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Case Report

The Use of Surgical Plates in Correcting the Canted Occlusal Plane

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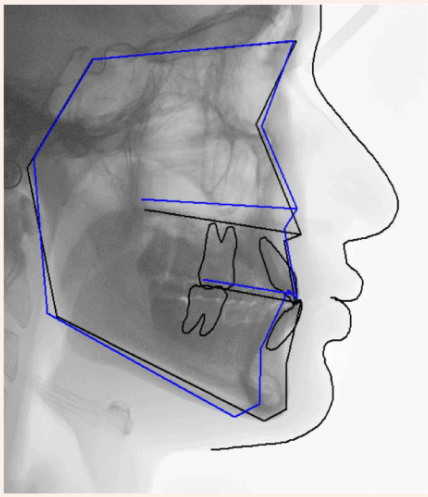
Abstract

Clinicians in daily orthodontic practice will face referral cases from another orthodontist; the reasons are variable, from because the patient moved to a new location, being unable to finish the case, or patient dissatisfaction. Most of the time, there will be no reason to reject the inquiry and to continue the treatment as much as possible. The case is a skeletal Class III with extracted left and right upper first bicuspids. All the cusps of the posterior teeth were flattened, with the anterior relation being end-to-end. The cant of the occlusal plane higher on the right side is obvious. The patient suffered from temporal mandibular disorder (TMD) and found it difficult to chew without pain. The TMD might have been related to the one-sided clenching habit as well as the deviated occlusal plane. As the patient refused surgical treatment, all efforts focused on how to bring the case to a better condition for the benefit of the patient and to finish the orthodontic treatment. A modified surgical plate (Anka plate) was used to treat the case, and the results were summarized and reported.

Diagnosis

Diagnosing and orthodontic treatment of Class III brachyfacial malocclusions in an adult patient where the upper left and right first bicuspids are already extracted and an end-to-end anterior teeth relationship can be challenging for the practitioner. The result of the upper jaw bicuspids extraction will result in the upper and lower molars relationship into Class II; most of the cusps of the molars were flattened because of bruxism and clenching habit. The jaw was deviating in open and close as the mandible moved to the right, associated with clicking on both sides (Figures 1 & 2).



Facial angle	85.10	5.80	86.4
Convexity	5.600	4.30	-4.2
A-B plane	-5.10	3.30	2.6
Y-axis	65.70	3.30	64.2
FH to SN	6.000	3.40	3.2
∠SNA	81.80	3.10	81.3
∠SNB	78.60	3.10	83.0
∠ANB	3.30	2.70	-1.7
N-Pog to SN	77.0	3.60	83.3
Nasal floor to SN	7.80	3.50	14.3
Nasal floor to FH	1.700	2.60	11.1
Mandibular pl. to SN	40.20	4.60	29.2
Mandibular pl. to FH	26.30	6.30	26.1
Ramus pl. to SN	89.00	5.20	83.8
Ramus pl. to FH	83.00	4.40	80.7
Gonial angle	131.00	5.60	125.4
U1 to SN	103.10	5.50	111.5
U1 to FH	108.90	5.60	114.6
L1 to mandibular pl.	94.70	7.20	99.5
Interincisal angle	129.70	9.01	119.8
Occlusal pl. to SN	20.20	3.50	16.0
Occlusal pl. to FH	9.500	4.00	12.8

Figure 1 and Figure 2

Figure 1 shows the cephalogram of the initial record. The blue line represents the profilograph of the normative Japanese population at the same age, and the red line represents the profilograph of the patient.

Figure 2 The outcome of measuring angulation in the initial records. The black numbers are the means, the blue are the standard deviation, and the red are the findings.

