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PROSTHETIC REHABILITATION OF THE CLASS 3 MALOCCLUSION: A CASE REPORT

KEY WORDS:

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ABSTRACT

Loss of posterior teeth impacts a patient's function as well as their facial esthetics. Changes in the Occlusal Vertical Dimension (OVD) may result in anterior crossbite or Class III malocclusion. This clinical report describes the prosthodontic management and stabilization of a patient with reverse anterior articulation due to loss of posterior occlusal support. The comprehensive diagnostic approach, the information gathered from the provisional phase and the consistent sequence of clinical and laboratory stages led to a definitive treatment outcome that guaranteed the success of the prostheses and the patient's comfort and satisfaction. The clinical case described indicates that the prosthodontic management of Class III malocclusion, when carefully planned, can be a safe procedure that aims to ensure the immediate and longitudinal improvement of a patient's function and esthetics. The treatment was based on the class III diagnosis. Therefore, the patient was rehabilitated by occlusal adjustments and conventional teeth and tissue - supported prostheses and without the need for invasive orthognathic surgery.

INTRODUCTION

Angle described class III malocclusion as one in which the mandibular first molar is positioned mesially relative to the maxillary first molar (1). A class III skeletal relationship can occur as a result of a normal maxilla with a mandibular protrusion, maxillary retrusion with a normal mandible, or a combination of maxillary retrusion and mandibular protrusion. A class III dental relationship can exist when the maxillary/mandibular relationship is normal. Class III malocclusions are one of the maxillofacial anomalies that cause the most discomfort to patients both aesthetically and functionally. Orthodontic, surgical, and prosthetic treatments should be considered together in adults with a crossbite. However, the long duration of orthodontic treatment and the discomfort of surgical interventions cause some patients to reject these treatment options. In such cases, case-specific prosthetic approaches can be applied. Prognathism and loss of occlusal vertical dimension are serious social and functional impediments. Its correction is essential to restore function and esthetics in the oral and behavioral rehabilitation of the prognathous patient. The class III anomalies may be in volume or in position (dental). In volumetric anomalies, mandibula is bigger than its normal volume and this is the real class III case.

For many class III malocclusions, both surgical and orthodontic treatments are required. Depending on the amount of skeletal discrepancy, surgical correction may consist of mandibular retraction, maxillary protraction, or a combination of both procedures. For some minor class III malocclusions, or in the case of a pseudo-class III malocclusion, surgical intervention may not be necessary. Treatment objectives, whether utilizing surgery, orthodontic treatment, or restorative treatment, are the same: to correct the class III crossbite, create an ideal overjet/overbite relationship, achieve a dental class I occlusion, correct the occlusal/incisal plane, correct the midline, and restore the teeth to proper size and proportion. The objective is to provide the patient with an acceptable functional occlusal relationship and an aesthetic dental/facial appearance (2).

Class 3 malocclusions are common. Patients with crowded and rotated teeth, spacing, or a crossbite who are unsatisfied with their appearance may not be interested in traditional orthodontic treatment or surgical correction. Their objections can be related to the length of time needed to complete treatment or fear of extensive surgery with extended recuperation. When deciding upon a treatment, the clinician must understand how the malocclusion affects the patient aesthetically, functionally, and biologically, and the long-term

impact of treatment. Many patients may not require treatment. Treatment may not be needed for many patients Others may need treatment to improve functions as well as improve the long-term prognosis of the teeth and stomatognathic system. Still, others may request treatment based solely on the desire to improve aesthetics (2).

The practitioner must determine the benefits and consequences of each treatment option. It is important to speak with the patient, and determine when a noninvasive treatment plan may be optimal. Once the patient understands and is fully informed of the treatment options, their benefits, and disadvantages, some individuals may desire treatment that does not involve orthodontics. In some cases, restorative techniques with veneers, crowns, or fixed prosthetics can provide exceptional strength, function, and aesthetics. The decision to proceed with the restorative alignment of the teeth rather than orthodontic alignment is dependent on full disclosure and understanding of the treatment options, and the clinician's understanding of preparation design, aesthetics, and occlusion (2).

