

Modified Interim Mandibular Advancement (MIMA) Appliance for Symptomatic Correction of Obstructive Sleep Apnea

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ABSTRACT

Obstructive Sleep Apnea (OSA) is a chronic, progressive, multifactorial, life-threatening disorder that causes significant impact on patient's life. Patients with OSA [Apnea/Hypopnea Index (AHI)>30] who cannot tolerate Continuous Positive Airway Pressure (CPAP) therapy or are not surgical candidates may benefit from oral appliances. This paper describes interim appliance devised from existing Hawley's retainer in patients with OSA. A 38-year-old man of athletic built with history of orthodontic treatment six months back due to esthetic concerns and wearing upper Hawley's retainer, reported with chief complaint of frequent nocturnal awakening along with excessive daytime somnolence. Based on diagnostic aids, he was diagnosed with Class II Division 1 malocclusion with severe mandibular retrusion. Sleep test revealed AHI score of 34, suggestive of severe OSA. With ENT and Oral surgeon concurrence, mandibular advancement of 7mm with Bilateral Sagittal Split Osteotomy (BSSO) with distraction was contemplated as a viable functional and curative stable treatment plan. Because of non-adherence and non-compliance with CPAP therapy and on request of patient, an interim anterior positioning appliance was devised to facilitate comfortable sound sleep till the time surgery is impending. After three months of wearing this customized appliance, improved quality of sleep was discernible; both subjectively as reported by patient and objectively using sleep test (AHI=9.8).

Keywords: Mandibular advancement devices, Severe sleep apnoea, Skeletal Class II

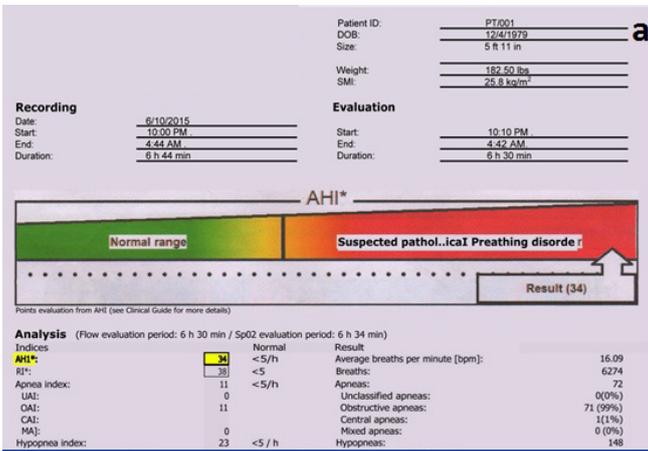
Obstructive Sleep Apnea (OSA) is a chronic, progressive, multifactorial, potentially life-threatening disorder that may have significant adverse impact on patients' orofacial, nutritional, esthetic and psychosocial development [1,2]. Hence, individualization of the diagnosis and multidisciplinary approach for management of patients with OSA is indispensable. Oral appliances form the mainstay of treatment for mild to moderate OSA patients. However, patients with severe sleep apnoea i.e., Respiratory Disturbance Index (RDI)>30, and who cannot tolerate CPAP therapy, or those who refuse surgical correction or are not surgical candidates, also benefit from oral appliance therapy [3,4].

A 38-year-old non-smoker, non-alcoholic male with athletic built having past history of orthodontic treatment six months back for esthetic and functional correction, presently on retention phase with conventional Hawley's appliance reported with chief complaint of frequent nocturnal awakening along with excessive daytime somnolence. Based on essential and supplementary diagnostic

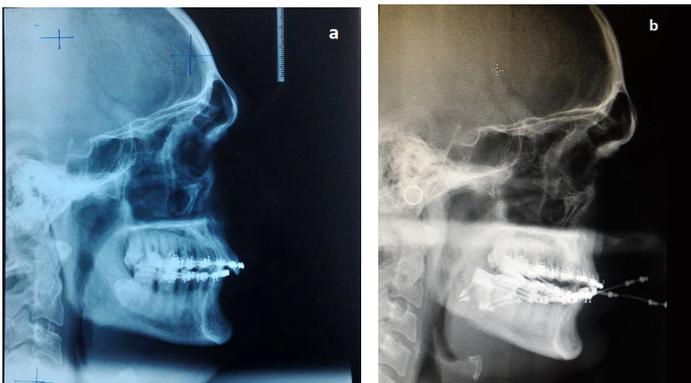
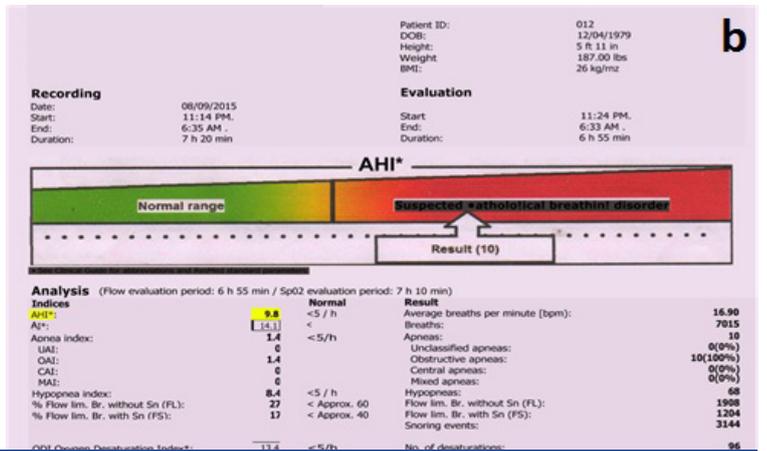
aids, patient was diagnosed with Class II Division 1 malocclusion with severe mandibular retrusion and short lower anterior facial height, causing OSA [Table/Fig-1a-1c]. His sleep test score revealed AHI Score of 34, suggestive of severe OSA [Table/Fig-2a]. After consultation with Ear, Nose, Throat and Oral surgeon, mandibular advancement of 7mm with BSSO with distraction was contemplated as a viable functional and curative stable treatment plan for surgical correction of anatomic obstruction of upper airway. On request of the patient, an interim mandibular appliance was devised to facilitate patient for comfortable sound sleep till the time surgery is impending. After three months of wearing this customised appliance during presurgical orthodontics, improved quality of sleep (reduction of snoring and day time somnolence to an acceptable level) both subjectively as reported by the patient and objectively using sleep study (RDI score of 9.8 illustrated in [Table/Fig-2b]) were noted. Presently patient has undergone distraction for mandibular advancement of 5mm [Table/Fig-3a,3b].



