



Correcting severe scissor bite in an adult

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Scissor bite often remains unnoticed by patients although it can adversely affect facial symmetry, jaw growth, and mastication. This case report illustrates the efficacy of temporary skeletal anchorage devices (TSADs) and a modified lingual arch in correcting severe scissor bite. A 28-year-old woman presented with severe scissor bite in the mandibular right posterior segment. To treat this condition, TSADs were used for maxillary posterior intrusion and a modified lingual arch for buccally uprighting mandibular posterior teeth. Long-term retention records demonstrate stable treatment results. (*Am J Orthod Dentofacial Orthop* 2019;156:113-24)

Scissor bite is a rare malocclusion caused by a relatively large maxillary dental arch compared with its mandibular counterpart.¹ Scissor bite remains a clinical challenge for orthodontists. People with scissor bite may have discrepancies in facial symmetry and difficulties in lateral excursive movements owing to excessive buccal eruption of maxillary posterior teeth and lingual tipping of mandibular posterior teeth.² Previous studies have sought to determine the exact etiology of scissor bite. Possible causes include familial inheritance, excessive sucking behavior, and mouth breathing.³ Despite these findings, the cause remains unknown, and the challenge in correcting such a malocclusion is further compounded by the fact that few patients are diagnosed with the condition.

Conventional therapies for the treatment of scissor bite often involve surgical procedures combined with fixed appliance orthodontics.³ Although surgical treatment is often required for ideal repositioning of the maxilla and mandible, many patients do not readily accept a surgical approach, because it is invasive, expensive, and carries associated risks. Other orthodontic treatments for correcting scissor bite have been

suggested, including a maxillary constriction plate, intermaxillary elastics, quad helix, and transpalatal arch appliance.^{4,5} Although these methodologies may be considered as noninvasive alternatives to surgical treatment, their limitations include excessive extrusive force requirements on the anchor teeth and a need for patient compliance.⁶

To avoid these dental side-effects in scissor bite correction, temporary skeletal anchorage devices (TSADs) have begun to be used in recent years. Previous case reports revealed their efficacy in alleviating transverse discrepancies and scissor bite, thereby affirming TSADs as a favorable alternate appliance.^{1,4,7} Because TSADs can be placed in various anatomic locations, they can serve as anchors for both maxillary and mandibular arches.⁸⁻¹⁰ Furthermore, TSADs have become widely accepted in the orthodontic community because they are biomechanically favorable and cost-efficient, and they eliminate the need for patient compliance.^{1,7,8} Given these favorable characteristics, TSADs hold great promise for treating scissor bite and correcting skeletal discrepancies in order to achieve functional occlusion.

In the present case report, we demonstrate the successful treatment of scissor bite with the combined use of TSADs for maxillary posterior intrusion and modified lingual arch for mandibular posterior uprighting.

DIAGNOSIS AND ETIOLOGY

A 28-year-old woman was referred with a chief complaint of buccal crossbite of the mandibular right posterior segment. She presented with a convex profile and facial asymmetry. Her lips were protrusive and incompetent at rest. Her maxillary dental midline was 1.0 mm to the right of the facial midline, and her mandibular dental midline was 2.0 mm to the right of the facial midline. When smiling, the patient showed

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Fig 1. Pretreatment facial and intraoral photographs.

disharmonious gingival contours on her anterior dentition (Fig 1).

Intraoral and dental cast examination revealed a Class I molar relationship on the left side. Molar relationship could not be determined on the right side due to severe lingual tilting of the mandibular posterior teeth. She had 5 mm overjet and 30% overbite on her left central incisors. The maxillary arch had moderate crowding with proclined incisors, and the mandibular arch had severe crowding with a lingually displaced right posterior segment. When her mandible was guided into centric relation, a functional shift was detected due to unilateral Brodie bite on the right side (Figs 1 and 2).

A routine periodontal examination was performed which included assessment of probing depths. Localized pocket depths were <3 mm on the mandibular right segment. A panoramic radiograph showed slightly different right and left condylar heads, but during the temporomandibular joint evaluation, the patient did

not report any muscle or joint pain or other symptoms typically associated with temporomandibular disease. All 4 of her third molars were impacted. Her dentition showed generally short roots, especially on the anterior dentition, due to proclination and pointed or dilacerated root shapes.

