

Case Report

## Managing Unexpected Iatrogenic Opening of Anterior Bite During Active Orthodontic Treatment: A Case Report.

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DOI: <https://doi.org/10.24191/cos.v7i0.17493>

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### Abstract

**Introduction:** Orthodontic treatment even though managed and properly controlled, on some remote occasion may lead to presence of unwanted movement. Anterior open bite is one such example of an iatrogenic outcome. This article describes the management of an iatrogenic anterior open bite case that occurred in active orthodontic treatment in the early stage of leveling and aligning. A few modalities had been employed to manage the open bite through some artistic bends followed by the use of modified low transpalatal arch with extended looped arms with loops as well as orthodontic mini implants for distalisation and some intrusion mechanics. This case report is aimed to share authors' anecdotal experience on overcoming the open bite.

**Keywords:** Anterior open bite; anchorage; orthodontic mini implant

**Abbreviations:** AOB (Anterior open bite); DPT (Dental Panoramic Tomogram); MI (Miniscrew implant); Mm (Milimetre); Oz (Ounce); TPA (Transpalatal arch)

Received 05 March, 2020 / Accepted for publication 04 June 2020.

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### Introduction

Anterior open bite (AOB) is a condition when there is an open vertical dimension between the incisal edges of the maxillary and mandibular anterior teeth, while loss of vertical dental contact may exist between mainly the anterior with some premolar involvement (Subtelny, J.D., Sakuda, M., 1964). AOB can be classified as skeletal or dental open bite (Sassouni, V., 1969). Presence of AOB may lead to occasions such as deterioration of the occlusion,

mastication problems, speech difficulties and change in the appearance (Ngan, P., 1997; Kim, Y.H., et al, 2000).

Many modalities have been documented to manage open bite cases such as the tongue crib therapy, posterior bite blocks and magnets, posterior intrusion using skeletal anchorage functional appliances, headgears to inhibit the vertical maxillary growth, chin cups to hinder the mandibular growth, or anterior extrusion using intermaxillary elastics or orthognathic surgery (Cambiano, A.O., et al, 2018). However, the treatment of choice is subject to clinicians' preference case and patient suitability.

Anchorage is important in orthodontic treatment. It has been defined as

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resistance to unwanted tooth movement (Costello, B. J., et al, 2010; Profitt, W.R., et al, 2013). Orthodontic mini implants (MI) provides absolute anchorage and can be used to manage anterior open bite (Kuroda, S., et al, 2004). This case report describes methods and mechanics of overcoming an unwanted anterior open bite during an active orthodontic treatment for common sharing to benefit all.

