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# TORQUE IN ORTHODONTICS: A REVIEW

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| **Dr. Ekta Singhania*** | MDS, 2nd Year Post Graduate Student MDS- Orthodontics and Dentofacial Orthopaedics. *Corresponding Author |
| **Dr. Shalu Jain** | MDS Orthodontics and Dentofacial Orthopaedics: Associate Professor in Department of Orthodontics, Subharti Dental College and Hospital, Meerut, India. |
| **Dr. Pradeep Raghav** | MDS Orthodontics and Dentofacial Orthopaedics, Professor and Head in Department of Orthodontics, Subharti Dental College and Hospital, Meerut, India. |
| **Dr. Kumar Amit** | MDS Orthodontics and Dentofacial Orthopaedics, Associate Professor in Department of Orthodontics, Subharti Dental College and Hospital, Meerut, India. |

**ABSTRACT**

**BACKGROUND:** The purposes of this review was to know in depth about torque and how it evolved with invention of different appliance system.

**MATERIAL AND METHOD:**Computerized data bases were searched regarding the literature "Torque in Orthodontics". Data base such as google scholar, pubmed etc were used during this search work. Once an article was selected. Information regarding the torque was taken from these articles and were compiled together in the order of oldest technique to newest technique.

**DISCUSSION:**Torque in edgewise to the clear plastic appliance has been discussed in different appliance system through the years.

**CONCLUSION:** Torque control should be maintained from the start of the treatment so that teeth can be moved to their final positions when the brackets and archwires are placed. Torque allows for a gradual flow towards the finishing stage, with less work to be done at the completion of the treatment.

**KEYWORDS :**

## INTRODUCTION

Every person's face, particularly the anterior teeth, is critical to their overall aesthetic look. In this aspect, the position of the teeth is critical. The goal of orthodontic therapy is to arrange the teeth so that they have the best appearance and function possible (1).

The force that allows the orthodontist to manage the axial inclination of teeth and arrange them in the harmonising positions that are desired for the final outcome is torque. Torque is the force that allows an operator to regulate the movement of a tooth's roots. It is an orthodontic adaptation that describes rotation around an x-axis and represents the bucco-palatal crown/root inclination of a tooth.

To offer a superior cosmetic, stability, and functional occlusal relationship, proper bucco-lingual inclination of anterior and posterior teeth is required. The maxillary incisors' torque is very important for generating an attractive smile line, correct anterior guidance, and a strong class I connection. As a result, one of the most crucial parts of any orthodontic treatment is torque control. There has been no proper documentation in depth literature about torque and how it evolved in various appliance systems until today.

The purposes of this review were to know in depth about torque and how it evolved with invention of different appliance system.

## MATERIALS AND METHODS

Computerized data bases were searched regarding the literature "Torque in Orthodontics". Data base such as google scholar, pubmed etc were used during this search work. This study included retrospective study. The selection criteria required for this study is (1) About introduction of torque in the field or orthodontics (2) Different values of torque in different appliance system (3) studies regarding comparison of torque in conventional and new appliance system. Once the article was selected. Information regarding the torque had been taken from these articles and were compiled together in the order of oldest technique to newest technique.

## DISCUSSION

### Torque In Edgewise

For almost a century, the edgewise appliance has been utilised in orthodontics.

Dr. Angle gave the edgewise bracket system but Dr Charles Tweed student oh his how to manipulate the edgewise system. In 1966, tweed also published a two-volume treatise. In which he explained how to incorporate all the three bends in the wire. (2).

There should be lingual root torque in the anterior teeth and buccal root torque in the posterior teeth in the maxillary arch for optimum axial inclinations. For optimal axial inclination in the lower arch, increasing buccal root torque was considered. Tweed advised employing torquing keys to incorporate torque into wire. He illustrated how to hold the wire between the pliers in his book using diagrams. He also stated that pliers are only used to hold the wire, and that bends and twists in the wire should be done using hands rather than pliers (1).

### Torque In Begg's Technique

Torquing auxiliary with spurs designed by Dr. P.R. Begg in the late 1950 is the auxiliary to torque the roots of one or more anterior teeth palatally or labially.

in the Begg's appliance system, there are different designs developed or introduced for anterior root torquing auxiliaries.

