

Short Article

Archform in Orthodontics: Part 1

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Abstract: One of the foremost characteristic of human dentition is the dental arch form. In due course of orthodontic treatment, it's crucial to know each individual dental arch pattern for diagnosis and treatment planning and one should always try to preserve it throughout the treatment to provide better stability post retention. In the literature review the evolution of shape, prevalence of the archform is included along with the components and steps to determine an archform for a particular case.

Keywords: Maxilla; Mandible; Archform.

INTRODUCTION

The achievement of a stable, functional and esthetic archform has been one of the prime objectives of orthodontics for a long period. Despite of numerous investigations, there is a little agreement as to the best size and shape for an ideal orthodontic archform. An archform may be best described as the arch formed by the buccal and facial surfaces of the teeth when viewed from their occlusal sides. According to Brader, it is a collective response of all teeth to all the environmental forces and their resultant positions in the oral cavity. The search for an ideal arch form was started in the latter half of 19th century and it evolved in various shapes and methods to determine. Many factors affect the archform of any individual. Nowadays, the use of preformed archwires has lessened the importance of archform which leads to compromise in stability post

retention phase. This literature review entails the evolution in the shape, prevalence, components of an archform along with determining and selecting archwires for different cases.

Evolution

1885 – Bonwill→ suggested mandibular arch to be tripod shaped and an equilateral triangle was formed by connecting two condyles and the midline (Bonwill, W. G. A. 1885).

1905 – Hawley along with Bonwill→proposed a geometric method for predetermining the dental arches in which the lower anterior teeth were arranged on the arc of a circle and the premolars and molars aligned with the second and third molars turned toward the center. Further, it was modified by Boone in 1963(Hawley, C. A. 1905) Fig 1 and 2)

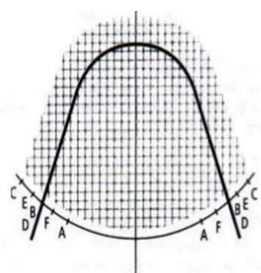


Fig.1 Bonwill Hawley chart

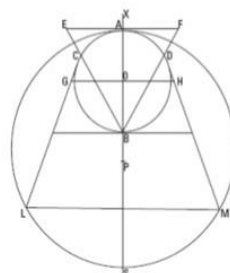


Fig.2 Modified Bonwill Hawley chart

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Journal homepage:

<http://www.easpublisher.com/easjdom/>

Article History

Received: 24.11.2019

Accepted: 17.12.2019

Published: 25.12.2019

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DOI: 10.36349/easjdom.2019.v01i06.006

1907 – E. H. Angle → brought into the term “line of occlusion”. Also, suggested that the line that the premolars and molars form is in the form of a parabola (Angle, E.H. 1907).

1934 – Chuck → noted the difference in archform i.e. square, ovoid and tapered (Chuck, G.C. 1934).

1949 – Mcconail and Scher → stated that the mandibular archform is in a shape that is formed by hanging a chain holding both the ends apart. It was

termed as the Catenary curve (MacConaill, M. A., & Scher, E. A. 1949).

1972 – Brader → improvised the concept of catenary curve by narrowing the archform beyond first permanent molars – Trifocal Ellipse (Brader, A.C. 1972).

1998 – Braun *et al.*, → reported that the human arch could be represented by a mathematical formula called the Beta Function (Braun, S. *et al.*, 1998) (Fig 3)

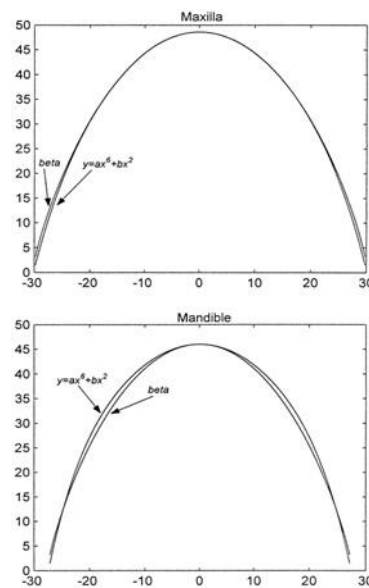


Fig.3 Beta Function of arches

Apart from these concepts Straight wire, Roth, MBT and Lingual systems developed their own archform according to their requirement in finishing the treatment. Moreover recent advancements include computer predictions using algebraic equations were used for achieving dimensions of archforms, also

individualized archforms came into existence as suggested by Lee *et al.*, (2011) that there is nothing called as generalized archform, it should be tailored according to the original working model of the individual.