Lateral cephalometric analysis indicated a skeletal Class II (ANB 4.0°) with a hyperdivergent growth pattern (SN-MP 45.5°). Even though she had a skeletal Class II pattern, her Wits measurement was low (Wits -3.0 mm) due to the clockwise rotation of occlusal plane.¹¹ Her maxillary and mandibular incisors were proclined (U1-SN 120.5°, IMPA 96.5°). Her lips were protrusive relative to the E-line (Table 1; Fig 3).

TREATMENT OBJECTIVES AND PLAN

The following treatment objectives were established: (1) relieve crowding in both arches, (2) correct the scissor

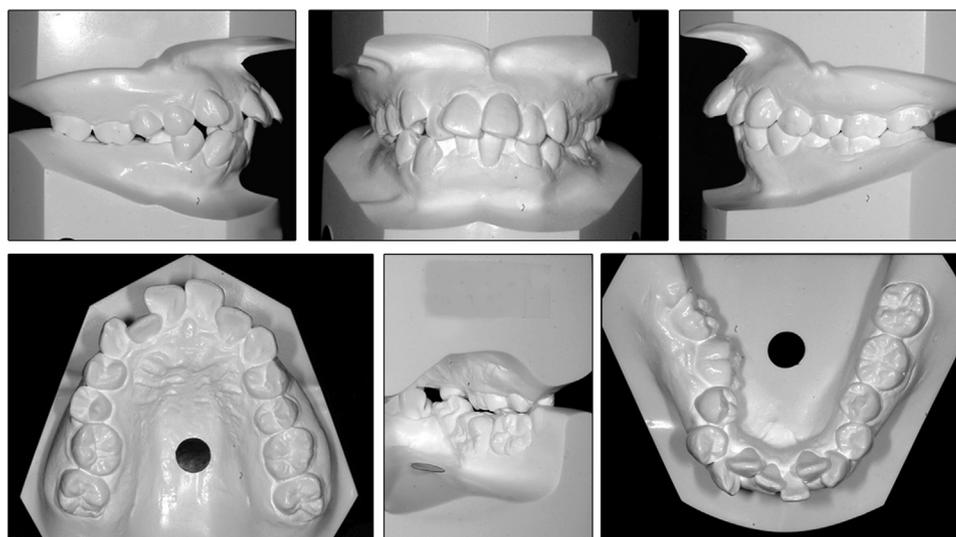


Fig 2. Pretreatment dental casts.

Table I. Cephalometric measurements

Measurement	Norm	Pretreatment	Posttreatment	6-Year retention
SNA (°)	82.0	81.0	81.0	81.0
SNB (°)	80.0	77.0	77.5	77.0
ANB (°)	2.0	4.0	4.5	4.0
Wits (mm)	0.1	-3.0	-3.5	-4.0
SN-MP (°)	34.0	45.5	46.0	46.0
FMA (°)	28.2	40.0	41.5	41.0
LFH (ANS-Me/N-ANS) (%)	55.0	55.0	55.8	55.8
U1 to SN (°)	104.0	120.5	97.0	98.0
U1 to NA (°)	22.0	35.6	16.1	17.3
IMPA (°)	90.0	96.5	86.0	87.0
L1-NB (°)	25.0	39.3	24.1	24.2
U1/L1 (°)	124.0	100.0	130.0	128.0
Upper lip (mm)	1.2	5.0	1.0	1.5
Lower lip (mm)	2.0	5.0	2.0	2.5

bite, (3) maintain Class I dental relationship on the left side and establish it on the right side, (4) obtain normal overjet and overbite, (5) improve the deviation on opening and correct the dental midline, (6) obtain a stable occlusal relationship, (7) improve facial and dental esthetics by establishing an esthetic smile, and (8) improve facial profile.

Because she was an adult patient with skeletal problems, orthognathic surgery was considered. Her mandibular constriction and unilateral Brodie bite could be corrected with the use of a Le Fort I and posterior segmental osteotomy along with mandibular symphyseal distraction.^{7,12,13} Because there was unilateral buccal crossbite, the mandibular transverse widening

would have to be primarily on the right side while the occlusion on the left side is maintained,¹² but the patient declined the surgical option.

