Full mouth reconstruction in prosthodontics and case presentation

Soo Cheol Jeong DDS, MS, FACP Clinical Associate Professor at UTHSA 09/22/2022

Goals

- Definition of Full mouth reconstruction (rehabilitation)
- What is Centric Realtion?
- How to determine OVD?
- Case presentation

Definition

- Rebuilding and/or replacing all of the teeth in a patient's mouth.
- Full mouth reconstructions combine esthetics with the science of restorative dentistry to improve the health, function, and beauty of the mouth.
- The process of repairing and rebuilding the appearance and function of your mouth, using multiple procedures at once
- Extensive and intensive restorative procedures
- Function and esthetics back to patient.

What procedures are Included in a Full Mouth Reconstruction?

- Placement of veneers can whiten, reshape, resize, close gaps and much more.
- Placement of crowns
- Placement of dental implants with Bone grafting
- Orthodontics may be required in order to help shift move teeth in the necessary positions for an optimal look.
- Contouring of the gums
- In extreme cases, an orthographic surgery
- Bruxism Treatment: This includes therapy for resolving teeth grinding and symptoms associated with it.

Objective

- Function -in case of missing teeth, worn down teeth and old fillings that need replacement
- Esthetics, as in case of multiple anterior worn down teeth and missing teeth.
- To obtain and maintain the health of periodontal tissues
- Temporomandibular joint disturbance is another reason
- Amelogenesis imperfecta, dentino

Classification of patients requiring occlusal rehabilitation THE JOURNAL OF

THE JOURNAL OF

PROSTHETIC DENTISTRY

OCTOBER 1964 VOLUME 52 NUMBER

FIXED PROSTHODONTICS . OPERATIVE DENTISTRY SECTION EDITORS

SAMUEL F. GUYER WILLIAM LEFKOWITZ WILLIAM F. P. MALONE JOHN E. RHOADS ROBERT C. SPROULL

Restoration of the extremely worn dentition

Kenneth A. Turner, D.D.S.,* and Donald M. Missirlian, D.D.S.**

PROSTHETIC DENTISTRY

FIXED PROSTHODONTICS . OPERATIVE DENTISTRY SECTION EDITORS

SAMUEL F. GUYER WILLIAM LEFKOWITZ WILLIAM F. P. MALONE JOHN E. RHOADS ROBERT C. SPROULL

Restoration of the extremely worn dentition

Kenneth A. Turner, D.D.S.,* and Donald M. Missirlian, D.D.S.** University of Iowa, College of Denmary, Iowa City, Iowa

Most dentists agree that minimal and gradual attrition of the occlusal surfaces of teeth is a normal process during the lifetime of a patient. However, excessive occlusal attrition can result in pulpal pathology, occlusal disharmony, impaired function, and esthetic disfigurement (Fig. 1). Patients with excessive wear often require extensive restorative treatment. This article discusses the diagnostic evaluation, treatment planning, and modes of restorative treatment for patients who suffer from extreme occlusal wear.

ETIOLOGY

Occlusal wear is most often attributed to attrition, which is defined as the wearing away of one tooth surface by another tooth surface.1 However, there are several etiologic factors that can result in exensive ootlutal wear.

Congenital anomalies

Amelogenesis imperfecta is a hereditary defect of dental enamel that occurs in a ratio of 1/14000 persons in the general population (Fig. 2). This anomaly has been classified into three basic types: hypoplastic, hypomaturation, and hypocalcified.² All three types result in relatively early loss of enamel with concomitant and more rapid attrition of tooth structure. In the hypoplastic type, the enamel has only one eighth to one fourth of the normal thickness, while the enamel of the hypomaturation type has normal thickness but is softer than normal and tends to fracture from the dentin. Enamel in the hypocalcified type is also of normal thickness but is extremely friable and frequently lost soon after touth eruption.

