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MOLLENHAUER ALIGNING TOURQUING AUXILIARY- REVIEW

Dental Science

Jibin Joy Daniel* Assistant Professor Pushpagiri College Of Dental Sciences Thiruvalla *Corresponding Author

Salman Amir Post Graduate Pushpagiri College of Dental Sciences Thiruvalla

ABSTRACT

Torque is the third key of the occlusion, described by Andrews as the inclination of the dental crown antero-posteriorly in the anterior teeth and traversal in the posterior teeth. Torque is the force that gives the operator control over them movements of roots of teeth. In this article we will be discussing about the historical perspective of using torque incorporation in different system, the various torquing auxiliaries that were used in various systems from past till present.

KEYWORDS

Torque, Auxillary, Orthodontic, MAA

INTRODUCTION

In modern orthodontic practice, fixed appliances form the mainstay of treatment modality for correction of malocclusion. Contemporary fixed appliances are predominantly variations of edgewise appliances system and the only current appliance system of relevance that doesn't utilize the edge wise system's ability to use rectangular wires in rectangular slot is the Begg appliance and to a certain extent Tip Edge appliance.

Malocclusions cannot be treated solely by brackets and arch wires. The treatment efficiency depends on mechanics used and these have evolved over time. They all have been using several aids to help in movement of teeth, rotation correction, anchorage purpose etc and they are called auxiliaries. Same auxiliaries may be used in different treatment mechanics with some modifications. Efficient use of auxiliaries help in the rapid and proper correction of malocclusion.

Depending on the initial malocclusion and also the type of mechanics used for moving the teeth, the clinician will come across situations which require torquing of teeth. In edgewise mechanics, since the torquing efficiency of bracket system is poor, this would mean requiring torquing auxiliaries in certain circumstances.

In Begg and Tip Edge, since the first two stages is achieved by tipping the teeth, the third stage in most occasions require torquing of anteriors. In Begg mechanics, it is achieved by torquing auxiliaries and in Tip Edge by side winder springs where in the uprighting of the teeth will close the slot's vertical dimension eventually leading to torquing. Torque bars are also used in these systems. In Tip Edge plus, the wire engagement in the deep slot will lead to the uprighting of teeth and eventually torquing.

Development Of Contemporary Fixedappliances[1] And Relevance Of The Torquing Auxiliaries

Edward H Angle 'Father of Modern Orthodontics' contributed not only to the classification and diagnosis but also in the development of new orthodontic appliances. Angle developed four appliance systems. They are E arch appliance, pin and tube appliance, ribbon arch appliance and edge wise appliances.

Earchappliance

In the late 1800s, a typical orthodontic appliance was dependent on some sort of rigid frame work to which the teeth were tied so that they could be expanded to arch form dictated by the appliance. Angle's first appliance E arch was an improvement in this basic design. Only molar teeth were banded and a heavy labial arch wire extended around the arch. Individual teeth were simply ligated to this expansion arch.

Pin and Tube

The E-arch was capable only of tipping teeth to a new position. It was not able to precisely position any individual tooth. To overcome this difficulty, Angle began placing bands on other teeth and used a vertical tube on each tooth into which a soldered pin from a smaller arch wire was placed. With this appliance, tooth movement was accomplished by repositioning the individual pins at each appointment.

An incredible degree of craftsmanship was involved in constructing and adjusting this pin and tube appliance, and although it was theoretically capable of great precision in tooth movement, it proved impractical in clinical use. It is said that only Angle himself and one of his students ever mastered the appliance. The relatively heavy base arch meant that spring qualities were poor, and the problem therefore was compounded because many small adjustments were needed.