The difference between SNA and SNB is measured at -1,7°. According to the Wits Appraisal (AB to Occlusal plane), the Class III relationship was validated at -5.5mm. The patient is 20 years and five months old. The patient came to our office after previously receiving treatment from two orthodontist offices. Treatment commenced at the age of 12. The patient's skeletal pattern was classified as class III, and their anterior dental relationship extended from end to end. The upper bicuspids have been removed because the 13th and 23rd positions were buccally positioned. The first bicuspids, 14 and 24, were removed to establish a left and right Class II relationship. Prolonged nasal problems and obstruction have resulted in the patient breathing through their mouth, which has affected tongue posture and caused a deviated swallowing habit. All remaining brackets were removed to reveal the present malocclusion state due to the detection of multiple caries (Figures 3-6).

The records of intra-oral photographs are as follows:

Figure 3,4,5,6

Figure 3 is the right-side view, Figure 4 is the frontal view, Figure 5 is the left-side view, and Figure 6 is the intra-oral view of the anterior teeth relation.

The upper and lower midlines are not aligned. The teeth's anterior relation is not just end to end but also displays an open bite at the front. All the teeth have flattened due to bruxism and clenching.

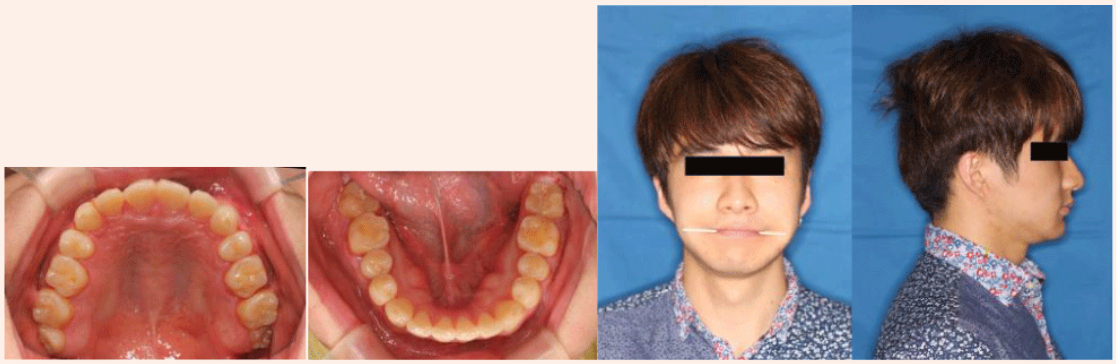
The decalcification of the teeth' surfaces results from poor oral hygiene.

Figure 7: upper occlusal view.

Figure 8: lower occlusal view.

Figure 9: Frontal facial view.

Figure 10: Depicts a facial view from the side.



Figures 7, 8, 9 and 10

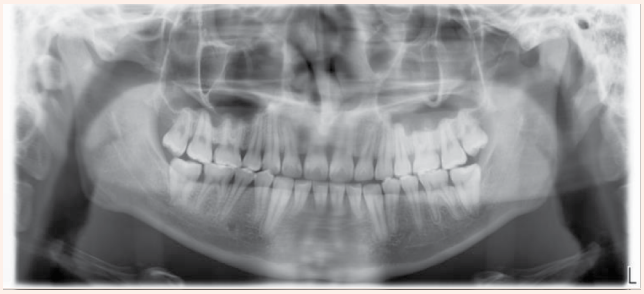


Figure 11: Initial Panoramic X-ray.

The frontal facial photograph shows a canted occlusal plane, and the examination of joint movement is accompanied by pain and clicking, which suggests a TMD problem.

The treatment plan was aimed to correct the cant of the occlusal plane to help reduce TMD symptoms [1] while providing appropriate canine and incisal guidance and eliminating occlusal interferences [2,3]. Reconstructing the cusps is crucial to flattening the occlusal table, but the patient has rejected it, making the task challenging [4-6]. To gain knowledge about the 3D condition of the matter, we took a CT X-ray [7-9]. The canted occlusal plane can easily be detected with a CT scan. After the treatment, the CT scan can be compared to determine the success of the treatment.

The treatment plans.

i. Oral function can be restored by receiving instruction on Myofunctional Therapy [10,11].

ii. Providing instruction and maintenance for oral hygiene [12].

iii. Fixed appliance and Temporary Anchorage devices to correct the malocclusion.

iv. Occlusal plane correction should be attempted as much as possible to alleviate joint pain and problems related to the temporal mandibular joint [13,14].

