

## CASE REPORT

# Orthodontic treatment of an adult patient with aggressive periodontitis – A case report

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### Abstract

A 26-year-old man with an aggressive periodontitis sought for orthodontic treatment to improve the appearance of his smile. He presented with generalised anterior spacing, missing lower left central incisor and deep traumatic bite. He was treated successfully with a combination of orthodontic and periodontal treatment. After 18 months of orthodontic treatment and follow up by the periodontist, his alignment of teeth was improved, a stable occlusion was achieved, and occlusal trauma was prevented. As a result, the patient's smile appearance and self-confidence were improved. Orthodontic tooth movement is not only to correct the alignment of his teeth but also to improve the bone level especially at the anterior region. This case report shows the successful treatment outcome in aggressive periodontitis patient which requires good collaboration between the orthodontist and the periodontist.

*Keywords: aggressive periodontitis, bone level, orthodontist and periodontist, occlusal trauma, traumatic bite*

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### Introduction

Awareness for orthodontic treatment among periodontic patients is increasing due to pathologic dental migration, which compromise the facial aesthetics (Brunsvold, 2005; Feng *et al.*, 2005). Periodontitis is the inflammation of the supporting tissues of the teeth, caused by specific microorganisms, which leads to progressive destruction of the periodontal ligament and alveolar bone with either pocket formation, recession, or both (Gyawali & Bhattarai, 2017). Interdisciplinary

approach by the orthodontist and periodontist is required in the orthodontic management of cases with compromised periodontium (Vinod *et al.*, 2012).

Aggressive forms of periodontal disease have been defined based on the following primary features (Lang *et al.*, 1999): non-contributory medical history, rapid attachment loss and bone destruction, and familial aggregation of cases. The general secondary features of aggressive periodontitis is: amounts of microbial deposits inconsistent with the severity of

periodontal tissue destruction. The other secondary features were laboratory features such as elevated proportions of *Aggregatibacter actinomycetemcomitans* (previously named *Actinobacillus actinomycetemcomitans*) and, in some populations, *Porphyromonas gingivalis*; phagocyte abnormalities; hyper-responsive macrophage phenotype, including elevated production of prostaglandin and interleukin in response to bacterial endotoxins (Lang *et al.*, 1999).

Aggressive periodontitis affects adolescents, and the percentage of adolescents is highest among orthodontic patients (Bagga, 2010). Prevalence of aggressive periodontitis varies widely among various races and ethnicities from 0.1% to 15% (Albandar *et al.*, 2007). Besides, genetics, age, and environment may also influence it. Females are found to be more affected than male (Hormand & Frandsen, 1979).

Patients with an aggressive periodontitis may lose the interproximal attachment and this is the main factor for the pathological migration of teeth (Martinez-Canut *et al.*, 1997). Changes the position such as proclination, rotation, spacing and extrusion the anterior teeth may compromise aesthetics (Towfighi *et al.*, 1997). Orthodontic treatment can facilitate improvement by light intrusive orthodontic forces to correct the pathological extrusion and migration of teeth (Garat *et al.*, 2005; Panwar *et al.*, 2010). Nonetheless, orthodontic treatment should be started only after the clinician is convinced that the patient is well motivated and can follow the oral hygiene instructions well (Gyawali & Bhattarai, 2017).

During the treatment, it is important to reinforce good oral hygiene. Clinicians should inform the patients the consequences of poor oral hygiene on the teeth and supporting structures. Orthodontic patients

with aggressive periodontitis also require a separate periodontal appointment with a periodontist once every 3 months (Levin *et al.*, 2012). Good communication and understanding between the orthodontist and periodontist are essential to achieve successful results and avoid unwanted complications. This case described the management of aggressive periodontitis through the interdisciplinary approach for improving the aesthetics and fulfilled the patient expectation. The correction of extruded upper central incisors with controlled intrusion led to a decrease in the clinical crown length, better access for oral hygiene procedures, better gingival form, and a more suitable distribution of occlusal forces (Rabie *et al.*, 1998).

### Diagnosis and etiology

A 26 year old male presented in October 2015 at the Orthodontic – Periodontic - Restorative Joint Specialist Clinic in Klinik Pergigian Cahaya Suria, Kuala Lumpur. His chief complaint was “spacing and forward position of the upper teeth”. He was very keen to improve his esthetics, which affected his self-confidence. Patient’s medical history was non-contributory. He was a light smoker. He had mentioned during history taking interview that his mother’s siblings had lost their teeth at early age and wearing dentures. Pre-treatment records indicated that the patient had full mouth plaque score of 51% and bleeding score of 38%. The presence of plaque was noted to be at supragingival areas and thin in thickness. These scores had improved following completion of initial periodontal therapy to 23% and 36%, respectively, prior to referral to orthodontist.