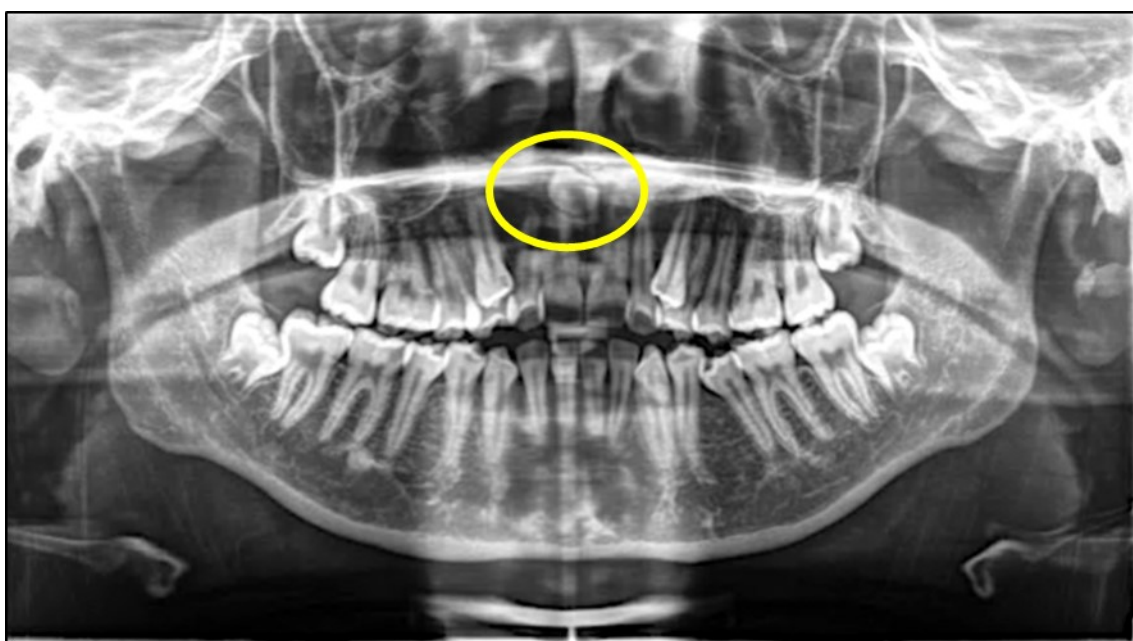
### Case Report

A.I., a 16 year old, Malay, young lady came to our clinic with a chief complain of overlapping teeth. She is asthmatic but currently under medication. She was presented with a Class II Division 1 incisor relationship on a Class 1 skeletal base with an average vertical proportion. Her malocclusion was complicated by the presence of supernumerary between the upper right and left central incisors, moderate crowding of the lower arch, severe crowding of the upper arch,

buccally erupted upper canines, increased overjet, minimal open bite of 1mm from the upper right second premolar to the contra-lateral second premolar, crossbites on the posterior without displacement, upper and lower centerlines shifted to the right by 1mm.

A.I. was treated with orthodontic camouflage in a single phase fixed appliances with surgical removal of the supernumerary as well as extractions of the upper first premolars and lower first molars (Figure 1). The Low Transpalatal arch (TPA) was prescribed as the anchorage reinforcement appliance.

The leveling and aligning phase took 6 months which resulted in an unexpected opening of the bite (from 1mm to 4mm) extending from the second premolar, anteriorly and to the contralateral second premolar even without continuously engaging the buccally erupted canines (Figure 2A). The AOB worsened due to the activation of the TPA while correcting the buccal crossbites and full engagement of



**Figure 1:** The dental panoramic tomogram (DPT) during pre-orthodontic treatment taken in January 2017. Note the presence of supernumerary (circled in yellow).

the upper canines. The AOB showed a symmetrical bowing effect from right to left. Both the upper and lower anterior teeth had proclined significantly with an overjet of 6mm which raised an alarming concern for both the operator and patient (Figure 2B).

At this stage (Figure 2B), mid treatment re-diagnosis of the mechanics was prompted and re-supervised to determine the cause of the AOB. An

