ORIGINAL RESEARCH PAPER

Orthodontology

KEY WORDS: dental arch form, ovoid, tapered, square

ASSESSMENT OF DENTAL ARCH FORM IN A SOUTH INDIAN POPULATION

Geeta Maruti Doddamani Arush Multispecilaity Dental Care, 32, MIG, KHB Colony, 8th Block, Koramangala, Bengaluru-560095

Girish Babu KL* Arush Multispecilaity Dental Care, 32, MIG, KHB Colony, 8th Block, Koramangala, Bengaluru-560095 *Corresponding Author

ABSTRACT

Introduction: Dental arch morphology plays an important role in achieving a stable, beautiful, and functional outcome of orthodontic treatment. Dental arch form will vary among countries, region, race and ethnic background.
Aim: To assess the dental arch form among south Indian population.
Materials and methods: The study sample consisted of maxillary and mandibular dental casts of Indian individuals collected from various orthodontic centers. The selected dental casts were used to assess the dental arch form using arch form templates. The arch form was grouped into ovoid, tapered and square.
Results: The ovoid, tapered and square dental arch form was seen in 66%, 24.5% and 9.5% of studied population, respectively.
Conclusion: The ovoid was the most common dental arch form observed followed by tapered and square.

INTRODUCTION

The field of Orthodontics has been built around the correction of malocclusion. Dental arch morphology plays an important role in achieving a stable, beautiful, and functional outcome of orthodontic treatment. Dental arch is shaped and confined by the supporting bone configurations, and it is affected by the eruption of teeth and the surrounding muscular forces.[1] Many orthodontists suggest keeping the dental arch form stable to prevent relapse.[2-5]

Dental arch morphology has a wide individual variation in humans.[6] The form of the dental arch range from elipsoid, parabolic, a segment of circle joined to lines, a segment of circle caternary curve, etc.[7-9] Several researchers have tried to classify the dental arch forms. Chuck in 1934, made the first classification for the dental arch in 3 forms, namely: ovoid, tapered, and square shape.[10] Ricketts considered factors such as arch correlation, size, and length and classified dental arch form into 5 forms viz: normal, ovoid, normal ovoid, tapered and narrow tapered. [11] Some researchers suggest using the mathematical formulas to find a more individualized shape for arches.[12] However it is more time consuming and tiring step for a busy clinician.

Establishment of dental arch form aid manufacturer in designing the arch wires accordingly. This will help the orthodontist in proper and easier selection of arch wire to shape the dental arches during the treatment. [10,13] Chuck also emphasized the importance of individualizing the arch wire form to each patient rather than using the same arch wire form for all patients.[10]

Studies have been carried out to document the dental arch dimensions in many population.[5-7,12,14] But the dental arch dimensions will vary among countries, region, race and ethnic background. Thus it is essential to estimate the dental arch form across different populations. Hence the aim of the present study was to assess the dental arch form among south Indian population.

MATERIALS AND METHODS

The study sample consisted of maxillary and mandibular dental casts of Indian individuals collected from various orthodontic centers of Banglore city. The age range was between 14 to 19 years. The inclusion criteria were:[14] 1) Sound pretreatment orthodontic models 2) Permanent dentition 3) Class I, II, and III malocclusion 4) Full dentition in both arches, excluding third molars. The exclusion criteria were: [14] 1) Casts from children with mixed or primary dentition 2) Missing teeth 3) Dental anomalies 4) Posterior cross bite 5) Retained deciduous teeth 6) Casts with severe transverse arch discrepancies 7) Casts with severe crowding. A total of 127 dental casts were collected and examined. Twenty seven casts were excluded due to poor quality. Thus 100 casts were included for further study purpose.

The selected dental casts were used to assess the dental arch form using arch form templates (Orthoform; 3M Unitek). The template was overlaid on the dental cast and the best template dental arch adaptation for each model was noted. The arch form was grouped into ovoid, tapered and square according to Chuck. [10]

RESULTS

The most common arch form in both maxilla and mandible was ovoid (66%). Males showed more number of ovoid arch form than females. Most of the males had ovoid maxillary arch form (57.14%) whereas most of the females had ovoid mandibular arch form (43.48%). Tapered arch form was the second common arch form seen (24.5%). This arch form was almost equally distributed among males and females and also in both arches. The least common arch form seen was square (9.5%). Males had more percentage of square arch form especially in mandibular arch.

DISCUSSION

The goal of orthodontics is to prevent, intercept and/or correct malocclusion. The changes brought over should be esthetically pleasing, functionally efficient and occlusally stable. The three components of occlusion that is teeth, bone and muscles should co-exist quite harmoniously. It is responsibility of the orthodontist to bring the equilibrium between all the three components for long lasting results.

An orthodontist should know the anatomical limitation of the dental arches. They should assess the dental arch dimensions and dental arch form during diagnosis and plan the treatment accordingly for the post treatment stability. As early as 1906 Angle pointed out the arch form is an important criterion for ideal occlusion.[8] Since then many researchers have emphasized the importance of determining the prevalence of the different arch forms among populations.

