

Case Report

Combining different treatment philosophies and techniques to reach the desired treatment goal using butterfly system: Customizing orthodontic treatment

ABSTRACT

This case report describes the orthodontic treatment of an 18-year-old male patient who presented with straight profile, tongue thrust habit, proclined upper incisors, generalized spacing in the upper and lower arches, Katz Class II premolar relation unilaterally, and Class II canine relation unilaterally with increased overjet and overbite. A butterfly system was used for the treatment combined with frictionless biomechanics in the initial stage of the treatment followed by continuous arch mechanics in the later part of the treatment. A tongued crib was used to stop the tongue thrust habit along with one elastic swallow exercise. Micro-implant anchorage was used unilaterally in the upper arch for retraction of the entire segment and correction of the unilateral Class II canine and premolar relationship. To avoid a dish-in profile, a nonextraction treatment was executed. Final correction of distally tipped canines was achieved using conventional Begg's uprighting auxiliaries in the vertical slots of the butterfly system in the finishing stage. The case was finished using bite-settling elastics. The total treatment time was 1 year and 2 months. Esthetic and functional goals were achieved satisfactorily with proper selection of biomechanics.

Keywords: Butterfly system, micro-implant, sectional mechanics, tongue crib, vertical slots

INTRODUCTION

Orthodontic practitioners and beginners in orthodontics often have many questions in mind: which philosophy to use? What bracket prescription is appropriate for a particular case? When to use a straight archwire and segmented mechanics? Is it appropriate to combine the various treatment philosophies and techniques to reach the final treatment outcome?

Making an accurate diagnosis of the changes observed in patients is of utmost importance. It is essential that an effective treatment plan is executed in order to treat the malocclusion within a shorter period of time, with as little injuries to protective and supporting tissues as possible. Thus, recommending the most appropriate treatment for a particular malocclusion, regardless of the type of bracket prescription, technique, or slot, is what really matters. For this reason, knowing the principles on which each technique is based on, as well as its limitations, is essential.^[1]

The preadjusted edge-wise straight wire appliance was introduced in the 1970s.^[2] Since then, there have been many suggested modifications to the bracket prescriptions in terms of torque and tiP values, often differing by only a few degrees. Over the years, clinicians have considered how bracket design can help achieve these objectives.^[3] Andrews made extensive measurements on untreated excellent occlusions.^[4] Molar anchorage loss has been shown to occur during the early stages of alignment with preadjusted appliances.^[5,6] Low friction is most advantageous during initial alignment, whereas friction is needed for control in finishing and torque

DHAVAL RANJITBHAI LEKHADIA, GAUTHAM HEGDE¹

Department of Orthodontics, Tristar Hospital, Surat, Gujarat,

¹Department of Orthodontics, A. J. Institute of Dental Sciences, Mangalore, Karnataka, India

Address for correspondence: Dr. Dhaval Ranjitbhai Lekhadia, 20, Prajeet Row House, Umra, Surat - 395 007, Gujarat, India. E-mail: drdhavalekhadia@gmail.com

Access this article online	
Website: www.orthodrehab.org	Quick Response Code 
DOI: 10.4103/ijor.ijor_14_17	

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Lekhadia DR, Hegde G. Combining different treatment philosophies and techniques to reach the desired treatment goal using butterfly system: Customizing orthodontic treatment. *Int J Orthod Rehabil* 2019;10:31-41.

expression. If the friction level of a bracket could be adjusted for different treatment stages, orthodontic tooth movement would be more efficient.^[7] In a conventional preadjusted appliance, with the buccal tube positioned parallel to the line of buccal cusps, the passive archwire will lie below the anterior brackets because of the curve of Spee. When the anterior teeth are engaged with a continuous archwire, a counterclockwise tip forward moment will be created on the molar resulting in anchor loss while the anterior teeth are extruded.^[4] This bite-deepening effect can be avoided by using a sectional archwire in the initial stage of treatment,^[8] and micro-implants can be used to reinforce the anchorage as they can be more efficient than traditional anchorage methods besides making treatments more predictable.^[9] Therefore, combining different treatment techniques and philosophies with a desired bracket system can bring about superior treatment results.