Presented as the Academy of Deposite Prosidence, Caesnado, Calif. *Prolessor and Chairman, Department of Fixed Prosthadomics. **Clinical Associate Perfeasor, Department of Fland Prosthodomica, University of the Pacific, Mehad of Denisory, San Francism,

THE FOURNAL OF PROSTHETIC DENTISTRY

Dentinogenesis imperfecta, or hereditary onalescent dentin, is a dominant autosumal trait with a high degree of penetrance and occurs in the general population in a ratio of 1/8000 persons. This anomaly may or may not be associated with the generalized skeletal disease outcogenesis imperfecta. Dentinogenesis imperfecta is characterized by an amber-colored translucency of the dentition, and because of a weakened attachment between the normal enamel and the affected dentin, the enamel has a tendency to shear and expose the relatively soft dentin subject to rapid and extensive attrition.

These are the most common congenital anomalies that contribute to excessive occlusal wear, but there are other more unusual dysplasias of the enamel and dentin that can result in early marked dental attrition.

Parafunctional occlusal habits

The effect of chronic bruxism and other oral habits such as biting on needles, pipe atems, pencils, and hairpins, if continued over an extended period of time, is aften attrition of tooth structure (Fig. 3). The habits are usually associated with emotional stress. Bruxism may be triggered by occlusal interferences. Counseling the patient to break these destructive habits, with concurrent occlusal splint therapy and occlusal adjustment, is often adequate treatment if the condition is diagnosed early. Occlusal habits of long-standing duration may result in extensive tooth attrition that requires resonation.

Abrasion

Abrasion is defined as the wearing away of tooth tissue by external agents. Toothbrush abrasion is a common example, but it is usually restricted to the gingival portion of the facial surfaces rather than the occlusal surfaces of the teeth. Occlusal abrasion is usually attributed to diet, the chewing of abrasives such as tobacco (Fig. 4), and environmental factors such as constant exposure to dust and grit in a farming occupa-

The Journal of Prosthetic DentistryVolume 52, Issue 4, October 1984, Pages 467-474

Classification by Turner and Missirla in 1984

- Category1 excessive wear with loss of vertical dimension of occlusion
- Category 2 excessive wear without loss of vertical dimension of occlusion but with space available
- Category 3 excessive wear without loss of vertical dimension of occlusion but with limited space available

The Journal of Prosthetic DentistryVolume 52, Issue 4, October 1984, Pages 467-474

Classification by Turner and Missirlain 1984

- Class 1
 - Excessive wear of anterior teeth
 - Few posterior teeth
 - Unstable posterior occlusion
 - Signs of some loss of facial contour
 - Drooping of the corner of mouth
 - Closest speaking space of 3mm and interocclusal distance of 6mm





The Journal of Prosthetic Dentistry Volume 52, Issue 4, October 1984, Pages 467-474

Classification by Turner and Missirlain 1984

Class 2

- Adequate posterior support
- History of gradual wear and continuous eruption -> maintain OVD
- Closest speaking space of 1mm and interocclusal distance of 2-3 mm



The Journal of Prosthetic DentistryVolume 52, Issue 4, October 1984, Pages 467-474

Classification by Turner and Missirlain 1984

Class 3

- Minimal posterior teeth wear with anterior teeth show anterior teeth excessive gradual wear over a prior of 20-25 years.
- Centric relation and centric occlusion are coincidental
- the most difficult



The Journal of Prosthetic DentistryVolume 52, Issue 4, October 1984, Pages 467-474

Etiology of extremely worn dentition

- Attrition
 - the loss of tooth structure by tooth-on-tooth contact.
 - normal aging process,
 - more rapid dental attrition may be due to larger dental problems.
- Abrasion
 - physically worn down by an external force
- Erosion
 - the chemical loss of mineralized tooth substance caused by exposure to acids not derived from oral bacteria.
 - Parafunctional occlusal habit
- Parafunction

New patient

- Diagnosis
- Treatment plan
- Treatment
- Maintenance

Diagnosis

- Comprehensive oral examination
- Medical history
- Dental history
- Radiographs FMS and panoramic radiograph
- Photographs color of teeth and gingiva is recorded and photographs are necessary to recall to patient's mind the state of his mouth prior to restorative dentistry.

