CASE REPORT

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USE OF MULTILOOP EDGEWISE ARCHWIRE (MEAW) FOR TREATMENT OF ADULT PATIENTS WITH UNILATERAL POSTERIOR CROSSBITE

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ABSTRACT
Background: *The Multiloop Edgewise Archwire (MEAW) technique is a biomechanically efficient orthodontic method employed to correct various malocclusions, including posterior crossbite caused by inadequate transverse relationships between the maxillary and mandibular arches. MEAW archwire incorporate boot loops, providing enhanced flexibility and precise control of tooth movement.* **Case Report:** *A 21-year-old female came to the orthodontic clinic with severe maxillary and mandibular crowding, The patient presented with dentoskeletal Class I malocclusion characterized by a convex profile, clockwise rotation of the mandibular plane, retrognathic mandible, ectopic upper canines, anterior and posterior crossbite. The maxillary midline had shifted 2 mm to the right, and the mandibular midline had shifted 4 mm to the right. SNA: 80º, SNB: 76º, and Wit's appraisal: 2.5 mm. as well as ectopic upper canines. Extraction of the upper and lower first premolars were performed. The combination of MBT 0.022" prescription and MEAW were used for this treatment. Active lacebacks were used to align ectopically erupted upper canines. MEAW was used to correct the posterior crossbite, resulting in improved interdigitation and ideal smile arch. Final Results: Post-treatment cephalometric analysis showed SNA: 80º, SNB: 77º, and Wit's appraisal: 2.5 mm. Retention was maintained using removable Hawley retainers.* ***Conclusion:*** *MEAW arches are made of 0.016" × 0.022" steel wire, providing flexibility to the archwire and allowing for horizontal and vertical control of tooth positions. Precise construction of MEAW is essential to achieving optimal treatment outcomes and maintaining stable relationships.*

Keywords: *MEAW, multiloop edgewise archwire, posterior crossbite*

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INTRODUCTION

Malocclusion, a common orthodontic problem, can be classified in sagittal, vertical, and transverse dimensions. Among these, transverse discrepancies such as posterior crossbite represent a significant clinical challenge, especially in adult patients where skeletal growth has ceased.[1] Posterior crossbite is defined as an abnormal buccolingual relationship of the posterior teeth and can be unilateral or bilateral. Etiological factors include skeletal asymmetries, dental tipping, and functional deviations, which, if untreated, may contribute to occlusal interferences and temporomandibular joint dysfunction.[2]

Conventional treatment of posterior crossbite in adults may require surgically assisted maxillary expansion, especially in cases involving significant skeletal constriction.[3] However, in cases where dental compensation is feasible, fixed appliance therapy using strategic biomechanics offers a non-surgical alternative. One such method is the Multiloop Edgewise Arch Wire (MEAW) technique, first developed by Dr. Sadao Sato, which incorporates a unique archwire design consisting of multiple vertical loops that enhance flexibility and force control.[4]

MEAW is particularly effective in cases requiring precise three-dimensional control of tooth movement. The loops in the archwire provide independent vertical and horizontal activation points, allowing clinicians to manage occlusal plane inclination, open bite, deep bite, and crossbite with minimal reliance on additional appliances.[5] Unlike straight archwire techniques, MEAW allows customized force systems to be applied to specific teeth or groups of teeth, which is especially beneficial in asymmetrical or complex malocclusion cases.[6]

Several studies have demonstrated the MEAW technique as a viable option for treating anterior open bite, deep bite, and transverse discrepancies.[7-9] A systematic review by Tabancis et al. highlighted its biomechanical advantages, stating that MEAW provides excellent vertical control and intermaxillary coordination in adult patients with compromised skeletal conditions. In addition, Suzuki et al. emphasized the

clinical efficacy of MEAW in managing open bite and asymmetrical malocclusions in adult patients.[10] underscoring the importance of individualized biomechanics in complex cases. Moreover, the MEAW approach offers significant benefits for patients who either prefer non-surgical treatment options or are medically unsuitable for surgical intervention.[11]

This case report describes the successful orthodontic management of a young adult female with unilateral posterior crossbite, severe crowding, and ectopic canines, using the MEAW technique. The case demonstrates the potential of MEAW to correct complex malocclusion without the need for invasive interventions, reinforcing its role as a versatile and effective biomechanical strategy in modern orthodontics.