TSADs were considered to be a useful treatment option in this case. The extruded maxillary right molars could be intruded and the lingually displaced mandibular right segment could be uprighted with the use of TSADs.⁷ While correcting the crossbite, a removable plate could be delivered on the maxillary arch to open the posterior segment so that the mandibular posterior teeth could be uprighted buccally. After correcting the unilateral buccal crossbite, her maxillary anterior teeth could be retracted with the use of TSADs after extraction of premolars to reduce lip protrusion and overjet.

TREATMENT ALTERNATIVES

Because her maxillary right molars were lingually displaced, we could use an expander containing 2 anchor teeth (first molars) rather than 4 teeth (first molars and first premolars).¹⁴ We also could solder an extension arm on the distolingual side of the maxillary right first molar band to expand the right second molar. To prevent transverse widening of the normal side, 1 miniscrew could be installed on the left posterior palatal slope or paramedian palatal region to maintain left-side occlusion during expansion. The patient was an adult, so we also considered slow expansion. After expansion, while using heavy rectangular wire, we could use intermaxillary crossbite elastics to upright lingually tilted mandibular right posterior teeth. During this procedure, we would prevent lingual tipping of the maxillary posterior teeth while using crossbite elastics. However, there

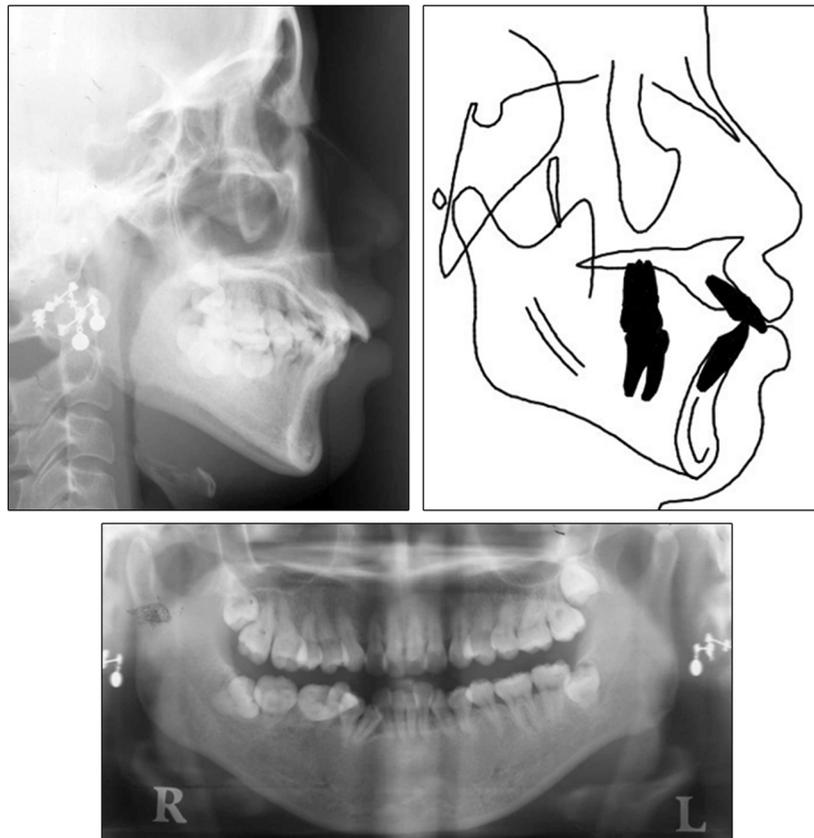


Fig 3. Pretreatment radiographs and lateral cephalometric tracing.

was some concern about extruding and tipping the maxillary right molars after expansion.

TREATMENT PROGRESS

Because the patient wanted to retract her upper lip as much as possible, the plan was to extract her premolars to relieve crowding and reduce her overjet. Because she did not want to extract all premolars and third molars at the same time, she was referred to an oral surgeon to extract her right third molars first. While extracting her right third molars, 2 TSADs (6.0 mm length, 1.5 mm diameter; Orlus, Seoul, Korea) were installed on the interdental space between maxillary molars buccally and palatally, and elastic chains were engaged from the buccal to palatal TSADs. To secure the elastic chains and wire passing through the contact, composite was cured on the occlusal surfaces of the 2 adjacent molars. Two months later, the maxillary molars were intruded and maxillary occlusal plane flattened. A modified lingual holding arch with soldered hooks was then used on the mandibular arch to tip the lingual tilted

molars buccally. While correcting the crossbite, a removable plate was delivered on the maxillary arch to open the posterior segment so the mandibular posterior teeth could be uprighted buccally (Fig 4).

