

Occlusal Rehabilitation of Pseudo-Class III Patient

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Abstract

To treat a patient with anterior crossbite, the clinician should first assess if it is a genuine class III or a pseudo-class III malocclusion. Cephalometric analysis is important; however, registering a patient's centric relation (CR) is simple, quick, and costless and can play a decisive role in a differential diagnosis for this type of patient profile. This clinical report depicts a patient clinically diagnosed as class III. After mandible manipulation in CR, it was noted that the patient in question was a pseudo-class III. The treatment was based on the pseudo-class III diagnosis. Therefore, the patient was rehabilitated by occlusal adjustments and conventional and implant-supported prostheses and without the need for invasive orthognathic surgery.

The intermaxillary relation in Angle's class III malocclusion presents a diagnostic challenge. The causes of this type of malocclusion can be hereditary,^{1,2} congenital,³ or acquired.⁴ Class III position is diagnosed through clinical, radiographic, and cephalometric analyses.⁵

Moyers suggested that pseudo-class III malocclusion was a positional malrelationship related to an acquired neuromuscular reflex.⁶ In these cases, the occlusal analysis within the clinical exam becomes the key factor for diagnosis. Pseudo-class III malocclusion can be diagnosed by means of a cephalogram analysis, family history, molar and canine relationships at habitual occlusion and centric relation (CR), and dentoskeletal morphology.⁷

CR is recognized worldwide⁶ and has been subject to broad discussions. The literature is vast on dental rehabilitations using CR as a starting point.⁸⁻²¹ The use of CR as a diagnostic tool in full occlusal rehabilitation cases should be incorporated as part of a routine clinical exam practice.

There are two types of joint manipulation techniques: the chin point guidance²² and the bilateral mandibular manipulation bilateral technique.^{23,24} Both techniques are efficient and reproducible. The CR position is used as a diagnostic tool for differential diagnosis of true or pseudo-class III malocclusions.²⁵

Pseudo-class III malocclusion is characterized by the forward shift of the mandible on closure, portraying a typical

class III skeletal and dental pattern in maximum intercuspal position (MIP).²⁶ When the mandible is moved to the CR position, a class I skeletal pattern, normal facial profile, and a class I molar relation is present. With the mandible maintained in this position, the anterior teeth may be without contact, or in an edge-to-edge relation. A concurrent increase in the restored occlusal vertical dimension (OVD)²⁷ may be required, a clinically challenging rehabilitation. A clinical report of a patient presenting an apparent Angle's class III at the MIP position is described.

Clinical report

A 55-year-old male patient (Fig 1) came to the Center of Continuing Education and Research in Implant Dentistry (Centro de Ensino e Pesquisa em Implantes Dentários [CEPID]) in the Department of Periodontology at the Federal University of Santa Catarina (Universidade Federal de Santa Catarina) for treatment. His chief complaint was the anterior position of the lower teeth and lack of posterior teeth, which compromised his esthetics and function.

After intra- and extraoral clinical exams, the patient was initially diagnosed with Angle's class III malocclusion. Periodontal examination was conducted, and the patient presented a highest probing depth of 3 mm. Clinical attachment loss

ranged from 1 to 2 mm; bleeding on probing was absent. The periodontal diagnosis was chronic generalized slightly reduced periodontium. The patient had a history of tooth loss due to extensive carious lesions and to endodontically treated teeth that resulted in tooth fractures. Teeth #2, 3, 13, 14, 15, 18, 19, 20, 28, and 30 were absent at the initial appointment.

Despite the absence of most posterior teeth, the remaining occlusal contacts presented by the patient maintained the OVD in a position that allowed him to function with comfort. Next, the patient's jaw was manipulated in CR for differential diagnosis using the bilateral manipulation technique.²³ In CR, there was contact between the right upper central incisor and the left central lower incisor, while the remaining anterior teeth were free from contact. Therefore, the OVD increased, indicating that the patient showed a pseudo-class III malocclusion. He was asked if his anterior crossbite was recent, and he stated that he always had the crossbite, which had always been a problem. The treatment plan was divided into two phases: preliminary and final. Alternative treatment options were presented to the patient at the initial consultation. The optimal treatment plan was dental implant rehabilitation for the missing teeth. Two additional treatment options were presented: (1) removable partial dentures (RPD) for the mandible and maxilla; or (2) combination of maxillary RPD with a mandibular fixed partial denture (FPD) from 27 to 31 and implant-supported prosthesis for 19 and 20. The patient rejected the last two options and chose the optimal treatment plan. He gave his informed consent to the treatment.