CASE REPORT

A 21-year-old female patient presented to the Department of Orthodontics, Faculty of Dentistry, Universitas Padjadjaran, with complaints of crowded teeth, difficulty in chewing, and dissatisfaction with her smile aesthetics. She was in good general health, had no systemic diseases, and had not received any prior orthodontic treatment.

Figure 1. Initial extra-oral

Extraoral examination revealed a convex facial profile with mild vertical excess and a retruded chin, suggestive of a retrognathic mandible and vertical growth tendency. The mandibular plane angle was increased, indicating clockwise rotation. Her lips were competent at rest, and the nasolabial angle was within normal range. (Figure 1)Intraorally, she exhibited severe crowding in both maxillary and mandibular arches. The maxillary canines were ectopically erupted in a buccal position due to lack of space. An anterior crossbite involved the maxillary central incisors, and a unilateral posterior crossbite was noted on the right side, involving the premolars and molars. The dental midlines were deviated: the maxillary midline was 2 mm to the right, and the mandibular midline was 4 mm to the right. (Figure 2)

The panoramic radiograph revealed complete permanent dentition, including third molars, with no signs of pathology or abnormal root morphology. (Figure 3) Cephalometric analysis before treatment showed an SNA angle of 80º, an SNB angle of 76º, and an ANB of 4º, indicating a mild skeletal Class II tendency due to mandibular retrusion. Wit's appraisal was 2.5 mm, confirming a dentoskeletal Class I relationship. (Figure 4)

Figure 2. Initial extra-oral photograph

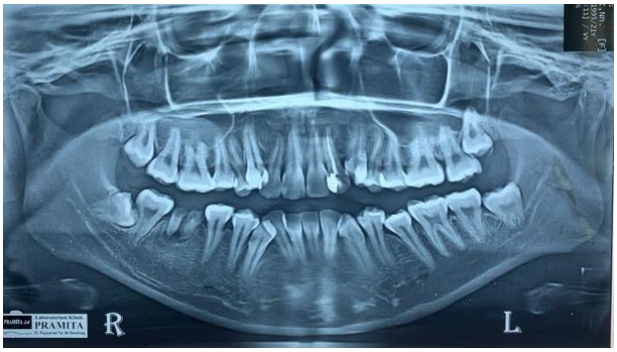

Figure 3. Initial orthopantomography

Table 1. Cephalometric Analysis Pre-Treatment and Post-Treatment

Measurement	Pre – Treatment	Post– Treatment	Measurement	Pre – Treatment	Post– Treatment
Skeletal Pattern			**Dental Pattern**		
SNA (°)	80	80	U1-NA (°)	18	20
SNB (°)	76	77	U1-NA (mm)	3	4
ANB (°)	4	3	U1-NB (°)	18	20
Facial Angle	91	84	U1-NB (mm)	5	5
Angle of Convexity	3	4	Interincisal Angle (°)	133	130
Wits Appraisal (mm)	2,5	2,5	U1-NA (°)	18	20
Y- Axis (°)	72	65	**Soft Tissue**		
Occlusal Plane (Occl-SN)	25	20	UL-E-line	1,5	2
Mandibular Plane Angle (GoGN-SN)	35	38	LL-E-line	1	2

Figure 4. Initial lateral cephalogram

The diagnosis included skeletal Class I malocclusion with a retrognathic mandible, severe crowding in both arches, ectopic eruption of the maxillary canines, anterior and unilateral posterior crossbite, dental midline discrepancy, and increased vertical dimension. The primary objectives of treatment were to relieve dental crowding, align the ectopic maxillary canines properly, correct the anterior and posterior crossbite, achieve bilateral Class I molar and canine relationships, harmonize the dental midlines, improve the smile arc, and maintain facial esthetics.

Treatment began with the extraction of all four first premolars to create space for alignment and retraction. Fixed appliances with an MBT prescription and 0.022” slot brackets were bonded to both arches. Alignment and leveling were initiated using nickel-titanium (NiTi) round wires and progressed to rectangular stainless-steel wires for torque control. Active lacebacks were employed to guide the ectopic maxillary canines into position and to preserve anterior anchorage.