Many studies have suggested different methods to assess the dental arch form. One method is to use the photocopies of the occlusal aspect of the dental casts to select the arch configuration, based on pre-contoured arches.[3] Another option is the application of a Cartesian system to the cast photocopies, identifying x and y axes, to facilitate the visual evaluation of the arch morphology among three preselected shapes (square, tapered, oval).[12] Some authors also suggest the use of reference models, called "diagrams", to assist in forming orthodontic wires or in the selection of pre-formed arch wires.[15] Recently, some authors presented the digitization of natural normal occlusion casts followed by the application of sixth-degree polynomials,

establishing the six most preponderant arch configurations, guiding the orthodontist to choose visually, among these shapes, the one best fit to each patient.[16] Independent of the complexity of the methodology used to determine and choose the dental arch shape, the orthodontist should make the final choice by visual analysis of the dental casts.[17] In the present study the dental arch form was assessed using arch form templates as it is quicker, easier and less time consuming. This method will be more convenient for a busy clinician to select the arch wire.

The most common arch form observed was the ovoid arch form in both males and females. Similarly Murshid observed ovoid arch form being the most prevalent among Saudi Arabian population.[18] Even in Iranian population ovoid arch forms were most common especially in mandible.[19] Paranhos et al reported ovoid arch form being most common arch form in mandible among Caucasian individuals.[17] Othman and coworkers observed major arch form to be ovoid among ethnic Malays compared to Malaysian Aborgines in Peninsular Malaysia.[20] In an Indian population Patel et al reported a greater tendency for wider arch and least for the pointed arch form. They also observed that greater tendency of females for narrow arch form while males for wider arch form.[21] Omar et al, using Ricketts pentamorphic 5 arch form, reported narrow tapered arch being most common followed by narrow ovoid in both males and females.[14]

Second common arch form was tapered. This arch form was almost equally distributed among males and females and also in both arches. Iranian population also observed similar results.[19] Even among Saudi population tapered arch form was the second most common especially among females than males.[14] In Caucasian population tapered arch form was least observed compared to ovoid and square.[17] In Yemeni population the most prevalent form was the narrow form in both male and female samples.[22] Sahoo et al observed narrow arch form to be most common among Indians than those of the Bhutanese.[23] Tapered was the most common dental arch form among northern United States populations.[24]

The third most common dental arch form observed was square. In accordance, Othaman et al also observed square dental arch form to be least common among Malaysian population.[20] Square dental arch form was also least observed among Saudi population.[18] Toodehzaeim also reported that square dental arch form to be the least common arch form among Iranian population.[19] But Kook et al observed that square form of dental arch to be most common among Korean population.[24] Among Caucasian population square dental arch form was the second most common.[17] Wider arch form was most common among Bhutanese than Indians.[23]

The results of the present study indicate that there are possible racial and ethnic factors contributing to the dental arch form. Based on the results, it can be concluded that orthodontist encounter more of ovoid arch form patients followed by tapered and square. Hence they need to use more of ovoid prefabricated arch wire followed by tapered and square during treatment of studied population. The data of the study also help the manufacturer to design the population specific arch wire to facilitate the work of orthodontist.

Future studies with larger sample size should be conducted to further validate our findings. Also, type of occlusion and other dental arch measurement like inter canine width, inter molar width and arch circumference should be studied as they may influence the dental arch forms.

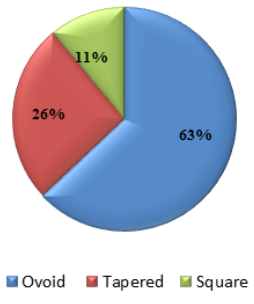
CONCLUSION

The ovoid was the most common dental arch form observed followed by tapered and square.

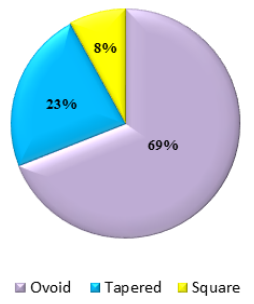
TABLE 1: PATTERN OF DENTAL ARCH FORM

PATTERN OF DENTAL ARCH FORM										
Dental arch (n=100)	Ovoid			Tapered			Square			Total
	Males n (%)	Females n (%)	Total n (%)	Males n (%)	Females n (%)	Total n (%)	Males n (%)	Females n (%)	Total n (%)	
Maxilla	36 (57.14)	27 (42.86)	63 (63)	18 (69.23)	8 (30.77)	26 (26)	6 (54.54)	5 (45.46)	11 (11)	100
Mandible	39 (56.52)	30 (43.48)	69 (69)	16 (69.56)	7 (30.44)	23 (23)	5 (62.50)	3(37.50)	8 (8)	100
Total	75 (56.81)	57 (43.19)	132 (66)	34 (69.38)	18 (30.61)	49 (24.50)	11 (57.89)	8 (42.10)	19 (9.50)	200

GRAPH 1: PATTERN OF DENTAL ARCH FORM IN MAXILLA



GRAPH 2: PATTERN OF DENTAL ARCH FORM IN MANDIBLE



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