ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)
IJDSIR : Dental Publication Service
Available Online at:www.ijdsir.com
Volume – 8, Issue – 1, February – 2025, Page No. : 164 - 170

Treating bimaxillary protrusion case with newly designed multiple variability (MV) loop: A Case Report

[1]Dr. Harsh Shah, [2]Dr. Gaurav Sharma, [3]Dr. Vatsal Singhvi, [4]Dr. Christina M.S., [5]Dr. Nathu Ram, [6]Dr. Aksharkumar Patel
[1-6]Vyas Dental College and Hospital, Jodhpur

Corresponding Author: Dr. Harsh Shah, Vyas Dental College and Hospital, Jodhpur

Citation of this Article: Dr. Harsh Shah, Dr. Gaurav Sharma, Dr. Vatsal Singhvi, Dr. Christina M.S., Dr. Nathu Ram, Dr. Aksharkumar Patel, "Treating bimaxillary protrusion case with newly designed multiple variability (MV) loop: A Case Report", IJDSIR- February – 2025, Volume – 8, Issue – 1, P. No. 164 – 170.

Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

Proclination of anterior teeth is significantly found in developing malocclusions and affecting both aesthetics, function and stomatognathic system. In bimaxillary protrusions cases or crowding cases, extraction therapy is often necessary. Orthodontic treatment is initiated with the extraction of maxillary and mandibular first premolars to relieve the protrusions or crowding and achieve a harmonious occlusion. There are two ways to retract anterior teeth during extraction space closure: friction mechanics or frictionless mechanics. This case report describes 25 year old female patient with the class III skeletal and class I dental malocclusion with anterior proclination. Accordingly, the innovative treatment plan for the correction of anterior protrusion using multiple variability (MV) loops and completion of case with fixed orthodontic treatment using MBT 0.022" slot prescription to obtain a stable occlusal relationship, overjet and overbite. The case should be finished with a stable occlusion between the maxillary and mandibular arches with adequate width of attached gingiva.

Keywords: frictionless mechanics, multiple variability (MV) loop, therapeutic premolar extraction, bimaxillary protrusion.

Introduction

Space closure is a vital component of orthodontic treatment. The severity of the malocclusion, either the existing space or additional space created by the extraction of some specific teeth such as premolars that can be used to treat a malocclusion[1]. Premolar extractions are widely used to treat the patients who have severe crowding, proclination in both jaws, convex facial profiles, and significant cephalometric discrepancy[2]. In orthodontics, space closure is one of the most important procedures to perform. To minimize unfavorable side effects, a proper understanding of biomechanics is necessary[1]. There are 2 types of mechanics that used for orthodontic tooth movement during space closure: sliding / frictional mechanics and loop / frictionless mechanics[3].

Frictionless mechanics provides required M/F ratio in three dimensions and as no force is lost due to friction

they are more predictable and versatile[4]. One of the important benefits of frictionless mechanics is that teeth receive a controlled force system[4]. Loops consists of horizontal force system, vertical force system, alpha bend, beta bend and helical component this component improve the moment-to-force ratio and provide continuous light force[4]. A loop with a low force-to-deflection rate will produce the significant tooth movement with a relatively small amount of force. For bodily movement, a moment-to-force (M/F) ratio of 10:1 is ideal for the loop[4]. The M/F ratio can be increased by incorporating loop designs that enhance arch wire resiliency[5].

The multiple variability (MV) loop was developed by Dr. Meenakshi Tiwari and Dr. Vikrant Jadhav[3]. They recommended that using 0.019 × 0.025" titanium molybdenum alloy (TMA) wire for MV loop preparation to ensure proper utilization. This case report explains how to correct a Bimaxillary Protrusion using an MV loop[3].

Case presentation

A 25 year old female patient reported to the department of orthodontics and dentofacial orthopaedics with the chief complaint of forwardly placed upper front teeth.