The intermaxillary relation in class III malocclusion presents a diagnostic challenge. The causes of this type of malocclusion can be hereditary, congenital, or acquired. Class III malocclusion is diagnosed through clinical, radiographic, and cephalometric analyses. This clinical case is aimed to describe the treatment of a patient with class III malocclusion in this article, it is aimed to describe a prosthetic treatment approach to provide aesthetics and function in an adult female patient with class III malocclusion. The aim of the treatment, in this case, is to protect the tooth structures and to improve the aesthetic and chewing functions using fixed and removable partial dentures.

Case Report

A 53-year-old woman sought treatment complaining of chewing difficulty, inability to eat, speech disorder, and unpleasant esthetics For that reason, this female patient applied to our clinic for prosthetic treatment.

Now in her 50s, the patient was unhappy with the appearance of his teeth and was interested in restoring his mouth to proper health without orthognathic surgery and orthodontics. The patient was seen for a comprehensive examination including radiography and digital photographs. The medical history was noncontributory. It was determined that the patient did not have any systemic disease in terms of general health. There was no remarkable finding in the family history either. In the extraoral examination of the patient, a

depression was detected in the midface region due to prognathism. Panoramic radiographs were also made (Figure. 1). Skeletal examination revealed a retrusive maxilla and protruded mandible. Examination of the face and profile revealed a shortened mid-face height and longer lower face length suggestive of a class III malocclusion. Aesthetically, the upper and lower incisors were not visible with the resting lip position. A flat to reverse smile line was present, with the incisal plane being shorter than the occlusal plane. The length of the lower teeth were short, these teeth were misshapen from wear, and not commensurate with the golden proportion. The color of the teeth did not complement the smile and were of low value (Figure. 2).



Figure 1. Initial panoramic radiograph of the patient

Evaluation of the temporomandibular joint revealed no history of previous problems and no current pathology. Jaw opening and range of motion were within normal limits. No joint sounds, signs, or symptoms of instability were evident. Head and neck, and muscles of mastication, were normal to palpation.

In the intraoral examination, it was determined that he had anterior and posterior crossbite (Figure. 2). It was observed that there was no bilateral contact due to partial edentulism in the posterior region. Existing teeth wear was evident throughout both arches. Intraoral examination revealed the absence of the left maxillary lateral incisor, premolars, and second molar, right maxillary central incisor, premolars, and molars. The mandibular right and left premolars and molars were also missing. The patient had generalized mandibular teeth abrasion. It was determined that there was no freeway space in the anterior region where the patient had occlusal contact and that the vertical dimension was lower than normal by making aesthetic and phonetic controls. Intraoral and radiographical examinations revealed loss of all but one posterior tooth, a maxillary 4-unit Fixed Partial Denture (FPD) with metal porcelain design (Bridge restoration was noted between the left maxillary canine tooth and the first molar tooth.), and severely damaged upper and lower teeth (Figure 1, 2). Clinical examination revealed plaque and gingivitis. The patient's oral hygiene was deemed poor. Anterior reverse articulation and reduced occlusal vertical dimension (OVD) were also noted (Figure 2). However, it was observed that when the patient was guided to the CR position, an incisal edge (edge-to-edge bite) relationship was achieved, while the OVD increased proportionately. After radiologic, intraoral, and extraoral clinical exams, the patient was initially diagnosed with class III malocclusion. Her medical and dental histories were recorded.



Figure 2. First facial and intraoral photographs. The front and profile photographs show a depressed middle third as well as an increased lower third, brachyfacial biotype, and a concave profile: all these are characteristic features of class III. Intraoral photographs show anterior and posterior deep crossbite.