Components of an Archform (Fig 4)

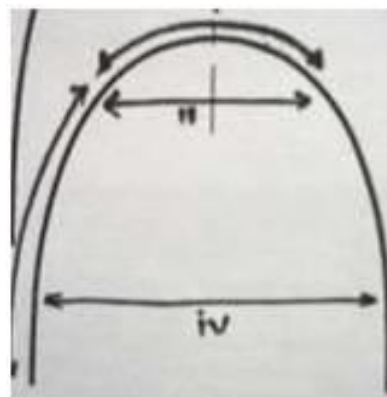


Fig. 4 Components of an archform

1. ANTERIOR CURVATURE

Based on inter-canine width the shape becomes more tapered when inter-canine width is narrow and squarer when inter-canine width is wide.

2. INTER-CANINE WIDTH

This appears to be the most critical aspect of arch form, because significant relapse occurs if this dimension is changed.

3. POSTERIOR CURVATURE

In the posterior area a gradual curvature between canine and second molars are preferred.

4. INTER-MOLAR WIDTH

Treatment changes in this dimension is more stable. Arch form in the inter-molar region can be widened or narrowed, depending on the need of the case.

Prevalance, Growth and Development

Moorrees (Baluta, J., & Lavelle, C. (1987) has pointed out that considerable individual variations in the archform occur with normal growth with a tendency of increase in the intermolar width during the transition of deciduous dentition into permanent specifically 7-12years of age. Also, sexual predisposition was observed with more growth among males. Among the arches maxillary is suggested to grow 3mm wider and mandibular 2mm. After the eruption of the permanent dentition, slight constriction of arch width can be observed in females whereas there was a decrease in depth in both sexes in the 3rd and 4th decade of life.

3. Intermolar width similarly increases with treatment progress but has less tendency for relapse after treatment
4. Inter 1st premolar width and intermolar width increases in non extraction cases
5. Inter 2nd premolar width and intermolar width in extraction cases decreases during treatment
6. Incisor to intermolar distance decreases with treatment.
7. The amount of change during treatment is directly proportional to the chances of relapse post retention. Hence, it can be stated that the pre treatment archform is the best guide for future stability.

Characteristics of an Archform

1. Inherent tendency of relapse post retention. A slight increase in the intercanine width can be maintained with proper retention protocol for an adequate period.
2. Intercanine width expands during treatment but may relapse in both extraction and non extraction cases.

Systemic Method to Select an Archform

Initial light wire can be used in any form as the forces are light and used for a shorter period of time hence, the negative influence of a wrong selection Intermediate archwire must be customized according the stage model using a clear template and individual archform technique (IAF) (Tiwari, A. *et al.*, 2018). (Fig 5)

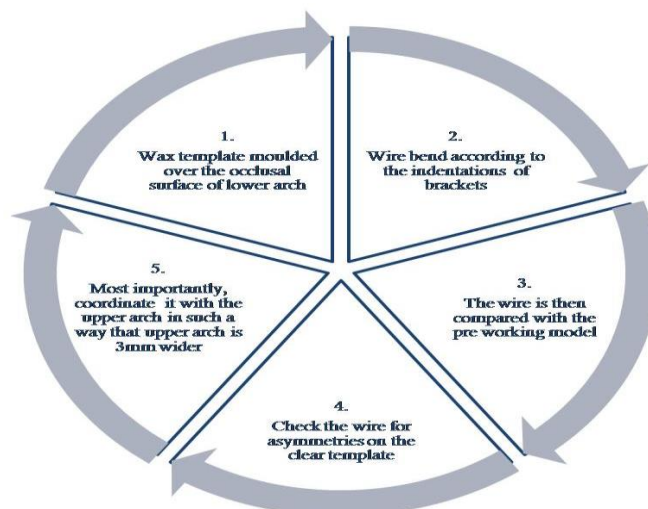


Fig.5 Flowchart of IAF. It is important in cases like Posterior torque cases, maxillary expansion cases, asymmetries, etc. Rigid working wire should also be selected by the same method adding a 3mm width to the upper arch.

CONCLUSION

Clinicians should be careful and cautious while selecting an archform as it is very important in achieving good esthetics, occlusion and function in a patient which is their utmost priority. A further review on different archforms used by various system mechanics and factors affecting will be published henceforth.

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