

Rehabilitation of a patient with occlusal disharmony using minimally invasive biomimetic approaches- Case Report.

Rawan Alaa^{1*}, Rawan Mohamed¹, Sara Ibrahim¹, Mariam Henean¹, Jounire George¹, Ahmed Wagdy²

ARTICLE INFO.

Keywords: Biomimetic; Vertical dimension of occlusion; Tooth Wear; Minimal invasive; Occlusal analysis.

Abstract

This case report discusses the functional management of a 33 years -old Egyptian male patient who suffered from bad esthetics of his upper anterior teeth and anterior guidance deformity as result of slight flat condylar path using veneers. The case required occlusal rehabilitation that includes centric relation verification done by bilateral manipulation, lateral and protrusive records where it was found that the patient had a flattish condylar path so we steepened the angle to 35 degrees and also modified the vertical dimension of occlusion within centric relation in order to achieve the aesthetic and functional needs of the patient. This case overcomes the functional drawbacks of the patient to reach an esthetic outcome and solves deformity of the anterior guidance with the most minimal invasive biomimetic techniques and proper anterior guidance, as well as aesthetics, is necessary for long-term occlusal stability. In prosthetic rehabilitation, anterior guidance often gets left unnoticed, even though it has an impact on the functional occlusion.

© 2022 MSA. All rights reserved.

1- Introduction

The depletion of hard tooth structure is described as tooth wear. This is the result of occluding surfaces of opposing teeth functioning against each other or due to the occluding surface and food throughout non masticatory and masticatory movements. ¹ This occurs with no dental caries or trauma present. Tooth wear can be divided into three main mechanisms which are erosion, abrasion and attrition. ² Attrition is referred to wearing caused by tooth-to-tooth contacting. ³ It is physiological wearing and has no foreign substance intervening. ³

Any bad habits that the patient may acquire like bruxism or a premature contact support the attrition to happen and are related to the function of

* Corresponding author.

¹Intern Faculty of Dentistry. October University for Modern Sciences and Arts.

² lecturer of Fixed Prosthodontics, Faculty of Dentistry. October University for Modern Sciences and Arts.

mastication. Attrition is a mechanical classification of wear.^{4,5} It can also occur when the patient has no teeth replacement for a long time due to lost or badly decayed mandibular or maxillary teeth. Occlusal vertical dimension can also be depleted and this result in the inter-arch distance to increase and over closure then takes place.⁵ This condition leads the patient to have their mandible move in a forward direction and employ their anterior teeth in mastication which will result in attrition.⁵ This state will also have the patient feeling fatigued easily as they masticate and they will have problems with the TMJ that may include clicking.⁴

The anterior teeth's occlusion is crucial for developing and maintaining an "ideal" occlusion.² In eccentric positions, the anterior teeth protect the posterior teeth by dis-occluding them, and in centric positions, the posterior teeth protect the anterior teeth by receiving the majority of the closing forces.³ Anterior guidance is the result of both anterior tooth position and condylar border movements; both factors must be taken into account when designing anterior guidance.^{6,7}

Anterior guidance is the dynamic interaction between the lower anterior teeth and the upper anterior teeth across all functional ranges.⁸ It has a significant dis-occluding action that protects the posterior teeth from protrusive and lateral forces.⁹⁻¹¹ when there are vulnerable periodontal tissues and high stresses, an unfavorable anterior guiding add to anterior alveolar bone loss and teeth mobility.¹²⁻¹⁴

The incisal guidance grows steeper as the overbite and overjet rise, resulting in higher off-axial stresses on the teeth, which can be problematic.¹⁵ The amount of overjet has a greater impact on the health of the anterior teeth because it allows the mandible to move anteriorly without damaging the anterior teeth's periodontal support.

2- Case description and results

This case series has been described according to the 2013 CARE checklist for case report writing and publishing guidelines.¹⁶

2-1. Patient Information

A 33 years old male patient showed up in the dental clinic of October University for Modern

Sciences and Arts university, complaining of

bad anterior esthetics that make him uncomfortable to smile confidently affecting both his appearance and his confidence. Thorough patient history was taken and revealed that the patient works at insurance company and living in Cairo, Egypt. He is socially active and medically free. He has started going to the dentist in 2018 due to badly decayed posterior teeth. In 2018, he had his 46, 25 and 26 endodontically treated. In 2019 he extracted his 36 tooth. In 2020, he had the tooth 24 endodontically treated followed by a metal post insertion. He brushes his teeth once a day using a hard tooth brush and uses Hexitol mouthwash whenever possible.