Ribbon Arch

Angle's next appliance modified the tube on each tooth to provide a vertically positioned rectangular slot behind the tube. A ribbon arch of 10 X 20 gold wire was placed into the slot and held with pins. The ribbon arch was an immediate success, primarily because the arch wire, unlike any of its predecessors, was small enough to have good spring qualities and was quite efficient in aligning malposed teeth. Although the ribbon arch could be twisted as it was inserted into its slot, the major weakness of the appliance was that it provided relatively poor control of root position. The resiliency of the ribbon arch wire simply did not allow generation of the moments necessary to torque roots to anew position.

Edgewise [1,2]

To overcome the deficiencies of the ribbon arch, Angle reoriented the slot from vertical to horizontal and inserted a rectangular wire rotated 90 degrees to the orientation it had with the ribbon arch-thus the name "edgewise" (Figure 12-3). The dimensions of the slot were altered to 22 X 28 mils, and a 22 X 28 precious metal wire was used. These dimensions, arrived at after extensive experimentation, did allow excellent control of crown and root position in all three planes of space. But the torquing efficiency of these bracket system was poor.

After its introduction in 1928, this appliance became the mainstay of multi banded fixed appliance therapy, although the ribbon arch continued in common use for another decade.

Beggappliance[3]

Given Angle's insistence on expansion of the arches rather than extraction to deal with crowding problems, it is ironic that the edgewise appliance finally provided the control of root position necessary for successful extraction treatment. The appliance was being used for this purpose within a few years of its introduction. Charles Tweed, one of Angle's last students, was the leader in the United States in adapting the edgewise appliance for extraction treatment. Tweed moved the teeth bodily and used the subdivision approach for anchorage control, first sliding the canines distally along the arch wire, then retracting the incisors. Raymond Begg had been taught use of the ribbon arch appliance at the Angle school before his return to Australiain the 1920s. Working independently in Adelaide, Begg also concluded that extraction of teeth was often necessary, and set out to adapt the ribbon arch appliances that it could be used for better control of root position. Begg's adaptation took three forms: (1) he replaced the precious metal ribbon arch with high-strength 16 mil stainless steel wire as this became available in the late 1930s; (2) he retained the original ribbon arch bracket, but turned it upside down so that the bracket slot pointed gingivally rather than occlusally ; and(3)headed auxiliary springs to the appliance for control of root position.

In the resulting Begg appliance, friction was minimized because the

area of contact between the narrow ribbon arch bracket and the arch wire was very small and the force of the wire against the bracket was also small. Begg's strategy for anchorage control was tipping followed by torquing.

The Begg appliance is still seen in contemporary use though it has declined in popularity. It is a complete appliance in the sense that it allows good control of crown and root position in all three planes of space .The greatest difficulty in using the appliance comes in the final stage, where it can be difficult to precisely position the teeth for which auxiliaries need to be used.

Refined Begg Appliance[4]

No treatment modality is ever perfect. With the passage of time its drawbacks become apparent. Unless the treatment evolves to overcome those drawbacks, it is likely to become stagnant. Refinements also be come necessary to incorporate new concept t sand technological progress. The present day Begg practice gradually refined from the original teachings of Dr Begg to overcome the shortcomings of the conventional Begg and to assimilate the contemporary thinking and material advances.

Contemporary Edgewise: The Modern Appliance

The Begg appliance became widely popular in the1960s because it was more efficient than the edgewise appliance of that era, in the sense that equivalent results could be produced with less investment of the clinician's time. Developments since then have reversed the balance: the contemporary edgewise appliance has evolved far beyond the original design while retaining the basic principle of a rectangular wire in a rectangular slot, and now is more efficient than the Begg appliance-which is there as on for its almost universal use now. Major steps in the evolution of the edgewise appliance include:

- Automatic rotation control
- Brackets were angulated relative to achieve proper positioning of the roots of the most teeth.
- Built in torque in bracket slot for each tooth
- Introduction of self-ligating brackets

Modern edgewise mechanics include sectional mechanics, bio progressive therapy, straight wire appliances etc. But still with all these advancements, since the torquing efficiency of the bracket system is poor, frequently auxiliaries need to be used.