Diagnostic data were collected to develop an individualized treatment plan for the patient. Pre-prosthetic extraoral and intraoral photographs, as well as primary upper and lower irreversible hydrocolloid impressions (Kromopan, Lescod, Italy), were taken for diagnostic casts. Casts mounted on the articulator were analyzed. A diagnostic wax-up was fabricated to design the anterior guidance necessary for the increased OVD and to calculate the prosthetic space possible treatment options were discussed. Implant placement had been rejected by the patient from the outset of treatment. The diagnosis was a class III malocclusion with an asymmetrical crossbite, that were in need of replacement, occlusal wear with possible loss of vertical dimension, and an unaesthetic smile.

Treatment Approaches; Prior to the development of the definitive treatment plan the benefits and limitations of the 2 main treatment options were discussed with the patient:

1. Orthognathic surgical treatment followed by restorative dentistry, or
2. Restorative dentistry alone.

All dentition would require restoration due to wear and need to reestablish anterior/cuspid guidance. The main complaints of the patient were not being able to eat, not speaking properly, and unaesthetic teeth and facial appearance. Thus, the treatment plan suggested included porcelain fused to metal fixed partial dentures (FPDs) combined with Removable Partial Dentures (RPDs) An informed consent form was signed by the patient. Mouth preparation, including oral hygiene measures and periodontal treatment, was performed. Subsequently, the upper fixed partial denture was removed, and the remaining teeth were assessed. The remaining teeth were prepared (Tooth preparations were refined, and definitive impressions taken using addition silicone impression material. Centric relation recording and registration ensued.) impressions were taken and record bases with wax rims/Silicon were used to orient the occlusal plane, the appropriate OVD was defined and the postural position of the mandible relative to the maxilla was recorded. During the laboratory steps, care was taken to render all elements of interim restorations, namely the shape, the contours, the incisal edge position, and the anterior guidance and occlusal parameters satisfactorily. The metal framework was constructed according to this information. The subsequent bisque try-in step was performed, for occlusion, marginal integrity, and anterior ceramic contours to be evaluated. The RPDs were connected to the FPDs via extra coronal clasps that provided increased retention of the definitive restoration. Moreover, porcelain denture teeth were selected to maintain the OVD achieved more securely, as occlusal stability was considered a high priority. At the delivery appointment, final occlusal adjustments were made to ensure posterior stability. The patient was delighted with the outcome and was accepting of the esthetics and function. He was given instructions regarding oral and denture hygiene.

After the initial examination, alternative treatment plans were considered, including orthognathic and prosthetic procedures. Orthognathic surgery would probably be the best treatment for the patient. However, this alternative is invasive and expensive. All the alternatives were presented, and the patient agreed that the fixed and removable partial dentures were the most simple and low-cost choice. A definitive maxillary and mandibular anterior metal-ceramic crown and bridge, and posterior removable partial dentures were then suggested. After consideration of all treatment options, the patient elected to restore all teeth without orthodontic and orthognathic surgical treatment.

The centric relation record was made with a silicone material (Zeta plus/ Oranash, Zhermack, Italy) to mount the mandibular cast. The VDO was increased (approximately

7mm) to provide enough space for the restoration of the missing teeth. The metal-ceramic bridge between the maxillary left canine and the first molar was removed and then all teeth were prepared as fixed and removable dentures abutments to contribute to support and stability of the dentures (Figure 3). The patient wear the fixed and removable partial dentures for 6 months and during this period, she reported acceptable comfort, esthetics, and functionality (Figure 3).

The impression with a condensation silicone (Zeta plus/Oranash, Zhermack, Italy) was taken. Rest seats were prepared on mesial surfaces of the maxillary canines maxillary superior of both sides and on occlusal mesial surfaces of the mandibular premolars. From the definitive impression, a master cast was made and a framework pattern for restoring the plane of occlusion was designed. The master cast was duplicated in investment to be mounted in an articulator. The circumferential clasp was planned for maxillary molar and bar clasps were planned for maxillary canines and mandibular premolars. Maxillary and mandibular RPDs were cast in chrome-cobalt alloy (Degussa, Legierung, Zur Anfertigung, Germany). Clasps and rests were in passive contact with the tooth when the framework was completely seated. The definitive dentures were try-in intraorally. The denture teeth used was an anatomic tooth to simulate the natural tooth form (Ivoclar, tooth form and tooth shade 3A; Ivoclar-Vivadent, Germany) and then the denture was polymerized.