2-2 Clinical and radiographic assessment

The patient diagnostic methods included; primary impressions (Fig. 1), radiographs including CBCT (Fig. 2), periapical x-rays (Fig. 3), panoramic radiograph (Fig. 4), occlusal analysis and facebow records, and an intraoral motivational mockup for aesthetic biological and functional verification. The occlusal analysis gave information that upon protruding the load falls merely on the 4 incisor teeth instead of the 6 anterior teeth as seen in (Fig. 5). The occlusal analysis was done by an articulating paper that was placed between the upper and lower anteriors. The patient then was asked to protrude and the markings of the articulating paper showed on the palatal surface of the upper anteriors. Diagnostic wax up, intraoral and extraoral records and an intraoral motivational mockup for aesthetic biological and functional verification were done. Treatment plan involved fixed lithium disilicate restorations using mockup guided preparation technique that followed gingival recontouring and occlusal adjustments of the anterior guidance, vertical dimension of occlusion and protrusive and lateral records.

Treatment plan was scheduled to be about 7 months including implant placement and loading. The length of the treatment plan period included a 2-3 month time period where muscle tone was under observation and returned to normal tone.



Fig 1: Primary impression



Fig 2: CBCT



Fig 3: periapical x-rays

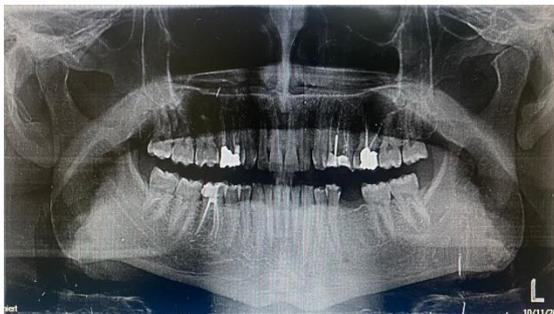


Fig 4: panoramic x- ray



Fig 5: Forces fall merely on the 4 incisor teeth instead of the 6 anterior teeth

Clinical examination showed attrition related to the mandibular anterior teeth. No chronic headache was found. Radiographically there was widening of the lamina dura noticed. Severe yellowish orange discoloration of maxillary and mandibular teeth occlusal surfaces was also present and black discoloration of occlusal surface of upper left first premolar due to metal post. The patient has carious lesions on the 47 and 35. Root canal treatment in 14, 15, 24, 25, 26 and 46 was performed. Implant placement for 36. Plaque deposits and gingivitis were also apparent on periodontal examination. Also noted that the gingival architecture of the patient wasn't aesthetically satisfying due to the zenith point in the laterals especially do not meet the gold standards. Highly attached frenum was also present with a diastema that bothered the patient. Preoperative intraoral photograph records are in (Fig. 6) .



Fig6: Intra-oral photographs

It was concluded from the patient's history that the anterior wear in the lower teeth and in the upper anteriors as well as the spacing is due to the anterior guidance deformation. The anterior guidance is believed to be deformed due to the disharmony of the anterior guidance and centric relation. This is because the patient undergoes bruxism and starts using their anterior teeth for all masticatory function due to the problems present posteriorly that include the missing molar and Endo treated teeth.

Upon clinical examination, it was apparent that the patient suffered from generalized gingivitis with localized

periodontitis. It was also apparent upon close examination of the radiographs that the 14, 15 and 25 were too short and thin endodontic treatments (Fig. 3). The diagnostic challenges included that the patient refused anything but a conservative approach so full crowns in the anterior to guarantee the ability of the durability of the restoration was impossible, even though it would have been the 1st line of treatment due to the wear, deep bite and anterior guidance disharmony of the patient.

2-3 .Stage 1: Preprosthetic phase

Patient education covering proper oral hygiene measures was done. The patient was instructed to wear an anterior bite programmer. The restorative treatment plan was discussed with the patient and it was decided to restore 47 (Fig. 7) and 35 (Fig. 8) using direct resin composite restorations. Tooth 47 was isolated; a rubber dam sheet and clamp W84 was used. Selective enamel etching for 30 sec was done and used universal bond (bisco bond) and cured for 20 sec, according to manufacturer instructions. Theracal is applied on the area close to the pulp and cured for 20 sec according to the manufacture instructions. Previous steps were done for tooth 35. Endodontic retreatment for 14 and 15 and for 25 was done.



