Periodontal Aspects Related to Fixed Prosthodontics

presented By

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3- **Crown contours:**

Buccal&lingual contour of the crown should be simulating the adjacent tooth.

Ideal contour provides access for hygiene and has the fullness to create the desired gingival form (improving Esthetics)
A) Buccal and lingual contour

1- Normal contour
- Favorable to periodontium
- Allow massage of the gingiva
- **2-Over contoured**
- Causes: under reduction
- Leads to lead to accumulation of food and subsequent gingivitis & periodontitis. In addition, bad esthetics will results.

2- Under contoured
- will results in flat surface, abnormal esthetics, & food impaction, leading to bone resorption.
Over contoured crowns

Over contoured crown leads to bone resorption
b) Proximal surfaces

1- Normal contact
Allow passage of dental floss with slight resistant

2- Open contact.
Leads to food impaction between teeth leading to pocket formation, periodontal ligament problems and caries in adjacent teeth.

3- Tight contact.
Leads to pressure on neighboring teeth preventing complete seating of restoration
Addition of low fusing porcelain to close the open contact
4- Embrasure design.

It is the space that widen out from the proximal contact areas of healthy teeth.

The design of the embrasure should be as normal teeth as possible, to the limit of passing dental floss.

It serve to
1- protect gingiva from food impaction
2- deflect the food to massage the gingiva
3- Provide spillway to the food during mastication
4- relief occlusal stresses when resistant food is chewed.
It should not to be too wide or too narrow

**TOO narrow** embrasure means tight contact with crushed gingiva in-between, **too wide** embrasure means open contact with resultant food impaction & gingival trauma.
5. Pontic design

- Pontics are fixed partial denture components that replace missing teeth and restore function and appearance compatible with continued oral health and comfort.

- There are certain requirements of the pontic:
  1. Restores function efficiently.
  2. Meet the esthetic demands.
  3. Biologically accepted.
  4. Hygienic design.
  5. Easily constructed

The principles guiding the design of the pontic are:

1. Cleansability.
2. Appearance.
The pontics can be classified according to tissue contact into:

**Mucosal Contact**
1. Saddle
2. Ridge Lap
3. Modified Ridge Lap
4. Ovate
5. Conical

**No Mucosal Contact**
1. Sanitary
2. Modified Sanitary
Mucosal Contact

No Mucosal Contact
1- Gingival surface:

The demands of esthetics often dictate tissue contact, whereas hygienic requirements favor tissue clearance.

So

1- The Portion of pontic touching the ridge should be:

a- Small

b- Convex

c- Passive contact (pressure free)

2- The tip of the pontic should never extend past the mucogingival junction. It should only contact attached keratinized gingiva.
Form of the gingival surface

1- Anterior and premolar area: 
*Due to esthetic demand tissue contact is recommended.*

So

*ridge lap or modified ridge lap is indicated.*

2- Posterior area due to hygienic demand tissue clearance is recommended

So

*sanitary or modified sanitary is indicated.*
2- Occlusal surface

3 concepts exist relative to the occlusal surface of a pontic.

a) The reduction of the occlusal table to $1/5-1/3$ the bucco-lingual dimension to control force on the abutment

b) Another maintains the normal occlusal width to provide soft tissue protective mechanism during mastication and to provide adequate occlusion with opposing arch.

c) The 3rd tends to minimize the significance of the occlusal dimensions based upon the importance of the proprioceptive mechanism in regulating the occlusal forces.
3-The buccal and lingual surfaces:

The buccal and lingual surfaces of the pontic may differ according to:

1. Esthetics.  2. hygiene.  2. Ridge morphology.

For esthetic the buccal surface of the pontic should follow the contour of the adjacent teeth.

In maxillary and mandibular anterior region
For esthetic demand maintain normal facial contour, axial alignment and length.

In mandibular posterior region
The buccal and lingual surfaces follow normal tooth form from cusp tip to the height of contour, sanitary design
4- Proximal surface:

- **Excessively broad** proximal contact areas crowed out the facial and lingual gingival papillae. These prominent papillae trap food debris that leads to gingival inflammation.

- **Too narrow** proximal contact areas create enlarged facial and lingual embrasures that don't provide sufficient protection against interdental food impaction.
Pontic Material

- The need for strength, rigidity, and durability has been established.
- The material must also permit acceptable color, contour and be biocompatible regarding effect of the material itself or the effects of the surface finish.
- Glazed porcelain the most biocompatible material.
  - easy to clean
  - plaque removal easier
Splinting

Splinting refers to any joining together of two or more teeth for the purpose of stabilization.

Function of splinting:

1- Protect loose teeth from injury while stabilizing them in a favorable occlusal relationship.

2- To distribute occlusal forces so that teeth weakened by loss of periodontal support do not become loose.

3- To prevent natural tooth from becoming loose and migrating.
2- Redistribution of forces on more than one tooth.

3- Prevent lateral forces which is destructive to periodontal ligament.

