

Custom Jig Technique for Recording the Optimal Maxillomandibular Relation in Mandibular Advancement Splint Fabrication for Obstructive Sleep Apnea: A Case Report

Obstrüktif Uyku Apnesi Tedavisinde Mandibulayı Önde Konumlandıran Splint Yapımında Optimal Maksillomandibuler İlişkinin Kaydedilmesine Yönelik Bireysel Jig Tekniği: Olgu Sunumu

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Abstract

Mandibular advancement splints (MAS) are used for the treatment of obstructive sleep apnea (OSA), and successful outcomes depend on appropriate therapeutic mandibular positioning during fabrication. This case report describes the clinical application of a simple custom jig fabricated from a disposable plastic spatula for recording the therapeutic maxillomandibular relationship during monoblock MAS fabrication in a patient with mild OSA. Approximately 70% of maximum mandibular protrusion with a 6-mm vertical opening was recorded. During 12-month follow-up, the appliance was well tolerated with no temporomandibular joint complications. Additionally, snoring and OSA-related symptoms improved, and the Epworth Sleepiness Scale score decreased from 18 to 10.

Keywords: Obstructive sleep apnea, mandibular advancement splint, oral appliance therapy, bite registration, mandibular protrusion, custom jig

Öz

Mandibulayı önde konumlandıran splintler (MAS), obstrüktif uyku apnesi (OSA) tedavisinde kullanılmakta olup başarılı tedavi için terapötik mandibula pozisyonunun uygun şekilde kaydedilmesi önem taşımaktadır. Bu olgu sunumunda, hafif OSA tanılı bir hastada monoblok MAS yapımı sırasında terapötik maksillomandibuler ilişkinin kaydedilmesi amacıyla tek kullanımlık plastik spatuladan hazırlanan basit bir bireysel jig tekniği sunulmuştur. Maksimum protrüzyonun yaklaşık %70'i ve 6 mm dikey açıklık kaydedilmiştir. On iki aylık takipte aparey iyi tolere edilmiş, temporomandibuler eklem komplikasyonu gözlenmemiş, horlama ve OSA'ya bağlı semptomlar düzelmiş, Epworth Uykululuk Ölçeği skoru 18'den 10'a gerilemiştir.

Anahtar Kelimeler: Obstrüktif uyku apnesi, mandibulayı önde konumlandıran splint, oral aparey tedavisi, kapanış kaydı, mandibular protrüzyon, bireysel jig

Introduction

Obstructive sleep apnea (OSA) is characterized by recurrent collapse of the upper airway during sleep and is associated with excessive daytime sleepiness and reduced quality of

life (1). Mandibular advancement splints (MAS) are effective treatment options for patients with mild to moderate OSA and for individuals who are intolerant of continuous positive airway pressure therapy (2,3). In monoblock appliances, the

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mandibular position is fixed during fabrication. As a result, inaccuracies during bite registration may adversely affect appliance fit and treatment efficacy. Several techniques have been described for recording the therapeutic mandibular position during MAS fabrication, including the George Gauge, phonetic bite registration, Lucia jig-assisted registration, and digital jaw-tracking systems (4-6). Although these methods may improve standardization, some require additional equipment, increased clinical time, or advanced operator experience. A simple chairside technique may provide practical advantages in routine clinical settings. Therefore, this report describes a simplified custom jig technique for recording the therapeutic mandibular position during fabrication of a monoblock MAS.

Case Report

A 25-year-old male patient presented with complaints of loud snoring, excessive daytime sleepiness, fatigue, non-restorative sleep, and difficulty concentrating. His body mass index was 27.5 kg/m² and he was a current smoker of approximately 1.5 packs per day. The medical history was otherwise noncontributory. Overnight polysomnography demonstrated an apnea-hypopnea index of 8.7 events/hour, consistent with mild OSA. The minimum oxygen saturation was 90%, and his Epworth Sleepiness Scale score was 18. Intraoral examination revealed adequate dentition and stable posterior occlusal support suitable for oral appliance therapy. No signs or symptoms of temporomandibular joint dysfunction were observed. Written informed consent was obtained from the patient prior to participation.

A monoblock MAS was planned. A disposable plastic mixing spatula was modified chairside to fabricate a custom jig. Initially, the overjet was marked on the upper edge of the spatula, and a shallow notch was prepared to stabilize the maxillary incisors. The patient was then instructed to protrude the mandible maximally without discomfort, and the most anterior position of the mandibular incisors was marked on the lower edge of the spatula.

Approximately 70% of the maximum protrusion was selected as the therapeutic advancement position, as the use of a non-titratable monoblock appliance necessitated the precise establishment of the mandibular position during bite registration. This position falls within the commonly recommended therapeutic range (50-75%) reported for oral appliance therapy and was considered clinically appropriate and comfortable for the patient (2,7,8). A second notch was prepared at this point while maintaining approximately 6 mm of vertical opening between the upper and lower notches. This vertical dimension was selected based on clinical considerations and previous studies (9,10). Although no consensus exists regarding the optimal vertical dimension for MAS therapy, evidence indicates that the vertical opening may influence mandibular position, patient comfort, and appliance performance. During bite registration, the upper notch engaged the maxillary incisors while the patient advanced the mandible until the mandibular incisors rested securely within the lower notch of the jig (Figure 1).

Elastomeric putty (Durabite; ERK Dental, İzmir, Türkiye) bite registration material was placed bilaterally between the maxillary and mandibular bicuspid and molars. Maxillary and mandibular impressions were obtained using irreversible hydrocolloid impression material (Tropicalgin; Zhermack, Rovigo, Italy) and subsequently poured in dental stone (Durguix; Protechno, Girona, Spain) to prepare casts. The casts were mounted on a simple hinge articulator (Group Dental Medikal Ltd., Ankara, Türkiye) using the bite registration records. A monoblock MAS was then fabricated using a self-curing clear acrylic resin (O-80; Imicryl, Konya, Türkiye).

