Case 1

Ortho Treatment of Stage IV Periodontitis Patient with Bone Regeneration

Case summary

This is a 50-year-old female case with stage IV periodontitis who underwent periodontal regeneration surgery combined with fixed orthodontic treatment to improve alignment and occlusion. The patient was classified as ASA type I patient, as nothing special was reported considering systematic disease or medication except former smoking habit. The chief complaint is malpositioned incisors and multiple missing teeth.

- Facial analysis: The frontal view showed an oval face with excessive lower facial height and good lip competence. At rest, 2-3mm lips gap and 0.5mm upper incisors exposure were captured. The upper midline was consistent with the facial midline, and the lower one was slightly shifted to the right. An upper occlusal plane cant could be found on the smile view. The profile view showed that the nasolabial angle, mentolabial angle and profile angle were normal, while the mandibular cervical angle was increased.
- Occlusal analysis: The upper midline was on and the lower one was 1mm shifted to the right; multiple missing teeth (16 · 17 · 26, 35 · 36 · 46) and 11, 24, 25, 47 occlusally malpositioned; upper diastemas and overall black triangles; acceptable Bolton index; bilateral Class II canine relationship (offset 1mm) with excessive anterior overjet (+3mm) and overbite (>1/3); normal curve of Spee on maxilla and excessive curve of Spee on mandible due to the mesial tipping of 37,47. Both upper and lower arch were asymmetrical parabola shape from occlusal view.
- Functional analysis: Comparing with the intercuspal position, Class II relationship was aggravated by 1mm on centric relationship position, while there was no obvious change in the mandibular midline. That's why we could assume that the deviation of the mandibular midline came from the asymmetric jaws instead of functional shift. No abnormality was found on TMJ.
- Periodontal examination showed at baseline 67% plaque index and a 50% bleeding index. 45% of teeth had periodontal pockets <3.4mm, 33% had ≥5.4mm, and 22% had between ≥3.4mm and <5.4mm. 11 had 7mm pockets with deepest probing depth in palatal side. Calculus could be detected on the lingual side

of mandibular incisors, and 37 and 47 showed type I furcation defect. Considering her complex periodontal condition and multiple teeth lose, she was classified as stage IV periodontitis.

- X-rays: Horizontal alveolar bone resorption was generally illustrated on periapical films and panoramic film, with great amount of attachment losses being found in the maxillary incisors and molars. 26 extraction was indicated. Cephalogram showed narrow airway, sagittal skeletal class II (maxillary protrusion), dolichocephalic type with increased lower facial height, and normal upper and lower incisors.

Diagnosis & Objectives

- The patient is skeletal class II, dolichocephalic type with Angle Classification's II occlusion. There are diastemas and missing teeth on both arches. The patient was diagnosed as stage IV periodontitis with 11 having pathological tooth migration.
- 1.1 regenerative periodontal surgery with enamel matrix derivate (EMD) was planned after completing the basic periodontal therapy. Fixed orthodontic treatment was taken to improve alignment and occlusion with managing space distribution for implants. At last, prosthetic rehabilitation and aesthetic veneers were respectively carried out for molars and maxillary incisors.

