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Evolution of orthodontic brackets

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ABSTRACT

Orthodontics distinguishes and differs itself from the other branches of medicine by its widespread use of an array of devices made of almost all the biomaterials known. From metals to plastic and from ceramics to composites, these materials bring beauty and health. Brackets evolutions from the introduction of pin and tube to lingual, magnetic and self -ligating brackets are rapid in pace and play a significant role in advancement of Orthodontic field. Though, we all are using recent brackets which are currently available in the markets, it is important to know the past history of brackets which was used earlier. Thus, this article reviews the history of various orthodontic brackets used till the present date.

Keywords: Orthodontic brackets, Orthodontic attachment.

EVOLUTION OF ORTHODONTIC BRACKETS

The term bracket was introduced by Dr. Edward Hartley Angle in 1916 when he devised the ribbon arch appliance. [1]

The meaning of the term bracket, a simple rigid L shaped structure, one arm of which is fixed to a vertical surface, the other projecting horizontally to support a weight, as a shelf. Raymond C. Thurow has defined bracket as an orthodontic attachment secured to a tooth for the purpose of engaging on arch wire and to transmit the adjacent force to the tooth in the proper, precise and effective manner [2].

Angle was the first person to design and use bracket-like attachment with introduction of his pin and tube appliance. He later modified this attachment and used a true bracket in his new technique the ribbon arch appliance in 1915. It was actually the first bracket, as such, to be used in orthodontic appliance. The tube of pin and tube appliance could not truly be called as a Bracket. [71]

The brackets used in Ribbon arch appliance were wide gingivo-occlussally with a vertical slot facing occlusally. Raymond Begg (1956) used the same design of the bracket but he used the bracket upside down with slot facing gingivally known as modified Ribbon arch appliance [3].

Angles final achievement, the Edgewise appliance was designed to allow the orthodontist to place teeth into his concept of line of occlusion. The basic component of the appliance was a metal (soft gold) bracket with a rectangular slot oriented horizontally, with a slot size of 0.022" x 0.028". The rectangular slot of the bracket received a rectangular wire of same dimensions in its narrowest side and with twisting or torquing forces imparted into the arch wire by appropriate bends so that axial inclination of teeth could be controlled [4].

Over the years, bracket has been modified many times. Holdaway, in 1952, reported for the first

time the use of preadjusted brackets for reducing the arch wire bending. In the late 1950's and early 1960's Ivan Lee introduced pre-torqued bracket designed to eliminate the complicated torquing bends usually given in conventional edgewise arch wire. In 1968, Jarabak suggested the use of angulated as well as torqued brackets for upper anteriors. Using these pre-angulated and pre-torqued brackets Andrews in 1971 developed a technique which commercially came to be known as the Straight Wire Appliance (S.W.A) [5].

R. J. Ricketts also used pre-angulated and pre-torqued brackets when he introduced the Bioprogressive technique in 1976 [6].

William Thomson in 1982 developed the Combination Anchorage Technique (CAT) or modern Begg. The bracket has both vertical as well as horizontal slot. In addition to it P. C. Kesling gave Tip-edge bracket keeping in view the free mesial and distal tipping of a tooth. Irwin Plecher introduced Activa Self-ligating brackets, which were a great advance in Clinical Orthodontics. Jin Wildman introduced Edgelock brackets, also a type of self-ligating bracket [7].

Apart from these variations in designs, brackets also differ in the material. Before Angle began his search for new materials, orthodontic attachments were made from noble metals and their alloys [8].

In 1887 Angle tried replacing noble metals with German silver which were actually copper, nickel, and zinc alloys that contained no silver. The mechanical and chemical properties of German silver were well below modern demands. Stainless steel entered dentistry in 1919, introduced by F.Hauptmeyer. By 1937 the value of stainless steel as an orthodontic material had been confirmed. However disadvantages like nickel hypersensitivity, corrosion has also been reported.

Plastic brackets were introduced in late 1960s mainly for esthetics but their tendency to undergo creep deformation when transferring torque loads and discolouration led to their unpopularity.

Ceramic orthodontic brackets were first introduced in 1987 as a more esthetic alternative to the traditional stainless steel brackets. However, the most serious clinical problems of ceramic brackets were brittleness, incidence of enamel fracture during debonding and occasional tie-wing fracture.

Owing to the allergic potential of Nickel that is released from stainless steel brackets and corrosion of these brackets, more recently metal brackets are coated with gold and platinum. Further improvement led to the introduction of titanium brackets, where titanium is known for its good biocompatibility. The introduction of Titanium brackets, for the patients who were hypersensitive to nickel, was also a great revolution, in the field of orthodontics.

As time passed, increasing awareness of aesthetics and adult patients seeking treatment brought about an introduction to Lingual appliance in 1973 and ceramic brackets in 1987. Various lingual appliances and its modifications were like Ormco Kurz, Creekmore conceal appliance, Begg Lingual, Fujita, Kyoto Takemoto, Self-ligating, and lingual care system are introduced.

Initially brackets were welded to the band. Later with the introduction of bonding, the bracket base was manufactured in various ways to increase the retention of the bracket. So various brackets with bases like Mesh foil, Dynalok, Sintered porous meta coated brackets and Microlok were introduced. The latest brackets are the APC coated brackets i.e. Adhesive Precoated Bracket [9].

SUMMARY

From this comprehensive compilation of the Literature on orthodontic brackets, we have seen the evolution of brackets till the present situation.

Since the time of Angle and his Pin and Tube appliance, we have come a long way in orthodontics and now think of organic brackets.

The basic aim through the evolutionary chain has been programmed bracket which has the best values of tip, torque and angulations.

The efforts at present are also concentrated on the removal of the age old metallic orthodontic look which is a frequent complaint of the patient.

The size of the bracket has also been reduced, the method of ligation has now become a feature inherent in the bracket all aiming at patient compliance and comfort and reduced working time for orthodontist. However, like all fields of technology, dynamism in orthodontics also exists and so are its effects seen with the present day research. All this, entails us with the basic principle of orthodontics: "KISS Principle" --Keep It Simple Sir.

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