The plan is to use surgical plate modification; the new model is a submucosal plate with the end above the mucosa, so we can attach spring wire and extrude the posterior molars to change the occlusal plane (Figure 12).

Figure 12: The modification of the surgical plate with three screws. At the other end of plate, which indicated as A, there is a screw attachment for auxiliaries. The Anka plate system is the name given to this system. The Anka plate is manufactured below:

Figure 12: The modification of the surgical plate with three screws. At the other end of plate, which indicated as A, there is a screw attachment for auxiliaries. The Anka plate system is the name given to this system. The Anka plate is manufactured below:

PSM Medical GmbH makes Anka plate at Gewerbestraße 10 in Gunningen, Germany.

Treatment

The following treatment mainly explains the correction of the occlusal plane and the use of Anka plates. Extrusion of the upper maxillary posterior teeth, particularly molars, was done by placing the Anka plates on both maxillary buttresses. On the mandible, the Anka plates were applied on the body of the mandible behind the mentalis external foramens to extrude posterior mandible teeth. The four Anka plates were also intentionally aimed at changing the mandible plane and increasing the vertical height of the lower third of the face as much as possible.

The placement of Anka plate on the maxilla.

The Anka plate should be placed in the maxillary area. The three-hole arms of the Anka plate were adjusted to match the configuration of the maxillary buttress before placement. The end area of the plate, as shown in Figure 12 A, should be placed in an appropriate position for the auxiliary to be attached. The A area is where a force is used to extrude the molars. The auxiliary in this case, is a simple stainless steel (SS) wire being used. The size of the wire is a 016X016 SS wire (Figure 13-15).

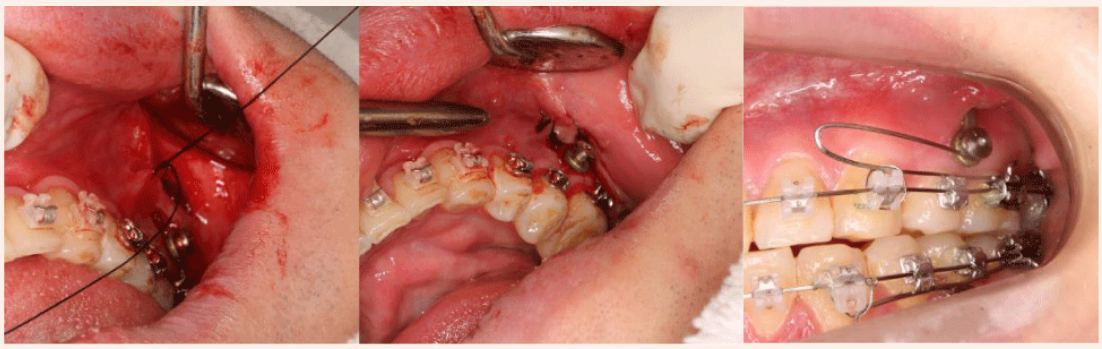


Figure 13, 14, and 15.

Figure 13: The plate was bent to adapt to the Maxillary buttress's surface, located at the end area on the superficial mucosal tissue. The wound had been closed and sutured.

The end of the Anka plate was left outside the mucosal layer.