Treatment plan

- Prior to start of the treatment.
- Communication and patient education are essential for success

Diagnostic impression, facebow transfer and articulation

 the process of transferring the facebow record of the spatial relationship of the maxillary arch and related anatomic reference point or points to an articulator

Diagnostic casts





Diagnostic wax up



Estimated vertical dimension



Diagnostic was up





Diagnostic wax up

- Before diagnostic wax up. The occlusal discrepancies in CR and Eccentric occlusion should be eliminated.
- Diagnostic preparation of gypsum stone teeth that will require prospective crowns is carried out.
- Planning of subgingival margins or surgical crown lengthening, then, wax is used to appropriately shape all crowns and final prosthesis is planned.
- Preparing an elastomeric putty for temporization
- Reduction guide intra-orally.

Terminology

- Centric Occlusion (CO)
- Centric Relation (CR)
- Maximum Intercuspal Position(MIP)
- Maximum Intercuspation

THE GLOSSARY OF PROSTHODONTIC TERMS Ninth Edition GPT-9 The Academy of Prosthodontics The Academy of Prosthodontics Foundation

Centric relation (CR)

- 1. A maxillomandibular relationship,
- 2. Reproducible position
- 3. Independent of tooth contact
- 4. Determined by the structural features of the TMJ
- 5. Musculoskeletally stable position
- 6. Most anteriosuperior position
- 6. CR is an area
- 7. CR definitions changed over time as well as recording techniques and materials.
 - a. 1950, CR = most retruded/ chin point technique was used
 - b. 1980, CR= RUM= rearmost uppermost and midmost position/ bimanual technique with without Lucia Jig

THE GLOSSARY OF PROSTHODONTIC TERMS Ninth Edition GPT-9 The Academy of Prosthodontics The Academy of Prosthodontics Foundation

Centric occlusion (CO)= Centric relation Occlusion

- The occlusion of opposing teeth when the mandible is in centric relation
- May or may not = MIP

THE GLOSSARY OF PROSTHODONTIC TERMS Ninth Edition GPT-9 The Academy of Prosthodontics The Academy of Prosthodontics Foundation

Maximum Intercuspal position (MIP)

• The complete intercuspation of the opposing teeth independent of condylar position

Maximum Intercuspation

- The position of the mandible when the relationship of opposing occlusal surfaces provides for maximum planned contact and/or intercuspation.
- This is a tooth-determined position.

Techniques

- 1. Bimanual technique Dawson 1973
- 2. Anterior guidance by a Lucia Jig JPD 1964
- 3. Anterior guidance by Leaf Gauge-Long-JPD 1973

4. Gothic arch tracings- Gysi 1910

- 5. Chin poing guidance –Lucia 1960
- 6. Unassisted free closure by patient with anterior deprogrammer (Campos?)
- 7. Three finger chin-point guidance method-Celenza-1984
- 8. Single-handed techniques
- 9. Anterior guidance by a tongue blade- Long-JPD 1970
- 10. Power centric registration method-Roth-1981
- 11. Myotronics
- 12. Schuyler technique-JADA-1932







Mandibular deprogramming

- Ask the patient to bite on these with anterior teeth for 5-10 minutes. The memory position of teeth intercuspation is lost.
 - Anterior jig
 - Leaf gauge
 - Cotton role

1. Bilateral manipulation method

- Guiding the condyles into most superior position in the glenoid fossa.
- Condyle is within 0.02 mm accuracy in three dimensions



2. Anterior stop technique (Anterior guidance by a Lucia jig)

- Anterior jig prevents posterior teeth from occluding and thus disrupts the proprioceotive memory
- Jig breaks the patient's habitual closure
- Tripod effect along with two condyles.
- The jig can also be made of autopolymerizing acrylic resin on mounted casts and then adjusted intraorally.
- After the jig is made, posterior bite record is taken.

Lucia, V.O. (1964) A Technique for Recording Centric Relation. JPD, 14, 492-505.