Preliminary treatment

The master casts were mounted on a semi-adjustable articulator (Whip-Mix, 300 series; Whip Mix Corp., Louisville, KY) by means of a facebow. For the preliminary treatment plan, an anterior stop CR record was fabricated. It is customary to use anterior deprogramming devices (permissive or restrictive splints), for example, Lucia Jig,²⁸ to deprogram the neuromuscular reflex. In this particular case, the anterior stop was made by the incisors, and therefore, the use of the Lucia Jig was not necessary. The dentist who prepared the record asked the patient to bite while conducting the bilateral mandibular manipulation technique. Next, the patient was asked to stay in that position to record the maxillomandibular relationship in CR with a thermoplastic bite wafer made from baseplate wax.

The preliminary treatment consisted of occlusal adjustment of premature contact using diamond tips (Intensiv; Grancia, Switzerland). During this process, other anterior teeth established contacts. Afterwards, occlusion was stabilized by means of light-cured composite resin (Filtek Z250; 3M/ESPE, São Paulo, Brazil) to add dental contacts in the anterior teeth and repair the incisal edges of the canine and premolar using adhesive technique for enamel²⁹ and dentine³⁰ (Fig 2). Invasion of the inter-occlusal space present after the occlusal adjustments and establishment of the occlusal contacts with composite resin were verified by asking the patient to say sibilant sounds without interferences. This space increased approximately 3 mm in the molar region. The patient did not use any provisional device to restore the absent posterior teeth. After adjusting the anterior guidance, canine disocclusion was es-

tablished by occlusal adjustment, separating the posterior teeth during eccentric mandibular movements. The anterior horizontal overlap was 0.5 mm, and the vertical overlap was 1 mm. The patient received an anterior occlusal guard (AOG) in acrylic resin for routine use.³⁰ The use of occlusal splints to test the effect of change in occlusion on the temporomandibular joint (TMJ) and jaw muscle before extensive restorative treatment is recommended.³¹ The AOG induces a therapeutic mandibular position that reduces stress in the disc/con-dyle complex.³² The AOG is typically placed in the maxillary arch with an anterior ramp. The ramp is designed to allow the disc/con-dyle complex to be altered temporarily while deprogramming muscle tone. The level of activation of the jaw elevator muscles decreases significantly during maximal clenching on an AOG with a bite ramp as compared to biting in MIP or clenching on a full-arch appliance.³³ Therefore, the authors indicate the use of an AOG customarily in extensive occlusal rehabilitations to protect the restored dentition. The patient was advised not to use the AOG constantly, but only when he was tense, to avoid the risk of over-eruption of the posterior teeth.

All of the aforementioned procedures were performed at the first dental visit. The patient was scheduled for the subsequent appointment 2 weeks thereafter.

In the second appointment, the patient showed a favorable response to the preliminary treatment outcome. He reported absence of TMJ discomfort or pain and expressed personal gratification. The outcome of the preliminary treatment was a stable occlusion and a more esthetic visual perception of the upper teeth.

Exams

Upper and lower casts were mounted on a semi-adjustable articulator. A diagnostic wax-up and radiographic-surgical (RS) guides were fabricated. A cone beam computerized tomography scan was performed with the RS guides for analysis. Images showed the presence of sufficient bone for dental implant placement.

Definitive treatment

External hex dental implants (Master Porous; Conexão Sistema de Prótese; São Paulo, Brazil) were placed in the following sites:

- 3.75 × 11.5 mm: #2, 3, 14, 20, and 30;
- 3.75 × 13 mm: #28;
- 3.75 × 10 mm: #19.

In sites #13 and 14, the patient needed a sinus lift, which he refused. The treatment option of an angled implant for tooth #14 and an anterior cantilever for #13 was given, and the patient accepted. After the initial 3-month healing phase, a temporary implant-supported prosthesis and conventional prostheses were fabricated with thermo-cured composite resin according to the newly established vertical dimension reached after CR jaw manipulation and occlusal adjustment therapy.