Fig7: Class II carious lesion



Fig8: Class II carious lesion

2-4 Stage 2: Prosthetic phase

Post and core to reconstruct endodontically treated 14,15,24,25 and 26 was performed. For tooth 26, removal of amalgam restoration and then white fiber post was used then core build up after isolation was done. For teeth 14, 15 and 24 yellow fiber posts were used then core build up. Endocrown was used to restore tooth 46 using wheel stone to reduce the occlusal surface 1-1.5 mm circumferentially and then using needle stone to open the contact mesially and distally. in the endocrown, there is a retention cavity that needs to be done inside the pulp chamber. Then sealing the dentinal tubules by flowable composite. Teeth preparation for veneers using lithium disilicate veneers in teeth number 13, 12, 11,21,22,23 to improve aesthetics, color of the teeth, and close the diastema. Depth grooves were done on the labial surface of the teeth based on the existing mockup with depth cutter stones of size (0.5 and 0.3mm). 0.3 depth cutter stone was used on the cervical plane of the teeth and the 0.5 was used on the middle and incisal plane as enamel thickness increasing towards incisally and not more than 0.5mm enamel for optimal bonding and longevity of the restoration. Incisal grooves were done, then the grooves were marked using graphite to be used as a guide to the preparation. The preparation was done using veneers preparation kit (microdont, veneers preparation kit, Brazil). After applying double retraction cord in the sulcus using the sizes (00, 0) respectively, secondary impression was taken for the upper arch using putty and light addition silicone impression material (zermack , hydrorize , poland) and bite registration was taken using bite registration material (zermack , occlufast , poland). The shade was taken then the impressions were sent to the lab and a cast was poured.

Try in was done and occlusal equilibration was completed. During the try-in we tested the shade and confirmed that it was appropriate, also checked the occlusion and did occlusal equilibration by using articulating papers all over and making sure all crowns are free of high spots. Proximal contacts and marginal integrity were checked.

Characterization and occlusal analysis were checked to make sure that the palatal surface of the canine now has force distributed. Final restorations are ready for the cementation phase. Isolation was done using rubber dam. Full coverage zirconia restoration in tooth number.

Occlusal veneers in 27, 16, and 17 to raise the vertical dimension of occlusion by 2mm posteriorly. Occlusal veneers are done by loss of occlusal tooth structure for an additive restoration of posterior teeth. An enamel ring needs to be done. Dental implant has been placed to replace 36.

Restorations made from lithium disilicate glass ceramic (IPS emax press) fitting surfaces were conditioned using 9% hydrofluoric acid (ultradent, germany) for 20 sec followed by application of silane coupling agent (bisco, z-prime, USA), then the tooth was conditioned by the application of

phosphoric acid 37% (ultradent,germany) for 15 sec followed by application of bonding agent (bisco, all bond , USA), then transparent light cured resin cement was used (Pentron , mojo , clear,usa) to cement restorations and light cured the veneers palatally first to orient the shrinkage palatally.

2-5 Results

The occlusal problems that were present has made the patients muscles bite in the wrong position so muscles are tense during smiling as shown in (Fig. 9), after occlusion is fixed, the remedied muscles are relaxed as shown in (Fig. 10)



Fig9: Tense muscles



Fig10: Relaxed muscles

For the natural appearance, layered veneers and characterization of the upper anteriors following the contour of the lower lip. As shown in figure 11 and 12.



Fig 11: Frontal view immediately after cementation of ceramic veneers showing characterization



Fig 12: layered veneers

2-6. Patient Perspective

After cementation of the veneers, the patient reported the highest level of satisfaction with the provided treatment.

Follow-Up

Directly after cementation, there was inflamed gingiva that healed by the next follow up after 3 weeks.

3- Discussion

This case report describes a case with noticeable attrition in the lower anteriors and spacing in the upper anterior region. This report describes a conservative method and biomimetic approaches to restore aesthetics and function. A 33 years old patient suffering from bad esthetics of his upper anterior teeth and anterior guidance deformity as result of slight flat condylar path. The patient complains from bad anterior esthetics that makes him smile uncomfortably affecting both his appearance and his confidence. He developed a habit to bite only on anterior area while in protrusion movement he bites only on 2 centrals and laterals.

The masticatory dysfunction was apparent due to the missing tooth and badly decayed teeth that led the patient to modify their own anterior guidance leading to severe attrition of the lower anteriors. ¹¹The suspected cause of such occlusal dysfunction is the patient's heavy load on the anteriors for a long period of time about 3 years due to the inability to use his posteriors on both sides of the oral cavity.

This patient needed an occlusal rehabilitation. An anterior deprogramming device was first used to free the mandibular movement so the muscles can be relaxed since they are active and bite in the improper position. This acrylic splint is 2mm and is a flat surface , its thickness is

2mm. Muscles took 2-3 months to return to normal tone. Centric relation verification was done by bilateral manipulation. Lateral and protrusive records had a flat condylar path so the angle was steepened to 35 degrees.¹⁷

The case's deep bite in this case report is solved by modifying the vertical dimension of occlusion within centric relation.¹⁷ Esthetic and functional wax up was obtained. Palatal surface of canines were raised in mockups to ensure force distribution over all anteriors.

