



## CASE REPORT

# Lingual Treatment of an Adult Patient with a Simplified Extraction Protocol

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## ABSTRACT

Successful orthodontic treatment of adult cases depends on the biological, mechanical, and esthetic requirements of patients. While customized lingual appliance systems meet the esthetic expectations of the patients, they provide improved patient comfort, have three-dimensional mechanical control, and can be used for the treatment of all types of malocclusions. This report demonstrated the use of fully customized lingual orthodontic brackets for treating an adult case with extraction.

**Keywords:** Customized lingual orthodontics, adult orthodontics, fixed lingual orthodontics

## INTRODUCTION

Visible orthodontic appliances are challenging for adult patients. In a recent study, 33% and 62% adults refused orthodontic treatment using a visible appliance (1). With the increasing esthetic demands of adult patients, lingual orthodontics and clear aligners have recently become popular (2). Lingual orthodontics provides the best esthetic option for complex cases with three-dimensional control (3). Customized lingual appliance systems have improved patient comfort, provided accurate bracket positions, and produced similar treatment outcomes as labial orthodontics.

The objective of this case report was to present the treatment results of an adult patient treated with extraction using fully customized lingual brackets.

## CASE PRESENTATION

A male patient 43 years 4 months of age was referred to our clinic with the chief complaint of dental crowding. Diagnostic records showed that he demonstrated Class II molar and canine relationships on the left side and Class I canine relationship on the right side with retrusive upper, protrusive lower incisors, normal overjet, and mildly increased overbite (Figure 1, 2). Upper right first molar had previously been extracted. There was an ectopic canine tooth with an unesthetic veneer crown on the upper left quadrant. According to dental cast analysis, dental arch discrepancies were measured as 9.2 mm in maxilla and 4 mm in mandibula. Cephalometric measurements are presented in Table 1.

Treatment goals were to eliminate dental crowding, obtain Class I canine relationship on both sides, and also achieve ideal overjet and overbite. The treatment plan was to extract the buccally positioned upper left canine and use upper left first premolar as canine substitution. The color and shape of the premolar were noted as suitable for the canine substitution. A dental implant was planned for replacing the upper right first molar. Written informed consent was obtained from the patient.



**Figure 1. a-h.** Pretreatment (T0) extraoral and intraoral images: Pretreatment extraoral frontal rest image (a); pretreatment extraoral frontal smile image (b); pretreatment extraoral profile image (c); pretreatment intraoral right lateral image (d); pretreatment intraoral frontal image (e); pretreatment intraoral left lateral image (f); pretreatment intraoral upper occlusal image (g); pretreatment intraoral lower occlusal image (h)

### Treatment Sequence

Fully customized lingual brackets (Incognito, TOP service, 3M Unitek, Bad Essen, Germany) were manufactured according to the patient's impressions and a digital setup was created (Figure 3). After the bonding of brackets, upper left canine was extracted. The arch-wire sequence was .014" SE (super-elastic) nickel titanium for levelling and alignment; .016"x.022" SE nickel titanium, .018"x.025" SE nickel titanium for correcting rotations and providing initial torque control; .016"x.024" stainless steel for torque control, and .018"x.018" TMA (titanium-molybdenum alloy) for finishing. Interproximal reduction was performed for the crowding of the mandibular anterior teeth during the treatment. An attempt was made to achieve mesial movement of the upper right second molar, but it failed due to pneumatization of the maxillary sinus. The patient refused to undergo a sinus lift surgery.

At completion of the treatment, Class II molar relationship on the left side and Class I canine relationships on both sides were obtained; also, a balanced and ideal occlusion was achieved (Figure 4). Post-treatment cephalometric radiographs are shown in Figure 5. Total treatment duration was 2 years and 8 months. Throughout this period, the attempt for molar mesialization took 10 months. After debonding, fixed retainers were bonded, and additional essix plates were fabricated for both arches. The cephalometric parameters for pre- and post-treatment are shown in Table 1. The superimposition of pre- and post-treatment lateral cephalometric radiographs showed the extrusion of upper molar and proclination of lower incisor (Figure 6).

### DISCUSSION

The demand for adult orthodontic treatment has progressively in-

**Table 1.** Pre- (T0) and post-treatment (T1) cephalometric measurements

	Norm Values	T0	T1
<b>Sagittal Analysis</b>			
SNA (°)	80±2	78.5	77.5
SNB (°)	78±2	74.6	74.2
ANB (°)	2±2	3.9	3.1
GoGnSN (°)	32±6	27.5	28.5
Gonial Angle (°)	130±7	111	111
<b>Dental Analysis</b>			
U1 -NA (mm)	4	3	4
U1-NA (°)	22±5	12.5	16
L1-NB (mm)	4	5.1	5.3
IMPA (°)	90±3	102	106
Overjet (mm)	3	3.5	2.8
Overbite (mm)	3	4	2.8
<b>Soft Tissue Analysis</b>			
Upper Lip-E Line (mm)	-4	-6	-5
Lower Lip-E Line (mm)	-2	-6	-4.4