3. Leaf guage

- Introduced by Dr. James. H. Long in 1973.
- The most useful and practical alternative to anterior jig.
- Leaf gauges of uniform 0.1mm thickness which are sequentially numbered are described.
- Convenient and measure the exact vertical opening between the incisors.



4.Gothic arch

- Gothic arch tracings- Gysi 1910
- Popularized by Alfred Gysi in 1920, with a device called as Gysi's Recording Device





Vertical dimension

- The distance between two selected anatomic or marked points
- OVD(Occlusal vertcal dimension)
- RVD (Rest vertical dimension)
- RVD OVD = free way space





Methods of determining Rest Vertical Dimension

- Facial measurement after swallowing and relaxing
- Speech
- Tactile sense
- Measurement of anatomic landmarks
- Facial expression.

Methods of determining Occlusal Vertical Dimension

- Mechanical methods
 - Ridge relationship
 - Pre extraction records
 - Measurement from formal dentures
 - Physiological methods
 - Using wax occlusal rims
- Physiologic rest position
 - Esthetics
 - Swallowing threshould
 - Tactile sense or neuromuscular perception
 - Patient's perception of comfort.

Silverman's closest speaking space method

- Proposed by Silverman in 1952
- Silverman identified that the production of certain sounds like S yes ch brings the anterior teeth very close together
- Silverman M.M. "The speaking method in measuring vertical dimension". J. Prosthet. Dent., 1952; 3(2): 192-199.

Swallowing technique

- Swallowing threshold
- Swallowing reflex is a primitive, innate reflex.
- When a person swallow, the teeth come together with a very light contact at the beginning of swallowing cycle.

Thomas E.J.ShanahanD.D.S, The Journal of Prosthetic Dentistry Volume 5, Issue 3, May 1955, Pages 319-324
Increasing occlusal vertical dimension – why, when and how

- VD is unrelated to temporomandibular disease (TMD)
- There is no evidence to suggest that by changing VD, one can treat TMD.
- However, VD can be increased or decreased for the best functional and esthetic anterior contact in centric relation as long as the range of change is within physiologic limitation.
- Vertical dimension can not be raised for every full mouth reconstruction case.

Significance of the Frankfort-mandibular plane angle to prosthodontics

Girard J. DiPietro, D.D.S.,* and James R. Moergeli, Jr., D.D.S.** Fort Benning, Ga.

G J Dipietro, J R Moergeli; December 1976, Pages 624-635

Significance of the Frankfort-mandibular plane angle to prosthodontics

Girard J. DiPietro, D.D.S.,* and James R. Moergeli, Jr., D.D.S.** Fort Benning, Ga.

Development of the cephalometer has enabled orthodontists to study various anatomic relationships and evolve points, planes, and angles that correlate radiographic measurements with clinical observations. Now, after many years of clinical research and observation, orthodontists use cephalometrics to plan and follow treatment serially before, during, and after active patient care. Through these studies, a sizable amount of pertinent information has been gleaned about prosthodontic diagnosis, treatment planning, and prognosis. However, most prosthodontists have ignored the use of this information and the cephalometer as a major diagnostic tool. This observation is particularly interesting since Broadbent, an orthodontist, and Hofrath, a prosthodontist, reported on cephalometrics almost simultaneously in 1930.¹

The purpose of this article is to (1) briefly discuss the technique of determining the Frankfort-mandibular plane angle (FMA), (2) review the correlations between radiographic measurements (specifically, FMA) and clinical observations, (3) point out the applicability of this knowledge to prosthodontic diagnosis, treatment planning, and prognosis, and (4) stimulate further research in this area.

BACKGROUND

Data obtained from the ossified structure of the head can be analyzed by radiographic cephalometry. The technique in common use requires orientation and immobilization of the patient's head by some type of headholder (Fig. 1). The radiographic film is placed beside the head and perpendicular to the line of radiation. With known focus-to-object and focus-to-film distances, a high kilowatt source of x-radiation is directed at the head.