Adhesion protocol in this case report started by using 9% hydrofluoric acid on the fitting surface of the veneers, followed by 37% phosphoric acid for 30 sec to get rid of any salt powders present as a result of the hydrofluoric attacking the glass in the porcelain, then we added silane.¹⁸ During smiling his musculature tense but after they are relaxed and his smile was much eased. For the natural appearance, layered veneers and characterization of the upper anteriors following the contour of the lower lip.

In this case report a new occlusion is obtained following the Christensen's phenomenon of the posteriors disoccluding as the mandible protrudes in order to be able to use veneers to esthetically change this patient. The best smile design is automatically achieved when the anterior teeth is in harmony with all guidelines of occlusal function and stability.³⁻⁵

Veneers on a case like this could only be possible if the muscles relaxed, anterior guidance altered, and finally occlusion must have the three primary requirements: Comfortable and stable Temporomandibular joint, anterior in harmony with the envelope of function and posteriors non-interfering.¹⁸

4- Summary and Conclusion

After a well thought management and treatment plan that included the functional rehabilitation of the patient's occlusion, the use of minimally invasive preparations were competent and possible with new occlusion being achievable.

Authors' Contributions

RM,RA managed the manuscript writing and design.

SI, MH managed the design and definition of intellectual contest.

JG managed concepts, design.

AW supervised the clinical work and case report preparation.

Informed consent

The patient accepted and signed a written informed consent to this treatment protocol.

Conflict of interest

The authors declare that they hold no competing interests.

Funding

The research study was self-funded by the authors

Acknowledgement

The authors would like to thank Ahmed Badawy for his precipitation in the clinical work.

5- References

1. Bishop K, Kelleher M, Briggs P, Joshi R: Wear now? An update on the etiology of tooth wear. *Quintessence Int.* 1997, 28 (5): 305-313.
2. Molnar S, McKee JK, Molnar IM, Przybeck TR: Tooth wear rates among contemporary Australian Aborigines. *J Dent Res.* 1983, 62 (5): 562-565. doi:10.1177/00220345830620051101.
3. Xhonga FA. Bruxism and its effect on the teeth. *J Oral Rehabil* 1997; 4: 65-7.
4. Glossary of Prosthodontic Terms. *J Prosthet Dent* 1999; 81: 39-110.
5. Stuart CE, Stallard H. Principles involved in restoring occlusion in natural teeth. *J Prosthet Dent.* 1960;10(2):304-313. doi: 10.1016/0022-3913(60)90058-5.
6. Abduo J, Lyons K. Clinical considerations for increasing occlusal vertical dimension: a review. *Aust Dent J.* 2012 Mar;57(1):2-10. doi: 10.1111/j.1834-7819.2011.01640.x. PMID: 22369551
7. Schuyler C.H. Correction of Occlusal Disharmony of the Natural Dentition. *New York J. Den.* 1947; 13: 445 462
8. Occlusal Vertical Dimension: Treatment Planning Decisions and Management Considerations." *Clinical Research.*
9. Chander NG, Venkat R. An appraisal on increasing the occlusal vertical dimension in full occlusal rehabilitation and its outcome. *Journal of Indian Prosthodontist Society.* 2011;11(2):77-81.
10. Nagarsekar A, Aras M. Role of anterior guidance in esthetic and functional rehabilitation. *J Indian Prosthodont Soc [serial online]* 2008 [cited 2022 May 29];8:225-7.
11. Schuyler CH. The function and importance of incisal guidance in oral . *J Prosthet Dent* 2001;86:219-32.
12. Ross IF. Incisal guidance of natural teeth in adults. *J Prosthet Dent* 1974;31:155-62.
13. Broderson SP. Anterior guidance: The key to successful occlusal treatment. *J Prosthet Dent* 1978;39:396-400.
14. Mizrahi B. The Dahl principle: Creating space and improving the biomechanical prognosis of anterior crowns. *Quintessence Int* 2006;37:245-251.
15. Dawson DE. Evaluation, diagnosis and treatment of occlusal problems. St. Louis: C.V. Mosby.
16. Riley DS, Barber MS, Kienle GS, et al. CARE guidelines for case reports: explanation and elaboration document. *J Clin Epidemiol.* 2017;89:218-235. doi:10.1016/j.jclinepi.2017.04.026
17. Dawson PE. *Functional Occlusion: From TMJ to Smile Design.* New York: Elsevier, 2007.
18. Pini NP, Aguiar FH, Lima DA, Lovadino JR, Terada RS, Pascotto RC. Advances in dental veneers: materials, applications, and techniques *Clin Cosmet Investig Dent* 2012;49:16.