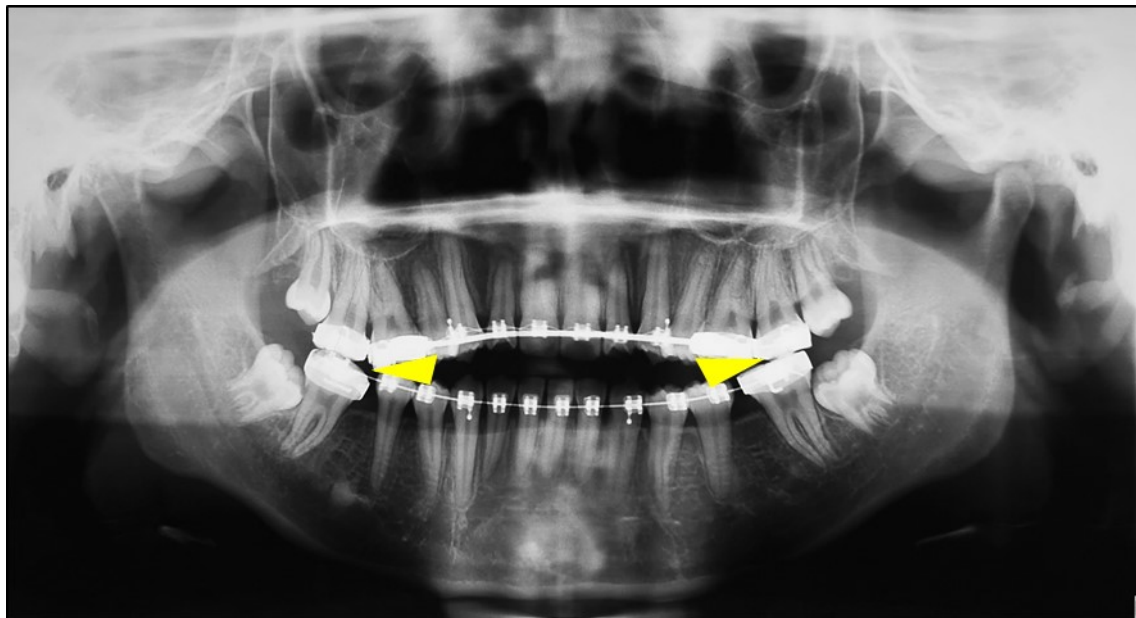
orthopantomogram was taken in June 2018 at mid-treatment to reassess the occlusal plane, parallelism of the teeth and possible points of teeth wedging (Figure 3). From the dental panoramic tomogram (DPT), the upper first molars was noted to be mesially angulated with the distal cusp plunging down out of the occlusal table, creating a wedge effect. Steps for immediate resolution was taken and outlined further in Phase 1, 2 and 3.



**Figure 2A:** Pre-treatment frontal view.



**Figure 2B:** Further opening of the bite (4mm) during leveling and aligning stage.



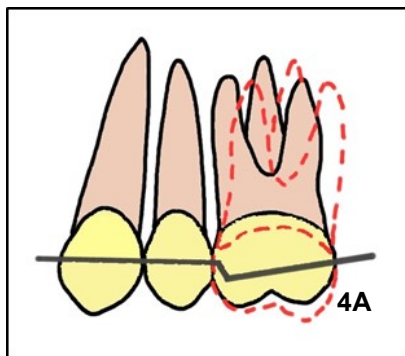
**Figure 3.** The dental panoramic tomogram (DPT) at mid-treatment. Note the presence of the magnitude of the wedge effect (yellow triangle).

Phase 1: Up-righting of the Upper First Molars and Reduction of the Anterior Open Bite

1. The AOB at this point was 4mm. Tip back bend of the upper first molars was introduced (Figure 4A). Upper and lower arch wires of 0.018 stainless steel were used.
2. Simultaneously, patient was instructed to use anterior box elastics (3.5oz) for full-time in the configuration of



3. The upper second molars were excluded from the arch-wire at this point to allow maximum up-righting of the upper first molars. Patient was followed up after 3 months, the overjet and overbite was noted to be reducing steadily. The up-righting mechanics took 6 months (Figure 5).



Figures 4A and 4B: The Tip back bend to upright the first molars and the anterior box elastics.

