Anchorage Control In Lingual Orthodontics – A Review

Dr. Sowmya Mohan Kumar
Post graduate student,
Department of Orthodontics and DentofacialOrthopedics,
SreeBalaji Dental College and Hospital,
Bharath Institute of Higher Education and Research,
Chennai-600100, Tamil Nadu, India.
*e-mail :*sowmyamohankumar3@gmail.com

Dr.Saravanan,
Professor,
Dept. of Orthodontics and Dentofacial Orthopedics,
Sree Balaji Dental College and Hospital,
Bharath Institute of Higher Education and Research,
Chennai-600100, Tamil Nadu, India.
Author 3:
Dr. M S Kannan,
Professor and Head of the Department,
Dept. of Orthodontics and Dentofacial Orthopedics,
Sree Balaji Dental College and Hospital,
Bharath Institute of Higher Education and Research,
Chennai-600100, Tamil Nadu, India.

Corresponding author
Dr.Sowmya Mohan Kumar,
Post graduate student,
Department of Orthodontics and DentofacialOrthopedics,
SreeBalaji Dental College and Hospital,
Bharath Institute of Higher Education and Research,
Chennai-600100, Tamil Nadu, India.
e-mail id: sowmyamohankumar3@gmail.com

ABSTRACT
This review article discusses about anchorage in lingual orthodontics, the techniques for preserving anchorage with their corresponding biomechanical aspect. When compared to labial orthodontics, molar elongation (which is the most common adverse effect noted in cases of labial orthodontics) is minimized. Though maintaining anchorage in both labial and lingual orthodontics is difficult, there are several ways by which the undesired movements can be minimized.

KEYWORDS: lingual orthodontics, anchorage, transverse bowing effect

INTRODUCTION

The development of numerous orthodontic techniques has led to achievement of high orthodontic standards of treatment. A pleasant esthetic look increases self esteem in people. The main goal to achieve facial balance with orthodontic treatment is to balance esthetic treatment, functional balance and harmony. Anchorage as explained by T M Graber, is the nature and degree of resistance to displacement offered by an anatomic unit when used for the purpose of effecting tooth movement. According to Moyers, it is the resistance to displacement. Anchor teeth can be either a group or a single tooth in the arch. According to Newton's third law of motion, For every action, there is an equal and opposite reaction. Thus when teeth are planned to be moved to a particular position, there is some amount of reciprocal force that acts on the anchor tooth. These anchor teeth have a range of movement from being held stationary or burning the anchorage. Accordingly, they can be classified as Group A, B or C anchorage.

History Of Lingual Orthodontics:

In 1726, Pierre Fauchard suggested the use of appliances on the lingual surfaces. Later in 1841, Pierre Joachim Lefoulon designed the first lingual arch for expansion and alignment of teeth. Since then, various lingual bracket systems have evolved. Ideal bracket system to be chosen depends on the biomechanics that has been planned once the treatment protocol has been decided. Biomechanics is determined by few major parameters like the anchor teeth, amount of retraction and intrusion needed, type of space closure needed, etc. Thus understanding on each of these parameters will aid in selection of accurate bracket system and employing the biomechanics. The concept of lingual orthodontics was given by Dr.Kinya Fujita[1] in 1967, where he introduced lingual multi bracket system with mushroom shaped archwires and obtained a patent for it in 1980 (Fujita Lingual brackets).

Lingual orthodontics was introduced by Dr.Craven Kurz[2], in 1975, where he used plastic Lee Fischer brackets bonded to the lingual aspect of the anterior dentition and metal brackets on the posterior dentition with slots directed palatally. Dr. Stephen Paige in 1982[3] used regular Begg labial brackets for lingual treatment. This bracket system used Unipoint combination bracket (Unitek) which had a gingival wing to place elastic modules orcontinous elastic chains. Introduced by Giuseppe Scuzzo with Kyoto Takemoto[4] from Japan in 2003, it was a prototype of lingual straight wire bracket and technique of STb(Scuzzo/ Takemoto bracket, Ormco). It was based on three concepts: greater comfort, more speed and enhanced reliability. This method required bracket being positioned much closer to the gingival margin and lingual surface of the tooth. The complicated wire bending of the mushroom-shaped archwire affected both the treatment results and the time spent on the chair.