Since the initial development of radiographic cephalometry, more recent methods have made possible the classification of different sets of characteristics into more or

^{*}Colonel, DC, USA; Director, Removable Prosthodontic Residency Training; Chief, Prosthodontic Department.

^{**} Major, DC, USA; Senior Resident, Removable Prosthodontics.

- The FMA is an angle formed by the intersection of the Frankfort horizontal plane and the mandibular plane.
- A rule of thumb used by orthodontists is that an FMA of 25.
 - 5 degrees is within normal range.
 - A "high-angle" patient is one with an FMA of 30 degrees or more Characterized by open bite skeletal pattern
 - A "low-angle" patient is one with an FMA of 20 degrees or less closed bite skeletal pattern.



G J Dipietro, J R Moergeli; December 1976, Pages 624-6.

Clinical characteristics	High FMA	Low FMA	
1. Biting force	Decreased	Increased	
2. Muscular line of force	Arcuate	Vertical	
 Molar position relative to elevators of mandible 	Anterior to line of force	Directly in line of force	
4. Size of masticatory muscles	Hypotrophic	Hypertrophic	
Mandibular bony processes	Underdeveloped	Well developed	
6. Relative tooth size	Large	Small	
7. Relative abrasion potential	Decreased	Increased	
8. Tooth eruption	Complete	Incomplete	
9. Occluding vertical dimension	Relatively noncritical	Critical	
 Long-span and cantilever fixed partial dentures 	Other factors being equal, on high-angle case	Other factors being equal, prognosis more favorable on high-angle case	
11. Complete denture stress directed to residual ridge	Decreased	Increased	
12. Fracture of complete denture base	Decreased	Increased	
13. Height of alveolar bone	Increased	Decreased	
14. Palatal vault	High and narrow	Broad and flat	
15. Buccal vestibules	Deep	Shallow	
16. Muscle attachments	Base of ridge	Crest of ridge	
17. Zone of attached gingiva	Increased	Decreased	
18. Planes of face	Hyperdivergent	Hypodivergent	
19. Facial profile	Convex	Concave	
20. Stability of dentition	Mesial drift	Relatively stable	
21. Component of force on prosthesis	Anterior	Vertical	
22. Residual ridge relation	Divergent	Parallel	
23. Tongue-thrust habit	Prone	Unlikely	
24. Lip length relative to skeletal base	Short	Long	
25. Position of glenoid fossa (limited studi	es) Superior and posterior	Anterior and inferior	

Table I. Clinical manifestations of high and low FMA

G J Dipietro, J R Moergeli; December 1976, Pages 624-635

Maintenance phase

- After placement and cementation of a prosthesis the patient treatment continues with carefully structured sequence of follow up appointments to monitor the dental health, stimulate meticulous plaque control habits, identify incipient disease and introduce any corrective measures if required.
- Adequate scailing is done periodically to maintain gingival health.
- Margins of restoration must be evaluated to detect secondary caries.
- Oral hygiene aids prescribed are tooth brushed, oral floss, interdental brush, oral irrigation device and oral rinses.

• At the goal of medicine is to increase the life span of the functioning individual, the goal of the dentistry is to increase the life span of the functioning dentition.

Case Presentation

- Complete denture
- Implant retained overdenture
- Implant supported fixed complete denture
- Classic full mouth reconstruction

Case 1 Complete denture





Case 2 Md. Implant retained overdenture



Case 3 Tooth postion





Case 3 Vertical dimension















Case 4 Condyle replacement (only rotation)













Case 5. Maintained Vertical dimension





Case 6 Implant supported fixed complete denture









Case 7 full mouth reconstruction

- Name : QD
- Age : 64 years old
- Sex : Male
- Race : Caucasian
- Martial status : Married
- Occupation : Retired
- Chief complaint :

"My teeth are worn out. I am interested in making them look better and I want to chew better."



