Soft tissue profile changes of patients treated with two different passive self ligating systems

Anjali Anna Thomas

Post Graduate, Department of Orthodontics and Dentofacial Orthopaedics Saveetha Dental College and Hospital, Saveetha Institute Of Medical And Technical Sciences, Saveetha University, 162, Poonamallee high road, Chennai – 600077
Corresponding author email: dranjali85400@gmail.com

Harish Babu

Professor, Department of Orthodontics and Dentofacial Orthopaedics, Saveetha Dental College and Hospital, Saveetha Institute Of Medical And Technical Sciences, Chennai – 600077
Email: harish.ortho@gmail.com

Abstract---Introduction: Orthodontists have been quite concerned about how orthodontic therapy, whether it involves tooth extraction or not, may affect the facial profile. The aim of the study was to compare the soft tissue profile alterations in patients with Class I malocclusions who underwent non extraction treatment protocol with AO and Damon passive self ligating bracket systems. Materials and methodology: Patients treated with passive self ligating brackets either Damon Q or AO were included in the study. This in vivo study consisted of 2 groups; each group had 10 subjects. Group 1: Damon passive self-ligating bracket, Group 2: AO passive self-ligating bracket. Data was compiled from lateral cephalometric radiographs taken before and after orthodontic treatment. Five linear and five angular soft tissue parameters were used in the study. An independent t test was performed to determine the mean difference between linear and angular soft tissue parameters in the AO and Damon passive self ligating groups. Results: The results of the independent t test showed that there was no statistical significant difference in any of the linear or angular parameters between the two groups(p<0.05). Conclusion: There is no statistical significant differences in the soft tissue parameters assessed to compare the two passive self ligating bracket systems. So non extraction treatment with self ligating brackets are advantageous in case of class I patients.

Keywords---passive self ligating brackets, Damon Q bracket, AO bracket, soft tissue profile, lateral cephalogram.

Introduction

Patients' appearance and function can both be enhanced through orthodontic therapy.For orthodontists, knowing how to evaluate face profiles and facial balance is a constant effort.The relationship between the incisors and the lips has been the subject of numerous research looking at how orthodontic treatment affects the facial profile, the aim was to correlate changes in incisor position to changes in lip projection(1,2).The interaction of the skeletal structures and the soft tissues that cover them is still a subject of some debate. According to Angle (1907), if the teeth are placed in accordance with predetermined norms, the soft tissue will shape harmoniously.

The examination of facial profiles is a continuous learning process that has been thoroughly researched(3). According to Allgayer et al. soft tissue and orthodontics continue to be a very important area of study(4). Orthodontists are frequently questioned about potential profile alterations brought on by various treatment options.In modern orthodontics, the facial appearance of patients after treatment is complete is emphasized since it is crucial to determining whether the therapy was successful(5). Patients frequently focus more on the esthetic dental and facial results of orthodontic treatment.It's crucial to comprehend how orthodontic therapy can affect the soft tissue profile in order to appropriately evaluate any patient's looks. This is because one of the main reasons individuals seek orthodontic treatment is to improve their facial attractiveness. Patients' soft tissues may be affected by orthodontic therapy, but the extent of such effects is still up for debate.

Over the past two decades, a very notable trend toward greater non-extraction treatment has been observed(6). Patients choose non-extraction treatment because it doesn't require the removal of any teeth for medical reasons. One of the modern orthodontic treatments, the passive self ligating system, is promoted as a method that virtually all cases may be handled without the need for any extractions.The self-ligating orthodontic method is recognised for rarely necessitating tooth extractions. Therefore, there hasn't been any research on how non extraction treatment affects patients' soft tissue profiles while employing the self-ligating device. It's critical to comprehend how orthodontic therapy using a non-extraction procedure may affect a patient's soft tissue profile. This study compared the soft tissue profile alterations in patients with Class I malocclusions who underwent non extraction treatment protocol with AO and Damon passive self ligating bracket systems.

Materials and Methods

The study was conducted in subjects who were undergoing fixed orthodontic treatment in the Department of Orthodontics. Patients treated with Passive self ligating brackets either Damon Q or AO were included in the study. Age of the patients ranged from 14 to 30 years. Patients with Cleft and craniofacial syndromes were excluded. All patients included in the study had good oral hygiene during treatment and no systemic health conditions contributing to quantitative or qualitative alteration of salivary secretion.

This in vivo study consisted of 2 groups; each group had 10 subjects. Group 1: Damon passive self-ligating bracket, Group 2: AO passive self-ligating bracket.Tanzo archwires were used along with AO passive self ligating brackets, whereas the Damon archwires were used with Damon passive self ligating brackets. 0.013,14*25 ,18*25 CuNiTi were the initial aligning archwires chosen from the Tanzo and Damon CuNiTi wires for the study.