1. On intraoral examination, patient had complete set of teeth, Class I molar relation on both sides, Class I canine relation on both sides, overjet of 3mm, overbite of 3mm, proclined upper incisors and lower incisors, mesiolabial rotation with 13,23,33,35,43,45, distolabial rotation with 11,12,21, mild crowding with upper and lower anteriors, upper and lower dental midline coinciding (fig.1 and 2).
2. On extra-oral examination, profile examination revealed a concave profile, acute nasolabial angle, average mentolabial sulcus, and incompetent lips (fig.3).
3. Pre- treatment records and radiographs were taken and cephalometric tracing was done (fig.4).
4. Examination of TMJ shows no history of pain or clicking while various jaw movements. The right and left both excursive movements were normal with a maximum mouth opening of 40 mm.

Figure 1: Pre-Treatment Intra Oral Photographs

Figure 2: Pre-Treatment Occlusal Photographs

Figure 3: Pre-Treatment Extra Oral Photographs

Figure 4: Pre-Treatment Radiographs

Diagnosis

Skeletal: Class III skeletal jaw base (ANB = -1°) with posteriorly placed maxilla (SNA = 71°) and posteriorly placed mandible (SNB =72°), and hyperdivergent growth pattern (FMA= 32°) (table 1).

Dental: Angle's Class I malocclusion with canine class I on both sides, proclined upper incisors and lower incisors, overjet of 3mm, overbite of 3mm, mesiolabial

rotation with 13,23,33,35,43,45, distolabial rotation with 11,12,21, mild crowding with upper and lower anteriors, upper and lower dental midline coinciding.

Soft tissue: Patient had concave profile, acute nasolabial angle, average mentolabial sulcus and incompetent lips.

History

Patient does not give any medical and dental history.

Patient gives no relevant history of habit.

Problem list

1. Retrognathic maxilla and mandible.
2. Proclined upper and lower incisors.
3. Mesiolabial rotation with 13,23,33,35,43,45.
4. Distolabial rotation with 11,12,21.
5. Mild crowding with upper and lower anteriors.
6. Incompetent lips.

Treatment objective

1. Correction of skeletal class III discrepancy.
2. Correction of upper and lower incisors axial inclination.
3. Correction of rotation with 11,12,13,21,23,33,35, 43,45.
4. Correction of crowding with upper and lower anteriors.
5. Establishment of proper overjet and overbite.
6. Establishment of proper lip seal.

Treatment plan

- Initial leveling and alignment of maxillary and mandibular arches were planned.
- Extraction of all quadrant's first premolars.
- Closure of extraction space using Multiple Variability (MV) loop with 2nd molar inclusion for anchorage.

Cephalometry analysis

Table 1:

Parameters	Normal	Pre-treatment value	Post-treatment value
SNA	(82 ± 2^0)	71^0	80^0
SNB	(80 ± 2^0)	72^0	76^0
ANB	(2 ± 2^0)	-1^0	4^0
Wits Appraisal	(0 to 1mm)	0mm	1mm
Upper Incisor to SN	(102 ± 2^0)	115^0	101^0
Upper Incisor to NA	(22^0, 4mm)	43^0, 14mm	22^0, 4mm
Lower Incisor to FH	(65^0)	42^0	52^0
IMPA	($85\text{-}95^0$)	106^0	98^0
Lower Incisor to A-Pog line	(22^0, 4mm)	45^0, 8mm	32^0, 4mm
Inter-Incisal Angle	(131^0)	97^0	120^0
FMA	($22\text{-}28^0$)	32^0	29^0
Nasolabial Angle	(102 ± 8^0)	92^0	110^0,
Mentolabial Angle	(122 ± 10^0)	129^0	120^0

Treatment progress

Bonding of maxillary and mandibular arches using an MBT 0.022" bracket slot prescription. 2nd molar were included to enhance the anchorage in both the arches. Initial leveling and alignment were performed with a suitable arch wires sequence, which includes 0.014" Nickel titanium wire, 0.016" Nickel titanium wire, 0.018" Nickel titanium wire, 0.016 × 0.022" Nickel titanium wire, 0.019 × 0.025" Nickel titanium wire, and 0.019 × 0.025" stainless steel (SS) wire in upper and lower arches. Arch wires were cinched distal to the molar to restrict further proclination of the anteriors in both arches.

0.019 × 0.025" stainless steel (SS) wire were passively placed in both upper and lower arches for 1 month. After that extraction of all first premolars and Mid-treatment records and radiographs were taken and cephalometric tracing was done (fig.5,6,7 and 8).