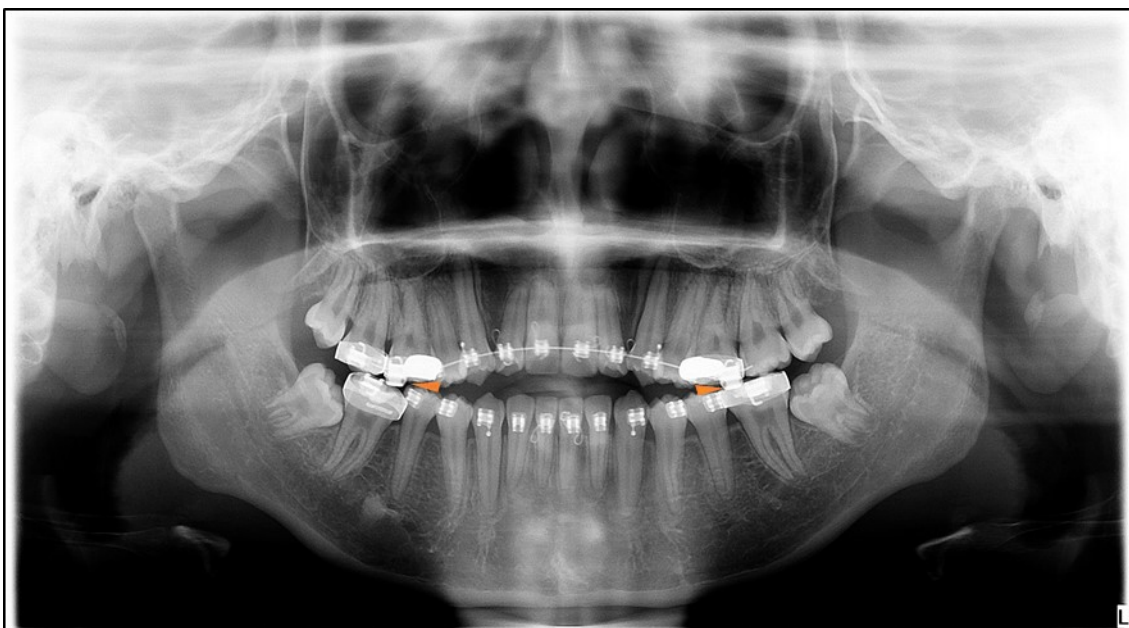
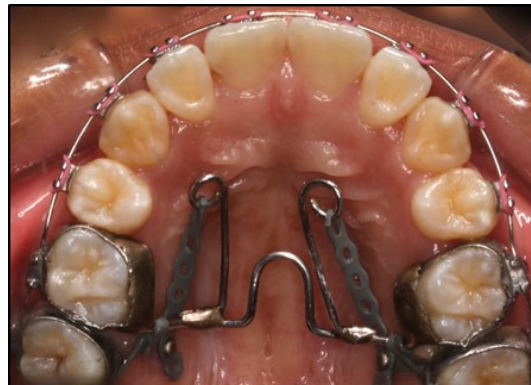
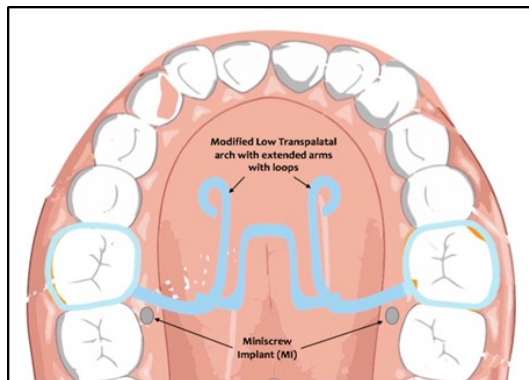


Figure 5: The dental panoramic tomogram (DPT) taken after the molar up-righting. Note the reduction in the size of the wedge effect (orange triangle).

Phase 2: Modified Low Transpalatal arch and Molar Distalisation using the Orthodontic Mini Implants.

1. Removal of the upper third molars was planned to allow for distalisation of the upper arch.
2. Mini implant (ORLUS, Korea) was placed between the upper first and second molars at the palatal side.
3. Fabrication and cementation of the Modified Low TPA with extended looped arms anteriorly for distalisation and some intrusion effect (Figure 6A and 6B). The TPA was constructed using 1.0mm stainless steel, a rigid wire which prevented tipping of the teeth.
4. The upper and lower arch wires used were 0.018 stainless steel. Elastomeric chain was placed from the loops to the MIs to aid in the distalisation and was changed every month.
5. The upper second molars were up-righted through arch-wire after the removal of the third molars. Thus, this created some space to allow the first molars to be distalised via this modified TPA.



**Figures 6A and 6B:** The design of the Modified Low Transpalatal arch with loops used for distalisation with elastomeric chain in placed.

