**MBT™ System as the 3rd Generation Programmed and Preadjusted Appliance System (PPAS)**

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SWA, developed by Andrews, dramatically changed the concept of the Edgewise Appliance System. This epoch-making creation by Andrews was a natural result of the evolution of the Edgewise Appliance System, which has always been intended for three-dimensional tooth movement since its development by Angle. Meanwhile, Roth’s most important contribution to orthodontics is the introduction of the Functional Occlusion Concept, which made orthodontics better qualified as a discipline of dentistry. He made another important contribution by simplifying and spreading the SWA as Roth Set Up, which can be regarded as the 2nd generation SWA. Thus, Andrews and Roth built the foundation of PPAS (Programmed and Preadjusted Appliance System) and popularized this system. As a result, PPAS is now used worldwide with an established reputation for its treatment effect. However, the system was yet to be refined through modification of mechanics, that is, bracket position, bracket specifications (torque, angulation and in/out), arch form, method of space closure, anchorage, etc. This modification of mechanics was the primary objective of the introduction of the MBT™ Versatile+ Appliance System as the 3rd generation PPAS by McLaughlin, Bennett and Trevisi. The diagram below outlines the structure of the MBT System with a brief description of ‘Modification of Mechanics’. It is intended that the diagram will help sort out the information concerning the MBT System. Various types of malocclusions treated with the MBT System are presented on the following pages.
Case 1 treated with the MBT™ System

Class I minor crowding case with occlusal instability
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Diagnosis and treatment plan
A 29-year-old female patient (Fig. 1) presented with occlusal instability (inability to chew well). Skeletally, she had a counterclockwise brachyfacial pattern with a large mandible and a skeletal Class III jaw. There was no problem dentally (Fig. 2). Non-extraction treatment was chosen since there was no need to change axial inclinations and crowding was very minor. This type of a case is suitable for checking properties of a bracket system.

Treatment progress and evaluation
Leveling was initiated with .014 HA wires (Fig. 3). The posterior occlusion was improved. However, the anterior overjet increased (Fig. 4, 5), which was attributable to the triangular shaped incisors with heavy marginal ridges. To solve these problems, the four upper incisors were sliced mesially and distally for space gathering and closure with active tiebacks (Fig. 6). .019x.025 SS wires were used for finishing, resulting in solid and stable occlusion after treatment (Fig. 7, 8, 9, 10, 11). The patient was satisfied with improved chewing ability. It is desirable to perform slicing of incisors with such a shape prior to bracket placement.

Figure 1

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11
Case 2 treated with the MBT™ System
Skeletal Class III with crowding treated by non-surgical approach
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Diagnosis and treatment plan
A female patient aged 17-year-7-month-old presented with high canines. The face was symmetrical with a slightly protrusive lower lip. Skeletally, the mandible was overdeveloped (ANB 2.6°, Witts -7mm). Dentally, the lower incisors were tipped lingually (L1 to mand. pl. 84.4°) with Class III canine and molar relationship. Upper and lower arch length discrepancies of ~5mm and ~6mm, respectively. The case was diagnosed as skeletal Class III case with crowding (Fig. 1, 2) and a non-surgical approach was used upon the patient’s request. The treatment plan included extraction of upper second and lower first premolars and use of .022” MBT Bracket System for elimination of crowding, crossbite correction, and establishment of Class I occlusal relationship (Fig. 3).

Treatment progress and evaluation
Leveling was initiated with .014 Nitinol wires (Fig. 4), followed by leveling, mesial movement of the upper first molars, and distal movement of lower canines with plastic chain (Fig. 5) for 7 months. Space closure and establishment of occlusal relationship were accomplished in 10 months with sliding mechanics using .019x.025 SS wires (Fig. 6). Upper wraparound-type removable retainer and lower 5-5 fixed lingual retainer were used.