CASE REPORT

The present case report showcases the treatment results achieved by combining the different treatment philosophies and techniques using butterfly system.^[10]

Diagnosis and treatment plan

An 18-year-old male patient in the permanent dentition presented with the chief complaint of forwardly placed anterior teeth with spacing in between them. Upon extraoral examination, the patient had a straight profile, horizontal growth pattern, reduced nasolabial angle, upper midline shifted to the right by 1 mm, competent lips, and nonconsonant smile [Figures 1-6]. He was also diagnosed with tongue thrust habit. Upon intraoral examination, he had proclined anteriors, generalized spacing in the upper and lower arches, distally tipped canines in the upper and lower arches, increased curve of Spee, Class I molar relation bilaterally, Katz Class II premolar relation and Class II canine

relation on the left side, and crossbite in relation to 15; the overjet was 7 mm and overbite was 40% [Figures 7-11]. The findings were confirmed with study models [Figures 12-16] and pretreatment radiographs [Figures 17 and 18]. Cephalometric analysis indicated a Class I skeletal pattern, horizontal growth pattern, reduced lower anterior facial height, and proclined upper and lower incisors [Table 1].

Following a comprehensive clinical and database analysis, we devised a treatment plan involving nonextraction approach leaving the incisors mildly proclined to prevent a dish-in profile and to have an adequate lip support.

Table 1: Cephalometric values

	Pretreatment	Posttreatment
SNA (°)	85	85
SNB (°)	83	83
ANB (°)	2	2
Angle of convexity (°)	-2	-2
Wits AO/BO (mm)	0	0
FMA (°)	17	19
SN-GO-GN (°)	16	18
Y AXIS (°)	58	58
Jarabak's ratio (%)	73.3	72.32
LAFH (mm)	58	61
Gonial angle (°)	121	124
Base plane angle (°)	15	17
U1 to NA angle (°)	47	37
U1 to NA linear (mm)	11	6
U1 to FH (°)	135	127
U1 to SN (°)	130	123
L1 to NB angle (°)	27	27
L1 to NB linear (mm)	5	4
Interincisal angle (°)	104	114
Nasolabial angle (°)	92	110
"S" line to upper lip (mm)	0	-2
"S" line to lower lip (mm)	0	-2
Lower lip to E-line (mm)	-2	-4



Figure 1: Pretreatment extraoral frontal view



Figure 2: Pretreatment extraoral frontal smile view



Figure 3: Pretreatment extraoral oblique view



Figure 4: Pretreatment extraoral oblique smile view



Figure 5: Pretreatment extraoral right lateral profile view

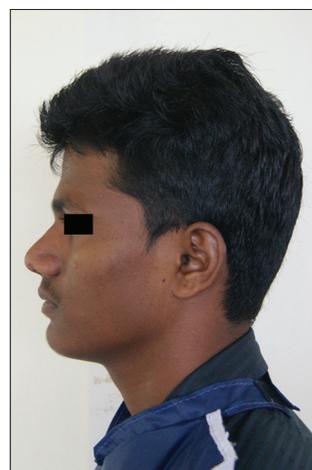


Figure 6: Pretreatment extraoral left lateral profile view



Figure 7: Pretreatment intraoral right lateral view



Figure 8: Pretreatment intraoral frontal view

Treatment progress

A butterfly system with 0.022" slot was used. Initial leveling and alignment was carried out in the upper and lower arches using sectional 0.016" nickel titanium (NiTi) wire from the second molar to canine as posterior section and incisors

in the anterior section [Figures 19-23]. This was done to prevent the bite-deepening effect of continuous archwire and prevent strain on the anchorage. Myofunctional exercise was advised for the correction of tongue thrust habit. After the correction of distal crown tip of canines, a continuous 0.016"