He presented with a symmetrical face and Class I skeletal profile (Figure 1). Intraorally, he had Class II division 1 malocclusion with an overjet of 10mm. The molar relationship on the right and left side were in Class I and

Class III, respectively. In addition, the canine relationships on the right and left side were in Class II and III, respectively. The posterior segment appeared acceptable occlusion, but the patient's main concern was at the anterior region.

Anteriorly, he presented with a 90% deep bite and traumatic to the palate on mandibular left lateral incisor. His mandibular right central incisor impinged on the cervical area of maxillary right central incisor, with proclination of the maxillary right central incisor and extrusion of both maxillary and mandibular incisors. He lost his mandibular left central incisor in his early 20's due to mobility. He did not replace the

mandibular left central incisor and unfortunately, the mandibular incisors migrated forward to fill an empty space area. Spacing in the upper and lower arch were 8mm and 5mm, respectively. The curve of Spee was 4mm. Gingival recession was noted at the anterior region with obviously exposed 1/3 of the root length of maxillary left central incisor. The periodontal probing depths were more than 6mm mainly at maxillary and mandibular incisors and molars; and right mandibular canine. Deepest probing depth was 9mm at mesial aspects of left maxillary central incisor. Mobility of grade 2 was recorded for maxillary incisor.



Figure 1. Pre-treatment extraoral and intraoral photographs

The panoramic radiograph (Figure 2) showed that all teeth were present except the mandibular left central incisor. It revealed a generalized horizontal bone loss of  $\geq \frac{1}{3}$  of root length to  $\geq \frac{1}{2}$  of root length, and more severe bone loss at first molars ( $\geq \frac{1}{2}$  of root length). A severe vertical bone loss of  $\geq \frac{2}{3}$  of root length was obvious on periapical radiograph at maxillary central incisors (Figure 7(a)). There was pathological displacement of the upper right and left central incisors. The upper right and left central incisors appeared extruded and

upper left central incisors displaced distally. Lateral cephalometric radiograph (Figure 2) showed a Class I skeletal pattern with proclined upper incisors. The mandibular plane angle within the normal range (28.7 degrees) and lower facial height ratio was normal. More cephalometric values pre-treatment as stated in Figure 6 and based on these findings, the patient was diagnosed with a Class II division I malocclusion on a Class I skeletal base with aggressive periodontitis.

