MANAGEMENT OF WORN-OUT DENTITION

INTRODUCTION

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.

Rehabilitation of worn dentition presents the clinician with many challenges and potential pitfalls. A systematic approach to diagnosis, treatment planning, and risk management is crucial for a predictable outcome. A staged approach to restoring the worn dentition provides the clinician opportunity to evaluate how a patient will respond to occlusal and esthetic changes.

Peter E. Dawson stated,

“Patient lose their teeth in two ways:

Either the teeth break down, or supporting structures break down”.

DEFINITION

Occlusal Rehabilitation

The restoration of the functional integrity of the dental arches by use of inlays, crowns, bridges and partial dentures.

Full Mouth Rehabilitation

Restoration of the form and function of the masticatory apparatus to as nearly a normal condition as possible.

OBJECTIVES IN A FULL MOUTH REHABILITATION

Objectives are:

- A static centric occlusion in harmony with centric relation.
- Even distribution of stresses in centric occlusion and on eccentric functional inclines.
- Equalization of forces directed against supporting structures.
- Restoration of normal healthy function of the masticating apparatus.

INDICATIONS

Indications are:

- Restore impaired occlusal function.
- Preserve longevity of remaining teeth.
- Maintain healthy periodontium.
- Improve esthetics.
- Eliminate pain and discomfort of teeth and surrounding structures.

CONTRAINDICATIONS

Contraindications are:

- Malfunctioning mouths that do not need extensive dentistry and have no joint symptoms
- A full mouth rehabilitation should not be taken as a preventive measure unless there is a definite evidence of tissue breakdown.

No pathology- No treatment.

CLASSIFICATION OF PATIENTS REQUIRING OCCLUSAL REHABILITATION

1. Classification by Turner and Missirlian (1984)
2. Classification by Brecker.

Classification by Turner and Missirlian(1984)

Category 1 - Excessive wear with loss of vertical dimension.

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

Category 1 -Excessive wear with loss of vertical dimension.

Few missing posterior teeth and unstable posterior occlusion, excessive wear of anterior teeth. Closest speaking space of 3 mm and interocclusal distance of 6 mm. Some loss of facial contour - drooping of the corners of mouth.

Treatment: Trial restorations that restores occlusal vertical dimension to estimated optimal position. A removable occlusal overlay splint / treatment partial denture for 6-8weeks.Teeth are prepared and provisional fixed restorations placed for 2-3 months. Final restorations given.

Category 2- Excessive wear without loss of occlusal vertical dimension but with space available.

Adequate posterior support and history of gradual wear. Closest speaking space of 1 mm and interocclusal distance of 2-3 mm. Anterior slide from centric relation to the patient's maximum intercuspation.

Treatment: Restoration of the posterior teeth for stability in centric relation in combination with enameloplasty of opposing teeth. Short clinical crowns-Strict parallelism of opposing axial walls, and supplemental pins or grooves. Crown lengthening – Gingivoplasty and Ostectomy4

Category No. 3. Excessive wear without loss of occlusal vertical dimension but with limited space

Posterior teeth exhibit minimal wear but anterior teeth show excessive gradual wear over a period of 20-25 years. Centric relation and centric occlusion are coincidental. Closest speaking space 1mm and interocclusal distance 2-3mm. Most difficult to treat because vertical space must be obtained for restorative material4.

Treatment: Orthodontic movement, restorative repositioning, surgical repositioning of segments.

Classification by Brecker

Group I

Class I Patients with collapse of vertical dimension of occlusion because of shifting of existing teeth caused by failure to replace missing teeth.

Class II Patients with collapse of vertical dimension of occlusion because of loss of all posterior teeth in one or both jaws with remaining teeth in unsatisfactory occlusal relationship.

Class III Patients with collapse of vertical dimension of occlusion because of excessive attritional wear of occlusal surfaces.

Group II

Class I Patients with all or sufficient natural teeth present, with satisfactory occlusal relationship. Class II Patients with limited teeth present and unsatisfactory occlusal relationship requiring aid in the form of occlusal.