Data was compiled from lateral cephalometric radiographs taken with the patient upright, the teeth in occlusion, and the lips relaxed before and after orthodontic treatment. The patients were instructed to close with their molars while relaxing their lips. On the same cephalometric unit, all cephalograms were produced.The linear and angular measurements used in the study are given in table 1.The pretreatment value was subtracted from the posttreatment value to get the values reported in this study.

Linear Parameters(mm)	Angular parameters(°)
Sulcus superior - E-line	Nasolabial angle
Sulcus inferior - E-line	Labiomental angle
Sn-Pog' - labrale superior	H angle
Sn-Pog' - labrale inferior	Z angle

Table 1. Linear and angular cephalometric parameters used in the study to analyze the soft tissue profile changes

Results

A statistical analysis was performed using IBM SPSS software version 23.0. Normality test was done with Shapiro-Wilk test and the data was found to be normally distributed. An independent t test was performed to determine the mean difference between linear and angular soft tissue parameters in the AO and Damon passive self ligating groups(table 2).The results of the current study showed that there was no statistical significant difference in any of the parameters between the two groups($p < 0.05$).

Parameters	AO	Damon	P value
Sulcus superior - E-line	0.47 ± 1.6	0.57 ± 1.4	0.961
Sulcus inferior - E-line	0.76 ±1.4	0.86 ± 1.7	0.783
Sn-Pog' - labrale superior	1 ± 1.9	0.95 ± 1.5	0.163
Sn-Pog' - labrale inferior	1.1 ± 1.4	1.03 ± 1.7	0.652
Nasolabial angle	0.47 ± 24.7	0.56 ± 24.5	0.345

Labiomental angle	0.05 ± 11.38	0.08 ± 10.7	0.562
H angle	0.1 ± 2.9	0.14 ± 2.4	0.336
Z angle	0.09 ± 4.7	0.1 ± 3.5	0.481

Table 2. Table shows the results of the independent t test done to determine the mean difference between linear and angular soft tissue parameters in the AO and Damon passive self ligating groups

Discussion

Since its inception, orthodontic practice has placed a high priority on the analysis of the aesthetics and harmony of the facial profile.The main purpose of the present study was to compare the effects of non extraction treatment on the facial profile between a sample of patients treated with AO and Damon passive self ligating bracket systems. The measurement of the lips relative to Ricketts' E-line(7) and Burstone's subnasale–soft tissue pogonion (Sn-Pog) line(8) focuses attention on the relationship of nose, lips, and chin.The study found that the soft tissue parameters remained the same for both the treatment groups and that all the measurements at the completion of treatment fell within the acceptable ranges, as indicated by Holdaway (1983).

According to Boley et al., an orthodontist's first consideration should be the impact orthodontic treatment may have on the patient's face(9). The majority of orthodontists are certain that orthodontic therapy affects the soft tissue profile, however there is disagreement over how precisely the soft tissue reacts when teeth are moved into different locations(10,11).There are conflicting views on whether there is a direct connection between the soft tissue reaction and the treatment-induced incisor alterations(12–14). Others discover that there are significant individual variances and that this reaction depends on a variety of variables, including age, sex, type of treatment, degree of incisor retraction, lip strain, and lip shape(1,15,16).

According to Luppanapornlarp and Johnston, when four premolars are extracted together with orthodontic therapy, the facial profile often flattens by 2-3 millimeters in comparison to non-extraction cases. Another illustration of this is the widespread notion that the dished-in of the facial profile that takes place when premolars are extracted for orthodontic treatment causes the face to prematurely age(10,17).The following findings were established in the study by Konstantonis when Class I cases that received extraction or non-extraction treatment were compared: The extraction group had bigger upper lips, more retracted lips, and a more acute nasolabial angle at the end of their orthodontic therapy. After treatment started, the nonextraction group displayed considerable upper lip retraction and lower lip protraction(18,19).The results of the study by Konstantonis disagrees with that of Khan and Fida as well as Allgayer et al.

Self-ligating brackets have received a lot of attention for their alleged abilities to speed up treatment, increase efficiency, and, in the majority of cases, prevent the

need for tooth extraction. These brackets are only superior to traditional brackets in terms of controlling mandibular incisor proclination, according to evidence-based study. So non extraction treatment with self ligating brackets are advantageous in case of class I patients(2,20).

From the results of this research it may be beneficial to do similar follow up studies with a bigger sample of patients.A more thorough investigation with the ability to compare individual cephalometric values between genders will be possible thanks to the larger sample size. To ensure that all of the patients still have the same growth potential and can be followed up as a group in future studies, it would also be great if the patients could be in the same age group.