After 7 months, the maxillary right molars were intruded and the mandibular right molars were buccally uprighted. The patient was then referred for the extraction of her maxillary first premolars and mandibular second premolars to relieve the crowding and reduce her anterior overjet efficiently. Full fixed 0.018-inch metal twin brackets (Dentsply GAC, York, Pa) were placed and bonded in both arches. After leveling and alignment, an additional miniscrew was installed on the maxillary arch between maxillary left second premolar and first molar for maximum anchorage. In the mandibular arch, during space closing, an 0.017×0.025 -inch TMA intrusion archwire was used to prevent bite deepening. After space closure, final detailing of the occlusion was accomplished with the use of 0.016×0.022 -inch steel archwires (Fig 5). Fixed retainers were attached on the maxillary anterior teeth and mandibular anterior teeth and first premolars. Wraparound removable retainers were also delivered to

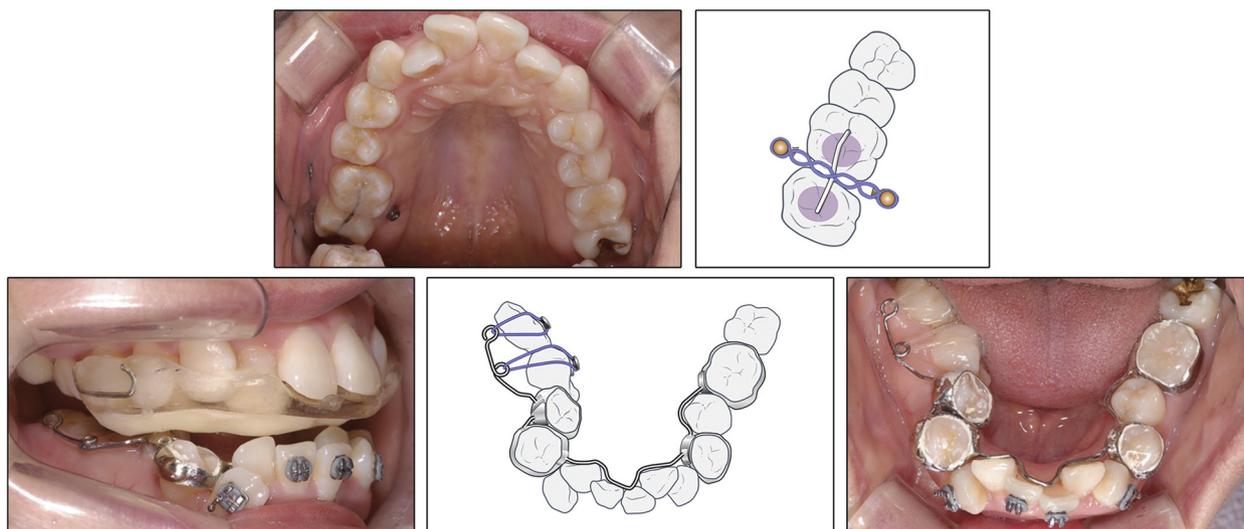


Fig 4. Maxillary right molar intrusion with the use of TSADs and buccal uprighting of mandibular right molars with the use of elastics.



Fig 5. Progress intraoral photographs of the TSADs for space closing in the maxillary arch and an intrusion archwire for mandibular anterior teeth.

secure the stability of both arches. Total treatment time for this patient was 3 years. After her orthodontic treatment, she was referred to surgeons to evaluate the extraction of her left third molars and gingival graft of the mandibular anterior segment.

TREATMENT RESULTS

Posttreatment records showed that the treatment objectives were achieved. Facial photographs showed

improved lip closure. The unilateral buccal crossbite on the patient’s right posterior segment was corrected. The crowding in both arches was relieved, acceptable overbite and overjet were achieved, and her dental midlines were improved. A Class I dental relationship was maintained on the left side and a Class I dental relationship was established on the right side (Figs 6 and 7).

The posttreatment panoramic radiograph showed proper space closure and acceptable root parallelism.



Fig 6. Posttreatment facial and intraoral photographs.