At delivery, the appliance demonstrated satisfactory retention and adaptation. Minor occlusal adjustments were performed to achieve an optimal intraoral fit. The patient was instructed regarding appliance insertion, removal, hygiene, and regular follow-up use. The patient returned for follow-up visits at 1 week, 1 month, 3 months, 6 months, 9 months, and 12 months after appliance delivery. During the first follow-up visit, minor occlusal adjustments were performed to further optimize appliance fit and comfort. No signs or symptoms of temporomandibular joint pain, tenderness, or dysfunction were observed throughout the follow-up period. In addition, the patient reported a marked reduction in snoring, as well as substantial improvements in daytime and nocturnal symptoms and other OSA-related discomforts. At the 12-month follow-up, his Epworth Sleepiness Scale score had decreased to 10, indicating a clinically meaningful reduction in daytime sleepiness.

Discussion

Recording the therapeutic mandibular position is a critical step in oral appliance therapy for OSA (2). Different registration methods, such as mechanical protrusive gauges, phonetic techniques, Lucia jig applications, and digital tracking systems, have been introduced to facilitate standardized bite registration (4-6). Nevertheless, many of these approaches may complicate the clinical workflow by requiring additional devices, prolonged chairside procedures, or greater technical expertise.

The technique described herein utilized a modified disposable plastic spatula as a custom jig to guide the mandible into a predetermined protrusive position during bite registration. This jig provided a simple reference for positioning the incisors during recording and facilitated consistent placement of the mandible in the predetermined therapeutic position. In the present case, the recorded relationship was transferred to the articulator and enabled the fabrication of a clinically acceptable monoblock appliance.

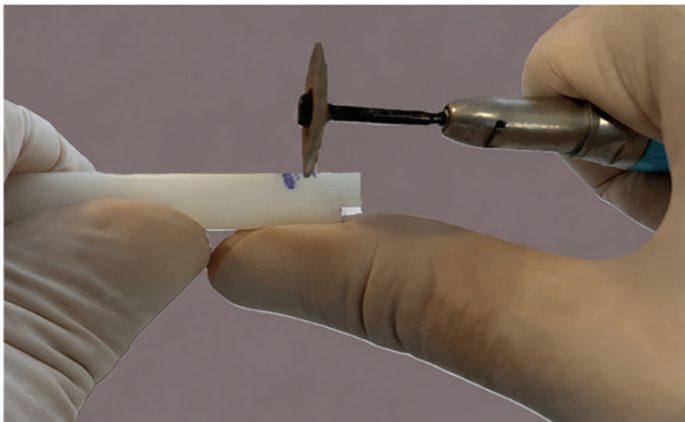
During the follow-up period, the appliance remained clinically acceptable after minor occlusal adjustments performed at the first follow-up visit. No temporomandibular joint pain, tenderness, or dysfunction was observed. Furthermore, the patient reported a marked reduction in snoring and daytime and nocturnal symptoms, with his Epworth Sleepiness Scale score improving from 18 at baseline to 10 at the 12-month follow-up. Although these findings are encouraging, they represent observations from a single clinical case and should



- 1** Preparation of a shallow notch on the upper edge of the spatula corresponding to the patient's overjet, allowing stable positioning against the maxillary central incisors.



- 2** Marking of maximum mandibular protrusion by recording the most anterior position of the lower central incisors on the lower edge of the spatula.



- 3** Determination and notching of approximately 70% of the measured maximum mandibular protrusion on the lower edge of the custom jig.



- 4** Intraoral positioning of the custom jig during bite registration, guiding the mandible into the predetermined therapeutic protrusive position.

Figure 1. Clinical steps of the custom jig technique.

not be interpreted as definitive evidence of the registration technique's overall efficacy.

The proposed technique appears to offer practical advantages, including simplicity, low cost, and ease of chairside application. In the present case, approximately 70% mandibular advancement was selected, as the fabrication of a non-titratable monoblock appliance required precision when determining the therapeutic mandibular position during bite registration. This degree of advancement aligns with the standard therapeutic range recommended for oral appliance therapy and proved both clinically appropriate and comfortable for the patient (2,7,8). Future prospective studies involving larger patient cohorts are warranted to comprehensively evaluate the reliability and broader clinical applicability of this technique.

Conclusion

The custom jig technique described in this case report may represent a practical and inexpensive option for recording the therapeutic maxillomandibular relationship during the fabrication of a monoblock mandibular advancement splint. Within the limitations of a single clinical case study, the approach proved clinically feasible, and the resulting appliance was well tolerated throughout the follow-up period. Further clinical trials are necessary to validate these initial findings and establish standardized protocols for wider implementation.

Ethics

Informed Consent: Written informed consent was obtained from the patient prior to participation.

Footnotes

Authorship Contributions

Surgical and Medical Practice: H.S.Ç., A.A., İ.Ç., Ö.K.B., Concept: H.S.Ç., A.A., İ.Ç., Ö.K.B., Design: H.S.Ç., A.A., İ.Ç., Ö.K.B., Data Collection or Processing: H.S.Ç., A.A., İ.Ç., Ö.K.B., Analysis or Interpretation: H.S.Ç., A.A., İ.Ç., Ö.K.B., Literature Search: H.S.Ç., A.A., İ.Ç., Ö.K.B., Writing: H.S.Ç., A.A., İ.Ç., Ö.K.B.

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