Group III

Patients requiring maxillofacial surgery or orthodontic treatment as an aid in restoring the lost vertical dimension.

Group IV

Patients in whom sectional treatment is required over extended periods of time because of status of health of the patient, age or economic factor.

ETIOLOGY OF EXTREMELY WORN DENTITION

Worn out dentition etiology:

- Congenital abnormalities- Amelogenesis imperfecta, Dentinogenesis imperfecta
- Parafunctional occlusal habit- Bruxism
- Abrasion
- Erosion
- Loss of posterior support

Congenital anomalies

Amelogenesis imperfecta is a hereditary defect of dental enamel that occurs in a ratio of l/14000 persons in the general population. This anomaly has been classified into three basic types: hypoplastic, hypo- maturation, and hypocalcified.' All three types result in relatively early loss of enamel with concomitant and more rapid attrition of tooth structure7.

In the hypoplastic type, the enamel has only one eighth to one fourth of the normal thickness, while the enamel of the hypo maturation 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 tooth eruption7.

Dentinogenesis imperfecta, or hereditary opalescent dentin, is a dominant autosomal trait. 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

Parafunctional occlusal habits

The effect of chronic bruxism and other oral habits such as biting on needles, pipe stems, pencils, and hairpins, if continued over an extended period of time, is often attrition of tooth structure. The habits are usually associated with emotional stress. Bruxism may be triggered by occlusal interferences.

Abrasion

Abrasion is defined as the wearing a way of tooth tissue by external agents. Occlusal abrasion is usually attributed to diet, the chewing of abrasives such as tobacco, and environmental factors such as constant exposure to dust and grit in a farming occupation.

Erosion

The destruction of hard dental tissues by chemical action also contributes to extensive tooth wear. Parts of the incisal edges and lingual or occlusal surfaces that exhibit a worn cupped-out appearance and do not occlude with an opposing tooth are diagnosed as exhibiting erosion (perimyelolysis).

Loss of posterior support

Extensive attrition of anterior teeth often occurs when posterior support has been compromised by loss of teeth, malposition of teeth, or occlusal interference that drives the mandible forward and exerts undue force on the anterior teeth.

VERTICAL DIMENSION AT OCCLUSION

Vertical dimension (VD) can be defined as the distance between any two points measured in the maxilla and the mandible when the teeth are in maximum intercuspation7. Anterior teeth are the dominant factor in determining vertical dimension .

The vertical dimension of occlusion (VDO) is determined by the repetitive contracted length of the closing muscles. Increases in VDO cannot be maintained as the jaw to jaw relationship will always return to the original dimension, ie., the muscles always win. Wear does not result in loss of VD, as the alveolar process lengthens to make up for this. But the position of the condyles does affect muscle length and hence the VDO.

It is commonly assumed that extensive occlusal wear results in decreased occlusal vertical dimension. Some symptoms are clenching of teeth; muscle fatigue; soreness of teeth, muscles, and joints; headache; intrusion of teeth; fractured porcelain; occlusal instability; and continued wear.' Therefore, it is critical to verify loss of occlusal vertical dimension prior to restoration at an increased occlusal vertical dimension.

EVALUATION OF OCCLUSAL VERTICAL DIMENSION

According to Sicher, "gradual tooth wear is compensated by continuous eruption of the teeth, which maintains occlusal vertical dimension". However, occlusal wear may occur more rapidly than continuous eruption depending on the etiology of the wear4.

Possible Clinical Concerns Behind Changing VD4:

- Joint or muscle pain
- Stability
- Muscle activity
- Phonetics

Joint or muscle pain

This is not a problem, as altering VD does not produce pain of more than one to two weeks' duration; any pain is a result of increased temporary muscle awareness.