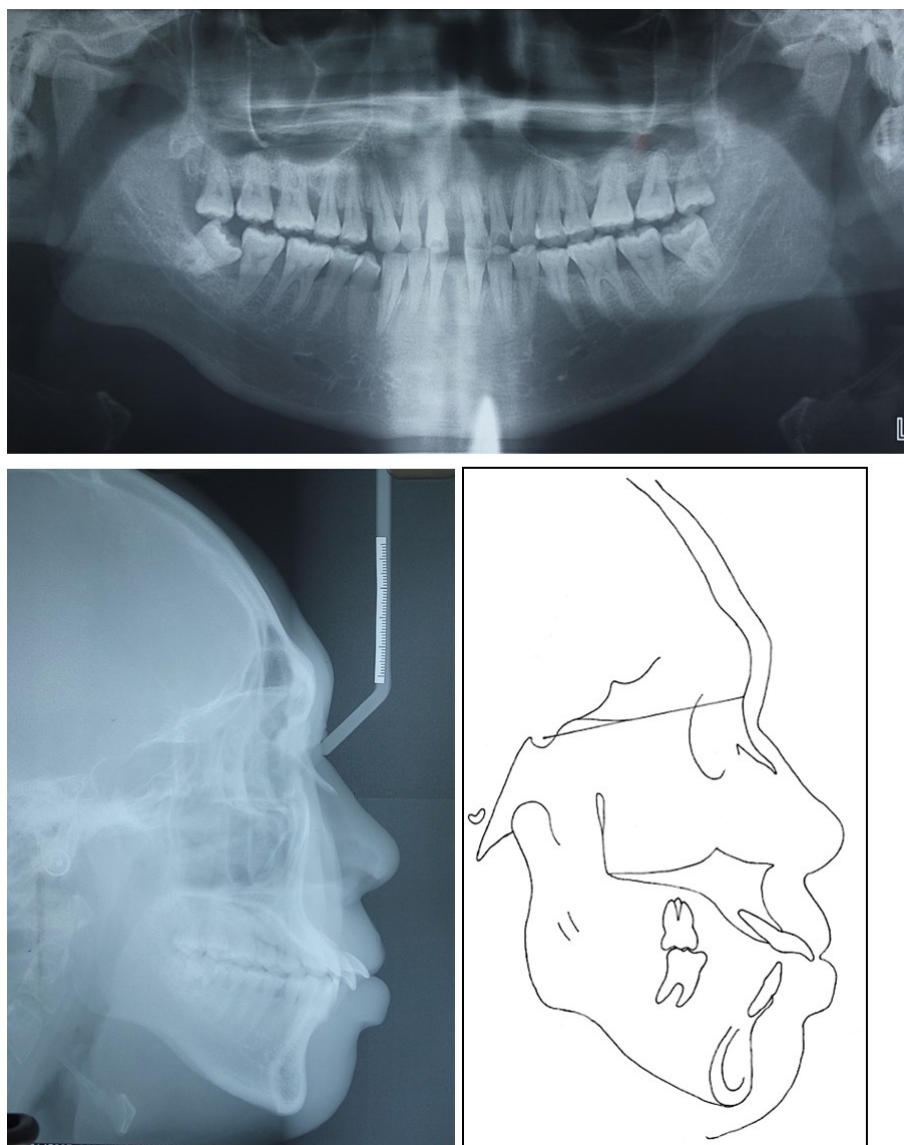


Figure 2. Pre-treatment panoramic radiograph and lateral cephalometric radiograph and tracing.

## Treatment options

The treatment options that were given to the patient in the interdisciplinary Orthodontic-Periodontic-Restorative Joint Clinic are as follows:

1. Comprehensive periodontal treatment until maintenance phase, followed by orthodontic treatment and later with Prosthodontic treatment. The patient needs to start with 2-3 years orthodontic treatment with regular follow up (every 6-8 weeks) with the orthodontist. In addition to that, patient have to be committed to the periodontal health care maintenance and attends regular review (every 3 months) with the periodontist throughout the active orthodontic treatment. After the course of the orthodontic treatment, the missing tooth was planned for replacement with a prosthesis, followed by night time (life time) upper and lower retainers. The patient was warned of potential loss of vitality of the upper central incisors and thus, needed close monitoring.
2. Endodontic treatment for upper right and left central incisors followed by crown placement. This treatment option saved cost and time for the patient. However, the traumatic overbite would not be corrected and it may cause continued trauma on the palatal mucosa.
3. Extraction of the upper central incisors and fabrication of prosthesis with either fixed prosthesis or partial removable prosthesis on upper central incisors. This treatment option may cause the patient to lose two sound teeth, which would be replaced with prostheses. The overbite would be not be corrected and the lower incisors may occlude on the fixed prosthesis or acrylic and may cause mobility of the lower incisors.
4. Orthodontic extrusion of upper centrals incisors to create bone for further prosthesis treatment. This treatment

option require orthodontic treatment and the overbite would be not corrected.

After the discussions and considering the risks and complications, the patient decided to proceed with combined orthodontic, periodontic and prosthodontic treatment which was the first option given to him. The patient agreed with the explained treatment and signed the written consent. The patient was referred to Periodontist prior to Orthodontic treatment.

The orthodontic treatment objectives were built on the complete treatment objectives for periodontal health (Xie *et al.*, 2014).

The complete periodontal treatment objectives for this patient consisted of:

- i) The medical problem was non-contributory and the patient was instructed to stop the smoking habit (Azouni & Tarakji, 2014).
- ii) Motivation and customized oral hygiene instructions were given in order for him to maintain good oral hygiene. The initial periodontal therapy was directed towards elimination or suppression of the infecting microorganisms and providing an environment conducive to long-term maintenance, of which include full mouth scaling and root planing (subgingival debridement). The subgingival debridement with combined systematic antibiotics as an adjunctive (Guerrero *et al.*, 2005). Reassessment was made for all the periodontal parameters and ensured stable. The full-mouth plaque index was targeted to be within 25%, the full-mouth percentage of positive bleeding on probing sites less than 30%, and no residual pockets deeper than 5 mm (Xie *et al.*, 2014).
- iii) Patient was referred to the orthodontist and restorative specialist to achieve stable occlusion and restore aesthetics (Azouni & Tarakji, 2014).

- iv) Once orthodontic treatment was finished, the maintenance phase began. The patient was required to be reviewed every 3 to 6 months to prevent reinfection and recurrence (Xie *et al.*, 2014).