Phase 3: Distally Descending Multiple Tip Bends in the Lower Buccal Segment

1. A multiple artistic tip back bend ( 2<sup>nd</sup> order bend) with descending steps from the lower canines to the second molars on a 0.018 stainless steel wire was placed (Figure 7A and 7B).
2. The patient was instructed to continue using the anterior box elastics full time.
3. Note that the overjet has been reduced and there was an incisal overlap (Figure 8A and 8B). The treatment time took 1 year.

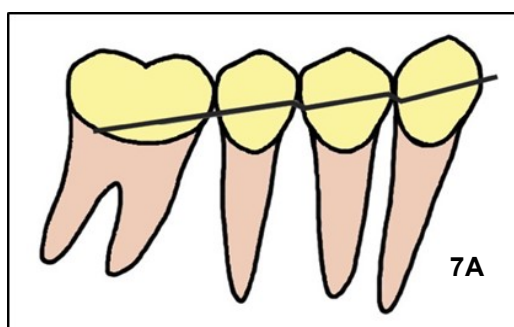


Figure 7A. The multiple descending second order bends on a 0.018" stainless steel wire.

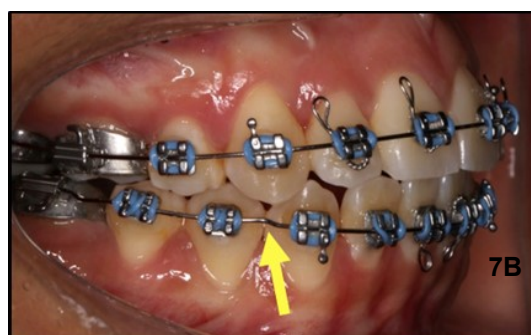
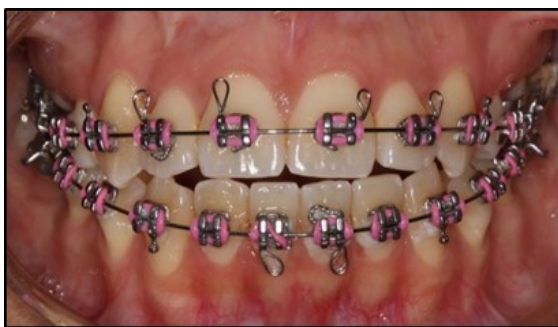
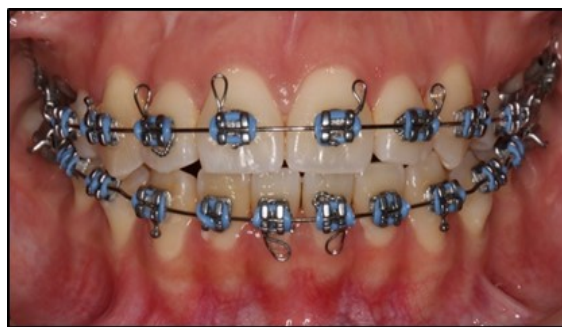


Figure 7B. The activated arch-wire placed in the lower arch.



**Figure 8A:** Reduced overbite following the tip back bend and distalisation.

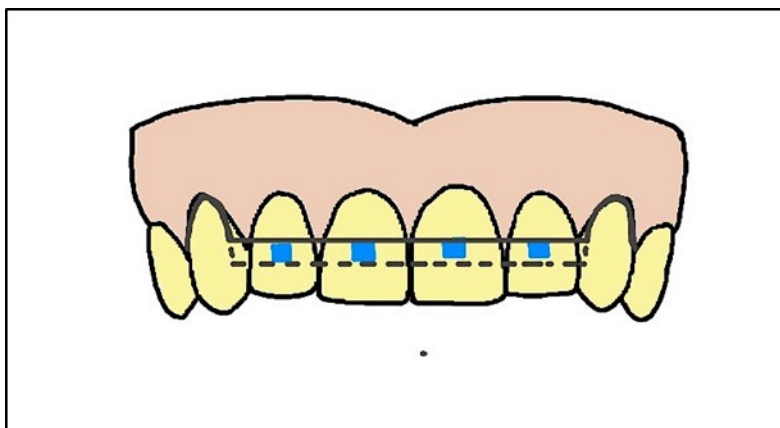


**Figure 8B:** Vertical overlap of the incisors achieved.

**Planned Retention Phase:**

The patient has been reviewed for vertical stability with anterior elastics and to further correct the centerline prior to debond. Retainers planned are the upper and lower Hawley retainers with mini composite tags