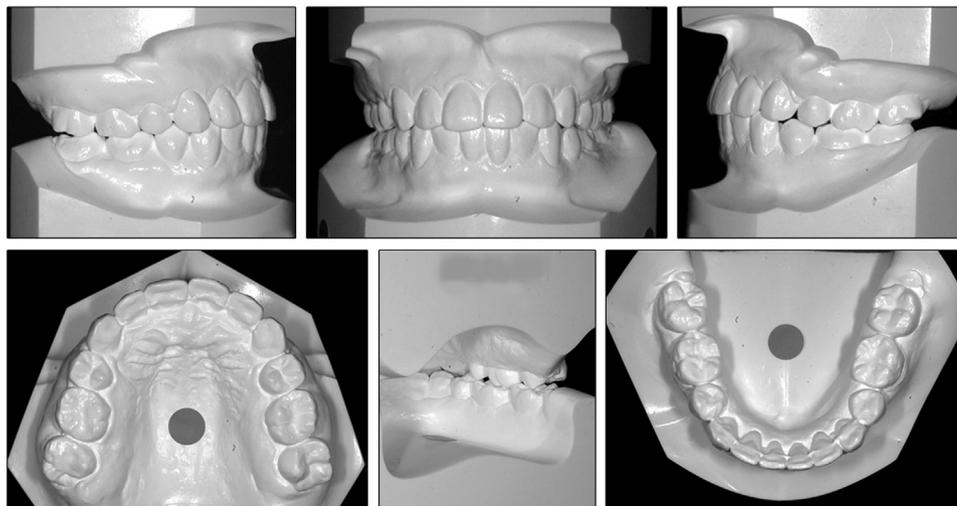


Fig 7. Posttreatment dental casts.

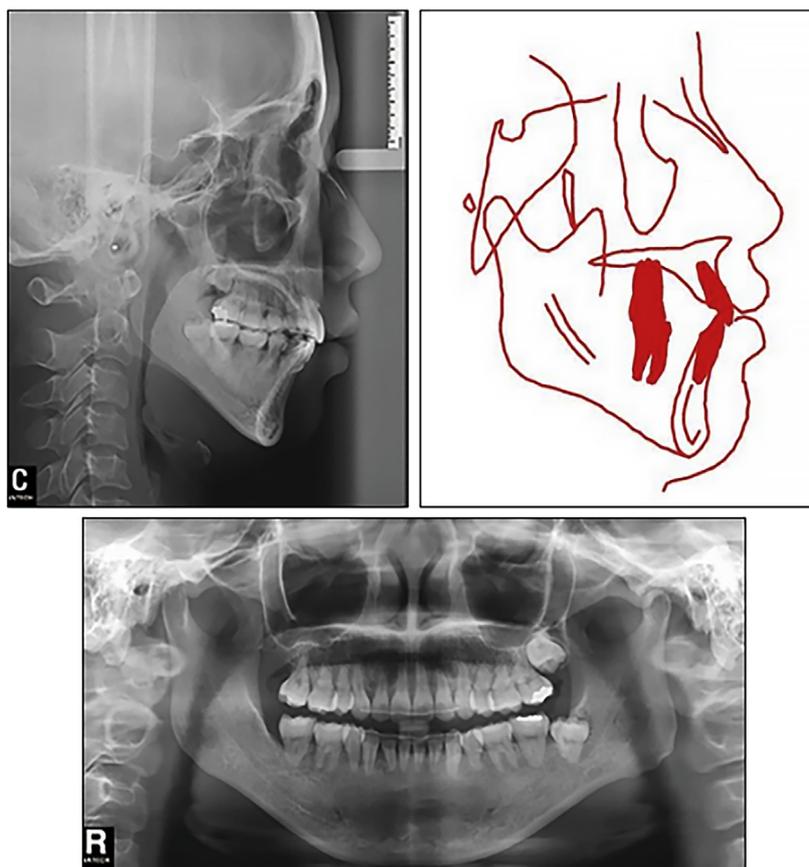


Fig 8. Posttreatment radiographs and lateral cephalometric tracing.

Although she developed more root resorption on her mandibular anterior segment, there were no significant signs of bone or root resorption compared with the pretreatment panoramic radiograph. Posttreatment lateral cephalometric analysis and superimposition showed no significant skeletal changes (ANB 4.5°, SN-MP 46.0°). The maxillary and mandibular incisor showed retroclination (U1-SN 97.0°, IMPA 86.0°). The patient's facial profile, especially the protrusion of her lips and smile esthetics, were improved (Table 1; Figs 8 and 9). At the 6-year retention examination, the records showed no significant relapse and the patient had a stable occlusion (Figs 10-12).