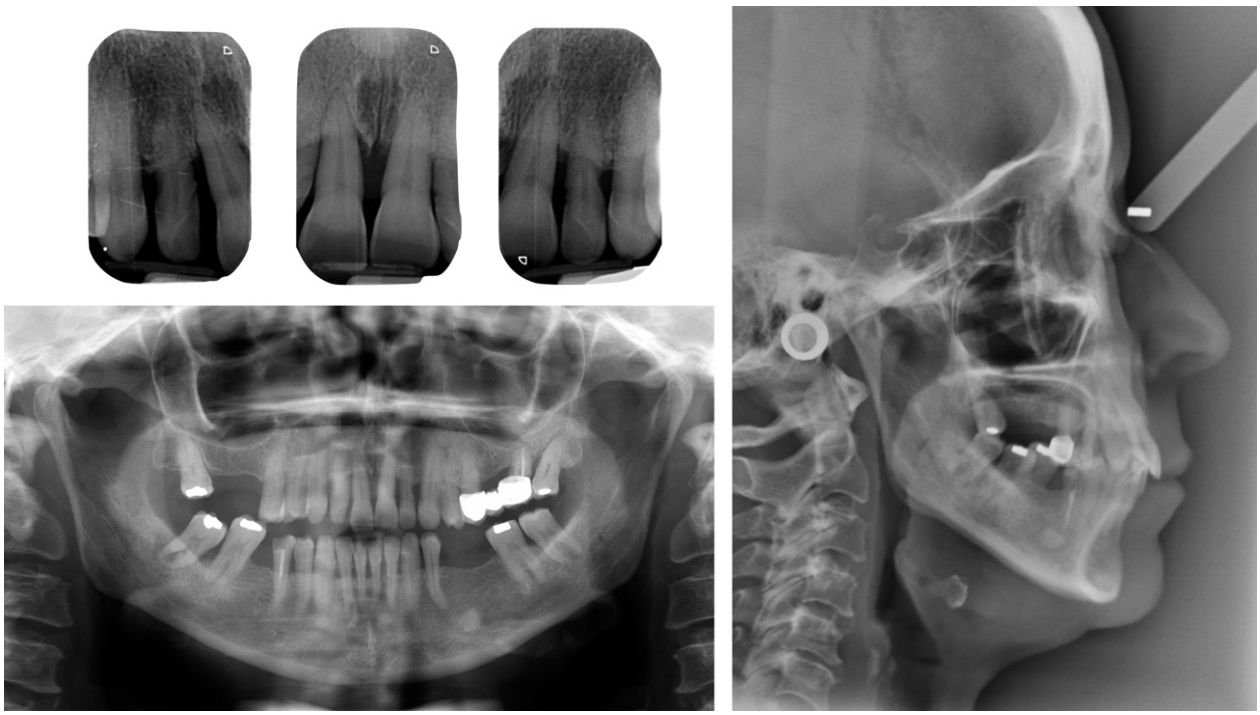
Treatment plan

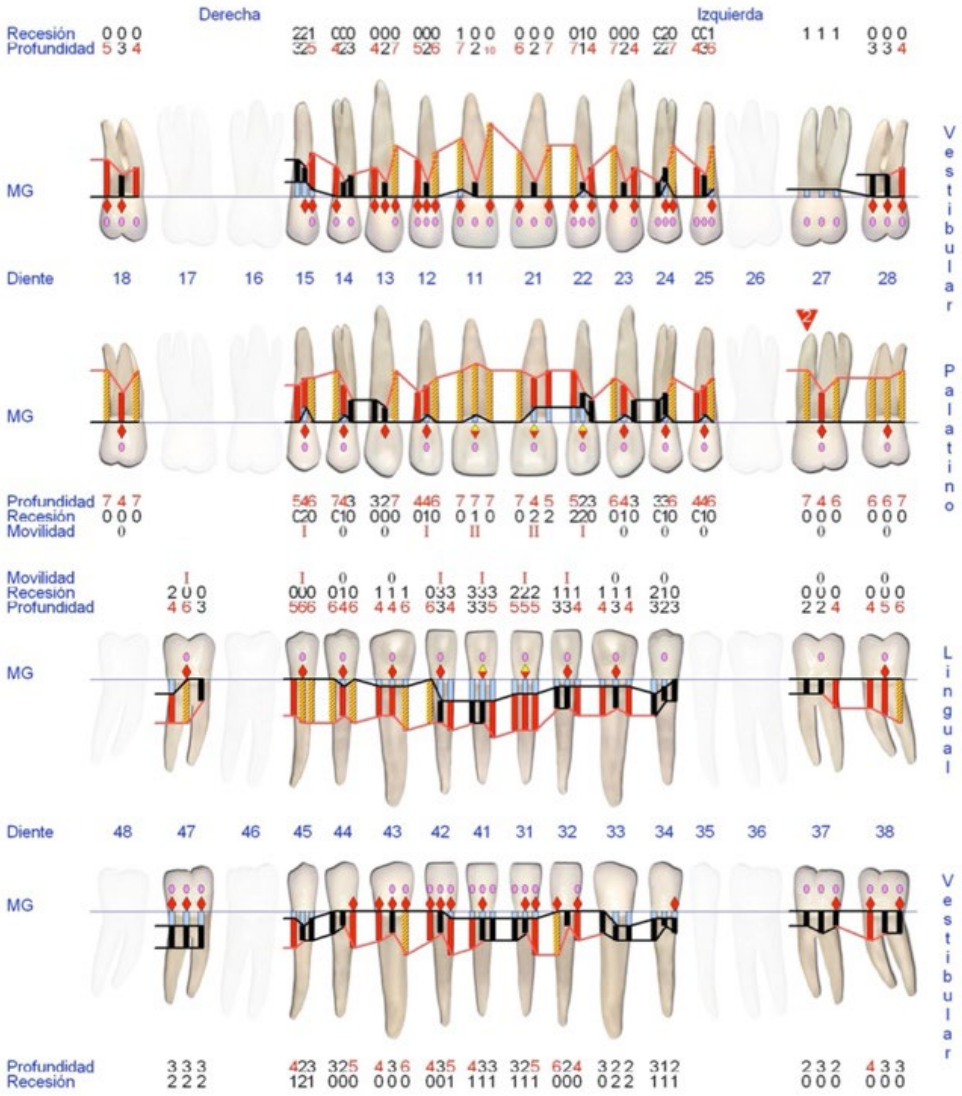
1) Calculating space distribution before orthodontic treatment
2) Implementing fixed orthodontic appliance to correct pathological tooth migration, adjust spaces for implants and deleting diastemas.
3) Basic periodontal support and regenerative periodontal surgery for maxillary incisors before orthodontic treatment
4) Prosthetic rehabilitation and aesthetic veneers after orthodontic treatment

Processing & Evaluation:

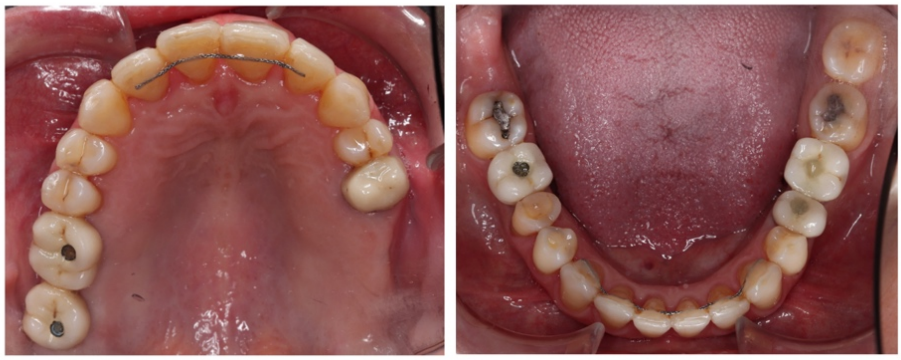
- Basic periodontal therapy helped to decrease the plaque index to 7%, the probing bleeding index to 15%; 1.1 regenerative periodontal surgery with enamel matrix derivate (EMD) was successfully carried out. Comparing the depth of 11 pocket 2 weeks after operation, 12 months during orthodontic treatment and 26 months after orthodontic treatment, we can see that the periodontal state is stable during the whole orthodontic treatment, and the probing depth decreases from 7-10mm to 2mm.
- Four weeks after periodontal surgery, orthodontic treatment was started with fixed appliance. Two miniscrews were inserted buccally and palatally between 2.4 and 2.5 to help to intrude both premolars. After mandibular Spee curve was leveled, open coil was used to open space for lower molars on 0.016*0.022 stainless steel wire. After 25 months of treatment, the fixed appliance was removed. Prosthetic implants and veneers were not set until the gingival state became stable about three months after orthodontic treatment. Finally, lingual fixed retainers were placed on both arches. Excellent root parallelism was revealed in post treatment panoramic radiography and there was no root absorption.

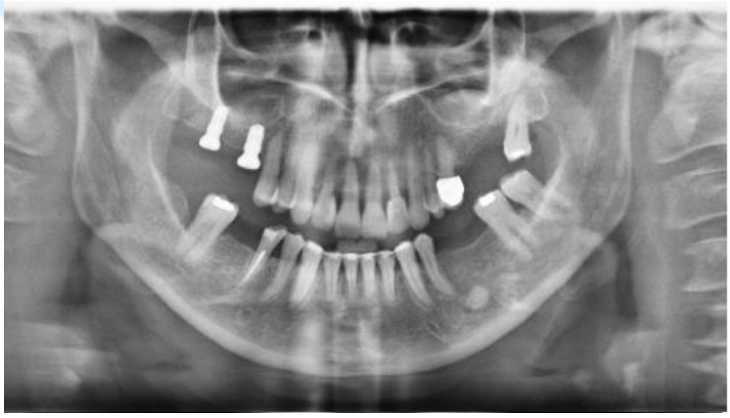
INITIAL RECORDS

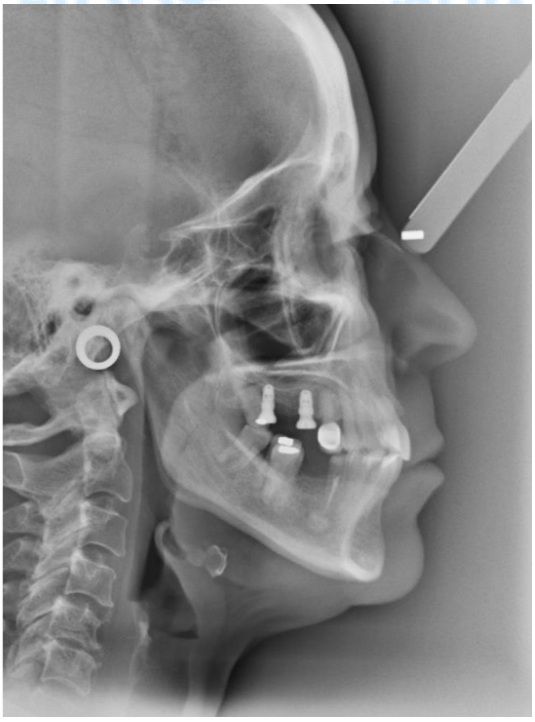


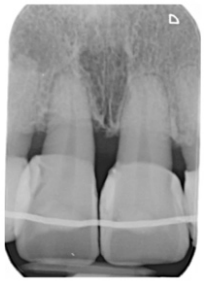

Derecha
Izquierda
Recesión
Profundidad
MG
Diente
18 17 16 15 14 13 12 11 21 22 23 24 25 26 27 28
Vestibular
Palatino
Movilidad
Lingual
48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38

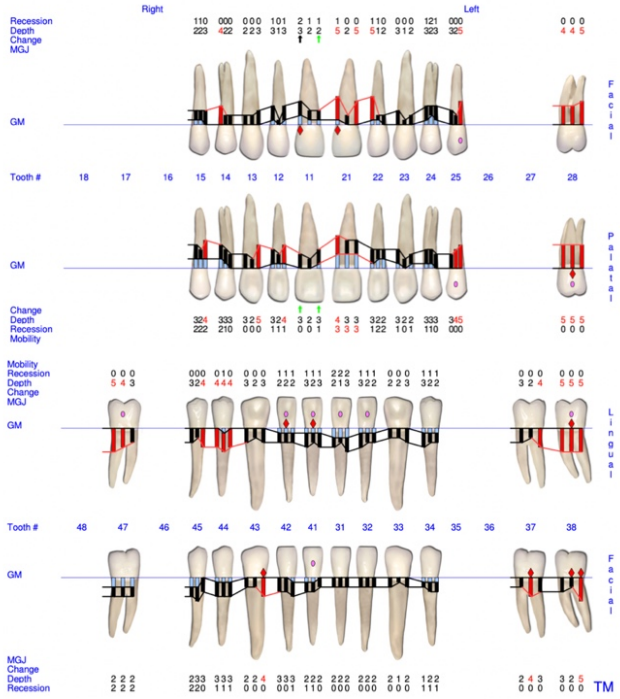
FINAL RECORDS











Case Discussion & Learning:

By evaluating the quality of scientific evidence in combination with the new international classification, the European Federation of Periodontology (EFP) issued S3 clinical diagnosis and treatment guidelines for periodontitis I ~ III and IV respectively. Stage IV is advanced periodontitis with extensive tooth loss and potential dentition loss risk. Multidisciplinary treatment is indicated for this kind of patient. Orthodontic treatment is an important part of providing multidisciplinary treatment for patients with stage IV periodontitis, especially when pathological tooth migration is presented.