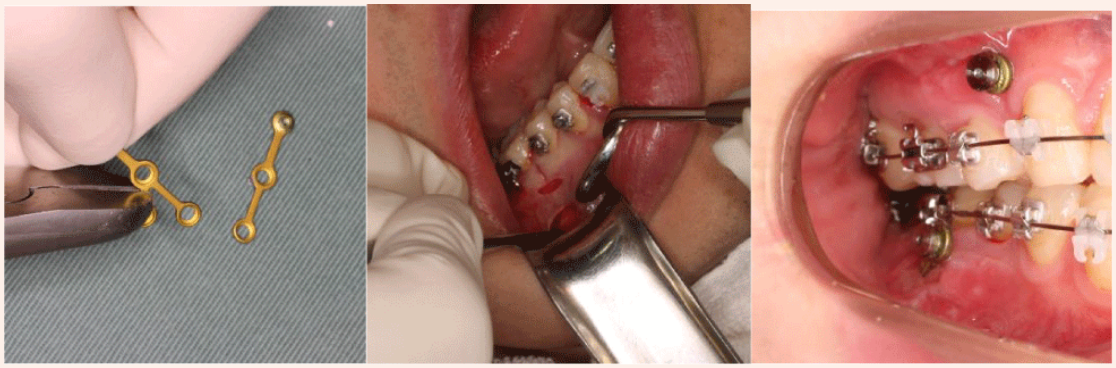
Figure 15: The end of the Anka plate and the spring auxiliary are attached to extrude the posterior teeth.

The placement of the Anka plate on the mandible.

To make the Anka plate more accessible and straight, one branch of the hole was reduced. Carefully detect the mentalis foramen and the roots of the lower bicuspid by checking CT for the location and distance of the roots to the surface of the buccal mandibular bone [15,16] (Figure 16-18).

Figure 16: The branch of the Anka plate was reduced, and the plate became a straight plate.

Figure 17: Two incisions were made to simplify the procedure, and fewer stitches were needed to close the wound.



Figures 16, 17, and 18

One week after the placement of the plates, the treads were removed, and the spring wires were attached.

All four auxiliary springs were set to increase the vertical dimensions, and the canted occlusal plane can be corrected by adjusting the forces.

The adjustment of the auxiliary springs continued until the patient asked to stop the treatment as he graduated from the university and moved to another town.The Anka plate has been applied for eight months, and the fixed orthodontic appliance has been used for twelve months for the total treatment duration (Figures 20-22).

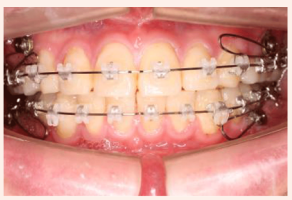


Figure 19

Result

Figures 20, 21, and 22 show when the fixed appliances were removed. The midline of the lower teeth is slightly to the left, as the extrusion force might have driven them somewhat to the left. There has been an improvement in the relationship between the upper and lower posterior regions. The joints do not click during the jaw's opening, lateral, and anterior movements. The symptoms of TMD had largely disappeared, and there was no pain.

Figures 20, 21, and 22.

A removable plastic retainer was positioned on both upper and lower teeth. Regular visits are impossible for the patient due to the distance between his new home and the office.

Treatment results

i. The extrusion of the teeth within the alveolar bone is more complex than intrusion. The difficulty lies in the following:

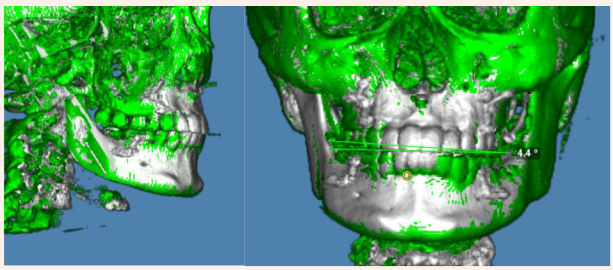
ii. Overcome the bite forces against the mastication muscle [17,18].

iii. As the teeth move posteriorly [19,20], they will encounter a wedge effect.

iv. The temporal mandibular joint is being adjusted [21,22].

v. The vertical dimension cannot be changed and increased by Orthodontics alone without the aid of Prosthodontics [23].

vi. Patient cooperation [24] (Figures 23-26).



Figures 23 and 24.

In Figure 23, the initial CT is depicted in white, and the after-treatment CT is overlaid with orange. In both the initial CT and after-treatment, the lateral cut of the jaw displays distinct positions.