ANCHORAGE CONSIDERATIONS:

Vertical And Horizontal Anchorage :[2]

Horizontal anchorage is the resistance of molars to anterior or posterior movement while the vertical anchorage is related to maintaining the molar in vertical position, that is, reduced extrusion which results in anterior open bite undesired effect). Most treatment modalities demand molar anchorage, like, closure of extraction spaces by en masse retraction which requires maximum anchorage control while space closure with loops demand moderate to minimum anchorage.

Biomechanics For Control Of Anchor Teeth:

Mechanical advantage of using lingual treatment is buccal root torque (in transverse aspect), distal rotation of molar (in sagittal aspect) and intrusive effect (as the brackets are positioned on the functional cusp – vertical aspect). This reduces the CR-CO discrepancy caused by initial contact and with reduction in elongation of molar, the mandibular clockwise rotation is reduced.

Methods to control horizontal and vertical anchorage can be done with combination of loops, elastics, transpalatal arches and headgear.

Depending on the type of anchorage requirement, various mechanics can be used.

For a maximum anchorage requirement in the upper arch, a minimal anchor tooth movement is desired. To achieve this, high pull headgear, Class II elastics, buccal sectional arch from first to second upper molars, or helical loop and T-Loop mechanics (0.017x0.025 TMA) combined with transpalatal arch can be used. For a moderate anchorage requirement in the upper arch, L Loop combined with transpalatal arch. The anterior segment (canine to canine) and posterior segment (second premolar to second premolar) can be consolidated by placing a figure-of-eight with ligature tie. Sliding mechanics can be used for space closure by placing power chain from the lingual surface of canine to lingual surface of the second premolar for first premolar extraction cases. For sliding mechanics, 0.016x0.022 stainless steel archwire can be used.

For a minimum anchorage in the upper arch, the extraction spaces are closed by reciprocal elastic force as in case of labial orthodontics. Power chain can be placed from canine to first molar and Class III elastics can be given for mesial movement of the molars. Most often, the second premolars are extracted facilitating mesial movement of molar. In such cases, the anterior teeth are consolidated (first premolar to first premolar) with ligature wire.

Methods For Anchorage Control In Lower Arch:

They can be broadly classified as sliding or loop mechanics. Sliding mechanics minimizes the bowing effect and avoids tongue irritation. In Class III cases, that might require nonsurgical management by dental decompensation, it is achieved by tipping the anteriors lingually; cases with asymmetric extraction, cases where sliding mechanics is not possible due to close proximity of roots to the cortical bone; in such scenarios loop mechanics can be used.

For a maximum anchorage requirement in lower arch, buccal sectional wire is arch is used for stabilization (0.017X0.025 TMA or 0.016x0.022 SS) and power chain is used in the lingual aspect. For a maximum anchorage, to minimize the mesial movement of posterior segment, a figure of eight tie is given with ligature wire from second premolar to first molar and a similar tie is given for the anterior segment. After consolidating, power chain is given for space closure which is usually accompanied by use of Class III elastics reinforced with extraoral force traction.

For a moderate anchorage requirement in the lower arch, sliding mechanics with reciprocal force (power chain from canine to second premolar) is given after giving a figure of eight tie for the anterior and posterior segments.

For a minimum anchorage requirement in the lower arch, it involves extraction of second premolars predominantly. The mesial movement of molar is achieved by placing a power chain from the molar encircling the canine and engaging on the buccal aspect of first molar.

ADVERSE EFFECTS OF LINGUAL ORTHODONTICS:

Transverse Bowing Effect :

During anterior retraction and space closure, vertical bowing effect and transverse bowing effect occurs that causes the archwires to deform three-dimensionally. This is manifested as anterior teeth tipping lingually and posterior teeth to tip mesially. This causes, posterior bite opening. In the horizontal plane, the inter premolar width is increased. Transverse bowing effect is seen in lingual appliance.

CONCLUSION:

Thus, proper biomechanics in preserving or altering the position of anchorage teeth should be planned before commencing with lingual appliance. There are various technique, as discussed above, by which anchorage can be controlled in all three dimensions of space.

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