SNA: Sella-nasion-A point angle; SNB: Sella-nasion-B point angle; ANB: A point, nasion, B point; GoGnSN: angle that is measured at the junction of the planes Gonion to Gnathion and Sella-Nasion; IMPA: incisor mandibular plane angle; U1-NA (°): angle between upper incisor inclination and NA plane; L1-NB (°): angle between lower incisor inclination and NB plane



**Figure 2. a, b.** Pretreatment (T0) radiographic records: Pretreatment lateral cephalometric radiograph (a); pretreatment panoramic radiograph (b)



**Figure 3. a-d.** In-progress intraoral images: In-progress intraoral right lateral image (a); in-progress intraoral left lateral image (b); in-progress intraoral upper occlusal image (c); in-progress intraoral lower occlusal image (d)





**Figure 4. a-h.** Post-treatment (T1) extraoral and intraoral images: Post-treatment extraoral frontal rest image (a); post-treatment extraoral frontal smile image (b); post-treatment extraoral profile image (c); post-treatment intraoral right lateral image (d); post-treatment intraoral frontal image (e); post-treatment intraoral left lateral image (f); post-treatment intraoral upper occlusal image (g); post-treatment intraoral lower occlusal image (h)

creased in recent years, and reportedly 25% of orthodontic patients were adults in United States (4). A previous study showed that 90% of adult orthodontic treatments required fixed appliances (5).

Customized lingual orthodontics is the most esthetic option for adult patients with three-dimensional control, and it is suitable for all types of malocclusions. Improved digital technology of customized lingual systems helps create a virtual set-up, customized bracket positioning, arch-wire, and bracket fabrication. These steps facilitate improvement in the of the treatment outcomes.

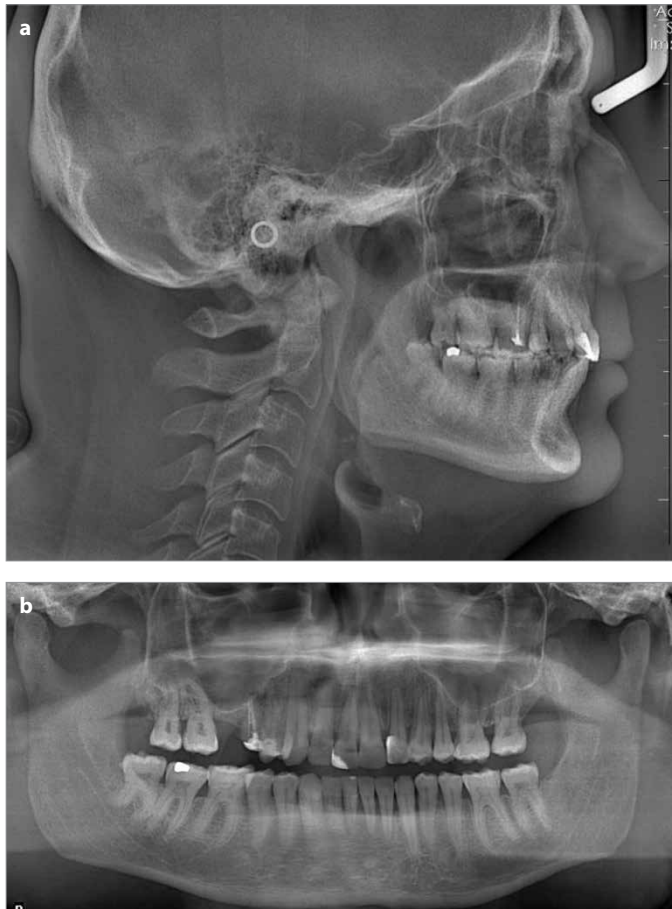
Adults generally have restored or endodontically treated teeth, which can complicate the treatment plan. In the patient in the present study, we extracted the buccally positioned upper left canine using endodontic treatment for correcting the dental crowding. We used upper left first premolar as canine. In literature, premolars are often used instead of canines, and it was suggested that premolars

would effectively enhance esthetics in cases of orthodontic space closure (6, 7).

The upper molar was attempted to move mesially but because of the pneumatization of the maxillary sinus, this movement was not completed. Teeth can be moved if there is adequate bone in the direction of movement and it is challenging to move teeth through anatomic limitations such as maxillary sinus, sutural, or cortical barriers.

## CONCLUSION

The treatment of adult cases with high esthetic concerns can be effectively performed using customized lingual brackets. Customized lingual appliance systems have the ability to treat complex cases, and advanced digital technology can help clinicians plan all the treatment steps.



**Figure 5. a, b.** Post-treatment (T1) radiographic records: Post-treatment lateral cephalometric radiograph (a); post-treatment panoramic radiograph (b)



**Figure 6.** Superimposition of pre- and post-treatment lateral cephalometric films  
Pre-treatment (T0): black line; post-treatment (T1): red line

**Informed Consent:** Written informed consent was obtained from the patient who participated in this study.

**Peer-review:** Externally peer-reviewed.

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