Figure 5: Mid-Treatment Intra Oral Photographs

Figure 6: Mid-Treatment Occlusal Photographs

Figure 7: Mid-Treatment Extra Oral Photographs

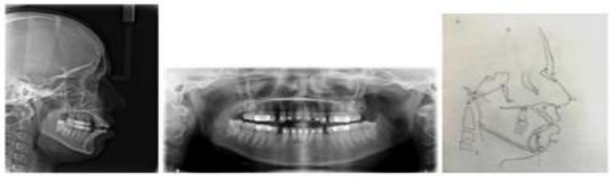

Figure 8: Mid-Treatment Radiographs

After extraction Multiple variability (MV) loop was used for space closure with en-masse retraction of anterior teeth using 0.019 × 0.025" TMA wire in both arches. The 15° of alpha bend and 20° of beta bend are placed in order to create moments on the anterior and posterior teeth. The loop was activated by 3 mm every 1 month with tight cinching back distal to molar (Fig.9).

Figure 9: Multiple Variability (MV) Loop Intra Oral Photographs

Complete space closure were achieved within 3 months. Both arches are well aligned with complete extraction space closure (Fig.10 and Fig.11). Finishing arch wire were placed in both arches for settling of the occlusion.

Figure 10: Complete Extraction Space Closure Intra Oral Photographs

Figure 11: Complete Extraction Space Closure Occlusal Photographs

Retention plan

After completion of treatment the patient was given Begg's wrap-around retainer followed by fixed lingual retention in both maxillary and mandibular arch to prevent relapse. Post- treatment records and radiographs were taken and cephalometric tracing was done (fig.12,13,14 and 15).

Figure 12: Post-Treatment Intra Oral Photographs

Figure 13: Post-Treatment Occlusal Photographs

Figure 14: Post-Treatment Extra Oral Photographs

Figure 15: Post-Treatment Radiographs

Treatment result

Comparing with the pre-treatment records and post treatment records showcased the improvement in facial profile and skeletal and dental problems were satisfied and resolved. (fig.12,13,14 and 15) Overjet and overbite of 2mm was achieved, Angles Class I molar and canine relationship was gained. Superimposition of Pre-treatment and Post-treatment lateral Cephalograms showed that the treatment goals and objective were achieved. (fig.16) The patient's prime concern regarding the aesthetics was satisfied. The patient was happy with the treatment outcome.

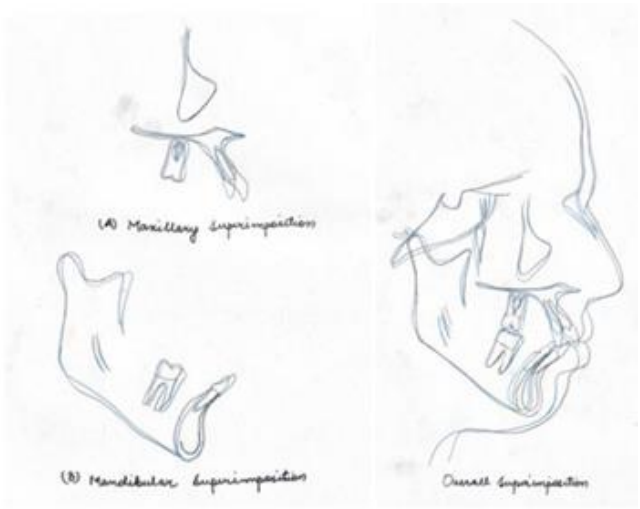

Figure 16: Superimposition of Pre and Post lateral Cephalograms

Discussion

Proclination refers to the forward inclination or tipping of teeth, typically in the anterior region, and it plays a significant role in the development of malocclusions. Proclination of teeth affects both aesthetics and function of individual[6]. Orthodontic diagnosis and treatment planning should carefully consider the proclination of anterior teeth and aiming for optimal alignment, stability, and overall harmonious occlusion[7]. To correct the proclination of anterior teeth, to achieve lip competency, and to decrease facial convexity, extraction of 1st premolars was carried out[8]. Drobocky found his study that the patients who had their first premolars extracted experienced an average reduction in lip prominence of 3.4 and 3.6 mm with Ricketts' E-line[11]. Closure of extraction space must be taken into consideration in the treatment plan when the malocclusion is corrected by extracting the premolars.