[Table/Fig-1a]: Pretreatment intra oral view showing retrognathic mandible and class II molar relationship. **[Table/Fig-1b]:** Pretreatment extra oral view. **[Table/Fig-1c]:** Pretreatment lateral cephalogram.



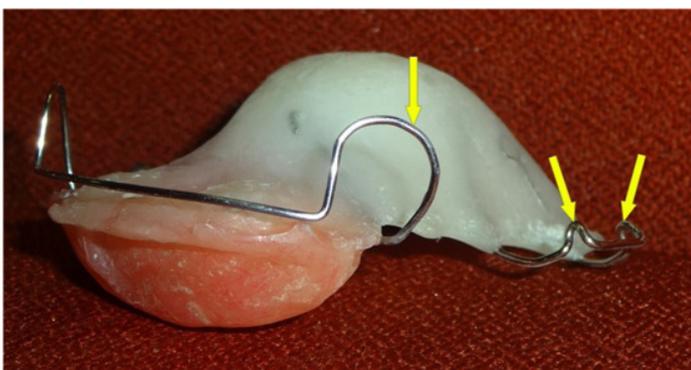
[Table/Fig-2a]: Pretreatment sleep test result showing AHJ index of 34 indicating severe OSA. [Table/Fig-2b]: Post-treatment sleep test result showing AHJ index of 9.8 indicating improvement in OSA symptoms after wearing "MIMA" appliance.



[Table/Fig-3a]: Presurgical lateral cephalogram. [Table/Fig-3b]: Post-distraction lateral cephalogram.



[Table/Fig-5]: MIMA appliance after modification of Hawley's appliance.



[Table/Fig-4]: Classical Hawley's retainer with added anterior guidance for mandible and arrows indicating potential area for modification.



[Table/Fig-6a]: MIMA appliance in situ showing stretching of retromolar tissue helping in mandibular advancement. [Table/Fig-6b]: MIMA appliance in situ showing its retention and utility with ongoing fixed orthodontic treatment.

[4] Appliance is later finished and polished thoroughly before being delivered to the patient.

This article describes the simple chairside modified interim anterior positioning appliance which has been fabricated from patients existing Hawley's retainer [Table/Fig-4].

STEPS OF FABRICATION [Table/Fig-4,5].

- [1] Actively advance/guide the mandible into desired pre-determined sagittal position (with minimum vertical opening to avoid the increase in collapsibility of airway) and obtain the indentations of lower anterior teeth into self-curing acrylic, which will help maintain/secure the mandible in forward position during sleep.
- [2] Cut and remove the labial segment and vertical mesial legs of labial bow. The cut ends of remaining curved portion of distal legs are bent and contoured with Universal style plier to form two pin heads on either side for retention.
- [3] The mesial and distal ends of bridge portion of Adam's clasp along with one arm of V-shaped arrowhead are cut. Subsequently, the remaining portion of arrowheads are modified and contoured to form pin heads for providing retention.

Advantages

- [1] It can be used in conjunction with ongoing presurgical orthodontic treatment without any interference with tooth movement [Table/Fig-6a,6b].
- [2] It acts as an aid in predicting outcome of planned surgical procedure for improvement of airway by advancing mandible in predetermined position.
- [3] It can also aid as surgical splint after addition of thin layer of acrylic block over the occlusal surfaces of posterior teeth, to be used as a guide during surgery.
- [4] It is silent, less invasive, effective and very economical as compared to CPAP. Hence, it can be used as an interim measure to improve quality of sleep.

Disadvantages

- [1] Being an interim appliance, it can't be used for long term curative purpose.
- [2] Patient co-operation is necessary to ensure desired outcome of the appliance.
- [3] Since this appliance is used most frequently with presurgical orthodontics, meticulous oral hygiene maintenance is required to avoid any dental or periodontal problems.

Contraindications

- [1] Since it is made up of acrylic, appliance is contraindicated in patients allergic to resin or monomer.
- [2] Hyperdivergent growth pattern contraindicates the wearing of the appliance.
- [3] Patients with macroglossia will have difficulty in retaining appliance as it will increase the bulk in patient's mouth.

CONCLUSION

'MIMA' can be considered as interim appliance in obstructive sleep apnoea patients who are undergoing presurgical orthodontics. Similarly, the appliance can be worn routinely with some modification like other mandibular advancement devices (MDSATM, NoSnoreTM), provided the patient is able to get accustomed with appliance without frequent dislodgment.

Nevertheless, 'MIMA' appliance proves to be a very economical and patient friendly adjunctive aid in multidisciplinary treatment of obstructive sleep apnea.

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