

Principles of removable partial denture design

The supporting structures for removable partial dentures (abutment teeth and residual ridges) are living things and are subjected to forces. The ability of living things to tolerate force is dependent upon the magnitude or intensity of the forces.

The forces occurring through the removable partial denture can be widely *distributed*, *directed*, and *minimized* by the selection, the design and the location of components of removable partial denture and by developing a harmonious occlusion.

Types of partial dentures

1. Removable partial denture, which includes the cobalt chromium and acrylic removable partial denture.
2. Fixed partial denture.
3. Implant supported partial denture, this could be fixed (implant retained partial denture) or removable (implant support partial denture).

General principle

1. Utilize what is present.

Whenever possible, select a design that fits the teeth and soft tissues, rather than choosing one that requires tissue alteration. The goal is to avoid gross, unnecessary preparations.

2. Minimize the framework elements.

Whenever possible, the fewest number of minor connectors should be used. This decreases the potential for plaque adhesion.

3. Plan for future.

Planning for the future might involve designing castings with rest seats and guiding planes so they may subsequently be used as partial denture abutments, if required in the future.

4. Consider caries susceptibility.

Cast clasps cover more tooth surface than wrought clasps. The latter would be preferred if caries incidence is higher than usual.

5. Avoid placing rest seats or guiding planes on direct restorations such as amalgam.

It is better to redesigning the partial denture to avoid these restorations (*have high creep values and low yield strength*) or to replace the restorations with onlays or crowns.

6. Never design any removable partial denture without surveying.

Factors influencing the design of removable partial denture:

1. Which arch, is needed to be restored:

Because each arch may have certain criteria indicates specific design, and if both arches are needed to be restored, the relationship between maxillary and mandibular arches in removable partial denture designing and construction may consider:

- Inter-ridge space as well as space available for missing teeth restoration.
- Orientation of occlusal plane.
- Occlusal relationship of remaining teeth.
- Arch integrity.
- Tooth morphology.

2. Type of support: cases supported entirely by teeth are different than cases with tooth-tissue support, if one or more distal extension bases are involved, the following must be considered:

- Type of secondary impression material and technique.
- Clasp design that will best minimize the forces applied to the abutment teeth during function.
- Need for indirect retention.
- Need for later relining or rebasing, which influence the type of base material used.

3. Abutment teeth: selection and modifications required (simple grinding to more complicated restorations or splinting). This may affect the clasp design and type.

Considerations in abutment teeth selection are:

- Tooth number and location in the arch relative to edentulous spaces.
- Periodontal health.
- Crown and root morphology.
- Crown to root ratio.
- Bone support (tooth response to stress (index area)).
- Opposing dentition relationship of the tooth to the other supporting units (length of the edentulous span).

4. Type of major connector indicated.

5. Materials to be used for the framework and for the bases.

6. Type of artificial teeth to be used, this may have influenced by the opposing teeth. In general, removable partial dentures opposing natural teeth will require greater support and stabilization over time because of the greater functional load demands. Therefore, occlusal relationships at maximum intercuspation should be broadly dissipated to the supporting units.

7. Patient past dental history and his experience with removable partial denture and the reasons for making a new one, e.g. if patient was objectionable for an anterior palatal bar because bulky, location or tissue irritation, another major connector could be used and located more posteriorly.

8. Using of other types of treatment modalities to restore missing tooth as replacing of single missed anterior teeth by fixed restoration or benefits from implant to simplify the removable partial denture design.

9. Response of oral structures to previous stress.