[1] The pathologic tooth migration coming with Stage IV periodontitis

In this case, we found the occlusally malpositioned maxillary incisors with great amount of attachment loss. It perfectly represeted the pathological tooth migration (PTM) in stage IV periodontitis patient. Dr.Mariano Sanz pointed out that the PTM is mainly due to unbalanced changes in the forces system controlling tooth movement within the oral cavity. As it's known to all, the main force controlling the position of teeth comes from periodontal ligament. In the case of advanced periodontitis, a large number of periodontal attachment support is lost. Meanwhile, the strength of lip and tongue muscles will tend to move their adjacent teeth, pushing them away from their original positions. Therefore, the teeth will show excessive proclination, retroclination or elongation accordingly. We call this kind of tooth movement pathological tooth migration, which is actually an indirect result caused by advanced periodontitis. Considering PTM can lead to occlusal interference, Dr.Mariano Sanz suggested that such patients should take orthodontic treatment. Only by removing oclusal interference, a good biomechanical environment for the recovery of periodontal tissue could obtain, which facilitate the reconstruction of periodontal supporting tissue, and lay a solid foundation for periodontal maintenance.

[2] Risk control of orthodontic treatment in patients with stage IV periodontitis

In the discussion, Dr.Mariano Sanz pointed out that orthodontic treatment for patients with stage IV periodontitis generally has the following two risks: The first risk is that orthodontic treatment may aggravate periodontal inflammation and bone resorption. Healthy periodontal tissue is the physiological basis of orthodontic tooth movement, and orthodontic treatment without control of periodontal

inflammation will accelerate the loss of periodontal attachment. Therefore, for periodontitis patients who are preparing for orthodontic treatment, it is necessary to control periodontitis through periodontal basic therapy. Only when the patients can effectively maintain oral hygiene can adjuvant orthodontic treatment be implemented to improve and restore occlusion.

Similarly, Dr. Maria Cadenas emphasized that just as we treat the adolescent patients, for adult patients with periodontitis, we should also carry out oral hygiene instruction in the process of orthodontic treatment. As Dr. Maria Cadenas suggesting, for patients with periodontitis, we can consider measuring probing depth every orthodontic visit. If we don't keep periodontal probing equipment in clinic, we should closely monitor the periodontal state of patients by conducting routine periodontal reexamination at least every three months. When it comes to appliance options, Dr. Maria Cadenas mentioned that it is easier for patients to maintain oral hygiene when they wear aligners rather than fixed appliance, as they can take off aligners and then brush and floss as usual. However, the convenience of oral hygiene maintenance is only one of the considerations in choosing appliances. We still need to carefully consider the force applied by appliances, to ensure that teeth will not be subjected to excessive force and uncontrolled force system, and of course, we should also consider the complexity of patients' malocclusion before treatment.

The second risk mentioned by Dr.Mariano Sanz is that orthodontic force may cause further root resorption when alveolar bone has been absorbed to a large extent. This risk is related to the type of orthodontic tooth movement. In orthodontic treatment, we always emphasize the need to use continuous light force to move teeth to avoid the risk of root resorption as much as possible. Dr. Maria Cadenas further introduced the details that should be paid attention to when continuously using light force in orthodontic treatment. If we want to control the teeth to move under proper force, we need to design customized force applying devices. For example, we can use TADs to selectly move individual teeth, or use segmental arch to apply force only to the teeth we need to intrude, while minimizing the reaction force on other teeth. In addition, avoiding the use of large-sized stainless steel wires, as the thicker the steel wires, the greater the force will definitely be applied.

[3] Regenerative periodontal surgery and orthodontic teeth movement

A common complication of advanced periodontitis is alveolar bone defect. In this case, if orthodontic treatment is started after repairing alveolar bone defect with regenerative periodontal surgery, it will help patients obtain positive prognosis and long-term stability. The main components of enamel matrix derivatives (EMD) used in regenerative periodontal surgery in this case are amelogenin and its related proteins. Amelogenin is a kind of protein secreted by inner enamel epithelium and Hertbing's epithelium during tooth germ development, which can induce interstitial cells to differentiate into cementinocytes and produce acellular cementum, that is, Sharpdy's fibers are produced to achieve the purpose of tissue regeneration.

When it comes to the issue of tooth movement in EMD or bone graft, Dr.Mariano Sanz mentioned in the discussion that previous studies have shown that the regenerative bone remodeling pattern is consistent with the normal alveolar bone remodeling pattern as long as there is no inflammation in local periodontal tissue in the area where regenerative periodontal surgery is performed. However, he pointed out that the bone maturity of regenerated tissue is different from that of healthy bone tissue, and teeth may move faster in the regenerated tissue area. So he reminded everyone that in this case, orthodontists need to strictly control the force scale and direction.