DISCUSSION

Scissor bite is a rare phenomenon in the general population, with an estimated occurrence of 1.5% of the general population,¹² and even fewer cases during the primary dentition period. However, such reported prevalence may be underestimated because an afflicted

individual is often unaware that they possess a scissor bite. The scissor bite is not corrected spontaneously and progressively worsens as maxillary teeth continue to overerupt and occlude on the buccal surfaces of the mandibular posterior teeth.¹⁵ Occlusion itself causes tipping of maxillary posterior teeth buccally and mandibular posterior teeth lingually.³ If this condition persists, mandibular posterior teeth can become completely tipped lingually and the alveolar bone may be severely affected as well.⁵

Untreated scissor bite in younger patients can lead to aberrant jaw growth and the development of facial asymmetry. Furthermore, as a patient ages and growth of the mandible slows, the correction of scissor bite becomes more challenging. For younger patients, more treatment options are available including constriction of maxilla and expansion of mandible before growth is completed.¹⁶ This early interceptive treatment can shorten the treatment time and decrease the complexity in later stages of orthodontic treatment.^{3,15} As such, early treatment of scissor bite is critical.

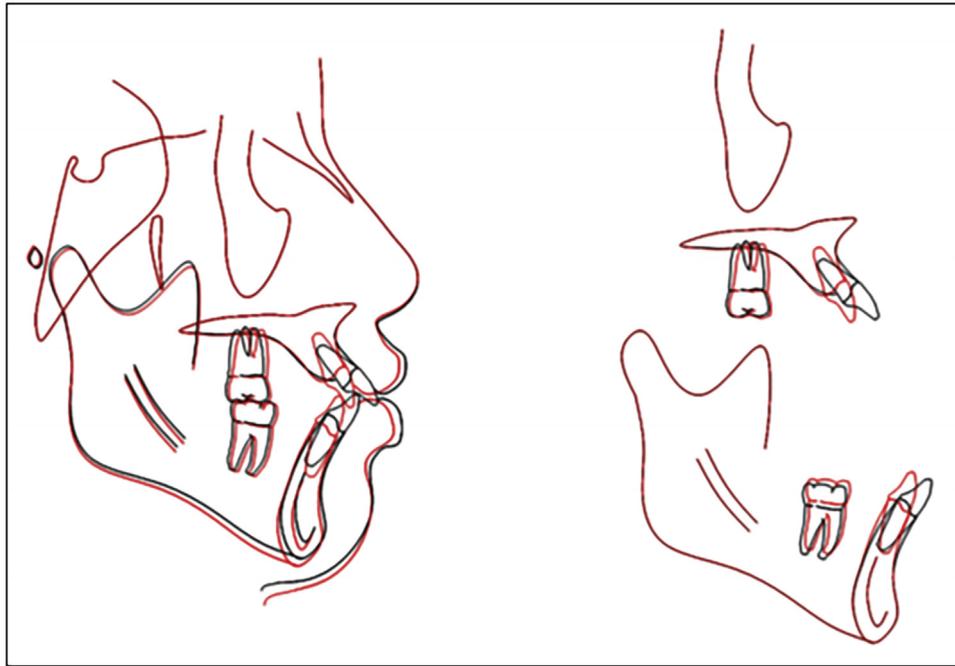


Fig 9. Cephalometric superimposition showing profile improvement. *Black*, pretreatment; *red*, post-treatment.