Patient expectations

- Esthetics
- Function
- Comfort
- Longevity
- Cost

Psychological and social appraisal

- Non smoker
- No drink
- Clenching
- Riding horse

Medical history

- Appendix surgery in 1956
- Quadricep rupture in 2011
- Physical status : ASA1
- Medication
- Metformin for diabetics 500mg bid.day
- Lisinopril for hypertension 20mg/day
- Simvastatin for high cholesterol 40mg/day

Dental history

- WNL
- No TMJ problem
- Clinching habit
- Amalgam filling #3,5,7,13
- PFM #12 and 14
- Gold crown #18 and 31
- Endo #12 and 14
- Missing teeth
 - #1,2,15,16,17,20,29,30 and 32

Extraoral photographs



Occlusal views



Frontal views



Full mouth radiograph



List of problems

• Generalized severe wear (attrition)

- #6.7.8.9.10.21.22.23.24.25.26. and 27

- Distally inclined teeth #21 and 28
- Short root #7 and 8
- Super erupted teeth #23,24,25, and 26
- Clenching

Treatment option

FULL MOUTH RECONSTRUCTION

Mx .arch

Mn. arch

- PFM -#3,4,5,6,7,10,11,12,13 and 14
- Implants #8,9 and 15
- Crown lengthening from #7 to #!0

- PFM -#18,20,21,22,27,28 and 31
- Implants -#20,23,26,28 and 29
- Endo, post and core -#22 and 27

Treatment sequence

- A. Diagnosis
- B. Treatment plan
- C. Treatment
 - a. Surgery phase
 - b. Restorative phase
- D. Maintenance phase

A. Diagnostic phase

- Existence of posterior support
- History of wear
- Evaluation of existing vertical dimension
- Interocclusal space between VDO and VDR
- Phonetics : closes speaking sound (space)
- Facial Profile

Restoration of extremely worn down dentition

- Category 1
- Excessive wear with loss of occlusal vertical dimension
- No posterior teeth & Unstable posterior occlusion
- Can increase VD for reconstruction

• Turner KA, Missirlian DM. Restoration of the extremely worn dentition J Prosthet Dent. 1984 Oct; 52(4): 467-74

Estimate vertical dimension

- Evaluated VD loss
- Took impressions for Mx. and Mn. Arch with alginate (PVS)
- Took CR record in estimated VD
- Took facebow transfer
- Mounted diagnostic casts on the articulator
- Fabricated modified Lucia jig





Jaw relation

- Deprogram muscle memory (Engram) by modified Lucia jig which was fabricated in estimated VD last time
- Took 3 sets of CR records with Lucia Jig in tentative VD
- Remounted diagnostic casts with CR records with modified Lucia jig on Hanau articulator







Diagnostic casts



Diagnostic wax up






B. Surgery phase

- Implant placement 8,9,15,20,21,23,26,28,29
 - a. #8.9 Astra 4.5 x 13
 - b. #15 Astra 5.0 x 11
 - c. #20,2128 Astra 4.0 x 9,13 and 11
 - d. #23,26 Astra 3.5 x 11 and 13

• Crown lengthening – Mx. Anterior sites

Implant placements









Panoramic radiographs



After healing









Mock up









Initial preparation and temporization



















2 pieces of casting post







Custom tray



Final impression





Cross mounting









Mounted Temporary casts











b. MOUNTING Mn. Master cast against mx. maxillary cast





Mounted master casts on articulator



Full contour wax up



Full contour wax up





Delivery








Night guard













Maintenance phase

- After placement and cementation of a prosthesis the patient treatment continues with carefully structured sequence of follow up appointments to monitor the dental health, stimulate meticulous plaque control habits, identify incipient disease and introduce any corrective measures if required.
- Adequate scailing is done periodically to maintain gingival health.
- Margins of restoration must be evaluated to detect secondary caries.
- Oral hygiene aids prescribed are tooth brushed, oral floss, interdental brush, oral irrigation device and oral rinses.

Objectives

- Definition of Full mouth reconstruction (rehabilitation)
- What is Centric Relation?
- How to determine OVD?
- Case presentation

Questions