Besides, after the regenerative periodontal surgery, how long do we have to wait before we can start

orthodontic tooth movement? Dr. Maria Cadenas thought this was still a controversial issue at present. Recent studies suggest that long intervals are not needed. One of these RCTs, which was recently awarded with the R. Earl Robinson Periodontal Regeneration Award 2022 by the American Academy of Periodontology, assessed the effect of timing of orthodontic therapy on the periodontal outcomes after regenerative periodontal surgery in patients with stage IV periodontitis. Patients received either early (4 weeks post-surgery) or late (6 months post-surgery) OT following regenerative surgery of intra-bony defects. No statistically significant differences between groups could be observed, concluding that OT can be initiated already 4 weeks after regenerative surgery with favorable results, thus reducing the overall treatment time.

Reference

1. Herrera D, Sanz M, Kebschull M, Jepsen S, Sculean A, Berglundh T, Papapanou PN, Chapple I, Tonetti MS; EFP Workshop Participants and Methodological Consultant. Treatment of stage IV periodontitis: The EFP S3 level clinical practice guideline. J Clin Periodontol. 2022 Jun;49 Suppl 24:4-71. doi: 10.1111/jcpe.13639.
2. Martin C, Celis B, Ambrosio N, Bollain J, Antonoglou GN, Figuero E. Effect of orthodontic therapy in periodontitis and non-periodontitis patients: a systematic review with meta-analysis. J Clin Periodontol. 2022 Jun;49 Suppl 24:72-101. doi: 10.1111/jcpe.13487. Epub 2021 Nov 22.
3. Papageorgiou SN, Antonoglou GN, Michelogiannakis D, Kakali L, Eliades T, Madianos P. Effect of periodontal-orthodontic treatment of teeth with pathological tooth flaring, drifting, and elongation in patients with severe periodontitis: A systematic review with meta-analysis. J Clin Periodontol. 2022 Jun;49 Suppl 24(Suppl 24):102-120. doi: 10.1111/jcpe.13529. Epub 2021 Aug 18.
4. Kloukos D, Roccuzzo A, Stähli A, Sculean A, Katsaros C, Salvi GE. Effect of combined periodontal and orthodontic treatment of tilted molars and of teeth with intra-bony and furcation defects in stage-IV periodontitis patients: A systematic review. J Clin Periodontol. 2022 Jun;49 Suppl 24:121-148. doi: 10.1111/jcpe.13509. Epub 2021 Nov 10. PMID: 34761413.
5. Jepsen K, Tietmann C, Kutschera E, Wüllenweber P, Jäger A, Cardaropoli D, Gaveglio L, Sanz Sanchez I, Martin C, Fimmers R, Jepsen S. The effect of timing of orthodontic therapy on the outcomes of regenerative periodontal surgery in patients with stage IV periodontitis: A multicenter randomized trial. J Clin Periodontol. 2021 Oct;48(10):1282-1292. doi: 10.1111/jcpe.13528.

Case 2

Ortho Treatment of Patient with Mucogingival Problems

Case summary

This is a 14-year-old female teenager who complained of malpositioned canine and biting lips and cheeks. Measles, chickenpox, and tonsillectomy was reported in her medical history. Currently, she suffers from migraine, and she takes antihistamines due to her allergies to pollen, dust and gramineae. There is no special oral history. She has normal swallowing and breathing pattern, but bad habit of biting nails.

Facial analysis: The frontal view showed an oval face with excessive lower facial height and lip incompetence. At rest, 5mm lips gap and 4mm upper incisors exposure were captured. Smile view showed that the exposure range of upper arch was from the left second premolar to the right second premolar; the maxillary gingiva was exposed 2mm; the smile arc was uncoordinated with less space on left buccal corridor; the occlusal plane was low on the left and high on the right, and the upper midline was shifted to the right by 1mm compared with the facial midline. A convex profile was presented with reduced profile angle, while the nasolabial angle and mentolabial angle are normal.

Occlusal analysis: The frontal view showed that the anterior overbite was more than 1/3, and the midline of

upper and lower dental arches was 1mm shifted to the right; Bolton ratio was almost normal, mandibular total crown size was 1mm larger than the upper and mandibular anterior crown size was 0.3 mm larger than that of upper. Bilateral molar and canines' Class II relationship can be found in lateral view with anterior overjet 5.5 mm on the lateral view. A moderately excessive curve of Spee was captured on the upper arch while a slightly excessive one can be found on the lower arch. The occlusal view showed that the upper dental arch was asymmetrically parabolic with 6.5 mm crowding, and the lower dental arch was symmetrically parabolic with 2.7 mm crowding.
Functional analysis: There was no significant symptom in bilateral temporomandibular joints.

Periodontal examination showed at baseline 14.8% plaque index and 8.3% blood index with normal gingival type.

X-rays: All third molars can be found in the panoramic radiography and the right mandibular ramus was shorter comparing to the left one. Stage 9 of hand-wrist radiography and Stage 4 of cervical vertebra maturity were reported. Lateral film showed skeletal class II pattern with normal vertical distribution and proclined lower incisors. No abnormality in airway. Frontal film showed no maxillary compression but asymmetric mandible with chin shifting to the right.

Diagnosis & Objectives:

This is a skeletal class II adolescent patient with no growth and development potential. The American Board of Orthodontics (ABO) Discrepancy Index (DI) scored 23 points indicating that this is a moderately difficult case. Upper premolars extraction was carried out aiming at improving alignment, intruding, and retracting upper incisors and adjusting the occlusal relationship to a complete Class II molars and Class I canines' relationship. Coordinating with fixed orthodontic treatment, mucogingival surgery was carried out to correct the altered passive eruption and achieve a correct incisor exposure.