In the present case, our patient exhibited a scissor bite with supraerupted maxillary posterior teeth occluding on the buccal surface of lingually tipped mandibular posterior teeth. We began the treatment by intruding her supraerupted maxillary posterior teeth. There are multiple treatment mechanisms available for intruding posterior teeth, such as headgear and posterior bite blocks.^{17,18} These treatment modalities, however, require stringent patient cooperation, thus compelling us to turn to other favorable alternatives, such as TSADs. TSADs have been shown to be very effective in molar intrusion. Sugawara et al demonstrated that TSAD-facilitated molar intrusion can achieve intrusion of 1.7 mm for the mandibular first molar and 2.8 mm for the mandibular second molar.¹⁹ Intrusion with the use of TSADs is efficient as intrusive forces can be applied in a stable manner and immediately after TSAD placement.²⁰ Furthermore, varying numbers of TSADs can be incorporated in molar intrusion techniques. In our case, we used the minimum number necessary for efficient intrusion to maximize patient comfort.²¹ We placed 2 TSADs on both buccal and palatal sides for balanced biomechanics, because tilting of the tooth during apical displacement can occur if force is only applied to just one side.²²

One of the complications associated with TSAD-facilitated molar intrusion was highlighted in a previous

study showing that intruded posterior teeth may consequently experience a relapse rate as high as 30%.¹⁹ Therefore, overcorrection of molar intrusion was necessary to achieve sufficient molar intrusion in our patient. In addition, previous studies reported that intrusion with heavy force can cause pulpal damage and interradicular root resorption,^{23,24} so we limited the magnitude of force to ~250 g per molar to prevent further root resorption.²⁴ Fortunately, in our case, molar intrusion for maxillary posteriors was achieved successfully without any of the aforementioned complications.

In severe cases of unilateral Brodie bite, as with our patient, treatment options including mandibular symphyseal distraction and TSADs have been shown to be effective. Distraction osteogenesis, a procedure involving osteotomy and a distractor to gradually stretch the callus,^{12,25} has been shown to be successful in expanding mandibular basal bone for the correction of true unilateral scissor bite. It is important to note, however, that distraction osteogenesis is most effective in younger patients with growth potential.² Therefore, less invasive procedures such as TSADs are particularly suitable for treatment of severe scissor bite in adult patients. The TSAD system allows the force to be applied closer to the center of resistance of the tooth, thereby producing translatory movement and allowing extensive tooth displacement.⁸ In this case, because buccal TSAD



Fig 10. Six-year posttreatment facial and intraoral photographs.

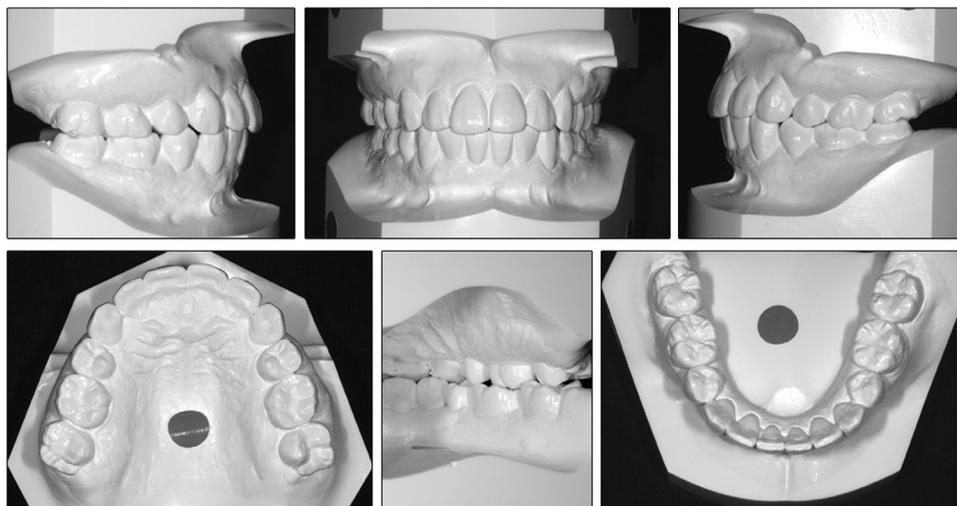


Fig 11. Six-year posttreatment dental casts.