After the initial phase of periodontal therapy, the patient was referred to Orthodontist. The Orthodontic treatment objectives were to:

- i) Secure the optimum oral hygiene before starting orthodontic treatment.
- ii) Ensure the vertical control in the reduction of overbite.
- iii) Eliminate dental crowding, intrusion of upper centrals, level and align the teeth.
- iv) Retract upper incisors to close the spaces and maintain the space for lower left central incisor.
- v) Obtain ideal overbite and overjet.
- vi) Achieve a mutually protective functional occlusion.
- vii) Retain the corrected results and referred to prosthodontist for the replacement of the missing teeth.

### Treatment progress

Patient was instructed to do his full medical examination to exclude the systemic diseases. Once patient notified his medical condition was clear, the patient was seen by Periodontist for the oral hygiene instructions and increased his motivation to maintain good oral hygiene. The scaling and subgingival debridement with combined systemic antibiotics regime as an adjunctive. This treatment approach has been thoroughly validated in randomized controlled clinical trials (Aimetti *et al.*, 2012; Guerrero *et al.*, 2005; Mestnik *et al.*, 2010; Mestnik *et al.*, 2012): achievement of adequate supragingival plaque control (<25% of tooth sites with detectable plaque); rigorous subgingival instrumentation with a

combination of hand and ultrasonic instruments completed within 2 days; and an adjunctive systemic antibiotic regime.

After three months the patient was referred to orthodontist when the periodontal status satisfied the referral criteria, which were proper infection control, full-mouth plaque index within 25%, the full-mouth percentage of positive bleeding on probing sites less than 30%, and no residual pockets deeper than 5 mm (Xie *et al.*, 2014). Patient was able to maintain satisfactory periodontal parameters throughout active orthodontic treatment as required.

Orthodontic treatment started in December 2015 and finished in June 2017. It took 18 months to achieve the stable and good occlusion. In order raise the bite for the placement of upper and lower fixed appliances, the upper removable appliance with an anterior bite plane and plint clasp was constructed. After two weeks, pre-adjusted edgewise brackets (0.022x0.028-in, MBT prescription) were bonded to all the teeth except the upper second molars (Figure 3).

Upper and lower 0.012-in nickel titanium archwires were placed and treatment progressed up to 0.019x0.025-in stainless steel archwires. Initial alignment followed by levelling in the upper and lower arches was achieved in 6 months. Upper and lower 0.019x0.025-in stainless steel archwires were maintained for 2 months in order to fully express the torque. The anterior bite plane was removed and en-masse retraction of the upper arch was done with elastic chains (150g) to close the remaining spaces. In the lower arch, same mechanics was used as an upper in order to retract lower arch. The space for lower left central incisor was maintained with dead coil spring.





Figure 3. Upper fixed appliances combination with anterior bite plane and plint clasp to facilitate the placement of fixed appliance in the lower arch.

After 16 months of active orthodontic treatment, all the spaces closed. Two months of finishing and detailing were done, the brackets were debonded and the patient was given the Hawley retainer. The patient was instructed to wear the retainers for 24 hours throughout 6 months and to continue wearing the retainers at night indefinitely. The patient was referred to prosthodontist for the construction of partial denture in the lower arch. The partial denture were planned to be replaced by resin bonded bridge. In addition, the vitality of upper centrals regularly monitored. Even though the orthodontic treatment was on the retention phase, the patient need to have regular review by periodontist for every 6 months to ensure the maintenance of good periodontal health and prevention of reinfection. It was reported that after a year after he was debonded, the patient was able to maintain good oral hygiene; the plaque and bleeding indexes were kept below 30%; all probing depths were  $\leq 5\text{mm}$ , and improved mobility of the maxillary incisor teeth.

### Treatment results

Figures 4 to 6 show the final outcome of the case. The post-treatment frontal photograph showed that there was significant improvement of his facial aesthetics. He appeared more confident with his smile compared to the pre-treatment frontal photograph. His facial profile showed more balanced with competent lips due to significant retraction of upper and lower lips, as shown in the general superimposition (Figure 6). After the treatment the occlusion was stable with acceptable alignment of the teeth, normal overjet and overbite. The traumatic occlusion was corrected with the proclination of lower teeth as shown in the mandible superimposition (Figure 6). In addition, the pathological migrated upper central incisors were successfully intruded and retracted. The adequate space for lower left central incisor was prepared for future prosthesis. The mobility of upper anterior teeth improved from grade 2 mobility in pre-treatment to grade 1 mobility in post-treatment.

The post-treatment panoramic radiograph (Figure 5) showed minimal root resorption especially in the anterior region. Periapical radiograph (Figure 7) of upper centrals showed some sign of bone deposition from

1/3 the root tip in pre-treatment and improved to nearly 1/2 of the root tip in post-treatment.