Figure 3: Final frontal, profile, and intraoral photographs after prosthetic rehabilitation.

Preparation of all maxillary and mandibular posterior teeth was accomplished utilizing the anterior vertical dimension/centric relation jig on the maxillary and mandibular anterior teeth as a guide. With the preparation of the teeth complete, and the anterior teeth completely seated in the jig, a bite relationship of the maxillary to mandibular prepared teeth was taken in a stiff silicone bite registration material. The bilateral bite registration material would become the posterior guide for restoring the case. Once this was completed, all teeth were seated in the bite registration. A silicon impression material was then used to capture both the maxillary and mandibular prepared teeth. A facebow transfer was taken of the maxillary arch to allow mounting of the maxillary master cast to the articulator. The provisional restoration was then prepared. The provisional restorations were cemented with provisional cement. With the occlusal adjustments complete, aesthetic re-contouring of the provisional was performed. The provisional restorations were polished to satisfaction.

These working casts were forwarded to the laboratory with instructions for the fabrication of the final restorations. Instruction included fabrication of metal- porcelain veneers crowns and bridge for all teeth, and fabrication of mandibular and maxillary removable partial dentures, All restorations were returned from the laboratory and inspected for accuracy prior to final delivery. All restorations were acceptable in regard to fit and contact on the master model. The patient presented for the cementation appointment and placement of the removable partial dentures. Anesthesia was administered and the provisional restorations were removed. The veneer's crowns were tried on teeth to check fit and accuracy. The removable partial dentures were also tried to inspect the fit of all restorations.

The patient was asked to bite together gently to verify

occlusion and vertical dimension. Although occlusal adjustments were required, the occlusal position and vertical dimension were acceptable. The restorations were tried in with an articulating paper and inspected for shade match to the other restorations. The restorations were then removed from the mouth. All fixed restorations were placed first. Then removable partial dentures were placed. After an appropriate setting time, all excess cement was removed. Once all restorations were secure the occlusion was adjusted to achieve proper centric contacts and establish proper anterior and lateral guidance. Lateral excursions were established as group function with excursive contact on the first molar to cuspids.

The patient was given postoperative instructions, and an appointment was made for evaluation in 24 hours. The next day the teeth were inspected for aesthetics, phonetics, and function. With the aesthetics and phonetics acceptable, the occlusion was re-evaluated. Adjustments were made to provide equal time-intensity-centric contacts. The final result was excellent and well accepted by the patient.

DISCUSSION

Combined fixed and RPD is reversible and cost-effective procedures (3). In the present clinical report, the patient was highly cooperative and demonstrated good oral hygiene. Maintaining all teeth will prevent the loss of residual alveolar ridge later in life. The method of treatment (fixed and removable partial denture combined treatment) on this clinical report can be less expensive than other alternatives but surely the most important feature is that it is less invasive. Orthodontic or orthognathic treatments are very safe, but their high invisibility may be a problem for the patient. This is of greater importance for patients who have completed the developmental age. It was aimed to provide optimal oral health, occlusal stability, comfort during function, and acceptable aesthetic appearance. The relationship of the jaws and teeth should be analyzed to determine which segment/teeth is/are properly related to the cranial base and skeletal facial profile (2,4). In this study, the treatment goal is to maintain what is correctly aligned and change what is not. Analysis of the mounted casts is an important step. An important outcome is an occlusal stability, with a focus on stable holding contacts for each tooth.

Radiographic examination plays an important role as well, establishing the biological health of the periodontium relative to pulpal, osseous, and structural concerns. The radiographic exam also provides an analysis of skeletal relationships to aid in diagnosis and treatment. When properly treated, crossbite relationships can be very stable, predictable, and maintainable. This is possible because the teeth are not being bodily moved through osseous tissue with retained memory of periodontal ligaments and other structures. Further, stability and maintainability are achieved through stable centric occlusion contacts. Crossbites can be divided into 2 categories: anterior crossbite and posterior crossbite, each with a different set of challenges and considerations. They may or may not occur together, and should be analyzed separately (2,4). The female patient described in this study had both anterior and bilateral posterior crossbites.