Figure 9: Pretreatment intraoral left lateral view



Figure 10: Pretreatment intraoral maxillary occlusal view



Figure 11: Pretreatment intraoral mandibular occlusal view



Figure 12: Pretreatment study model right lateral view

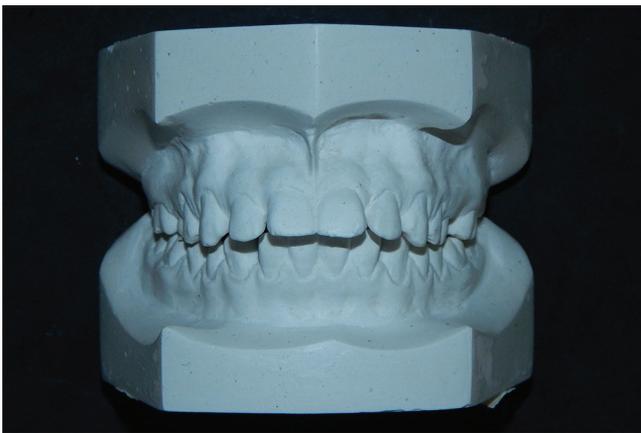


Figure 13: Pretreatment study model frontal view



Figure 14: Pretreatment study model left lateral view

heat-activated NiTi wire was placed in the upper and lower arches. This was followed by $0.019 \times 0.025''$ heat-activated NiTi wire.

A miniscrew was placed in the apical portion, between the 2nd premolar and 1st molar, near the Cres of posterior segment on Class II side [Figure 24]. This assisted us in achieving a

Katz Class I premolar and a Class I canine relation without disturbing the molars.

Space closure was done on $0.019 \times 0.025''$ stainless steel wires in the upper and lower arches using NiTi closed coil springs. Direct anchorage from the implants was used on the Class II side. A fixed tongue crib was placed because of



Figure 15: Pretreatment study model maxillary occlusal view



Figure 16: Pretreatment study model mandibular occlusal view



Figure 17: Pretreatment lateral cephalogram



Figure 18: Pretreatment orthopantomogram



Figure 19: Initial leveling and alignment with sectional archwire right lateral view



Figure 20: Initial leveling and alignment with sectional archwire frontal view

the persistence of the tongue thrust habit [Figure 25]. An openbite was observed at the end of space closure which was because of the tongue thrust habit. This was corrected using box elastics in the anteriors [Figure 26] and tongue crib. Since the patient did not have enough incisor exposure upon social smile, extrusion of anteriors by box elastics helped achieve a favorable incisor exposure.

At the end of space closure, conventional Begg's uprighting springs were used on the upper and lower canines to achieve final correction of the canine tip [Figures 27-29]. This ensures stability of the treated case. Finishing was done using triangular elastics with hooks in vertical slots on a light 0.016" NiTi wire in the upper and lower arches.

DISCUSSION

Making an accurate diagnosis of the changes observed in patients and formulating an appropriate treatment plan is



Figure 21: Initial leveling and alignment with sectional archwire left lateral view

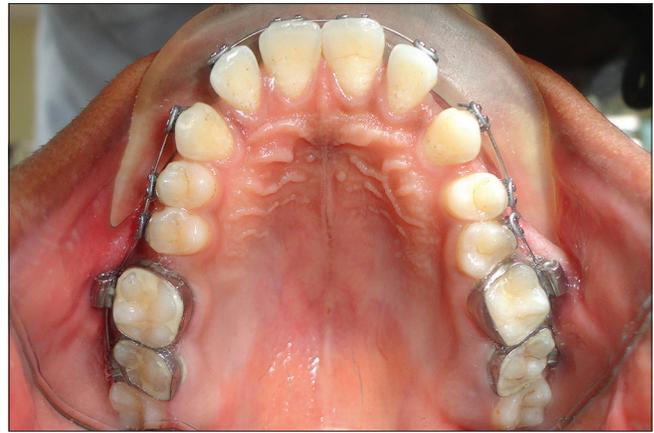


Figure 22: Initial leveling and alignment with sectional archwire maxillary occlusal view