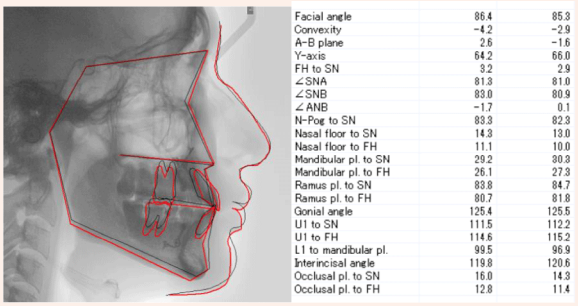
Figure 24 shows the elongation, particularly on the right side, as evidenced by the Anka plate's influence on extruding the posterior teeth and alveolar bone.

Figure 25 shows the initial lateral cephalogram (black line) and the after-treatment cephalogram (red line), showing the elongation of the lower third of the face.

Figure 26 displays the distinctions between before (left numbers) and after treatment (right numbers).

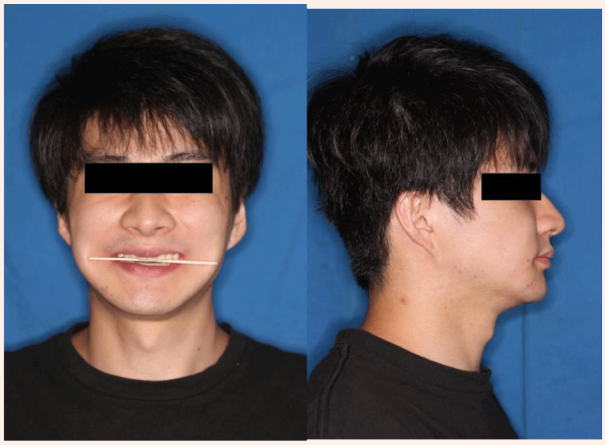
The mandible -SN angle was increased from 29.2°to 30.3°.

The total vertical height is increased as N-Me changed from 119.6mm to 122.2mm or a different of 2.6mm.



Facial angle	86.4	85.3
Convexity	−4.2	−2.9
A-B plane	2.6	−1.6
Y-axis	64.2	66.0
FH to SN	9.2	2.9
∠SNA	81.3	81.0
∠SNB	83.0	80.9
∠ANB	−1.7	0.1
N-Pog to SN	83.3	82.3
Nasal floor to SN	14.3	13.0
Nasal floor to FH	11.1	10.0
Mandibular pl. to SN	29.2	30.3
Mandibular pl. to FH	26.1	27.3
Ramus pl. to SN	83.8	84.7
Ramus pl. to FH	80.7	81.8
Gonial angle	125.4	125.5
U1 to SN	111.5	112.2
U1 to FH	114.6	115.2
L1 to mandibular pl.	99.5	96.9
Interincisal angle	119.8	120.6
Occlusal pl. to SN	16.0	14.3
Occlusal pl. to FH	12.8	11.4

Figures 25 and 26.



Figures 27 and 28

The canted occlusal plane was corrected to a degree of 4,4° (Figure 24).

The frontal facial photo at the end of the treatment is shown in Figure 27.

The lateral photograph after the treatment is displayed in Figure 28.

Discussion

The case demonstrated that the extrusion of molars and their alveolar bone can be done effectively using the surgical plate modification of the Anka plate. The vertical dimension of the lower third of the face increases as the mandibular plane rotates downward. The treatment was previously started by two orthodontists at the age of 12.

The patient unable to cooperate may have been burdened by the prolonged orthodontic treatment. TMD treatment is among the objectives that have been achieved. However, several reasons involved are the length of the ramus of the left and right of the mandible; biting more on the right side when chewing and eating habits may also exaggerate the symptoms of the joint problem. It is necessary to continue monitoring the joint problem after orthodontic treatment, but it is not feasible. The elimination of the habit is advisable. Relapse when the oral mastication habit is not corrected is possible. The anterior crossbite is corrected, and the case's stability is permissible.

Conclusion

In this case, the Anka plates effectively treat the canted of the occlusal plane well. However, to verify the validity, more cases need to prove the use of this modification of surgical plate. This method of using a plate can be an option when a patient refuses a Surgical Orthodontic such as a Le-Fort1 osteotomy.

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