**The different types are listed as follows (80)-**

1) 4 spurs
2) Brandt type 4 spurs

3) 2 spurs (van der Heydt auxiliary)
4) Short 4 spurs
5) Reciprocal
6) One to one
7) SPEC
8) Udder type
9) Rat trap (Pre wound)
10) Individual
11) Jenner
12) Vertical
13) Kitchton

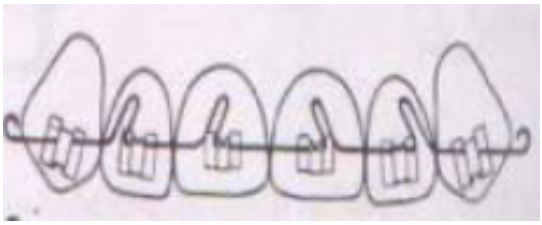

**FIG-1: Torquing Auxiliaries- 4 spurs**

**FIG-2: Torquing Auxiliaries-Kitchton**

### TORQUE IN PREADJUSTED EDGEWISE TECHNIQUE ANDREW'S STRAIGHT WIRE APPLIANCE

This was the first time when torque was incorporated in the bracket rather wire and hence the name was given pre-adjusted system.

**Torque values were for his appliance is as follows:**
**Table-1: Torque Values For Straight Wire Appliance**

| Tooth | C.I | L.I | Canine | 1ST PM | 2ND PM | 1STMolar | 2ndMolar |
|---|---|---|---|---|---|---|---|
| Maxillary | +7 | +3 | -7 | -7 | -7 | -9 | -9 |
| Mandibular | -1 | -1 | -11 | -17 | -22 | -30 | -35 |

### TORQUE IN BASE V/S FACE

Andrew claims that torque in base is a requirement for a fully programmed appliance that gives good results without arch wire bends, assuming the brackets are properly set. The LA point, the base point, and the slot point were all on the same horizontal plane when the brackets were designed. An acute angle at the occlusal aspect of the bracket base and an obtuse [>900] angle at the gingival aspect of the bracket base are used to achieve this (8).

### II GENERATION OF PREADJUSTED EDGEWISE

To overcome the shortcoming of PEA "Roller Coaster Effect" he increased the torque in his bracket system which is called as second generation of PEA.This improved maxillary incisors aesthetics, provided more space for lower anterior teeth, and established proper anterior guidance (10).

**Table-2: Torque Value For Roth Appliance**

| Tooth | C.I | L.I | Canine | 1ST PM | 2ND PM | 1STMolar | 2ndMolar |
|---|---|---|---|---|---|---|---|
| Maxillary | +12 | +8 | -2 | -7 | -7 | -14 | -14 |
| Mandibular | -1 | -1 | -11 | -17 | -22 | -30 | -30 |

### III GENERATION OF PREADJUSTED EDGEWISE

The MBT system considered the pre-existing system insufficient in delivering torque and increased the torque values of in maxillary incisor , molars and mandibular premolars in their bracket system.

**Table-3: Torque Value For Mbtsystem**

| Tooth | C.I | L.I | Canine | 1ST PM | 2ND PM | 1STMolar | 2ndMolar |
|---|---|---|---|---|---|---|---|
| Maxillary | +17 | +10 | -7, 0, +7 | -7 | -7 | -14 | -14 |
| Mandibular | -6 | -6 | -6, 0, +6 | -12 | -17 | -20 | -10 |

### TORQUE WITH LINGUAL APPLIANCE

Dr. Craven Kurz of the United States (14) and Dr. Kinya Fujita of Japan were among the first to create Lingual Orthodontics as a full method in the 1970s (15,16)

The lingual tooth aspect is said to be more complex and adaptable, therefore any change in bracket location on the lingual side could result in an unpredictable and considerable change in torque and vertical tooth height. Furthermore, between lingual and traditional appliances, the distance between the centre of resistance and the point of force application may change, affecting the amplitude of the moments of forces. As a result, torque control in lingual orthodontics is more challenging (17). A comparative assessment of torque generated by lingual and conventional brackets by Sifakakis et al (18) indicated that the Incognito and STb lingual brackets generated the maximum moments. The self-ligating lingual brackets had the lowest torque expression, followed by the traditional brackets.

