Principles of Partial Denture Design
Partial Denture Design

• Denture design may be defined as a planned visualization of the form and extent of the partial denture, arrived after study of all the factors involved.
Partial Denture Design

Successful RPD design depends upon favorable control of the forces acting on the RPD and favorable distribution of masticatory stresses over the supporting structures.
Stresses acting on a partial denture

1. Masticatory stress tends to move the denture vertically towards the tissues (tissue-ward movement).

2. Gravity tends to displace a maxillary denture downward (tissue-away movement).

3. Sticky food tends to pull the denture occlusally away from the tissues (tissue-away movement).
Stresses acting on a partial denture

4. Muscle pull and tongue action tends to displace a denture from its foundation.

5. Intercuspation of the teeth may tend to produce horizontal and rotational stresses, unless the occlusion is adjusted.
A properly constructed partial denture must have:

1. **SUPPORT**: adequate distribution of the load to the teeth and mucosa and resisting tissueward movement.

2. **RETENTION**: sufficient to resist vertical displacing forces (tissue away movement).

3. **RECIPROCATION**: nullifying the effect of pressure on one side of the teeth by application of pressure, equal in amount, but in an opposite direction, on the opposite side of the teeth (during insertion and removal).

4. **STABILIZATION** and **BRACING**: creation of firmness by resisting horizontal forces.
Support

- Tooth support
- Tissue support
- Tooth-tissue support
Designing Support

• Generally, either the abutment teeth, or the residual ridges, or both resist masticatory forces applied to a partial denture. These structures resist the tissueward movement of the denture.
Designing Support

a- Tooth (tooth support):

- Tooth support is most commonly obtained by the use of occlusal rests.
- When abutment teeth are available at both ends of the denture base (bounded saddle), the teeth can carry the load almost entirely.
- Tissueward movement of the denture bases is markedly reduced in tooth-borne cases. Teeth provide the best support for a partial denture provided that, they are healthy.
Designing Support

a- Tooth (tooth support):
Decision on the support

- Periodontal support
- Mucosal bearing
- Mixed (P/M) support
Periodontal support
b- Mucosa: (mucosa support):

- The mucoperiosteum covering the residual alveolar ridges is composed of surface epithelium and connective tissues containing elastic and collagenous fibers, fat, mucous glands, blood vessels and nerves. Because of the nature of the covering mucoperiosteum, it allows varying degrees of displacement.

- The amount of displacement (tissueward movement) that can take place will depend upon:
Mucosal bearing
Designing Support

b- Mucosa: (mucosa support):
Factors influencing tissue support:

- The amount of pressure or load applied.
- The nature of mucoperiosteum.
- Area covered by denture.
- Fit of denture base.
- Type of impression
Designing Support

b- Mucosa: (mucosa support):

1. **The amount of load or pressure applied.** The more pressure the bigger the degree of tissue displacement.

2. **The nature of the mucoperiosteum (it’s thickness).** The thicker the mucoperiosteum the more it is liable to displacement. Thin mucoperiosteum is less liable to displacement.

3. **Area covered by the denture.** The wider the area of coverage the less the displacement.
Designing Support

b- Mucosa: (mucosa support):

4. *Fit of the denture base:* The better the base fits the denture foundation, the less the degree of displacement. Metal bases have better fit than acrylic resin bases.

5. *Type of impression:* (anatomical, functional or selective pressure) against which the denture bases are fabricated. Minimization of tissueward movement of the partial denture can be accomplished by wide coverage, in other words, increasing the size of the foundation area.
c. Combination tooth and mucosa (tooth-mucosa support):

- The best example of this type of support is the bilateral distal extension (free-end saddle) restorations. Tooth surfaces provide the support at one extremity of the denture base, whereas, soft tissues support the denture base posteriorly. Under stresses, the area supported by the tooth will have little tissueward movement in contrast to the tissue borne posterior part.
Mixed support
Designing Support

b- Mucosa: (mucosa support):
From:

- Rests
- Denture bases
Designing Support

c. Combination tooth and mucosa (tooth-mucosa support):

- Torque on the abutment teeth will take place, depending on the degree that the free-end of the denture base moves towards the tissues. To minimize the torque, a clasp with stress breaking action such as bar clasp or wrought wire clasp should be used.
Designing Support

c. Combination tooth and mucosa (tooth-mucosa support):
Designing Support

c. Combination tooth and mucosa (tooth-mucosa support):
Tooth-Tissue Supported RPD

The problem of support may be managed through

1. Reducing the load.
2. Distributing the load between the teeth and ridge.
   a) varying the nature of connection between clasp and the base.
   b) by anterior placement of the occlusal rest
   c) by functional impression techniques
3. Broad load distribution.
Retention
Retention

The resistance of the partial denture to dislodgment (tissue-away movement) is gained mainly by mechanical means such as friction, interlocking parts (intracoronal attachments) or clasp arms engaging undercut areas on tooth surfaces.
Retention
Retention