Lingual Appliance[5]

A major objection to fixed orthodontic appliances has been their visible placement on the facial surface of the teeth. This has always been one reason for the use of removable appliances. The introduction of bonding in the 1970s made it possible to place fixed attachments on the lingual surface of teeth and produce an invisible fixed appliance, and attachments designed for placement on the lingual surface were first offered soon after bonding was introduced. As a result, torquing auxiliaries are used in the system have been modified to suit the bracket system and lingual aspect of the teeth.

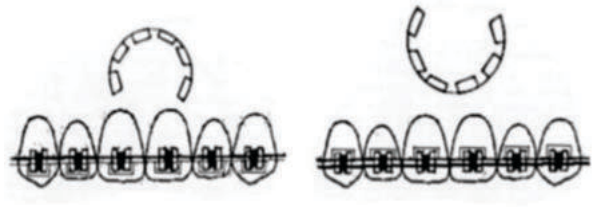
Torquing Auxiliaries Used In Fixed Appliancetherapy

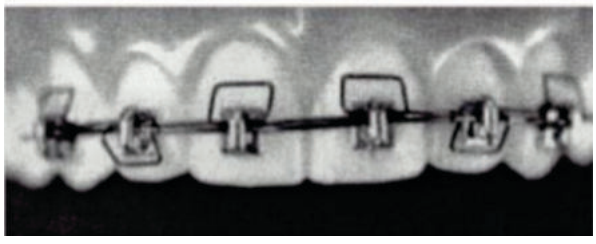
1. Torquing auxiliaries with spurs
2. Single root torquing auxiliary
3. Reciprocal torquing auxiliary
4. Reverse torquing auxiliary
5. Buccal root torque on molars
6. Labial root torque on lateral incisors
7. Pre-wound torquing auxiliary
8. Lingual root torquing auxiliary by Kitchton
9. Udder arch
10. Mollenhauer aligning auxiliary
11. Miscellaneous auxiliaries like Jenner auxiliary
12. Simultaneous torquing, aligning and retraction spring
13. Warren torquing spring
14. Goodman torquing auxiliary
15. Palatal root torquing spring
16. Buccal root torquing spring
17. Molar root torquing spring
18. Burstone torquing arch
19. Side-winder
20. Torque bars
21. Hugo tipping, torquing, rotating and spacing auxiliary
22. Hugo lingual reciprocal torquing auxiliary
23. Hugo staple auxiliary
24. Hugo lingual torquing auxiliary
25. Hugo de-torquing bar

Mollenhaueraligningauxiliary(Maa)[28]

MollenhaueraligningauxiliaryisanaligningauxiliarydesignedbyMollenhauerBforribbon arch bracket. The auxiliary is a major advance in begg appliance. It is a significant deviation from classic begg's treatment. It provides enhanced treatment quality and shorter treatment time.

The MAA, attempts root control from the very beginning, of the treatment without significantly affecting the anchorage and overbite correction. This has become possible by using a combination of a stiff base arch wire made from0.018" Premium plus, and ultra-light root moving forces from the MAA made from the 0.009" Supreme grade wire.





Maa Torquing Auxillary

Development

Mollenhauer first experimented with rectangles made in 0.010" wire for reciprocal torque in adjacent incisors. He named this auxiliary as 'SPECS'. he felt that even this wire generated forces that were too heavy for anchorage conservation and bite opening.