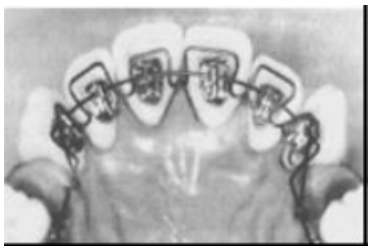

**FIG-3: Torquing auxiliary and Torqued ribbon arch for lingual light wire technique.**

### TORQUE WITH CLEAR PLASTIC APPLIANCE

Clear plastic tooth movement appliances are a great alternative for patients who are hesitant to wear permanent appliances and have mild to moderate alignment issues. Essix tooth movement is a unique biomechanical technique that employs a thin, strong, and nearly undetectable detachable plastic appliance (19). When compared to edgewise brackets, the efficiency of essix-induced torque is higher since the distance between opposing moments is limited by the length of the clinical crown measured in millimetres rather than the width of a rectangular bracket slot measured in thousandths of an inch. Torque is generated by simultaneously creating a force-inducing projection in the plastic with Hilliard Thermo-pliers or composite mounding on the labial and lingual aspects of the target tooth (20).

### TORQUE WITH SELF LIGATING BRACKETS

Self-ligating brackets often fall into one of two design types, active or passive, depending on how the slot is closed. Badawi and colleagues (21) investigated the difference in third-order moments produced by attaching 0.019 x 0.025-in stainless steel archwires to two active and two passive self-ligating brackets. They came to the conclusion that active self-ligating brackets offer better torque control because the active clip drives the wire into the bracket slot. Active self-ligating brackets have less archwire bracket slop than passive self-ligating brackets. The passive self-ligating brackets produced smaller moments at low torsion angles and higher moments at high torsion angles, which made them unsuitable for clinical usage.

Active self-ligating brackets provide a broader clinically

applicable range of torque activation and higher expression of torque at clinically useable torsion angles (0°-35°) than passive self-ligating brackets. Thomali (22) and colleagues compared the torque expression of active and passive selfligating brackets and found just a modest variation between the two brackets. When the engagement angle and slot size were both raised, the torque expression rose as well.\

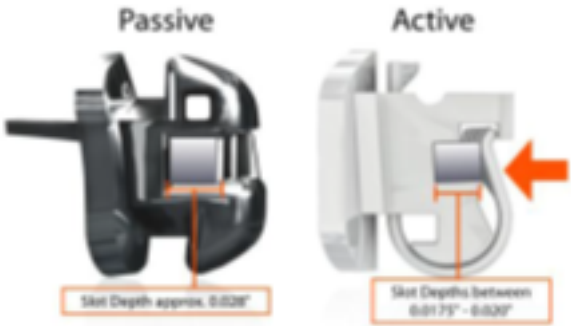


**FIG-4: Passive and Active self-ligating brackets**

## WHICH PRESCRIPTION TO CHOOSE

Torque expression is influenced by a number of elements. The torque moments are affected by the material, cross sectional geometry, shape of the wire's corner, height and width, and deformation of arch wire. Design, material qualities of hardness and modulus of elasticity, manufacturing methods, and ligation method are all sources of torque variation in the bracket. Torque is affected by tooth morphology and inter-bracket distance.Because of the limits of bracket-to-bracket mechanics and the poorly defined reciprocal movements inherently created, traditional edgewise orthodontic mechanics are considerably limited in their capacity to provide incisor torque control.

Begg's, on the other hand, used a multi-loop, light wire, differential force approach, as well as torquing auxiliaries, but tooth movement was not precisely controlled. The equipment required a lot of force, and posterior root torque was difficult to achieve.

As a result, with the introduction of the Straight wire appliance, a range of pre-adjusted edgewise appliances have been made available to address these shortcomings. The bracket prescription had little effect on the subjective and aesthetic judgements of posttreatment study models, according to certain comparative investigations between the McLaughlin Bennett Trevisi and Roth prescriptions (23). Furthermore, the differences in torque values between the two prescriptions do not result in any clinically significant differences in tooth inclination (24).

## CONCLUSION

As a result, when treating cases using any of the current treatment philosophies and appliance systems, great attention must be taken with torque control. Torque control should be maintained from the start of the treatment so that teeth can be moved to their final positions as soon as the brackets and archwires are placed. Torque allows for a progressive flow towards the ending step, with less work necessary as the process progresses. Future research and product development should focus on improving present knowledge and armamentarium for this purpose, so that the aims of orthodontic treatment, such as achieving optimal functional occlusion, aesthetics, and stability, can be achieved.

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