Stability

When closing VD there is very little relapse; it may open by up to 1 mm within the first year and will then remain stable. Such a small amount is not detectable by the clinician or the patient. When opening the VD some patients can remain stable, others can relapse a little, and others a lot, but again this may go unnoticed dentally.

Muscle activity

VD increases electromyographic activity of the elevator muscles when clenching. This is short lived, as if readings are taken two to three months later they will have returned to base line values. The postural muscle tone (ie the rest position) reduces when VD is increased but is also back to normal within three months.

Phonetics

This can sometimes be a problem for the 'S' Initially wait for one month to see if the patient can adapt (this will usually be the case) before considering any changes. If not then this will need to be corrected by creating space. Generally this will be by shortening the lower incisors

as shortening the upper incisors will have aesthetic implications - how depends on the lower incisor position when the ‘S’ sound is created:

1. If ‘S’ is generated with the lower incisors in the cingulum area of the upper incisors (ie behind and above the upper incisal tip), shortening the lower incisors will leave them out of contact when the teeth are in occlusion. For this reason the VD will then need to be reduced.

2. If ‘S’ is generated by the incisors being more edge-to edge the lower incisors can be reduced and the lingual of the upper incisors built out to maintain contact.

RATIONALE FOR ALTERING VD

1. Aesthetics.
2. Alter the occlusal relationship.
3. For prosthetic convenience to allow space for restorations.

Restoration of a worn dentition can be accomplished only by increasing occlusal vertical dimension, even though a loss of occlusal vertical dimension cannot be diagnosed. Alternative procedures are often preferable despite the lack of vertical space for restorative materials between maxillary and mandibular teeth7. Modification of vertical dimension should be accomplished through cautious trial with removable occlusal splints followed by fixed provisional restorations.

ANTERIOR DETERMINANTS OF VERTICAL DIMENSION

When changing incisal position restoratively, it is paramount to do this in provisional restorations first.

1. Stable CR contacts.

2. Upper half of the labial surface. After CR the second most important determination is upper incisal edge position. However, this will not be precise until the upper half of the labial contour has been determined. There is no bulge in nature from the alveolus to upper labial surface ie the upper half of the labial surface is continuous with the labial surface of the alveolar process.

3. Lower half of labial surface. This is in two planes - for incisal position and to allow the lip closure path to slide along the labial surface hence the need to roll in the incisal tip.

4. Incisal edge. This should rest along the inner vermillion border of the lower lip and is best determined by observing the patient to counting from 50 to 55 ie ‘F’ sound. This needs to be in harmony with the neutral zone, lip closure path, phonetics, envelope of function and aesthetics.

5. Anterior guidance. This is determined by the protrusive path but should include a ‘long centric’ that allows a little freedom before this path is engaged and so the lower incisors are not bound in.

6. Contour of the lingual surface from the centric stop to the gingival margin. There should be no interferences with the ‘T’, ‘D’ or ‘S’ sounds.

Criteria for success

DIAGNOSIS

- Medical history
- Dental history
- Radiographs - IOPAs and OPG
- Photographs
- Clinical examination
- CBCT
- Mounted diagnostic casts

Mounted diagnostic casts

Occlusal discrepancies in centric and eccentric occlusion eliminated. Diagnostic wax up. One of the main advantages is that the wax-up provides an ideal starting place for refinement of all the anterior teeth contours, including the precise location of the incisal edges and the anterior guidance. A putty silicone matrix is made from the wax-up, to be used for fabricating the provisional restorations after the teeth are prepared.

TREATMENT

The patient was given the options: no treatment of wear, restore worn teeth only with an equilibration.

Surgical orthodontics - to reduce the overjet orthodontically would have required osteotomy along with two years of orthodontic treatment.

Full mouth rehabilitation at an increased vertical dimension to treat wear BUT also to improve his facial aesthetics and smile.

Confirmative Approach

When relatively small amount of restorative treatment is required. Designed around the patients existing Inter Cuspal Position. The ICP may or may not coincide with the Centric Relation.

