

# ASSESSMENT OF TYPE OF RETRACTION MECHANICS COMMONLY CHOSEN BY ORTHODONTIC RESIDENTS

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## ABSTRACT

This study was designed to understand and evaluate the choice between friction and frictionless mechanics in extraction space closure. The orthodontics case sheets were evaluated to identify extraction cases. After examining 428 case sample tabulation of choice between friction and frictionless mechanics were examined. More female patients underwent orthodontic treatment. More cases were treated by friction mechanics rather than by frictionless mechanics. Only 55 cases of the whole were treated by loops for retraction and space closure. More orthodontists preferred retraction using friction mechanics which can be attributed to factors like being treated by faster mechanics, less cost and lesser demanding skill of clinician. The chair side time required is reduced.

**KEYWORDS:** biomechanics; friction ; frictionless; orthodontics; retraction.

## INTRODUCTION

There are many methods to canine retraction that are divided according to it being able to produce a distal driving force, its parts and integral elements. (Burstone and Koenig, 1976; Sonis, 1994; Natrass, Ireland and Sherriff, 1998). Frictional binding and the swing effect are main problems associated with sliding mechanics. Overcomement of frictional mechanics can sometimes alternatively be overcome by frictionless mechanics which includes a loop as the source of the applied force (Frank and Nikolai, 1980).

Frictionless systems fail to produce better results in practice because of complexity of loop forming and presence of unknown factors. (Ziegler and Ingervall, 1989; Siatkowski, 1997)

While providing absolute anchorage, these devices are used for specific periods of time and rely only on mechanical retention with the surrounding bone. (Sivamurthy and Sundari, 2016)

Several attempts have been made to determine effectiveness with respect of tooth movement, as static and dynamic approaches. The initial period of treatment is also a time of acclimatization for patients because they

experience restrictions concerning the food that can be masticated with a bonded appliance. (Samantha et al., 2017) Space closure without knowledge can result in failure to achieve an ideal occlusion. The fundamentals of orthodontics is that teeth move through the alveolar bone when adequate forces are delivered. Various local and systemic factors like age, nutrition, consumption of drugs, etc seem to affect orthodontic tooth movement. (Krishnan, Pandian and Kumar S, 2015) The side effects of maxillary dentition as an anchorage unit for protraction could lead to labio version of maxillary incisors, extrusion of maxillary molars, counter clockwise rotation of palatal plane and clockwise rotation of mandible (Vikram et al., 2017)

Biomechanical base of base clinicians to determine anchorage and treatment options , reach prognosis , specific adjustments can improve the outcomes of care. Regulation of space closure is determined by anchorage , treatment options , prognosis of various alternatives , and decision specific adjustments to improve the outcome of care.

Six goals of space closure :

- (1) differential space -closure and anchorage control
- (2) minimum patient cooperation
- (3) Axial inclination control
- (4) Control of rotations and arch width
- (5) Optimum biological response
- (6) Operator convenience (Ribeiro and Jacob, 2016)

Anchorage should be established at the beginning of treatment and its preparation is a very important part of treatment. (Burstone and Koenig, 1976) The aim of this study is to evaluate the number of extraction cases, the mechanics used in retraction for space closure whether it is friction or frictionless mechanics.

## **MATERIALS AND METHODS**

The setting of the study is in an online platform in the centre of Saveetha Dental College using the record keeping software. There is an availability of wide range of data at a given point. The selection bias of retraction due to fabrication difficulties. Choice of mechanics also depends on patient compliance.

The number of people who are examining this study are the guide and the investigator. The approval obtained from ethical approval of the university review board.

The sampling was done from a period of June 2019 to March 2020. Evaluation of casesheets that had reported to the orthodontic clinic , the identification of extraction protocol and the choice of retraction mechanism. The sample size required is of 400 with using G power analysis assuming power at 90. (Rhee, Chun and Row, 2001)

To minimize the possible non-response bias the treatment decision at the start of the retraction phase was alone taken into account.

The tabulation of records was done in excel sheets with the variables being friction and frictionless retraction mechanics.

## RESULTS AND DISCUSSION

Evaluation of 1279 case sheets revealed that 428 patients had undergone therapeutic extraction for the purpose of orthodontic treatment. More female patients have undergone orthodontic treatment and likewise extraction mechanics.

The retraction mechanics most frequently done by the residents are friction mechanics - by the use of NiTi coil spring or E chain taking support either from molars or mini-implants to a retraction hook. Friction mechanics were adopted in 316 cases.

Frictionless mechanics are usually done by loop formation in 55 cases. There were various loops that the residents and guides had used, attempts to form new loops were also noted. In 56 cases the type of retraction mechanics could not be applicable to either mechanics.

The orthodontist should have a thorough knowledge about the force applied by the auxiliaries, in order to predict the outcome of the treatment. Through the careful usage of this force delivering auxiliaries, the movement of teeth can be controlled and the desired tooth movement can be achieved. (Dinesh et al., 2013) There are various schools of thoughts concerning the merits of friction and frictionless mechanics. (Quinn and Yoshikawa, 1985) The ideology of optimal force as minimum force results in maximum rate of tooth, tooth movement within limits of biological responses. In previous studies conducted that the rate of tooth movement increases with increasing the force up to a point, increases force in an appropriate increase in tooth movement (Quinn and Yoshikawa, 1985) To overcome the side effects of conventional analysis, establishment of ratios to assess the skeletal, dental and soft tissue relationships by comparing one segment of the craniofacial complex with other would be more appropriate. This will be useful to ascertain discrepancy of one particular skeletal component when compared to another without having to refer to a population standard. (Felicita, Chandrasekar and Shanthasundari, 2012) Light forces are delivered over a long time with definitive results as compared to the not consistent force delivery. (Felicita, 2018)

Optimum orthodontic force is that which produces most desirable biologic response with minimum tissue damage and results in rapid tooth movement. (Nikolai, 1975) The malocclusion is managed by extraction and space closure. (Rubika, Felicita and Sivambiga, 2015) It is to establish proper facial soft esthetics. (Pandian, Krishnan and Kumar, 2018) Tooth movement happens by bracket bonded onto enamel of teeth. (Ramesh Kumar et al., 2011)

The force not of retraction not passing through the centre of resistance an additional moment when rotation not necessary. Antirotation bends can be placed to prevent rotation during canine retraction by loops. (Yamaguchi et al., 1996; Kojima, Kawamura and Fukui, 2012).