Anterior and posterior crossbites are analyzed separately because they are evaluated by different criteria. Anterior crossbites are evaluated with regard to aesthetics, anterior centric contacts, and anterior guidance. Posterior crossbites are evaluated based on the teeth in relationship to the bone, tongue, and cheeks, and the occlusal relationship of maxillary teeth to mandibular teeth. A posterior crossbite may be a functional, stable relationship similar to a normal arch relationship, and may not require treatment. Evaluating anterior and posterior crossbites separately may reveal situations where correction of the crossbite (anterior or posterior) is not necessary to achieve the desired goal. The

potential problems associated with anterior crossbites are: aesthetics, absence of centric contact on anterior teeth or reversed anterior contacts, and lack of anterior guidance. Anterior crossbites do not provide anterior guidance in protrusive or lateral excursions. Class III malocclusions do not have traditional anterior/ cuspid guidance, while class I and II occlusions do have this guidance. The class III patient does not use protrusive movements in a similar way to class I and class II patients who use these movements. Most class III patients limit their function to vertical movements and have a vertical functional pattern. They are vertical chewers with a vertical envelope of function because the class III malocclusion does not allow forward movement. Most crossbite patients do not use lateral functional movements similar to class I and class II occlusions. Regarding vertical movement, the goal is to maintain the posterior centric stop position from the previous class III in the new class I position relative to the vertical axis of the root. After treatment, the new class I occlusion should be designed and restored with minimal overjet and overbite, and minimal anterior guidance (2). Additional consideration must be given to changes that occur in the proprioception of the teeth and lips. With an anterior crossbite, when moving maxillary anterior teeth forward, there must be sufficient alveolar bone to support the new tooth position. The stresses exerted are reversed, so it may take time for the alveolar bone and periodontal ligament to realign to the new stresses. The teeth may be tender when functioning during the period of realignment, or just after (2,4).

Another consideration when treating a crossbite, which is also a concern during rehabilitation, is the possibility of increasing the vertical dimension. Evaluation is required to determine if the vertical dimension should change. Changes in the vertical dimension may be required to correct a deep bite, level the occlusal plane, meet the prosthetic requirements anterior teeth when restoring anterior tooth position (as present in class II or class III malocclusion)(2,5). In this case, prosthetic rehabilitation was performed by increasing the vertical dimension by approximately 7 mm. Increasing the vertical dimension can help accomplish 2 goals when attempting to correct an anterior crossbite. First, increasing the vertical dimension causes the mandibular anterior teeth to move down and away from the lingual of the maxillary anterior teeth along the arc of the opening and closing path while the condyles are in centric relation. This will allow the mandibular incisors to be more in line with the maxillary anterior teeth, helping to correct the anterior crossbite. The second is improved aesthetics. Many patients with an anterior crossbite have short clinical crowns. By increasing the vertical dimension, the room is created to lengthen the teeth and improve aesthetics. When establishing the occlusal plane it is better to keep the Curve of Wilson and Curve of Spee relatively flat and on an even plane (one that is more shallow) (6).

The treatment plan would be a full-mouth restoration of all remaining teeth with crowns, bridges, onlays, onlay veneers, and porcelain veneers to correct the class III crossbite, restore carious and worn teeth, restore anterior/cuspid guidance, and improve aesthetics. Initial treatment would consist of a diagnostic workup, including models mounted by facebow transfer to an articulator in centric relation. Occlusal analysis of the mounted models would be performed to identify the skeletal and dental relationship. This would allow the determination of how much (if any) the vertical dimension of occlusion would need to be opened to restore the maxillary and mandibular arch form, and correct the crossbite (7-15). Before the treatment, it was discussed with the patient that some difficulties might be experienced during and after the treatment. These difficulties are; change in speech, change in the appearance of the upper lip as a result of the new position of the teeth, the effect of the new jaw position on the TMJ and masticatory muscles, increased vertical size, and shape of the

anterior teeth, position and contacts. Care was taken not to unduly increase the vertical dimension when treating any full mouth restorative case in which the vertical dimension would be altered. In this case, the goal was to increase the rear vertical dimension to the golden ratio.