4- Single tooth begin to function as multi-rooted teeth or as molars

**Types of splints:**

**Classification of dental splints according to the duration**

1- Temporary or short term splints.
2- Intermediate or long term Splints:
3- Permanent splints.

**Splints can also be classified as:**

1- Removable splints.
2- Fixed splints.
I. **Temporary or short term splints:**

– Used for less than 6 months.
– Mainly indicated to immediately stabilize a tooth loosened by a blow, or completely lost and replanted.
(bad esthetics and biologic problems may result)

**Types of splints:**
1) Wire and Composite Splint:
2) Composite resin splint:
3) wire and acrylic splint:
4) Ligature wire:
5) Orthodontic band:
6) Removable temporary splits:
   A) **Acrylic bite-guards (mouth guard) or occlusal splint:**
   B) **Cast continuous clasp splint:**
1) Wire and Composite Splint:

• A horizontal groove 2-3 mm wide and 1.5 mm depth is prepared in the lingual surface of anterior teeth or the occlusal surface of posterior teeth. A braided wire is fitted and imbedded in the groove, light-cured composite fills the groove. After hardening, the surface is polished.
The right central incisor was partly displaced by a blow. This wire and composite splint is rigid allows the tooth to be positioned correctly in the occlusion while the splint is attached. It was removed after three weeks by which time the injured tooth was firm.
2- Composite resin splint:

• Splints made from wire and composite resin, are not chemically integrated with dental resins, thus were easily disrupted by shear stress.

• It is a well accepted technique for stabilization used for:

  1. Treatment post acute trauma to prevent mobility.
  2. Preventing tooth drifting after loss of an adjacent tooth.
3) The wire and acrylic splint: Frequently used for the stabilization of incisors. It is stronger and more reliable than the composite-filling splint. Usually the teeth from canine to canine, or first premolar to first premolar, are included in the splint.

A wire and acrylic splint. The roots of the four incisors were resected. The splint has remained effective until complete alveolar healing has occurred. The patient is ready for a bridge.
4) **Ligature wire**

When anterior teeth require splinting:
- Involve wrapping wire around the teeth.

5) **Orthodontic band**

Orthodontic bands are used especially in posterior segments, where they are not obvious:
- Stainless-steel bands are fitted to the teeth to be splinted and welded together.
6) **Removable temporary splits**:

i. **Acrylic bite-guards (mouth guard) or occlusal splint**: is a removable, rigid acrylic appliance used for treatment of bruxism, may also be used as splint.
i. **ii. Cast continuous clasp splint:** A removable continuous clasp is fabricated like a partial denture framework. It rests at the height of contour and the cingulum of anterior teeth and at the buccal and lingual surfaces of posterior teeth. The appliance is rigid and does not enter undercuts as does a partial denture clasp.
II. Intermediate or long term Splints:

• This type of splints is used when teeth need to be stabilized for several months or years.

  **Heat polymerized full coverage acrylics:**
  This method is commonly used with *periodontally compromised* patients where there is a commitment to fixed splints after periodontal therapy. These splints are then removed, periodontal therapy performed, and the interim splints is replaced. After healing, permanent cast restoration is cemented.
III) Permanent splints.

It can be performed using a removable prosthesis, fixed partial denture either with rigid connector or non-rigid connector.

Minimum preparation splint-bridge of Rochette type.

Fixed partial denture splints:
6- Furcation involvements

The normal position of the osseous crest is approximately 1.5 mm apical to the CEJ in young and healthy adults. 

*Root complex* is the portion of a tooth that is located apical of the cemento-enamel junction (CEJ), i.e. the portion that normally is covered with a root cementum. *The root complex* may be *divided into* two parts, the root trunk and the root cone(s).

*The root trunk* represents the undivided region of the root. The height of the root trunk is defined as the distance between the CEJ and the separation line (furcation) between two root cones (roots). Depending on the position of the separation line the height of the root trunk may vary from one surface to the next in one given molar or premolar.
**Furcation fornix:** the roof of the furcation.

**Degree separation:** the angle of separation between two roots (cones). **Divergence** is the distance between two roots; this distance normally increases in apical direction.

**Furcation entrance:** the transitional area between the undivided and the divided part of the root.
Classification of furcation involvements

Class I: vertical loss of bone support is less than 3mm apical to the CEJ no radiographic evidence of bone loss.

Class II: vertical loss greater than 3mm but the total horizontal width of the furcation is not involved osseous loss in evident in x-ray.

Class III: horizontal through-and-through lesion that is occluded by gingiva but allows passage of an instrument from the buccal, lingual, or palatal surface.

Class IV: horizontal through-and-through lesion that is not occluded by gingiva.
Different methods of therapy are recommended according to the degree of furcation involvement as following:

Treatment of a defect in the furcation region of multi-rooted tooth is intended to meet two objectives:
1- The elimination of the microbial plaque from the exposed surfaces of the root complex.
2- The establishment of an anatomy of the affected surfaces that facilitates proper self-performed plaque control.