on the labial surface of the incisors. The labial bow will sit above the composite tags for the upper arch and below the tags for the lower arch (Figure 9). Bonded retainers are to be placed on the buccal side of the lower premolars and upper second premolars and first molars.



**Figure 9:** The design of the Hawley retainer with composite tags on the labial surface of the incisors.

**Discussions**

Time and time again the correction of AOB has been one of the toughest malocclusion to treat and the best method with strong evidence to treat it has yet to exist. It is imperative to identify the underlying cause of the presenting malocclusion prior to any orthodontic treatment. The aetiology could be due to skeletal, dental, soft tissue and habits. By acknowledging and understanding the underlying cause of a malocclusion, it would aid in treatment

planning and to ensure that the treatment will go as planned.

The possible aetiology of the AOB in this particular case are inherited incomplete overbite, high and buccally positioned upper right and left canines with potentially upwards inclination of the occlusal Curve of spee and moderate tending to high vertical proportion (MMPA=30°).

Multi stage approach was required to treat the AOB as no specific mechanic was able to overcome the presenting malocclusion

and simply extruding the incisors only is prone to relapse. Uprighting the molars, employing the MIs for distalisation, anterior box elastics as well as the multiple artistic bends led to the counterclockwise rotation and improvement in the overjet and overbite.

As shown previously, the AOB of this patient worsened and aggravated during the active orthodontic treatment. Some of the causes of the further opening could be due to insufficient anchorage of the first molars and lack of vertical control; the upper second molars were not banded or bonded at the start; upper incisors proclination as a resultant of the upwards inclination of the occlusal plane and the inadequate space for the canine alignment; the choice of extraction (the upper first premolars and lower first molars) as well as the activation of the TPA, led to the worsening of the AOB.

A few recommendations could be made to avoid unwanted bite opening. One recommendation is to use adequate anchorage reinforcement such as the MIs and TPA to prevent anchorage loss as well as for vertical control. Continuous Nitinol arch-wire should also be avoided when the canines are buccally displaced. Segmental arch-wire mechanics of splitting the anterior and posterior segment during leveling is recommended with the distal tipping of the buccal segment incorporated early with stainless steel wire. Also, the upper second molars were not included at the beginning of the treatment as it was feared to worsen the vertical dimension. Banding or bonding can still be instituted by positioning the band or tube more occlusally on the second molars to avoid opening the bite further.

Presence of a habit such as lipping or tongue thrusting needs to be recognised and curbed at the start, during and even after

the treatment to prevent re-emergence of open bite. Habit breaking appliance such as the tongue crib can be proposed and incorporated in the modified TPA at the anterior region. Removal of the third molars at the start of the treatment also could allow uprighting (provided first and second molars are present).

Post treatment stability is questionable as there is a high tendency of relapse. Proper tongue posture and function is an important factor for stability. A close monitoring and follow up post debond is required.

### Conclusion

A thorough as well as accurate diagnosis and treatment planning is an important step in any orthodontic treatment. In spite of that, a slip-up may create another unwanted malocclusion and worsen it. In this case, a sudden emergence of unwanted open bite was managed promptly by re-diagnosing the mechanism and re-supervised by employing alternative mechanics. This case report showed one of the ways to manage an unwanted occurrence of an AOB.

### Acknowledgements

There is no conflict of interest or fund received from any company or body throughout the duration of the orthodontic treatment.

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