Figure 4. Post-treatment facial and intraoral photographs



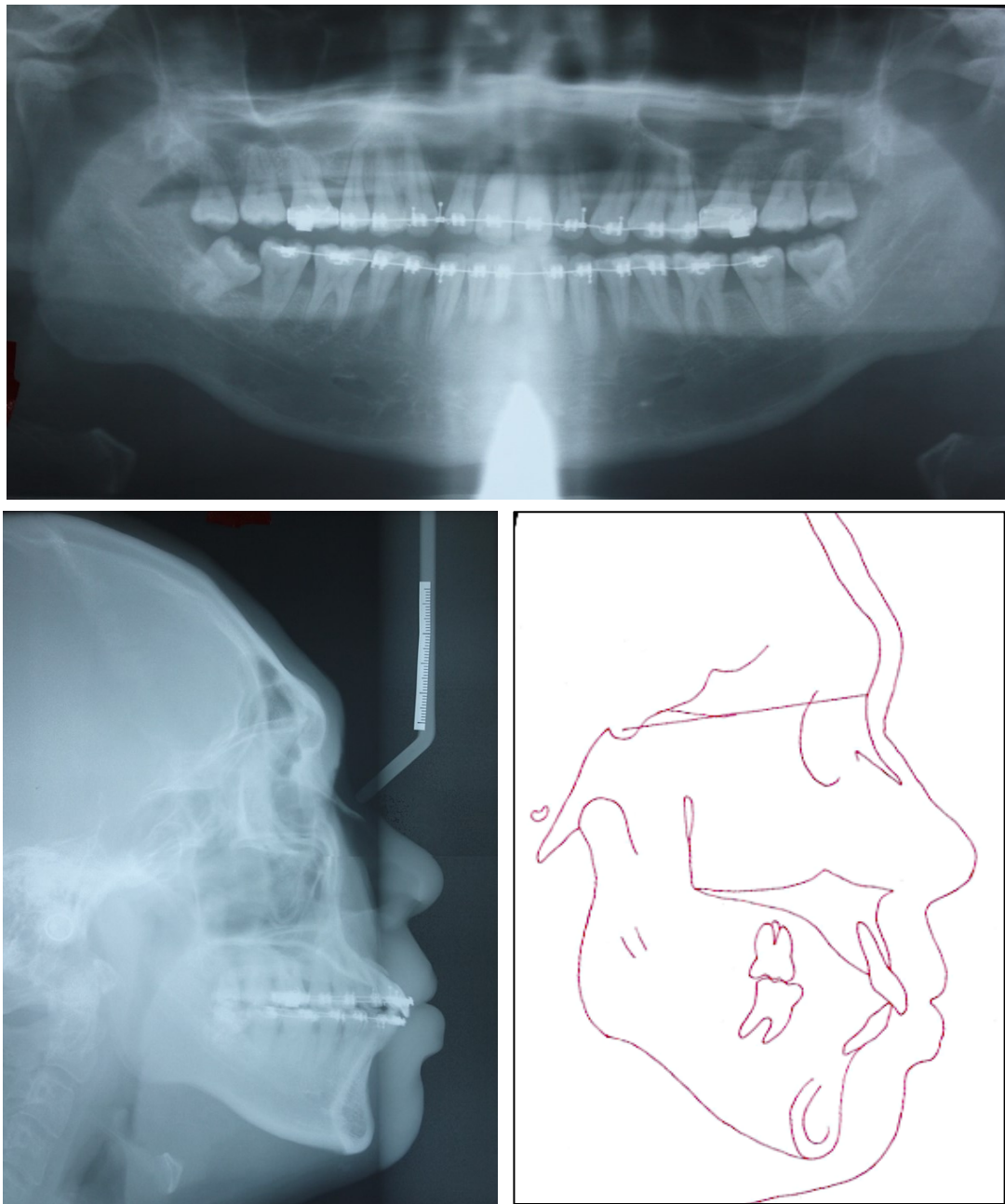
