages of the patients ranged from 12-40 yrs with the mean age of 23 years ± 6.7 years. 28% were adolescents (12-18 years) and 72% were adults (19-40 years). 26% of the population were females and 74% were males.

Arch forms

In the 100 class true skeletal III malocclusion patients analysed 63% had an average arch form also known as the ovoid arch form, whereas 31% of the participants had square or broad arch form and 6% of the participants had tapered or narrow arch forms as shown in Figure 1.

Association between age,gender, and arch forms

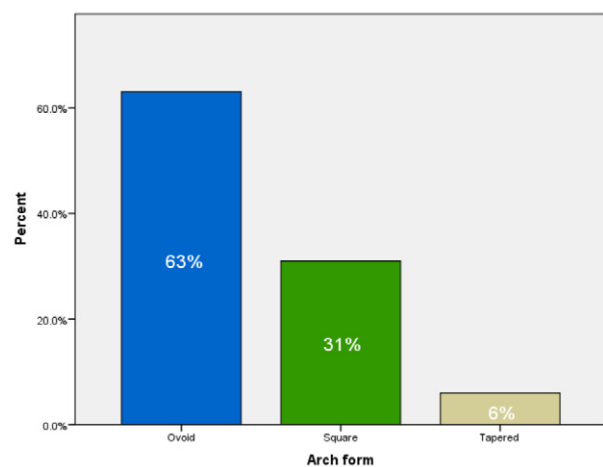The results of our study revealed that 56.9% of the adults had ovoid arch forms, 36.2% had

Figure 1: The bar chart depicts the percentage distribution of different arch forms. X axis represents the different arch forms and Y axis represents the number of participants in each category. Out of the 100 participants, 63% had an ovoid arch form, 6% tapered forms and 5% square arch forms.

square arch forms and 6.9% had a tapered arch form. Among adolescents, 78.5% had ovoid arch forms, 17.8% had square arch forms and 3.7% had tapered arch forms as shown in Figure 2. However, there was no statistically significant association between arch forms and age groups as determined by Pearson's chi-square tests (p value>0.05).

According to the current study, 57.6% of females had ovoid arch forms, 42.4% had square arch forms. Among males, 64.8% had ovoid arch forms, 27% had square arch forms and 8.2% had tapered arch forms as shown in Figure 3.
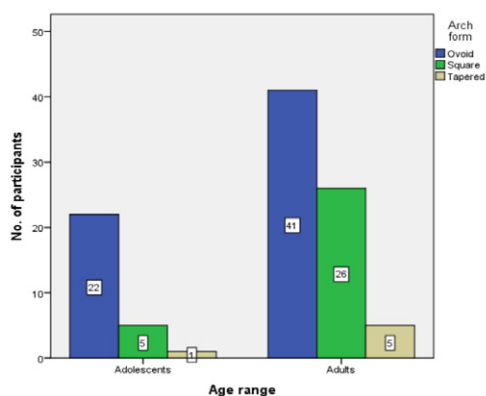

Figure 2: The bar graph represents the association between different arch forms and age groups. X axis represents the different age groups whereas the Y axis represents the number of participants in each category. There is a higher incidence of square forms (green) among adults than in adolescents. However, there was no statistically significant association between age and arch forms as determined by Pearson's chi-square test. (Pearson's chi square value- 4.046; df -2; p value- 0.13 (>0.05)).
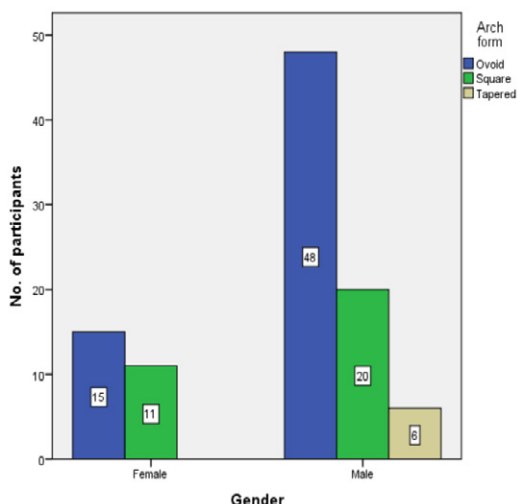

Figure 3: The bar graph represents the association between different arch forms and gender. X axis represents the gender whereas the Y axis represents the number of participants in each category. There was a higher incidence of square arch (green) forms among females than males and tapered forms (beige) among males than in females, however there was no statistically significant association between genders and arch forms as determined by Pearson's chi-square test. (Pearson's chi square value- 3.71; df-2; p value -0.15 (>0.05)).

However, there was not statistically significant (p>0.05) association between the arch form and gender from the Pearson's chi -square tests performed.

The commonest arch form in class III malocclusion was ovoid followed by square and tapered forms, respectively. This study is conducted to determine the prevalent arch form in patients with class III malocclusion, the sample was representative of a group of south Indians population of dental patients that attended the orthodontic department of Saveetha dental college from June 2019-February 2020.

The size and shape of the dental arches have considerable implications for orthodontic diagnosis and treatment planning [19]. These tend to have an impact on the space, stability of the dentition, esthetics as well as the periodontal health. All these factors need to be kept in mind during treatment planning. Teeth should not be forced to move out of their periodontal envelope and the arches should not be drastically changed or expanded as this would only lead to deleterious effects and this can be prevented only by tending to the individualized arch forms [27].

In the present study, the commonest arch form was ovoid (63%) followed by square arch forms (31%) and tapered arch forms (6%). The study conducted by Imran T et al. 19 in 2011 stated that tapered and ovoid arch forms are the most common with 37.5% each and square forms are found to be least frequent (25%), which is quite contradictory to the results of the present study. Olmez et al. [28] reported that there was an increased frequency of tapered arch (55%) followed by ovoid forms (28.5%) and square forms (16.5%) forms in class III malocclusion. Zuhair et al. [29] reported that 84.2% of the participants had square arch forms followed by ovoid arch forms (15.8%). These results were contradictory to the results of our study.

Khatri et al. [30] reported that square and ovoid forms were common and tapered arch forms were least frequently observed among class III malocclusion patients. Arumugam et al. [31] reported that the distribution of square and ovoid type had the highest frequency distribution (46.7%) followed by tapered type (6.7%) which is comparable to the results of our study. Similarly, the study by Celebi et al. [32] reported that ovoid arch forms (45%)

were most common followed by square (40%) and tapered forms (15%) among Turkish class III malocclusion patients. Zuhair et al. 2012 29 also reported that tapered forms were found to be the least common arch forms among class III malocclusion patients, which is following the current study. This can be explained by common pathogenesis of class III malocclusion and the resultant dental compensation by lingual tipping of the mandibular anterior teeth, causing the anterior part of the mandible to flatten.

According to the current study there was no significant association of arch form and different genders. This could probably be due to similar geographic location and similar methods of determining the arch form. Similar results have been obtained by Zuhair et al. [29] and Arumugam et al. [31].

One of the limitations of this study was small sample size, thus it does not represent the entire south Indian population. In addition, this study did not consider all methods of determining the arch form also did not include the mandibular arch forms.

Therefore, further research is still needed to overcome the limitations which will include a larger sample size all other methods of arch form determinants and include and identify associations with the maxillary arch forms too, then the results can be generalized to the population.

CONCLUSION

Within the limits of the study, it can be concluded that the most common arch form in class III malocclusion patients is ovoid followed by square and tapered forms. With this study, one can understand the importance of determining arch form prior to treatment to achieve best functional, stable, and esthetic outcome.

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CONFLICT OF INTEREST

Nil.

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