Treatment plan

- Routine periodontal therapy before and during orthodontic treatment to maintain good periodontal health
- At the meantime of upper first premolar extraction, the maxillary canines were initially moved distally with bilateral posterior segmental arches (0.018 bracket system) . After the bilateral canines were restored to centric relationship, the full-mouth appliance was bonded and then the arches was aligned, leveled and the midline was adjusted with IPR.
- Mucogingival surgery was carried out to correct the altered passive eruption.

Processing & Evaluation

Firstly, the maxillary posterior tooth segmental arch was bonded, and the canines were passively pulled by 8-figure ligation. After the canines recovered the centric relationship, the maxillary anterior arch and mandibular arch were bonded step by step, and the dentitions were aligned with NiTi round wire (7 months);

The NiTi and stainless steel rectangular wires were replaced sequentially on the maxilla and mandible to level the arch and close the extraction gap. At the same time, the left-side Class III elastics and the right-side Class II elastics were taken with the mandibular asymmetric IPR for midline adjusting. (26 months)

During fine adjustment, vertical W elastics of bilateral posterior teeth and IPR of maxillary central incisors (3 months) were implemented.

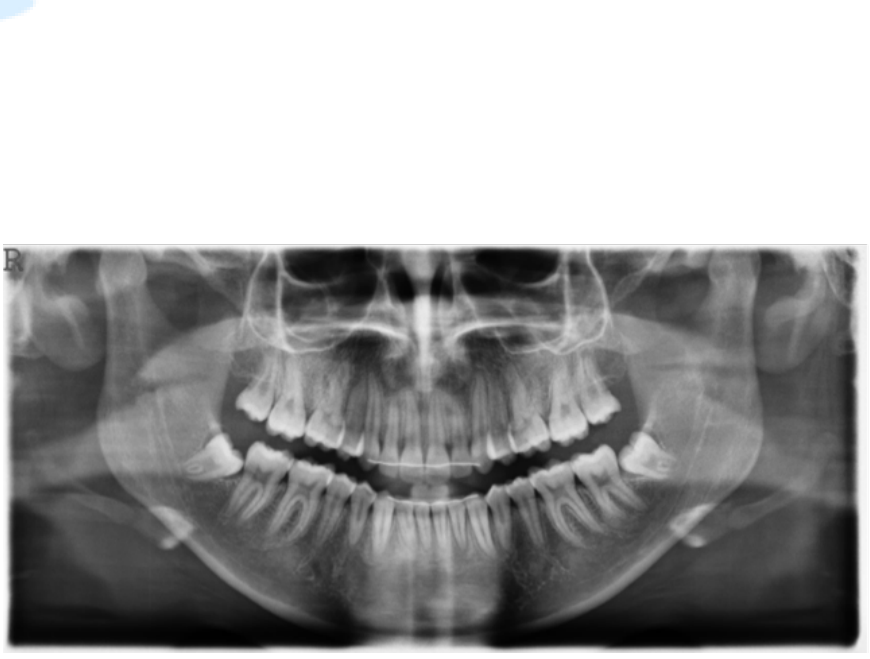
The fixed appliance was removed after 36 months treatment, and fixed lingual wires were installed respectively for upper and lower arches.

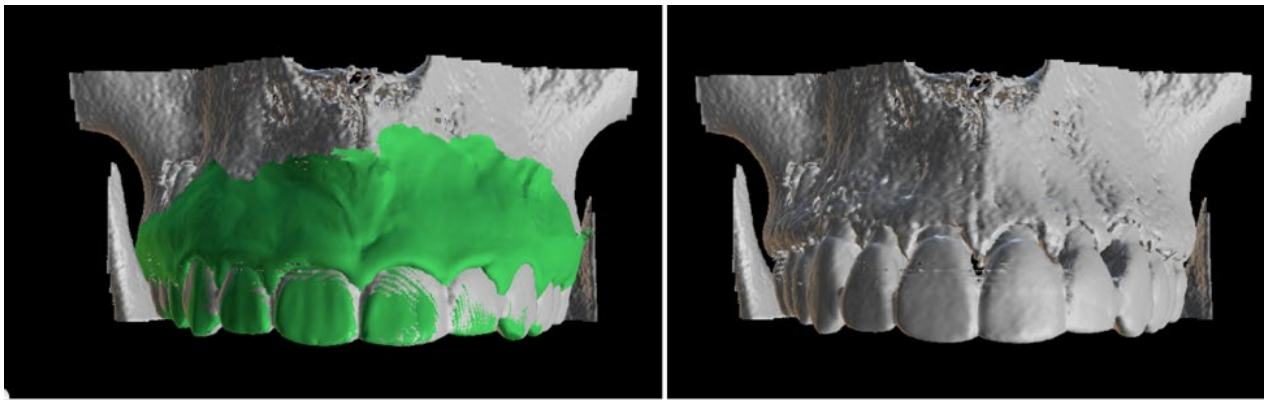
During orthodontic treatment, severe gingival inflammation and hyperplasia occurred in the mandibular anterior arch. A gingivectomy was then performed to solve this problem. After orthodontic treatment, patient underwent another mucogingival surgery for altered passive eruption (APE) to improve exposure of maxillary incisor crowns. In this case, the gingival resection range was designed based on clinical periodontal examination, maxillary digital model, CBCT and upper lip dynamic examination. By overlapping the maxillary digital model and CBCT, the abnormal gingival tissue was circled, and a gingival resection template was made for maxillary gingivectomy.