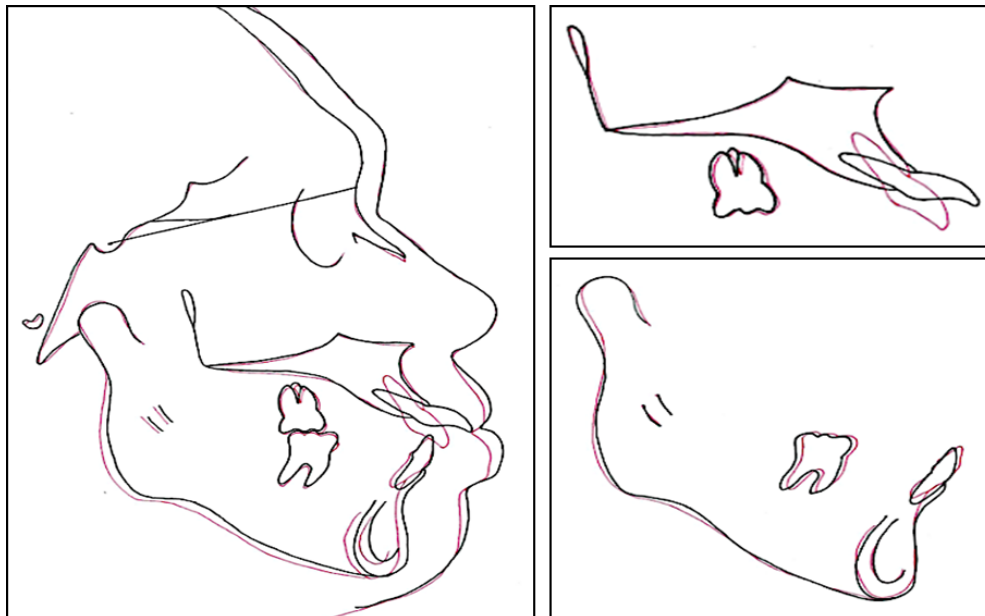
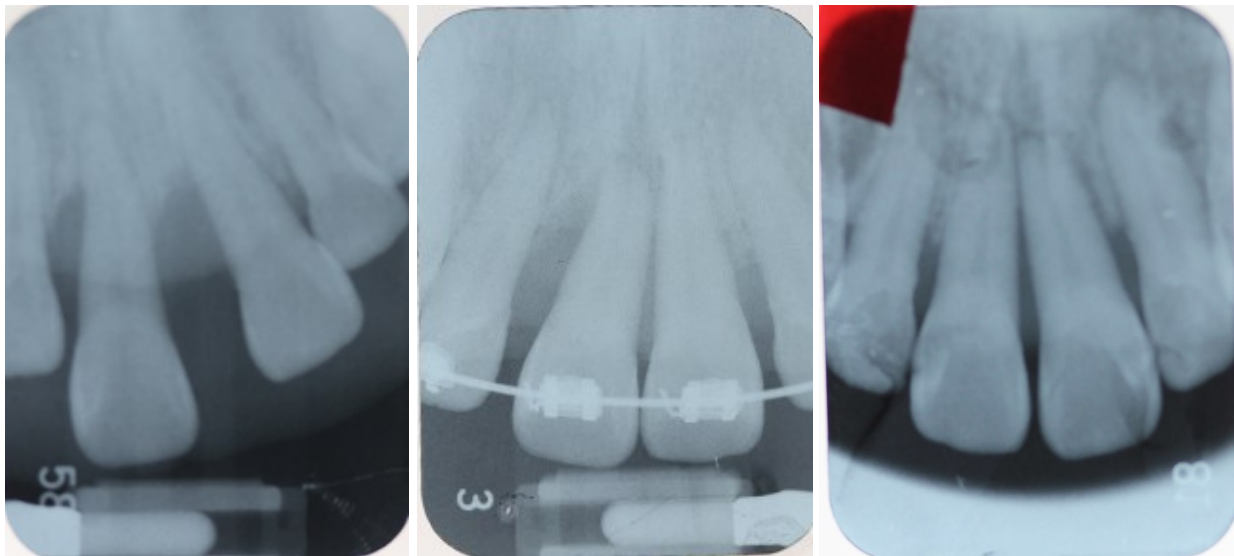