It includes two situations:

Occlusion is untouched prior to tooth preparation although small changes can be made on restorations such as elimination of the non-working contacts.

Occlusion is modified by localized occlusal adjustments before tooth preparation that is shortening of an opposing cusp, elimination of non-working side interferences and removal of a deflective contact on tooth to be restored.

Reorganised Approach

New occlusal scheme is established around centric relation position. Reorganised if the existing intercuspal position is unacceptable and needs to be changed or when extensive treatment is to be undertaken to optimize patient's occlusion.

Indications: loss of vertical dimension, repeated fracture/failure of teeth or restorations, severe bruxism, lack of interocclusal space for restorations, trauma from occlusion, unacceptable function and esthetics, presence of temporomandibular disorders or developmental anomalies. Restores the structural and functional integrity of the dental arches that are compromised extensively.

Occlusal relationship

- Cusp - fossa occlusal relationship (tooth-to-tooth relationship)
- Cusp - ridge occlusal relationship (tooth-to-two-teeth contact/cusp-embrasure relationship)9

Cusp - fossa occlusal relationship (tooth-to-tooth relationship)

In cusp-fossa pattern of occlusion, the cusps and fossae of one tooth occlude with the cusps and fossae of only one opposing tooth. This scheme is rarely found in natural dentition. It's usually indicated in full mouth rehabilitations. The occlusal forces are directed centrally and along the long axis of the teeth. This scheme was devised by P.K.Thomas.

Cusp - ridge occlusal relationship (tooth-to-two-teeth contact/cusp-embrasure relationship

In cusp-ridge pattern of occlusion, one stamp cusp into a fossa and another stamp cusp of the same tooth into the embrasure area of two opposing teeth (against two marginal ridges of adjacent teeth). This occlusion is found in 95% of individuals. Its indicated for single unit restorations and short span bridges. This technique was advised by E.V.Payne.

Tripodization

Tripodization contacts are distributed on the inclines of the fossae. When viewed occlusally they appear as three points of contact, which distributes lateral forces on the teeth. When viewed mesially or distally, teeth are in proper contact to distribute and direct the forces of occlusion, exhibit three distinct contacts during centric closure. Stuart refers to these as the A. B, and C contacts.

- The 'A' contacts are points on the shearing cusps of maxillary teeth contacting points of the stamp cusps of the mandibular teeth.
- The 'B' contacts are the stamp cusps of the mandibular teeth contacting stamp cusps of the maxillary teeth.
- The "C' contacts are the stamp cusps of the maxillary teeth occluding with the shearing cusps of the mandibular teeth.
- The key contact points are the 'B' contacts. Without these the occlusion is unstable.

Physiologic occlusion:

"A physiologic occlusion is one in which the relationship between the 'teeth and periodontal tissues is such that under occlusal stress no injury is produced by them and, the tissues are best able to withstand the forces of occlusion without the initiation of pathologic changes in the periodontium.

Functional occlusion:

An arrangement of teeth, which will provide the highest efficiency during all the excursive movements of the mandible, which are necessary during function.

Therapeutic occlusion:

A therapeutic occlusion is one in which the arrangement of teeth and their opposing occlusal surfaces satisfy functional and esthetic requirements, while distributing and directing forces of occlusion over as many teeth as possible during function of the mandible.

There are three recognized concepts-

- Bilaterally balanced occlusion
- Unilateral balanced occlusion
- Mutually protected occlusion

Unilaterally Balanced Occlusion (Group function)

Schuyler in 1929

Definition: Multiple contact relations between the maxillary and mandibular teeth in lateral movements on the working side whereby simultaneous contact of several teeth acts as a group to distribute occlusal forces.

Beyron in 1969 has listed characteristics of this type of occlusion: Teeth should receive stress, along the long axis.

Total stress should be distributed among the tooth segment in lateral movement. No interference occur from closure into intercuspal position.

Teeth contact in lateral movement without interferences.