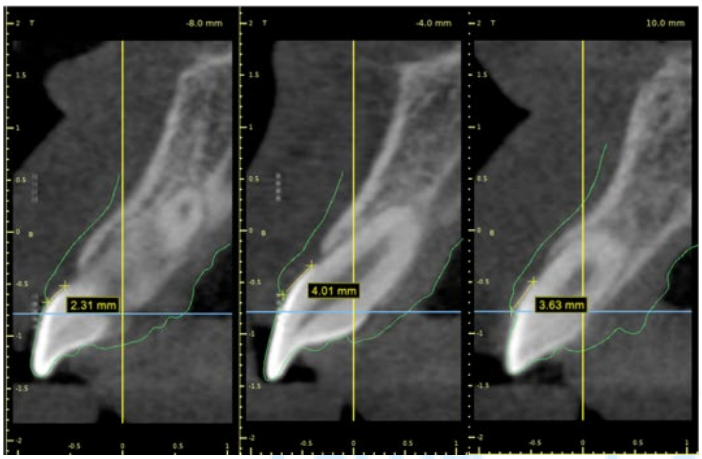
After treatment, the position and exposure of maxillary incisors were improved, and the smile arc were coordinated. Bilateral molar class II and canine class I were finally set with normal anterior overbite and overjet. Normal root parallelism, balanced canine guidance and harmonious profile were finally obtained.

INITIAL RECORDS


R







FIGURES: INITIAL (first pictures) and FINAL records of the patient. Planned gingivectomy and final intraoral pictures after gingivectomy.

Case Discussion & Learning

Orthodontic treatment combined with mucogingival surgery to improve altered passive eruption in adolescents

Passive tooth eruption is a gradual change process of periodontal soft tissue after active tooth eruption is completed and occlusal contact is finally established, which may last for about five years. At the age when teenagers start orthodontic treatment, the passive eruption of teeth is not completed in some cases, and there is not enough space for periodontal soft tissue to attach occlusally to the cemento-enamel junction. In this case, periodontal soft tissue tends to overgrow and accumulate, which brings corresponding periodontal problems and needs mucogingival surgery to improve.

【1】The timing of mucogingival surgery

Dr. Mariano Sanz shared his views on treatment timing basing on the mechanism of passive eruption of teeth. When passive eruption of teeth is insufficient, periodontal soft tissues tend to overgrow. If the external environment changes and local stimulating factors show up at this time, for example, after orthodontic patient wearing fixed appliances, oral hygiene maintance becomes more challenging, gums may be severely swollen and hyperplastic. In this case, we need to take periodontal surgery, such as gingivectomy, to remove hyperplastic gingival tissue, so as to continue and complete orthodontic treatment. However, from another point of view, if we only want to solve the aesthetic problems of insufficient crown exposure or excessive gingival exposure, periodontal surgery is generally arranged after orthodontic treatment. Moreover, for adolescent patients, there is no need to rush to perform periodontal surgery immediately after orthodontic treatment. Instead, we should wait as long as possible, until the patient is 16-18 years old and then we can determine the passive eruption of the crown is basically completed before starting the crown lengthening surgery.

【2】The option of mucogingival surgery

For different types of passive tooth eruption, different options of periodontal surgery are considered, including gingivectomy or crown lengthening surgery. Starting with the concept of biological width, Dr.

Mariano Sanz compared the differences between gingivectomy and crown lengthening surgery. Biological width refers to the periodontal tissue with a height of about 2mm from the bottom of gingival sulcus to the top of alveolar ridge, which includes two parts, one is epithelial tissue attached to the enamel surface of crown on the occlusal side of cemento-enamel junction, and the other is connective tissue attached to the cementum surface of root on the apical side of cemento-enamel junction. The significance of biological width is to provide soft tissue sealing collar, and isolate periodontal ligament from oral environment. If this part of the structure is missing, the periodontal connective tissue will tend to grow excessively due to the lack of sufficient attachment space, which will show inflammatory swelling and gingival hyperplasia.

Under this situation, we need to use crown lengthening surgery to create sufficient space for periodontal ligament attachment, so as to maintain the long-term stability of periodontal soft tissue. However, if the biological width is normal, the space for periodontal tissue attachment is sufficient, then we only need simple gingivectomy at this time.

In addition, we can also understand this problem by comparing the size of anatomical crowns with that of clinical crowns. Anatomical crown refers to the crown size from cemento-enamel junction to incisal or occlusal margin. The clinical crown refers to the crown size between the gingival attachment edge and the incisal or occlusal margin. Normally, the spatial difference between the gingival attachment edge and the cemento-enamel junction is for periodontal tissue attaching. When this part of space is insufficient, periodontal soft tissue tends to show excessive hyperplasia. In this case, the length of anatomical crown is enough, but the length of clinical crown is insufficient, so we need to do crown lengthening surgery to adjust the size of clinical crown to be consistent with that of anatomical crown.

【3】Digital procedure of mucogingival surgery

When the orthodontic treatment combined with periodontal surgery, patients can intuitively see the expected treatment effect by using digital means, especially when we plan to improve the aesthetic effect, patients can fully understand and communicate the treatment plan through digital simulation, which is the premise for us to obtain satisfactory treatment outcome. Designing and making surgical guide plate before operation and determining the amount of gingival and alveolar bone resection during operation can effectively implement the surgery. In this case, Dr. Claudia Molina first designed the gingival resection range based on clinical periodontal examination, maxillary digital model, CBCT and upper lip dynamic examination. Then, by overlapping the maxillary digital model and CBCT, the operation scope was determined, and the template was printed for clinical surgery. In previous studies, the 3D design and fabrication process of crown lengthening guide plate was divided into several steps: superimposing oral scan data and CBCT, designing crown shape and gingival margin position, and printed surgery guide plate. Generally, the design process can be realized by cooperating with intraoral scanner (STL format data), CBCT (DICOM format data) and 3D image processing software, and the guide plate can be obtained by cooperating with 3D printer after the design is completed.