Figure 23: Initial leveling and alignment with sectional archwire mandibular occlusal view



Figure 24: Micro-implant on Class II side in maxilla



Figure 25: Fixed tongue crib



Figure 26: Box elastics

the key to successful orthodontic treatment. A preference to butterfly system^[10] was given to treat the present case because it has versatile vertical slots which could be used to upright the canines in the finishing stage of treatment; +3° mesial crown tip which helps to reduce marginal ridge discrepancy, especially on the Class II side; progressive

mandibular anterior tip which in this case would help tent posting of the lower incisors which in turn would increase the stability of the end results; and preventive mandibular anterior torque of -5° which helps prevent lower anterior flaring and finishing with an adequate overjet without having Bolton's discrepancy. An initial continuous archwire was not used because, unlike sectional mechanics, continuous

archwires with distally tipped canine crowns tend to deepen the bite and put more strain on the anchorage.^[4] Training of correct swallow and posture of the tongue was done by myofunctional exercise^[11] where the patient was guided regarding the correct posture of the tongue during swallowing by various exercises. The patient was asked to place the tip of the tongue in the rugae areas for 5 min and is asked to swallow and repeat the same with an increased

frequency. An micro-implant was placed on the Class II side because there was spacing mesial to the molar, leaving a weak anchorage value. Maximum anchorage was required on the left side as the entire segment had to be retracted in a functional Class I occlusion. The position of miniscrew was preferred in the apical portion, between the 2nd premolar and 1st molar, near the Cres of posterior segment [Figure 24]. Use of miniscrew for the reinforcement of orthodontic anchorage



Figure 27: Traditional Begg's uprighting springs – right lateral view



Figure 28: Traditional Begg's uprighting springs – left lateral view



Figure 29: Traditional Begg's uprighting springs – frontal view



Figure 30: Posttreatment intraoral right lateral view



Figure 31: Posttreatment intraoral frontal view



Figure 32: Posttreatment intraoral left lateral view

has become increasingly popular in recent years, especially for the space closure in maximum anchorage cases.^[12] At the end of space closure, traditional Begg's uprighting springs were used in the vertical slots of canine brackets as described by Bowman and Carano.^[10]

A Class I molar relationship was maintained throughout the treatment, and Katz Class II premolar relation was achieved bilaterally along with bilateral Class I canine relation. Overjet was 2 mm and overbite was 2 mm, and the midlines were coincident at the end of the treatment [Figures 30-34]. An



Figure 33: Posttreatment intraoral maxillary occlusal view



Figure 34: Posttreatment intraoral mandibular occlusal view



Figure 35: Posttreatment extraoral frontal view



Figure 36: Posttreatment extraoral frontal smile view



Figure 37: Posttreatment extraoral oblique view



Figure 38: Posttreatment extraoral oblique smile view

esthetic, stable, and functional occlusion was achieved at the end of the treatment. Furthermore, a consonant smile arc and pleasing soft-tissue profile were achieved at the end of the treatment [Figures 35-40].

Superimposition of pre- and post-lateral cephalogram reveals that the maxillary incisors were left with enough proclination to provide lip support. The mandibular incisors were finished with adequate tip and torque and mild proclination [Figure 41]. Postoperative orthopantomogram revealed parallel roots without any significant root resorption [Figure 42], and postoperative lateral cephalogram revealed adequate lip support and pleasing profile at the end of the treatment [Figure 43]. The findings were confirmed from posttreatment study models [Figures 44-48].