Once adequate alignment was achieved, multiloop edgewise archwires (MEAW) made of 0.016” × 0.022” stainless steel were fabricated and placed in both arches. The multiloop design provided precise control over vertical and horizontal tooth movement. To assist in correcting the posterior crossbite, intermaxillary elastics were applied, guiding the buccal tipping of the maxillary teeth and lingual movement of the mandibular teeth on the affected side. Cross elastics and asymmetrical elastic wear were used to address the dental midline discrepancies. The MEAW technique also enabled control over vertical dimension, minimizing the risk of further clockwise rotation of the mandibular plane. (Figure 5)

Figure 5. MEAW

After 24 months of active treatment, the results demonstrated successful alignment of both arches, with complete correction of the anterior and posterior crossbite. The dental midlines were aligned with the facial midline, and bilateral Class I canine and molar relationships were established. The ectopic maxillary canines were properly aligned, and the smile arc was significantly improved. Post-treatment cephalometric analysis showed an unchanged SNA angle of 80º, a slight increase in SNB to 77º, and an ANB angle of 3º, suggesting improved mandibular projection. Wit's appraisal remained stable at 2.5 mm. (Figure 6)

Figure 6. Post-treatment ekstra and intra-oral photographs

Panoramic and cephalometric radiographs confirmed well-aligned roots with no evidence of resorption or periodontal compromise. (Figure 7 and 8) The retention phase involved the use of removable Hawley retainers for both arches, which the patient was instructed to wear full-time for the first six months, then at night thereafter.(Figure 9) The patient expressed satisfaction with the functional and esthetic outcomes, and follow-up evaluations showed good stability of the occlusal results.

Figure 7. Post-treatment orthopantomograph

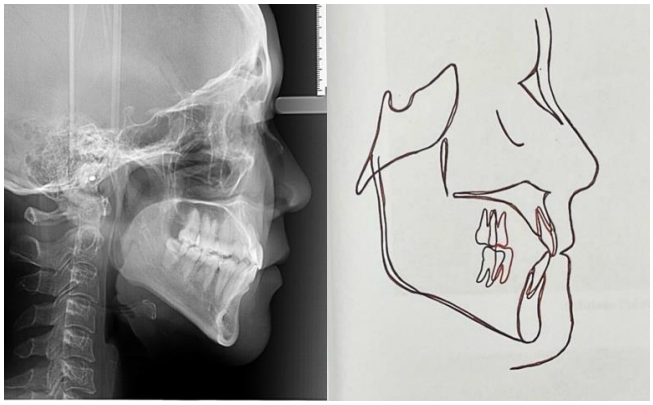

Figure 8. Post-treatment lateral cephalogram

Figure 9. Hawley Retainer

DISCUSSION

Unilateral posterior crossbite in adults poses a particular challenge in orthodontics due to the cessation of skeletal growth and reduced adaptability of the maxillary suture system.[1] While orthopedic expansion is an effective option in growing patients, such as rapid palatal expansion or hybrid expanders, these techniques are generally not feasible in adults without surgical intervention.[2] As a result, clinicians often rely on dentoalveolar compensation through fixed appliances or biomechanically controlled mechanics to resolve transverse discrepancies.

The Multiloop Edgewise Archwire (MEAW) technique, developed by Dr. Sadao Sato, offers a unique biomechanical approach that utilizes light, continuous forces for three-dimensional tooth control.[3] The incorporation of vertical loops in the archwire enables differential force application, facilitating complex tooth movements including intrusion, extrusion, torque, and uprighting.[4] This allows orthodontists to treat not only vertical discrepancies such as anterior open bite, but also sagittal and transverse problems, including posterior crossbite, without requiring auxiliary appliances or surgical assistance.[5]

In the present case, the use of MEAW allowed for the correction of a unilateral posterior crossbite by selectively expanding the maxillary arch on the affected side and coordinating it with the mandibular dentition. The combined use of intermaxillary elastics and MEAW enabled buccal tipping of maxillary teeth and lingual tipping of mandibular teeth were achieved—restoring proper occlusal relationships without compromising overall arch form. The flexible 0.016” × 0.022” stainless steel wire used provided light forces sufficient for physiological tooth movement, consistent with biomechanical principles described by Burstone.[6]