- Thoughts on camouflage treatment options for adolescent Class II patients

In this case, the camouflage treatment with upper premolar extraction was adopted, and finally class I canines and full class II molars was established, while relieving the crowding and midline shifting. Although the skeletal Class II pattern was maintained, both the patient's profile and occlusion achieved excellent results after treatment. Under what circumstances will we still get satisfactory results when choosing orthodontic camouflage treatment for adolescent skeletal Class II patients? Dr. Maria Cadenas shared her views in the discussion session: First of all, it is necessary to consider the degree of skeletal

deviation. The satisfactory treatment outcome of this case is based on the premise that the patient only present mild skeletal abnormality; Secondly, whether the patient has growth potential at the beginning of treatment is also an important consideration. If the patient still has a lot of growth potential, the mandible may grow forward, relieving the mandibular retrusion and improving the profile. Based on this change in jaw position, the maxillary premolar extraction scheme may need to be reconsidered. The last but not the least consideration is the patient's soft tissue thickness and lip closure state. We can see that the patient's soft tissue thickness is relatively plump, so she can compensate for mild skeletal deviation to a great extent, which is why her profile improve through treatment. If we have a patient with thin soft tissue, and take the aging changes into account, our treatment plan may need to be adjusted. Even if we still choose extraction plan, we should carefully control the torque of maxillary incisors in the process of retracting them, preventing too much uprighting of maxillary incisors from causing excessive lip closure and worsening the profile.

- Periodontal issues with orthodontic extraction treatment

【1】The timing of tooth movement after extraction from periodontal standpoint

Dr. Maria Cadenas believes that the faster the tooth extraction gap closes, the greater the possibility of gingival clefts. As Dr. Maria Cadenas mentioned, if the gap was closed immediately after tooth extraction, the low level of bone density at the tooth extraction site was liable to make gingival cleft occur. A recent RCT (Bertl et al 2020) suggest that this early movement is linked with the presence of gingival clefts, which are less prevalent in patients where movement has started later (around 8 weeks after extractions). Considering that 1 week after extraction the socket is largely filled with granulation tissue with no woven bone yet, it seems reasonable to wait for a few weeks before starting space closure, so that some woven bone has formed and orthodontically induced bone remodeling can take place. Factors such as pretreatment buccal bone dehiscence or the amount of space needed for closure were also linked with gingival Clefts.

【2】 Factors affecting the stability of tooth extraction space after closure

Recent literature (Janson et al, AJODO, 2022) suggest more tendency to space reopening in the upper jaw and in cases where the first premolar was extracted, compared to the lower jaw or the second premolar. These were proved by Dr. Maria Cadenas basing on her clinical observation. In addition, Dr. Maria Cadenas mentioned in the discussion, if the first bicuspid is extracted during orthodontic treatment, and the canines move to the original position of the first bicuspid after the extraction gap is closed, the distribution of bite force may lead to the reopening of extraction gap during retention. Dr. Maria Cadenas believes that bite force is an important factor affecting the stability of extraction site. For example, people with strong masticatory muscles, such as patients with low mandibular angle and deep overbite, their bite force is very strong, so under such circumstances, the extraction gap is more inclined to recur and open. Besides, whether the bite force distribution is balanced at the end of treatment and whether the patient has bad oral habits will also affect the stability of extraction site. For example, when the patient has the habit of tongue thrusting, the incisors may tend to spread out and it may also cause the extraction gap to reopen again.

References

1. Bertl K, Neuner H, Meran A, Bertl MH, Reich I, Nemec M, Bruckmann C, Stavropoulos A, Bantleon HP. Does the time-point of orthodontic space closure initiation after tooth extraction affect the incidence of gingival cleft development? A randomized controlled clinical trial. J Periodontol. 2020;91:572–581.

2. Janson G, Rizzo M, Valerio MV, Oyonarte R, Garib D. Stability of first and second premolars extraction space closure. Am J Orthod Dentofacial Orthop 2022;162:367-73

3. Pini-Prato G, Mancini EA, Papini O, Crescini A. Mucogingival approaches in young orthodontic patients: Combined strategies for success. Semin Orthod 2014;20: 150-169.

4. Marzadori M, Stefanini M, Sangiorgi M, Mounssif I, Monaco C, Zucchelli G. Crown lengthening and restorative procedures in the esthetic zone. Periodontol 2000. 2018 Jun;77(1):84-92. doi: 10.1111/prd.12208.

5. Camargo PM, Melnick PR, Camargo LM. Clinical crown lengthening in the esthetic zone. J Calif Dent Assoc. 2007 Jul;35(7):487-98.

Writer Information

Siqi Liu, D.D.S, Ph.D.

Department of Orthodontics, Peking University Hospital of Stomatology, First Clinical Division

Visiting Scholar of University of Pacific, Arthur A. Dugoni School of Dentistry

- Affiliate member of the Angle Society Northern California Component
- Member of American Association of Orthodontists
- Member of World Federation of Orthodontists
- Reviewer of European Journal of Orthodontics