**Furcation involvement class I**
Recommended therapy: Scaling, root planning and Furcation plasty.

**Furcation involvement class II**
Recommended therapy: Furcation plasty, Tunnel preparation.
**Furcation involvement class III, IV**
Recommended therapy: Tunnel preparation, Root resection, and Tooth extraction.

*Root amputation* is removal of root without touching the crown.

*Hemisection* is a procedure in which the tooth is separated through the crown and furcation, producing two equally-sized teeth.
Treatment of furcation involvement:

1. **Scaling and root planning**
   In the furcation entrance of a class I involvement in most situations result in the resolution of the inflammatory lesion in the gingiva.

2. **Odontoplasty-osteoplasty**
   This procedure involves recontouring of both the tooth structure and the supporting bone to improve access for cleaning. A minimal amount of tooth structure and bone is lost in this procedure. This can be used in class I and incipient class II lesions.
Tunnel preparation is a technique used to treat deep class II and class III furcation defects in mandibular molars. This type of resective therapy can be offered at mandibular molars, which have a short root trunk, a wide separation angle and long divergence between the mesial and distal root.

1. The reflection of buccal and lingual mucosal flaps

2. The granulation tissue in the defect is removed and the root surfaces are scaled and planned.

3. The furcation area is widened by the removal of some of the interradicular bone, mesial and distal to the tooth in the region is also removed.

4. Following hard tissue resection enough space has been established in the furcation region to allow access for cleaning devices.
3- **Root amputation = [Root resection]**

**Root amputation is indicated in:**

1. Severe vertical bone loss involving one root of a mandibular molar or one or two roots of a maxillary molar.
2. Furcation involvement that is not treatable by odontoplasty-osteoplasty. [class II, III].
3. Vertically or horizontally fractured roots.
4. Vertically or horizontally fractured roots.
5. Severe root caries. Internal or external resorption.
6. Inability to treat one root canal successfully.
7. Sever dehiscence and sensitivity of a root
8. Failure of abutment in long span splint or FPD.
Contraindication to root resection.

1- Closely approximated and fused roots.

2- Significantly decreased general osseous support or increased crown root ratio.

3- Remaining structure that will not provide adequate resistance against the force of mastication.

4- Excessive loss of supporting root structure.

5- Inability to be treated endodontically.

6- Remaining structure that can't be restored
**Hemisection**

- cutting the tooth in half. In the case of mandibular molars, when one hemisected root is to be extracted, then subsequent restoration of the remaining root is done. Sometimes the roots are to be maintained and each half of the tooth is restored separately, a procedure known as **Bicuspidization**. The individual roots may then be separated orthodontically.
Premolarization or Bicuspdisation
Mesial root of lower molar is prepared to receive post crown
Saving the mesial root of mandibular molar
Crown configuration:

1- Maxillary distofacial root:

It doesn't create any esthetic problem, because it is hidden by the mesiofacial cusp in normal tooth alignment.
2. **Maxillary mesiofacial root:**

- The resulting occlusal outline tends to the more "triangular" because of the greater faciolingual dimension of the root that has been removed.
3- Maxillary palatal root:

- The presence of lingual cusps would:
  a) Produce an area inaccessible to hygiene maintenance,
  b) Create a severe torquing moment on the tooth which could be either tip the tooth lingually OR fracture tooth under the crown.
4- Maxillary facial roots:

Occlusal contacts should occur on the lingual cusp tip. There should be minimal occlusion facial to the central groove of the crown.

Preparation of the tooth overlying this root will result in either "oval or circular" configuration depending upon the shape of the root itself.
5- Sky furcation:

Roots are cut apart and then rejoined by a crown which acts as interadicular splint with concave connectors from one root to the other.

To separate the roots of maxillary molar without removing a root.
This is possible only if roots are: 1 - long, well supported by bone. 2 - distinctly separate.
8- Bridge design

The magnitude of tipping force varied according to different design of fixed partial denture.

1- cantilever bridge:

- If the edentulous span is long comparing to the number of abutment

So may occur looseness of the bridge and its failure.
- while if there is increase in the surface area of the resisting periodontium comparing to the tipping force

- This means that when the edentulous span is short comparing to the number of the abutment so the lamina dura will thickened to give rise to increasing retention.

The cantilever bridge has a deleterious effect on both the single abutment & periodontium.
2- Fixed-supported bridge

The advantage of this type of bridge is that the semi rigid connector can be separated before the bridge is cemented and so the two parts of the bridge can be cemented separately to reduce forces on a compromised abutment.

The fixed-supported bridge force distribution is 11/16 towards the soldered abutment, & 5/16 towards the rest seat on the inlay or onlay retainer.
3- Fixed-fixed bridge

The best bridge design regarding force distribution

Extra hard material must be used in long span bridge. If not, the stressed periodontium may suffer deleterious effects.

There is one unit of deflection (X). The deflection will be 8 times as great for a given span length (p) (8X) if the span length is doubled (2p).
Thank You