Figure 5. Pre-treatment panoramic radiograph, lateral cephalometric radiograph and tracing, Lateral cephalometric radiograph measurements



Cephalometric Measurements			
	Pre-treatment	Post-treatment	Difference
<b>Skeletal</b>			
SNA (°)	85°	85°	0°
SNB (°)	80°	78°	-2°
ANB (°)	5°	7°	+2°
SN-Mx (°)	7°	7°	0°
FMA (°)	34°	35°	+1°
<b>Dental</b>			
U1 to NA	+14.0mm	+5.0mm	-9.0mm
U1 to Mx	143°	115°	-28°
L1 to NB	+10.0mm	+11.0mm	+1.0mm
L1 to MP	90°	97°	+7°
IIA	94°	114°	+20°
<b>Facial</b>			
E-line to UL	+2.5mm	+1.0mm	-1.5mm
E-line to LL	+7.0mm	+4.0mm	-3.0mm
LFH ratio	57.0%	58.0%	+1.0%
<i>U1, maxillary incisor; L1, mandibular incisor; UL, upper lip;                      LL, lower lip; LFH, lower facial height; Mx, Maxillary Plane;                      MP, Mandibular plane; IIA, Interincisal Angle</i>			

Figure 6. The overall superimposition, maxillary and mandibular superimpositions with the measurements are also shown. Pre-Treatment (Black), Post-Treatment (Red)



(a) Pre-treatment

(b) Mid-treatment

(c) Post-treatment

Figure 7. Evidence of bone deposition on the mesial and distal root of 11 and 21 respectively. The bone level was about  $\frac{1}{3}$  of alveolar bone crest at the root tip (in pre-treatment periapical radiograph) had improved to nearly  $\frac{1}{2}$  in post-treatment radiograph. Pre-treatment periapical radiograph from the left (a) Post-treatment periapical radiograph; (b) Mid-treatment periapical radiograph; (c) Post-treatment periapical radiograph.

### Discussion

Aggressive periodontitis is described based on age-dependent terminology such as early-onset periodontitis or juvenile periodontitis (FH, 2018). In the 1999, Classification Workshop of the American Academy of Periodontology (AAP), a consensus report adopted the term aggressive periodontitis as a new name for this unique disease classification, replacing the term early-onset periodontitis (Lang *et al.*, 1999; Tonetti & Mombelli, 1999). This proposed terminology was to the greatest extent based on clinical presentation and the AAP committee concluded that all periodontal diseases were infectious in nature but could be categorized as either slowly progressing (chronic) or rapidly progressing (aggressive) disease (Armitage, 1999, 2000; Fine *et al.*, 2018). The prevalence of aggressive periodontitis varies significantly between populations and different racial/ethnic origins (Susin *et al.*,

2014). The pool prevalence of aggressive periodontitis was 1.6% and relatively higher prevalence was found in Africa (4.2%) (Bouziane *et al.*, 2020). In a small population study in Malaysia, the prevalence of aggressive periodontitis was 5.3% (Yee *et al.*, 2016). However, the most recent periodontal classification 2017 was just launched during EuroPerio9 in Amsterdam in 2018. This new classification had regrouped the chronic and aggressive periodontitis as a single category. Since the classification is fairly new to most clinician, the terminology of periodontal disease within this paper follows the previous classification.

In this patient, the diagnosis of aggressive periodontitis was based on the patient history, clinical examination, and radiographic assessment (FH, 2018). It is important to note that the patient was a healthy patient without systematic disease and this is a primary feature of aggressive periodontitis (Albandar, 2014). Another

primary feature that defines the aggressive form of periodontal disease is rapid attachment loss and bone destruction in young age with genetic component (Lang *et al.*, 1999). The definitive diagnosis of aggressive periodontitis for this patient was also made based on the secondary features whereby the amounts of microbial deposits inconsistent with the severity of periodontal tissue destruction (Lang *et al.*, 1999). This case was sub-classified as generalized aggressive periodontitis as the patient exhibited generalized interproximal attachment loss affecting at least three permanent teeth other than first molars and incisors (Lang *et al.*, 1999; Tonetti & Mombelli, 1999).

Pre-treatment records indicated that the patient had full mouth plaque score of 51% and bleeding score of 38%. The presence of plaque was at supragingival area and thin in thickness. These scores had improved following completion of initial periodontal therapy to 23% and 36%, respectively. Although scores for bleeding index were similar, the post treatment bleeding was only minute bleedings (pin points-like). Plaque accumulation was noted on the pre-treatment photos and this indicated possibility that the patient has some form of local aetiologic factor contributing to the periodontal disease for aggressive periodontitis (Albandar, 2014). It was reported that throughout the active orthodontic treatment period and after a year after he was debonded, the patient was able to maintain good oral hygiene; the plaque and bleeding indexes were kept below 30%; all probing depths were  $\leq 5$ mm, and improved mobility of the maxillary incisor teeth.

After the initial periodontal phase, the patient was referred to the orthodontist for the corrective phase. In the corrective phase, the aesthetic concern was managed by orthodontist and Prosthodontist. Orthodontic

treatment with a proper force and good oral hygiene may avoid further damage of the periodontal tissue because with plaque, the same force can cause bone defects and attachment loss (Garat *et al.*, 2005). In this patient, it was extremely important for both periodontist and orthodontist to work together to eliminate inflammation before, during, and after the orthodontic treatment. In the retention phase of orthodontic treatment, the maintenance phase begin and the patient need to be reviewed every 3 to 6 months to prevent recurrence (Xie *et al.*, 2014).