Conclusion

There is no statistical significant differences in the soft tissue parameters assessed to compare the two passive self ligating bracket systems. Finally, it is very challenging to quantify with numbers alone the overall aesthetic effects of these sizable changes on the facial soft tissue profile. To some extent, it is a matter of subjective opinion, variable in non extreme cases from person to person and even according to modes, races, and social groups.

References

1. Hershey HG, Garland Hershey H. Incisor tooth retraction and subsequent profile change in postadolescent female patients [Internet]. Vol. 61, American Journal of Orthodontics. 1972. p. 45–54. Available from: http://dx.doi.org/10.1016/0002-9416(72)90175-3
2. Yogosawa F. Predicting soft tissue profile changes concurrent with orthodontic treatment. Angle Orthod. 1990 Autumn;60(3):199–206.
3. James RD. A comparative study of facial profiles in extraction and nonextraction treatment. Am J Orthod Dentofacial Orthop. 1998 Sep;114(3):265–76.
4. Allgayer S, de Lima EMS, Mezomo MB. Influence of premolar extractions on the facial profile evaluated by the Holdaway analysis [Internet]. Vol. 26, Revista Odonto Ciência (Online). 2011. p. 22–9. Available from: http://dx.doi.org/10.1590/s1980-65232011000100007
5. Peck S, Peck L, Kataja M. Skeletal asymmetry in esthetically pleasing faces. Angle Orthod. 1991 Spring;61(1):43–8.
6. Rinchuse DJ, Busch LS, DiBagno D, Cozzani M. Extraction treatment, part 1: the extraction vs. nonextraction debate. J Clin Orthod. 2014 Dec;48(12):753–60.
7. Ricketts RM. Esthetics, environment, and the law of lip relation. Am J Orthod. 1968 Apr;54(4):272–89.
8. Burstone CJ. Lip posture and its significance in treatment planning. Am J Orthod. 1967 Apr;53(4):262–84.
9. Boley JC, Pontier JP, Smith S, Fulbright M. Facial changes in extraction and nonextraction patients. Angle Orthod. 1998 Dec;68(6):539–46.
10. Saelens NA, De Smit AA. Therapeutic changes in extraction versus non-extraction orthodontic treatment. Eur J Orthod. 1998 Jun;20(3):225–36.
11. Holdaway RA. A soft-tissue cephalometric analysis and its use in orthodontic

treatment planning. Part II. Am J Orthod. 1984 Apr;85(4):279–93.

12. Anderson JP, Joondeph DR, Turpin DL. A cephalometric study of profile changes in orthodontically treated cases ten years out of retention. Angle Orthod. 1973 Jul;43(3):324–36.

13. Komolpis RP. Cephalometric Comparison Between First Premolar and Seccond Premolar Extraction: A Thesis Submitted in Partial Fulfillment ... for the Degree of Master of Science in Orthodontics .. 1998. 200 p.

14. Phulari B. An Atlas on Cephalometric Landmarks. JP Medical Ltd; 2013. 230 p.

15. Branoff RS. A roentgenographic cephalometric study of changes in soft tissue profile related to orthodontic treatment. Am J Orthod. 1971 Sep;60(3):305–6.

16. Wisth PJ. Soft Tissue Response to Upper Incisor Retraction in Boys [Internet]. Vol. 1, British Journal of Orthodontics. 1974. p. 199–204. Available from: http://dx.doi.org/10.1179/bjo.1.5.199

17. Khan M, Fida M. Soft tissue profile response in extraction versus non-extraction orthodontic treatment. J Coll Physicians Surg Pak. 2010 Jul;20(7):454–9.

18. Trevisi H, Trevisi Zanelato RC. State-of-the-Art Orthodontics E-Book: Self-Ligating Appliances, Miniscrews and Second Molars Extraction. Elsevier Health Sciences; 2011. 240 p.

19. Garner LD. Soft-tissue changes concurrent with orthodontic tooth movement. Am J Orthod. 1974 Oct;66(4):367–77.

20. Southard TE, Marshall SD, Bonner LL. Orthodontics in the Vertical Dimension: A Case-Based Review. John Wiley & Sons; 2015. 544 p.

21. Fitra, Legowo, D., Utomo, B., Suroto, N. S., Parenrengi, M. A., & Al-Fauzi, A. (2021). Intracranial foreign body granuloma caused by oxidized cellulose polymer and etherified sodium carboxymethyl cellulose: an experimental study with orictolagus cuniculus rabbits. *International Journal of Health & Medical Sciences*, *4*(2), 267-272. https://doi.org/10.31295/ijhms.v4n2.1741

22. Widana, I.K., Sumetri, N.W., Sutapa, I.K., Suryasa, W. (2021). Anthropometric measures for better cardiovascular and musculoskeletal health. *Computer Applications in Engineering Education*, *29*(3), 550–561. https://doi.org/10.1002/cae.22202