Figure 39: Posttreatment extraoral right lateral profile view

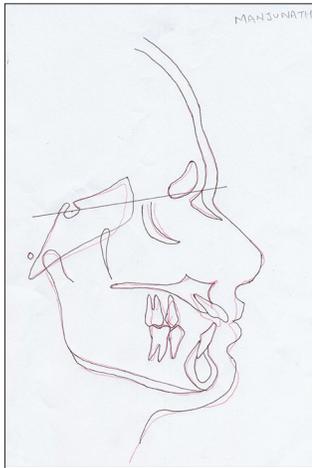


Figure 41: Pre- and post-lateral cephalogram superimposition



Figure 40: Posttreatment extraoral left lateral profile view



Figure 42: Posttreatment orthopantomogram



Figure 43: Posttreatment lateral cephalogram



Figure 44: Posttreatment study model right lateral view



Figure 45: Posttreatment study model frontal view



Figure 46: Posttreatment study model left lateral view



Figure 47: Posttreatment study model maxillary occlusal view



Figure 48: Posttreatment study model mandibular occlusal view

Clinical significance

Use of different techniques in a single case after reaching a proper diagnosis proves to be an efficient treatment mechanism. Unlike the traditional approach of treating all the cases with an MBT or Roth prescription and a continuous archwire mechanism, using a different system and combining and customizing the treatment methods is the need of the hour. The present case report is an evidence of such a method of treating each case differently based on its diagnosis and combining different techniques to suit the demands of a particular malocclusion.

CONCLUSION

A careful combination of philosophy, bracket prescription, biomechanics, anchorage reinforcements, and finishing auxiliaries can help us to reach the desired treatment outcome. Each malocclusion type requires customizing of treatment method and selection of an appropriate bracket prescription from the pool of bracket systems available. A combination of butterfly system with sectional mechanics in the initial stage and continuous wire in the later stage, use of micro-implant where necessary, and use of traditional Begg's

uprighting auxiliaries in the vertical slot of a preadjusted edgewise appliance have proved to be effective in the present case report.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Caldas SG, Ribeiro AA, Simplicio H, Machado AW. Segmented arch or continuous arch technique? A rational approach. *Dental Press J Orthod* 2014;19:126-41.

2. Thickett E, Taylor NG, Hodge T. Choosing a pre-adjusted orthodontic appliance prescription for anterior teeth. *J Orthod* 2007;34:95-100.
3. Andrews LF. *Straight Wire, the Concept and Appliance*. San Diego: L. A. Wells; 1989.
4. McLaughlin RP, Bennet JC, Trevisi HJ. *Systemized Orthodontic Treatment Mechanics*. Wolfe, London: Mosby; 2001.
5. Rajesh M, Kishore M, Shetty KS. Comparison of anchorage loss following initial leveling and aligning using ROTH and MBT prescription – A clinical prospective study. *J Int Oral Health* 2014;6:16-21.
6. Su H, Han B, Li S, Na B, Ma W, Xu TM, *et al*. Factors predisposing to maxillary anchorage loss: A retrospective study of 1403 cases. *PLoS One* 2014;9:e109561.
7. Chen S, Chen G, Xu T. Clinical application of the PASS technique. *J Clin Orthod* 2015;49:508-15.
8. Orton HS, McDonald F. A simple sectional canine retraction technique using the properties of nickel titanium rectangular wire. *Eur J Orthod* 1985;7:120-6.
9. Marassi C, Marassi: Mini-implant assisted anterior retraction. *Dent Press J Orthod* 2008;13:57-74.
10. Bowman SJ, Carano A. The butterfly system. *J Clin Orthod* 2004;38:274-87.
11. Speidel TM, Isaacson RJ, Worms FW. Tongue-thrust therapy and anterior dental open-bite. A review of new facial growth data. *Am J Orthod* 1972;62:287-95.
12. Park HS, Bae SM, Kyung HM, Sung JH. Micro-implant anchorage for treatment of skeletal class I bialveolar protrusion. *J Clin Orthod* 2001;35:417-22.