Opening the vertical dimension in the golden ratio, as in complete edentulism, is not have a negative effect on the TMJ. Also, it is a known fact that changing the vertical dimension in this way does not cause muscle pain. Compliance time in prosthetic dentistry can be several months, but it is more easily tolerated than compliance after orthognathic surgery and orthodontic treatment.

A full pretreatment analysis is required when correcting an anterior crossbite. Waxing of all anterior teeth should be done, representing the final contours and tooth position. Instructions should be forwarded to the laboratory in central relationship with all diagnostic materials, including photographs and mounted models. Instructions should include a description of soft tissue changes, desired length of incisors, maxillary and mandibular arch form changes, anterior tooth ratios, molar relationships, overjet and overbite sizes, anterior/cuspid guidance requirements, and amount of increase in vertical size. A diagnostic waxing may be necessary to visualize the result. In addition to the diagnostic wax, an acrylic temporary prosthesis should be prepared that captures the new vertical dimension of the maxillary and mandibular teeth. This temporary prosthesis will be the preparatory guide providing a vertical stop in the new vertical dimension in the central relationship. With this temporary restoration, the patient's tolerance to the new vertical dimension and occlusal relationship will be assessed, followed by the definitive restorative phase(12-20). All records of the female patient, including all photographs, diagnostic models, the desired vertical dimension, and the length of the incisors, were transmitted to the dental laboratory. After reaching a consensus on prosthetic restorations, the restorations were completed and placed on the patient.

This treatment was selected as it was minimally invasive, had a relatively low laboratory and clinical costs, and was a simple technique. Clinical results were functionally and esthetically satisfactory. The treatment combined fixed and removable prosthodontic treatment, requiring few clinical appointments as compared to other therapies. A reverse articulation occlusal relationship is classified as a dental or class III skeletal malocclusion. For patients with class III malocclusion, maxillary arch size deficiency, maxillary retro positioning, true mandibular excess, mandibular forward positioning, or any combination of these may be present. Treatment including orthodontics and combined orthodontic/oral surgery may be indicated to correct this problem. It has been shown that rapid maxillary expansion may also serve to disrupt the maxillary sutures and enhance the protrusion effect of the face mask in young and/child class 3 cases. For the patient with a Class III relationship, a removable partial denture (RPD) offers advantages, including the possibility of preservation of remaining teeth, minimal gingival coverage, and enhanced labial support. The low cost of treatment compared to an implant-supported fixed partial denture is another reason for considering a RPD.

CONCLUSION

When determining if treatment for malocclusion is indicated, the clinician must understand how the malocclusion affects the adult patient aesthetically, functionally, and biologically, as well as any impact of treatment. It is important to consult the adult patient and advise when a less invasive orthodontic treatment plan may be optimal. Once the adult patient is fully informed of the treatment options and desires treatment without orthodontics, a restorative/prosthodontic approach using veneers, crowns, or fixed /removable prosthetics can provide exceptional strength, function, and aesthetics. As demonstrated

in this Class III case, with the proper examination, diagnosis, treatment planning, and communication, excellent aesthetic, phonetic, and functional results can be achieved and maintained. After the treatment was concluded, surgical and/or orthodontic treatments were no longer needed. Patient satisfaction in treatment outcome and comfort during therapy was our main goal.

The patient case with class 3 malocclusion presented in this article is suitable for the prosthetic approach and achieves results that solve functional and aesthetic problems in a short time, and thus, improvement in dentofacial aesthetics and function is achieved. The aim of this treatment was to create sufficient space in the vertical, diagonal, and horizontal planes for the placement of fixed and removable dentures to provide functional occlusion and attractive tooth structure.

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