Tooth #8 showed a questionable prognosis at the initial exam and resulted in root fracture at a follow-up appointment when it was extracted. The site was thoroughly debrided, decontaminated with tetracycline-HCl (at a 1:1 ratio with saline solution)

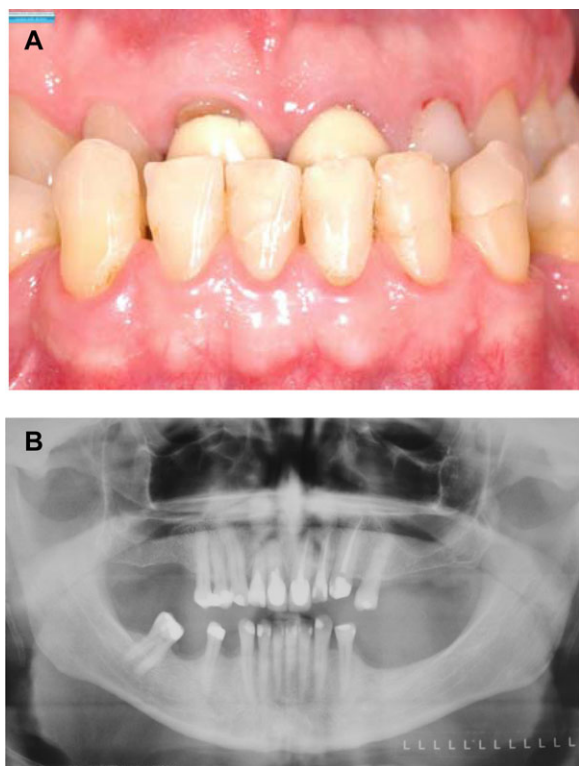


Figure 1 (A) Frontal view of patient in maximum habitual intercuspatio. Note severe anterior and posterior crossbite. (B) Panoramic radiograph taken at initial appointment.



Figure 2 Frontal view of mandible in centric relation after occlusal adjustment and composite resin restoration of the incisal edges of the canine and premolar.

for 3 minutes and thoroughly irrigated with saline solution. Next, a 5 × 13 mm implant (Master Porous) was immediately replaced. The implant-supported definitive prostheses were delivered 4 months after implants were activated with the interim prostheses. Meanwhile, the patient received a 4-unit temporary FPD. After the delivery of the first set of interim prostheses, an AOG was fabricated for use only at night.

The patient used the interim prostheses for a period of approximately 4 months. Castable plastic abutments with a metal collar (UCLA 056025; Conexão Sistema de Prótese) were used



Figure 3 Frontal view of the porcelain-fused-to-metal definitive implant-supported and conventional prostheses.



Figure 4 Panoramic radiograph showing stability of the peri-implant bone 4 years after final dental implant prosthetic delivery.

to fabricate crowns for sites presenting reduced interarch space. Additional occlusal adjustments were performed aiming to achieve more effective occlusal contacts. The patient's rehabilitation was adjusted and maintained to a canine guidance occlusal scheme. The patient was seen for monthly periodic adjustments and did not report any complaint for a period of 120 days. Impressions were made, and the casts were mounted in the articulator. Acrylic resin was placed in the incisal table, and customized with the guide pin to copy protrusive and lateral movements.

Porcelain-fused-to-metal conventional and implant-supported prostheses were then cemented, first on the maxilla and then the mandible (Fig 3). The horizontal overlap presented at the time of prosthetic delivery was approximately 1 mm. The patient's final profile remained the same as the profile registered at CR. The final OVD established after the delivery of the definitive prostheses was similar the initial OVD established after the initial occlusal adjustments were performed; however, 4 years after the definitive restorations were placed, a panoramic (Fig 4) radiograph shows stability of the peri-implant bone. The patient has not reported any pain or discomfort. Note that implant #30 could have been longer.