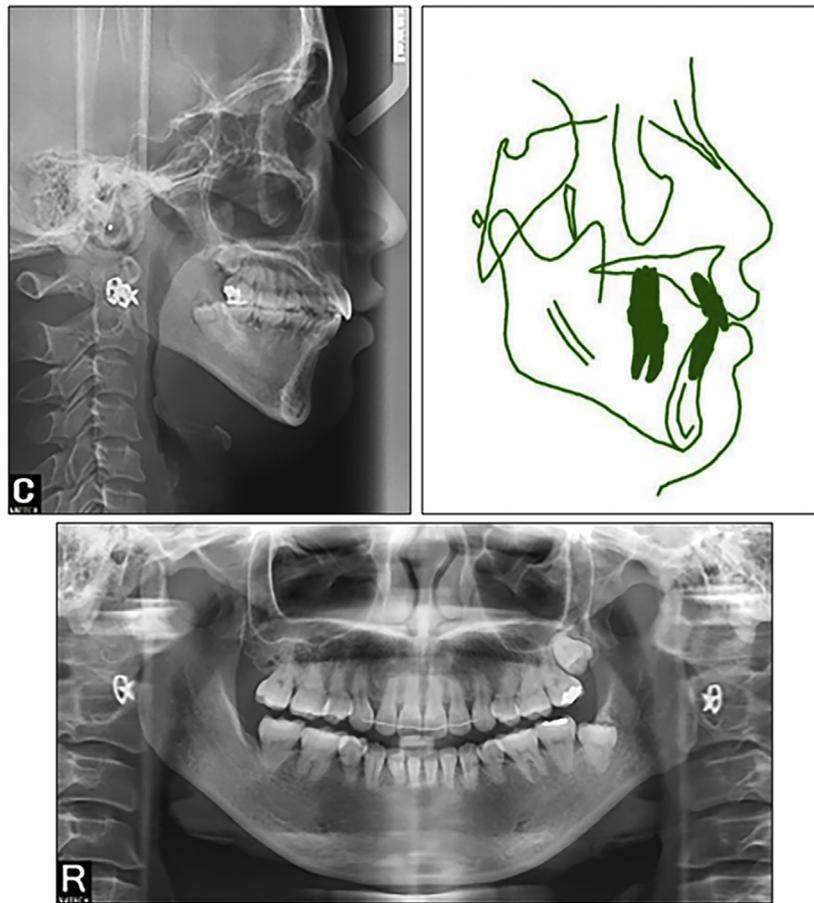


Fig 12. Six-year posttreatment radiographs and lateral cephalometric tracing.

placement was able to facilitate mandibular right posterior uprighting, we initially considered using TSADs as a treatment option. However, with severely tilted buccal alveolar bone as seen in our patient, buccal insertion of TSADs could have caused significant patient discomfort. In addition, TSADs placed in the mandible are known to have higher failure rates.^{26,27} To avoid potential complications with TSAD use, we decided to use a modified lingual holding arch for molar uprighting in the mandible. We designed a modified buccal extension arm on the lingual holding arch. To maximize anchorage on the lingual arch, we placed bands on a larger number of teeth and performed mandibular premolar extraction after the buccal uprighting of the mandibular right posteriors. Molar uprighting progressed successfully and scissor bite was significantly improved in just 7 months.

During the initial 7 months, we used a maxillary bite plate to facilitate the treatment of scissor bite. The reason for this was to prevent occlusal interference when the mandibular posterior teeth moved buccally

while simultaneously preventing unwanted extrusion of the maxillary posterior teeth.^{1,4,28} Although it is also possible to place bite resin on individual teeth, undesirable extrusion of teeth that did not have bite resin might occur.⁷ Our patient was receptive and compliant to the full-time application of the bite plate, which may have contributed in facilitating our treatment progress.

As seen from 6-year retention records, this case had excellent posttreatment stability. After a year of full-time retainer wear, retainers were used infrequently. Once scissor bite is corrected, the lingual incline of the buccal cusp of the maxillary teeth and the lingual incline of the lingual cusp of the mandibular teeth occlude properly so that the occlusion itself functions as a retainer to prevent scissor bite from reoccurring,²⁹ but it is important to note that scissor bite treatment stability is often compromised owing to treatments involving dental expansion. It has been shown that the expansion of basal bone relative to alveolar bone is critical in establishing long-term stability.^{12,30} In this case, the

mandibular constriction was isolated to the right quadrant with excessive dental tipping. By uprighting the mandibular right posterior teeth, we were able to reposition the alveolar housing as well and achieve long-term stable results.

CONCLUSION

A specially designed lingual holding arch used in this study was able to provide sufficient anchorage and patient comfort to buccally upright lingually tilted mandibular posterior teeth. The integrated approach of TSADs for maxillary intrusion and a lingual holding arch for mandibular uprighting could be an effective way to orthodontically treat severe scissor bite in adult patients.

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SUPPLEMENTARY DATA

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ajodo.2017.11.047>.

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