Mutually Protected Occlusion or Canine – Protected

Definition: An occlusal scheme in which the posterior teeth prevent excessive contact of the anterior teeth in maximal intercuspal position, and the anterior teeth disengage the posterior teeth in all mandibular excursive movements. D'Amico in 1958 stated that cuspid protected articulation and disocclusion were natural adaptations for preventing destructive occlusion.

Features of a mutually protected occlusion(Dawson in 1974) are1:

Uniform contact of all teeth around the arch. Stable posterior tooth contacts with vertically directed resultant forces. Centric relation coincident with maximum intercuspation. CR = IP. No contact of posterior teeth in lateral or protrusive movements. Anterior tooth contacts harmonizing with functional jaw movements.

Advantages : (Lucia 1961)

- As minimum amount of tooth contact is involved, this makes for better penetration of food.
- A cusp to fossa relationship produces an interlocking , thereby giving maximum support in centric relation in all direction. Force is nearly closely to the long axis of each tooth.
- This occlusion fulfils criteria for ideal occlusion1. Disadvantages :
- Mutually protected occlusion is contraindicated when the Periodontium of the anterior teeth is compromised.
- In Class III and cross-bite cases mutually protected occlusion is contraindicated.

- Missing canine or a prosthetic canine contraindicated MPO.
- Arbitrary amounts of posterior disclusion.

CONCLUSION

Management of worn-out dentition requires the proper implication of interdisciplinary concepts to achieve functional and esthetic success. Treatment plan should target at deciding the need of altering the VD for meeting the biologic, restorative, and esthetic requirements.

The principles of treatment are universal, all the functional factors are interrelated, and all efforts should be made to construct an occlusal interface such that the periodontium of teeth, muscles of mastication, and TMJ's function in harmony with each other. This requires accurate diagnosis regarding the etiology of the deranged condition, intra-oral changes and other adverse effects on jaw relations. Optimal occlusion according to the needs of the patient should be attained in rehabilitation procedures. Chewing efficiency can exist over a wide range of occlusal forms and types of occlusal schemes, so no set rule can be applied to all the patients.

Occlusal rehabilitation is a radical procedure and should be carried out in accordance with the dentist's choice of treatment based on his knowledge of various philosophies followed and clinical skills. A comprehensive study and practical approach must be directed towards reconstruction, restoration and maintenance of the health of the entire oral mechanism.

Author name:

Dr. Murugesan, Professor

REFERENCES

1. Evaluation, diagnosis, and treatment of Occlusal Problems. Peter. E. Dawson foreword by L.D.Pankey.

2. Morgano SM, VanBlarcom CW, Ferro KJ, Bartlett DW. The history of The Glossary of Prosthodontic Terms. Journal of Prosthetic Dentistry. 2018 Mar 1;119(3):311-2.

3. Functional occlusion from TMJ to smile desig. Peter. E. Dawson

4. Turner KA, Missirlian DM (1984) Restoration of the extremely worn dentition. J Prosthet Dent 52:467–474

5. Gary M. DeWood. Gnathology and Pankey-Mann-Schuyler : fulfilling the requirements of occlusion in oral rehabilitation

6. Brecker S.C, Clinical procedures in occlusion Rehabilitation, W. B. Saunders Philadelphia 1958

7. Bloom DR, Padayachy JN. Increasing occlusal vertical dimension—Why, when and how. British dental journal. 2006 Mar;200(5):251-6.

8. Abduo J, Lyons K. Clinical considerations for increasing occlusal vertical dimension: a review. Australian dental journal. 2012 Mar;57(1):2-10.

9. Pawar RS, Kulkarni RS. Clinical Considerations while increasing Occlusal Vertical Dimension: a case report. International Journal of Prosthodontics and Restorative Dentistry, July-September 2017;7(3):103-107

10. Tiwari B, Ladha K, Lalit A, Naik BD. Occlusal concepts in full mouth rehabilitation: an overview. The Journal of Indian Prosthodontic Society. 2014 Dec1;14(4):344-5.