Another critical consideration in this case was the patient’s vertical skeletal pattern. The convex profile and clockwise mandibular rotation indicated a vertical growth tendency, which necessitated careful control of the occlusal plane and vertical dimension. The MEAW technique, when used with vertical elastics, effectively limits undesirable mandibular rotation while promoting vertical dimension control, particularly in the posterior segments.[7] This aligns with the findings of Park et al., who reported improved vertical dimension and skeletal balance following MEAW treatment in adult Class II open bite patients.[8]

Although MEAW is traditionally associated with the treatment of anterior open bite, its role in transverse correction has been highlighted in recent literature. Ribeiro et al. successfully utilized MEAW in a patient with long-face syndrome and an open bite, noting enhanced skeletal and dental control.[9] Additionally, Tabancis et al.’s systematic review confirmed the versatility of MEAW in addressing various malocclusion types, including asymmetries and crossbites, when applied with proper case selection and technical precision.[5]

Post-treatment stability remains an important concern, especially in adult cases where alveolar bone remodeling is limited. Studies indicate that posterior crossbite corrections obtained through dentoalveolar compensation are more stable when followed by adequate retention protocols.[10] In this case, removable Hawley retainers were prescribed to maintain the corrected arch coordination and intercuspation. According to Rodrigues de Almeida et al., retention periods of at least 12 months are recommended to minimize relapse in transverse corrections.[10]

In conclusion, the MEAW technique provides a conservative, effective, and biomechanically sound approach to managing unilateral posterior crossbite in adult patients. Its ability to deliver multidirectional tooth movement without surgical intervention makes it a valuable option in complex malocclusion cases—particularly when careful control of the vertical and transverse planes is necessary.

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REFERENCES

1. Proffit WR, Fields HW, Sarver DM. Contemporary Orthodontics. 6th ed. St. Louis: Elsevier; 2019.
2. Thilander B, Wahlund S, Lennartsson B. The effect of early interceptive treatment in children with posterior crossbite. Eur J Orthod. 1984;6(1):25–34. https://doi.org/10.1093/ejo/6.1.25
3. Sato S, Kuroda S. The Sato technique: MEAW and Orthodontic Philosophy. Orthod Wave. 1995;54(3):115–30. https://doi.org/10.1016/S13440241(13)80087-2
4. Park YC, Lee SY, Kim DH, Jee SH. The skeletal and dental changes after multiloop edgewise archwire (MEAW) therapy on Class II open bite malocclusion. Korean J Orthod. 2000;30(1):35–46. https://doi.org/10.4041/kjod.2000.30.1.35
5. Tabancis M, Ratzmann A, Doberschütz P, Krey KF. Multiloop edgewise archwire technique and denture frame analysis: a systematic review. Head Face Med. 2020;16:19. https://doi.org/10.1186/s13005-020-00233-5
6. Burstone CJ. The biomechanics of tooth movement. In: Kraus BS, Riedel RA, editors. Vistas in Orthodontics. Philadelphia: Lea & Febiger; 1962. p. 197–213.
7. Chang YI. Orthodontic treatment of skeletal open bite with multiloop edgewise arch wire. Angle Orthod. 1994;64(2):147–56. https://doi.org/10.1043/0003-3219(1994)064<0147:OTOSOB>2.0.CO;2
8. Park YC, Lee SY, Kim DH, Jee SH. The skeletal and dental changes after multiloop edgewise archwire (MEAW) therapy on Class II open bite malocclusion. Korean J Orthod. 2000;30(1):35–46.
9. Ribeiro GLU, Regis S, Da Cunha TDMA, Sabatoski MA, Guariza-Filho O, Tanaka OM. Multiloop edgewise archwire in the treatment of a patient with an anterior open bite and a long face. Am J Orthod Dentofacial Orthop. 2010;138(1):89–95. https://doi.org/10.1016/j.ajodo.2008.10.026
10. Suzuki T, Suzuki H, Deguchi T, et al. The Multiloop Edgewise Arch Wire (MEAW) Technique and its Clinical Application. Bull Tokyo Dent Coll. 1998;39(3):125–135. https://doi.org/10.2209/tdcpublication.39.125
11. Rodrigues de Almeida R, de Almeida M, Oltramari-Navarro VP, Conti CC, Navarro RL, Marques VA, et al. Posterior crossbite: treatment and stability. J Appl Oral Sci. 2018;26:e20170678. https://doi.org/10.1590/1678-7757-2017-0678