In late 1984, .009" Supreme wire was made by A.J. Wilcock at the request of Mollenhauer.B. initially he use it to align the teeth similar to a NiTi or Co-ax wire. Later on,he started making a boxed auxiliary, which he named as "an aligning auxiliary for ribbon arch bracket"

Requirements For Use Of The Maa

Mollenhauer has enumerated the requirements as under:

1. It must generate very light root moving forces. Therefore, wire size must not exceed0.009"
2. For the same reason, when reciprocal torque is required on adjacent teeth, the adjacent rectangles must not diverge by more than 45 degrees
3. At the same time the auxiliary must be able to resist deformation. Hence it must be made in a highly resilient wire viz. supreme grade(preferably pulse straightened)
4. The bae wire should be able to resist the vertical and transverse reactive forces from the MAA .Therefore, it must be made in 0.018" premium plus wire.
5. In Mollenhauer's application, the MAA is engaged first and the main wire is engaged piggy back. The rectangles for lingual root torque lift away from the tooth surface. Which are held down with the help of pins, thus indirectly transmitting the torqueing action through the pins to the brackets on to the teeth. Therefore, here commends the thickest possible lock on hook pins.

Advantages Of The Maa

1) Efficacy of intrusion and retraction
2) Reciprocability of torque
3) Early root control with short stage [29]
4) Efficiency
5) Stability
6) Periodontal advantages
7) Attachment flexibility
8) Tidiness

Application Of Maa

1. Body alignment of crowded teeth by combination of a)Expansion +Crown alignment(looped arch wire like effect)&b) Root torque.
2. After stage I as braking mechanics(by bending more positive torque)
3. For labial root torque on a) Lower incisor in class II b) Upper incisor in class III (For cortical bone development)
4. MAA-tip for controlling Mesio-distal angulation of root apices in stage I(superior to light uprighting springs for anchorage

Constructing And Activating The Maa

Tweed's plier is used for the construction of MAA. Make a blank of the required number of rectangles from an appropriate length of 0.009" SS wire. The width of the rectangles vary according to the width of the teeth. The wire ends are wound at the mesial of the two terminal boxes.

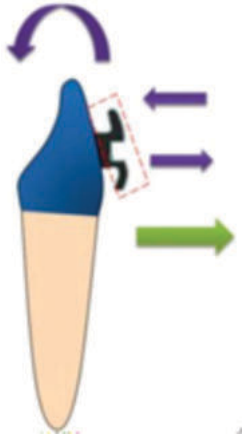
The blank is then activated by shaping it into an open-ended circle. If the two ends of the blanks are manually pulled together to form the required size open-ended circle,so that the legs of the rectangles start crossing. A similar shape is given by changing the angulation from the right angle to a slightly acute angle so that the base legs of the rectangles cross over each other. The inter-box span may also be curved slightly.

When reciprocal torque is needed on one or more number of teeth, boxes on these teeth are made at right angle to the plane of the blank and with cross overbends.

The blank is activated by shaping it into an open-ended circle in a configuration similar to the shape it would assume when ends are pulled together.

Biomechanical Aspect

When MAA is tied onto a blocked-out tooth, it exerts a labial force on the tooth as well as couple. The labial force creates a moment that leads to tipping of crown labially. The couple applied by MAA creates a counterbalancing moment which cancels the moment created by labial force. This results in tooth being moved



Biomechanics of action of MAA on lower incisor. Purple arrows indicate the couple force generated and the resultant torque. Green arrow indicates the labial force generated on tying the MAA to the lingually placed tooth.

CONCLUSION

Torque is probably one of the most important and potent forces of orthodontic treatment mechanism. With proper understanding and systemic technical approach, it is not difficult to accomplish. The operator's ability to control torque properly will mean the difference between artistically treated cases that has all esthetic beauty desired in a finished denture and an ordinary tooth straightening accomplishment that contains very few of these desirable features. The auxiliaries provide adequate forces which can be easily controlled by the clinician thus providing aesthetic results. After proper knowledge and practice, it depends upon the operator to decide which auxiliary to use. With the continuously evolving techniques and introduction of 3rd generation Straight wire appliance, the torque has now been incorporated into the brackets (either in face or base) and the need of different auxiliary has reduced thereby reducing the extra bulk of wire in the mouth and thus decreasing the chances of plaque accumulation and facilitating good oral hygiene.

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