Discussion

Pseudo-class III malocclusion occurs in less than 1% of the Caucasian population.³⁴ The treatment of this condition is approached early in life in order to correct the anterior displacement of the mandible by guiding the canines and premolars to erupt into class I with orthodontic therapy. In addition, early therapy provides a normal environment for maxillary growth and elimination of the anterior cross-bite.³⁵ This clinical report shows the management of an adult presenting pseudo-class III malocclusion. The patient did not report family history of pseudo-class III malocclusion. He did not receive early orthodontic therapy. The pseudo-class III malocclusion was diagnosed during the clinical exam while manipulating the patient's jaw to CR when the maxillary teeth were in tip-to-tip relation. This indicated that the pseudo-class III relationship was a positional malocclusion with an acquired neuro-muscular reflex.⁶ The treatment option chosen by the patient was the least invasive; in addition, it showed more prompt results. After therapy, the patient functioned with more occlusal units anteriorly and posteriorly, eliminating the need for orthognathic surgery. This treatment option for patients who present the same diagnosis has been conducted for several patients at the CEPID with complete resolution and stabilization of the condition.

The postural rest position has a considerable range of adaptability to increases in the OVD; however, the range of comfort may vary considerably among individuals and even within a single individual under different conditions.³⁶ To evaluate if the temporized OVD was within the functional free space, interim prostheses were used to maintain the newly established OVD. They were fabricated with a slight overbite of approximately 1 mm, which established an anterior guidance to assist in posterior disocclusion. In addition, an AOG was used to deprogram the muscle tone during the process of adaptation. In the present case, if the new OVD had caused pain or discomfort to the patient, the interim prosthesis would have been readjusted until a comfortable OVD was reached. The patient was followed up for 4 months prior to the delivery of the definitive prostheses to verify the muscular-articular behavior. The evaluation of the patient's response was favorable; therefore, the definitive prostheses followed the same parameters. The anterior guidance was then customized and transferred to the definitive prostheses.

There seems to be no apparent correlation between length of anterior cantilever and screw loosening; however, the ratio of posterior cantilever to the anteroposterior spread was significantly associated with screw loosening.³⁷ Therefore, an anterior cantilever was used in the FPD (teeth #13–14), to minimize or prevent screw loosening.

The association of malocclusions and occlusal interferences, as well as tooth contact patterns with clinical and subjective temporomandibular disorder (TMD) symptoms were studied.³⁸ The mechanical compression or tension of the TMJ is influenced by the magnitude of duration and adaptive capacities of the host.³⁹ Prolonged strains beyond the level of adaptation of the TMJ, the periodontium, and the dental occlusion, shifts in the fluids within the disc and retrodiscal tissues will result in an alteration of the architecture of the collagen and noncollagen proteins and ultimately

a change in tissue morphology.⁴⁰ In the general population, TMJ disorders show a prevalence of 12% in clinical practice.⁴¹

Occlusal schemes have been discussed from different viewpoints; however, no scientific evidence encourages the use of one occlusal scheme over the other. Akoren and Karaagaçlıoğlu⁴² compared the electromyographic activity of 30 individuals with canine guidance and group function. The patients were asked to chew gum during the electromyographic analysis. There was no statistical difference between patients presenting both occlusal schemes; however, canine guidance showed a narrower chewing model than group function, and reduced anterior temporal muscle activity during sliding. The authors suggested that in the presence of healthy canines, canine guidance occlusion would be preferable. In the presented report, canine guidance was selected as the occlusal scheme.

To our knowledge, this is the first report showing the management of adult pseudo-class III management with dental implant rehabilitation. Our rehabilitation strategy depended on the patient being able to be manipulated in CR; otherwise, the proposed treatment option would not have been available. The literature presents extensive management of class III malocclusion with an orthognathic surgery approach; however, we cannot determine if any of the reported cases could have been an undiagnosed pseudo-class III malocclusion.

Conclusion

It is known that there is only one "correct" diagnosis; however, there are several ways to treat a disease. For this patient, it is believed that the diagnosis was accurately reached, and that the treatment was properly performed. Other forms of treatment could have been proposed. For instance, orthognathic surgery, orthodontic treatment,²⁹ and the combination of these procedures in conjunction with prosthetic rehabilitations; however, such treatments would have been costly, traumatic, and certainly more time consuming. After the treatment was concluded, orthognathic and orthodontic treatments were no longer needed. Patient satisfaction in treatment outcome and comfort during therapy was our main goal.

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