One of the most common problems after space closure is incisor torque. Round wire or undersized wire can lead to lingual tipping of crown. Methods to correct undesired incisor, such as twisting the wire or using special springs. (Felicita, 2017a) Reusing has been the subject of debate within the profession following the regulations concerning the use and reuse of medical devices. (Kamisetty et al., 2015) There is an evidence that the genetic determinants play a role. (Viswanath et al., 2015) The optimum force required for en-masse intrusion and retraction can be calculated by using simple mathematical formulae. (Felicita, 2017b)

A full size wire should be used to provide less play between wire and bracket. High torque activation small amount of activation and frequent wire adjustment. Impossible to determine the amount of third order bend

providing enough moment to force ratio. Adjacent bracket side effects can receive equal and opposite movements.

The incisor will receive the desired moment while undesired vertical force should be avoided using stabilizing archwire. Bracket has the advantage of easy visualization and measurement of torsional activation. (Isaacson and Rebellato, 1995)

There is no such thing as the best method of space closure. Some situations require some techniques over others and orthodontists might have their own preferences.

## **CONCLUSION**

Friction mechanics was most commonly chosen to close space in this space. Friction mechanics were superior to frictionless mechanics for rotational control and arch dimensional maintenance. Frictionless mechanics are more effective than friction mechanics at reducing tipping and extrusion. This study wouldn't establish superiority of the two methods.

## **LIMITATIONS OF THIS STUDY**

In certain cases retraction mechanics are not specified. Unequal sample size available in male and female orthodontic patients. Not all friction mechanics used the same elastic materials. Variation in efficacy and ease of formability in various loop mechanics.

## **FUTURE SCOPE**

Well designed RCT evaluate the friction and frictionless mechanics to assess the anchorage demand, necessary and differential moments, biological effects, in relevance of mini-implants, hygiene, operator time and skill. Differential force delivery systems and versatility in various bracket slots.

## **AUTHOR CONTRIBUTIONS**

All authors have equally contributed for the conduction of this research, writing and formatting of this manuscript.

## **CONFLICT OF INTEREST**

The authors declare that there has not been any conflict of interest.

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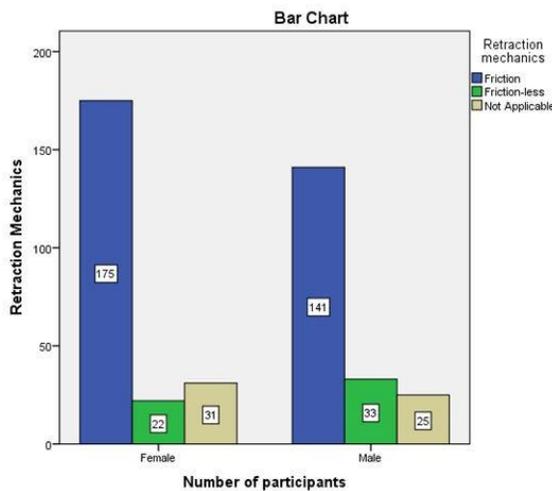


Figure 1: Bar graph showing the comparison between the gender of the cases treated with extraction and retraction mechanics. X axis represents the gender and Y axis represents the type of retraction mechanics of which Blue color represents friction mechanics, green color represents the frictionless mechanics whereas grey color represents that mechanics that can't be summed up to any one of the mechanics. The inference from this study is that in both the male and female patients(316) retraction was most commonly done using friction mechanics. Pearson Chi square value is 4.55 and p value is 0.103 (>0.05) , hence the results of this study is not significant.

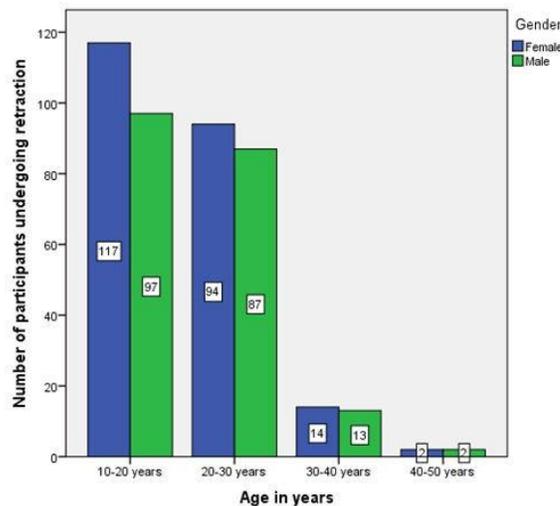


Figure 2 : Bar graph representing the comparison between age and gender amongst the orthodontic cases that needed retraction. X axis represents the age of the patient where as Y axis represents the gender of which Blue color represents females and green color represents males. The inference from this chart is that majority of female patients in the age group of 17- 25 years approached needing to be treated for orthodontic purposes. Pearson Chi square value is 4.553 and p value is 0.103 (>0.05) , hence the results of this study is not significant.