In orthodontic procedure, it is essential to control tooth movement in all three planes (transverse, sagittal, and vertical) in order to achieve optimal tooth positions during the extraction space closure[9]. Maxillary and mandibular six anterior teeth can be retracted using the Multiple variability (MV) loop[3]. Multiple variability (MV) loop has a specific dimensions, with an occluso-gingival height of 7 mm and a mesio-distal length of 8 mm. Easier design allows fabrication of the Multiple variability (MV) loop within few minutes[3]. Multiple variability (MV) loop has a high range of activation with less chance of breakage due to its simple design. The overall treatment is reduced with the use of Multiple variability (MV) loop in extraction cases[3].

The case was completed within the 15 months. The aims of treatment objectives were accomplished, and the patient's concerns were addressed appropriately. Patient was notably pleased with the treatment outcome.

Conclusion

The application of the Multiple variability (MV) loop in the correction of protrusion of anterior teeth, bimaxillary protrusion cases or any extraction cases the loop represents a promising and innovative approach in the field of orthodontics. This case report underscores the successful utilization of the Multiple variability (MV) loop technique, showcasing its efficacy in addressing complex malocclusions and achieving significant improvements in both functional and aesthetic aspects associated with malocclusion.

References

1. Jadhav VV Sr, Tiwari M, Kamble R, Shrivastav S, Thote A: Comparative assessment of the efficacy of newly designed multiple variability loop and opus loop for anterior en masse retraction in orthodontics: a finite element study. Cureus. 2023, 15:e44817. 10.7759/cureus.44817.
2. Sharma N, Kamble R, Atole S, Nerurkar S, Kaiser J. Innovative Treatment Approach: Multiple Variability (MV) Loop Intervention for Angle Class I Malocclusion with Dewey's Type 2 Modification: A Case Report. Cureus. 2024 Jul 17;16(7):e64733.
3. Jadhav VV, Kamble R, Shrivastav S, Thote A, Tiwari M. Evaluation of Efficacy of MV Loop for En masse Anterior Retraction as Compared to Opus and Snail Loop Using Finite Element Method and Clinical Intervention: A Research Protocol. Journal of Datta Meghe Institute of Medical Sciences University. 2024 Apr 1;19(2):335-42.
4. A comprehensive review on loops in orthodontics. Sudhakar SS, Shrinivasa KA, Shetty P, Antony G, Shaji MS. IP Indian J Orthod Dentofacial Res. 2021; 7:191–207.
5. Wani MA, Amir M, Siddiqui S, Shukla D, Sangal S, Trivedi S, Khan MA. Orthodontic management of a bimaxillary protrusion malocclusion using a continuous T-loop archwire.
6. Atole S, Kamble R, Nerurkar S, Kaiser J. Frictionless Mechanics for Correction of Bimaxillary Protrusion: A Case Report. Cureus. 2024 Mar;16(3).
7. Sanjay N, Rajesh RN, Scindia R, Ajith SD. Space closure with loop mechanics for treatment of bimaxillary protrusion: a case report. Journal of international oral health: JIOH. 2015 May;7(5):65.
8. Chakravarthy CN, Kumar PK. 'Loops in orthodontics'—A review. Indian J Mednodent Allied Sci. 2014 Feb;2(1):57-63.
9. Felemban NH, Al-Sulaimani FF, Murshid ZA, Hassan AH. En masse retraction versus two-step retraction of anterior teeth in extraction treatment of bimaxillary protrusion. Journal of orthodontic science. 2013 Jan 1;2(1):28-37.

10. Tawfik MG, Izzat Bakhit DM, El Sharaby FA, Moustafa YA, Dehis HM. Evaluation of the rate of anterior segment retraction in orthodontic patients with bimaxillary protrusion using friction vs frictionless mechanics: a single-center, single-blind randomized clinical trial. The Angle Orthodontist. 2022 Nov 1;92(6):738-45.
11. Drobocky OB, Smith RJ. Changes in facial profile during orthodontic treatment with extraction of four first premolars. American Journal of Orthodontics and Dentofacial Orthopedics. 1989 Mar 1;95(3):220-30.