The use of MBT™ brackets and nickel titanium wires greatly facilitated the elimination of crowding. .019x.025 SS wires were used as ideal arches for long enough to effectively express the tip, torque, and in/out specifications of the brackets.
Case 3 treated with the MBT™ System

Bimaxillary protrusion case
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Diagnosis and treatment plan
A 28-year-5-month-old female patient (Fig. 1) had skeletal Class I bimaxillary protrusion and labially inclined upper incisors. Her chief complaint was protrusion of the lips. Lower arch length discrepancies were -2.5mm on the left side and -3.5mm on the right side with -2mm of Curve of Spee and -4mm of cephalometric correction, total discrepancy being -12mm. A decision was therefore made to extract four first premolars for 5mm of lower incisor retraction (Fig. 2, 3). While 2mm of anchorage loss was allowed for the lower molars, the upper first molars were held with Nance™ Holding Arch and headgear.

Treatment progress and evaluation
Lacebacks were used upon initiation of leveling (Fig. 4) for canine retraction (Fig. 5). After one year of leveling and canine retraction, the anterior teeth were retracted for 6 months with sliding mechanics using posted archwires (.019x.025) and elastic tiebacks in combination with headgear and Class II elastics (Fig. 6). The appliance was removed after 5 months of detailing. Active treatment time was 2 years and 3 months (Fig. 7, 8).

Although the upper anterior teeth were intruded less than the V.T.O., the incisor position appeared to be acceptable in relation to the lip line (Fig. 10). The treatment goals were nearly achieved with minimal wire bending for compensating torque on the upper incisors and light reverse curve in the lower arch. The roots were nice and parallel (Fig. 9). It may be safer to regard a case allowing only 2mm of posterior anchorage loss as a maximum anchorage case in orthodontic treatment with a preadjusted appliance.
Case 4 treated with the MBT™ System

A functional, anterior crossbite case

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Diagnosis and treatment plan

The patient was an 11-year-7-month-old female with no facial asymmetry. Her profile was almost straight with a protrusive lower lip. Intraoral examination (Fig. 1) revealed 2mm of crowding in the upper arch and 4mm of spacing in the lower arch. The patient showed CO-CR discrepancy due to premature contacts between the upper and lower central incisors. There were –2.4mm of overjet and +5.2mm of overbite. Non-extraction treatment was planned for this high-angle case with a functional, crossbite to level and align the lower arch, followed by anterior retraction using the available space, and to tip the upper anterior teeth labially for overjet correction.

Treatment progress and evaluation

The lower arch was leveled with lacebacks to the canines (Fig. 4), followed by retraction of the lower anterior teeth and leveling of the upper arch at the same time (Fig. 5). 10° torque brackets were placed on the upper anterior teeth to prevent their excessive labial tipping (Fig. 6). The case was finished with .019x.025 finishing archwires after 16 months of active treatment (Fig. 7). Posterior anchorage loss was minimized with the use of lacebacks to the lower canines during leveling of the lower arch. Torque control of the upper anterior teeth against excessive labial tipping was also successful (Fig. 10). Fig. 9 shows the post-treatment panoramic radiograph.
Case 5 treated with the MBT™ System

A Class II high-angle case with an open bite
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Diagnosis, treatment plan and mechanics

This case was diagnosed as an Angle Class II malocclusion with an open-bite (Fig. 1, 2) and planned for four first premolar extraction to improve axial inclinations of teeth while maintaining Fx (Fig. 3). The treatment plan also included the use of palatal bar, Class II elastics, and MFT to eliminate tongue habit. Lacebacks to canines were started as soon as .014” Nitinol wires were placed as initial archwires (Fig. 4). .019x.025 SS wires were used as active wires for space closure by sliding mechanics (Fig. 5, 6). Intermaxillary springs and short Class II elastics (bite fixers) were used for Class II correction (Fig. 6, 7).

Treatment progress and evaluation

Post-treatment intraoral and facial photographs are shown in Fig. 8 and panoramic radiograph in Fig. 9. Fx opened by 1° (Fig. 10). A palatal bar was used to reinforce upper molar anchorage. Use of a high-pull headgear would have further increased both vertical and horizontal anchorage and prevented Fx from opening. Brackets were placed upside down on the palatally displaced upper lateral incisors. Bends were needed for the upper and lower canines during finishing, which seemed to be due to the morphology of the canines. Treatment time was only 1 year and 6 months (Fig. 8).