Orthodontic treatment plan and accurate biomechanics in a three dimensions need to be considered before starting the orthodontic treatment. The main factor of reduced bone level and loss of periodontal support made the orthodontist treat this case differently like other normal cases. In a sagittal dimension, placement of upper removable appliance with stopper on the mesial of upper canines was an advantage of this case. Upper removable appliance covered the palatal mucosa and palatal surface of the upper teeth acted as anchorage unit for the upper arch. Initial placement of light force with upper 0.012-in Nickel Titanium (Hazan-Molina *et al.*, 2013) in combination with an anchorage reinforcement by upper removable appliance used to move upper centrals with reduced bone support (FH, 2018). In these case, the center of resistance was moved apically, and large moments are needed to control the root movement given the increased moment of the applied force (Nanda, 2012).

In a sagittal direction, a large moment created for upper right central controlled by the other anterior teeth and upper anterior bite plane. Once the 0.012-in archwire ligated on the upper anterior teeth, the crown of upper right central incisor tipped palatally. However, the palatal movement of upper central incisor limited by the labial movement



of upper right lateral incisor and upper left central incisor. Transient increased in overjet happened and was reduced by the retraction of upper labial segment. However, this round tripping movement caused the incisors root to resorb as evident in the periapical radiograph (Figure 7) (Alexander, 1996; Krishnan, 2017). In addition, other advantage of using upper removable appliance covering the palate in this case could reduce the mesial migration of molars, termed the "row-boat effect" (Kim *et al.*, 2014). In the lower arch, the curve of Spee flattened by the proclination of lower incisors and extrusion of lower posterior teeth with the placement of lower fixed appliances.

In the vertical direction, placement of upper archwire into a high upper right central incisor deformed the general arch form and could cause canting of the occlusal plane (Nanda & Tosun, 2010). However, this side effect was reduced by the use of the upper removable appliance and the placement of upper 0.019X0.025 -in stainless steel archwire, which corrected the root angulation and occlusal canting. In the lower arch, the proclination of lower incisors with placement of lower fixed appliances corrected the overbite. In a transverse direction, placement of the fixed appliance in the high position of upper right central and distal angulation of upper left central caused correction of the upper left central distal angulation and moved the of the upper midline towards to the left due to the larger moment for the right central incisor and later the upper midline would be corrected by the placement of elastics.

Anterior bite plane played an important role in the case because it eliminated of occlusal force and facilitated correction of deep bite. The gentle force with step by step manner in changing the archwire allowed correction of the position of upper central incisors. In the finishing stage, the stiff archwire 0.019X0.025-in stainless steel was used to

control the roots of the teeth. Excellent control of torque facilitates the stabilization of tooth roots in the central cancellous bone of the alveolar bone and contributes to reconstruction of the bone (Xie *et al.*, 2014). The newly formed bone is shown in the periapical x-ray films (Figure 8).

Correction of Class II division I malocclusion usually required large amount of space of about 14mm in order to reduce the overjet, which is commonly managed with extractions of premolars. In this case, the periodontal health was compromise and did not favour extraction to reduce the overjet. However, the overjet correction was facilitated by proclination of lower incisors, retroclination and intrusion of the upper incisor. The facial profile was improved as the lip changes followed the supporting incisors. Overall, a downward and backward displacement of the mandible was observed due to the side effect of extrusion of the upper and lower molar as shown in the superimpositions (Figure 6).

In terms of retention of the orthodontic results and long term follow up, removable retainers were used in the upper and lower arch because removable retainers aided periodontal health maintenance but the poor compliance by the patient may result in relapse (Gyawali & Bhattarai, 2017). Fixed retainers was not in option after active orthodontic treatment because it may contribute to plaque retention (Levin *et al.*, 2008). In addition, periodontal examination should be done for each follow up session because for the patient who have not developed aggressive periodontitis till the end of active orthodontic therapy may develop during the retention phase (Gyawali & Bhattarai, 2017). Regular periodontal follow-up and combine radiographic examination once a year along with strict oral hygiene measures contribute to long term maintenance of the achieved result (Harpenau & Boyd, 2000; Levin *et al.*, 2012).

## Conclusion

Management of patients with an aggressive periodontitis is a challenge for orthodontist and periodontist. The importance of having good oral hygiene before, during and after orthodontic treatment significantly improve the function, esthetic and periodontal health of the patient. Therefore, a good collaboration between orthodontist and periodontist are important to ensure the successful treatment outcome in patient with aggressive periodontitis.

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## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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