Successful Outcomes in Contemporary Removable Prosthodontics: Clinical Removable Partial Dentures
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Best Approach to RPD Design

“There are over 65,534 partially edentulous situations per arch meaning there are literally tens of thousands of potential RPD designs.” Beaumont, A. J. Micro-computer aided removable partial denture design, the next evolution. JPD 62:551-6, 1989

Best Approach to RPD Design
- Identify biomechanical classification of partially edentulous arch
- Design should satisfy biomechanical requirements of tooth borne vs. tooth & tissue borne removable partial dentures
- Utilize a small number of well designed components whose selection is based on sound biomechanical principles

RPD Design Philosophy
- Minimal tooth and minimal gingival coverage
- Equitable distribution of functional forces

Major Connector Selection
- mandibular arch: lingual vestibular depth
- maxillary arch: requirement for support
- need for contingency planning
Primary Supporting Areas

Clasp Selection

- need for stress release anterior to the fulcrum line axis

Tooth Borne RPD

Tooth & Tissue Borne RPD

Tooth Borne RPD’s

Tooth & Tissue Borne RPD’s

Tooth & Tissue Borne RPD’s

Tooth & Tissue Borne RPD’s

RPI

RPC

Combo WW
Selection of Components and Design Considerations for Removable Partial Dentures

Design Criteria:
- Minimal Tooth and Tissue Coverage
- Equitable Distribution of Forces

Tooth & Tissue Borne RPD’s
No Clasp (rest only)
CC (non-retentive)
Combo WW

Tooth Borne RPD’s

Major Connectors:
- Maxillary RPD’s
- Mandibular RPD’s

1. Anterior Palatal Strap
2. Sublingual Bar
3. Lingual Plate
2. Posterior (mid-palatal) Strap
3. Anteroposterior Palatal Strap
4. Modified Palatal Plate
5. Complete Palatal Plate

Clasp Assemblies:
- Cast Circlet (Akers)
- Combination Bar
- Embrasure Clasp
- RPI
- RPC
- Combination WW (Same as Mandibular Tooth & Tissue Borne RPD’s)
Requirements of Major Connectors

- Sufficiency Rigid
- Properly Located
- Must Not Impinge on the Gingiva

Maxillary Major Connectors
1. Anterior Palatal Strap

Maxillary Major Connectors
2. Posterior (mid-palatal) Strap
Maxillary Major Connectors
3. Anteroposterior Palatal Strap

Maxillary Major Connectors
4. Modified Palatal Plate

Maxillary Major Connectors
5. Complete Palatal Plate

Selection of Components and Design Considerations for Removable Partial Dentures

Design Criteria:
- Minimal Tooth and Tissue Coverage
- Equitable Distribution of Forces

Major Connectors:
- Tooth Borne RPD's
- Tooth & Tissue Borne RPD's

Clasp Assemblies:
1. Cast Circlet (Akers)
2. Combination Bar
3. Embrasure Clasp

(RPD's are Removable Partial Dentures)
Selection of Components and Design Considerations for Removable Partial Dentures

Mandibular Major Connectors

1. Lingual Bar

- Minimal Tooth and Tissue Coverage
- Equitable Distribution of Forces

Major Connectors: Maxillary RPD's
- Anterior Palatal Strap
- Sublingual Bar
- Lingual Plate

Mandibular RPD's
- Posterior (mid-palatal) Strap
- Anteroposterior Palatal Strap
- Modified Palatal Plate
- Complete Palatal Plate

Clasp Assemblies:
- Cast Circlet (Akers)
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1. RPI
2. RPC
3. Combination WW (Same as Mandibular Tooth & Tissue Borne RPD's)

Selection of Components and Design Considerations for Removable Partial Dentures

Mandibular Major Connectors 2. Sublingual Bar

Selection of Components and Design Considerations for Removable Partial Dentures

Mandibular Major Connectors 3. Lingual Plate
Selection of Components and Design Considerations for Removable Partial Dentures

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- Mandibular RPD’s
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**Clasp Assemblies:**
- 1. Cast Circlet (Akers)
- 2. Combination Bar
- 3. Embrasure Clasp
- 1. RPI
- 2. RPC
- 3. Combination WW (Same as Mandibular Tooth & Tissue Borne RPD’s)

**Requirements of a Clasp Assembly:**
- Retention
- Stability
- Support
- Reciprocation
- Adequate Encirclement
- Passivity
Requirements of a Clasp Assembly

- Retention
- Stability
- Support
- Reciprocation
- Adequate Encirclement
- Passivity

Clasp Assemblies - Tooth Borne

1. Cast Circlet (Akers) Clasp
2. Combination Bar

Selection of Components and Design Considerations for Removable Partial Dentures

Design Criteria:
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Major Connectors:
- Maxillary RPD's
- Mandibular RPD's

Clasp Assemblies:
- Cast Circlet
- Combination Bar
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- RPI
- RPC
- Combination WW

Clasp Assemblies - Tooth borne

1. Cast Circlet (Akers) Clasp
2. Combination Bar

Clasp Assemblies - Tooth borne

1. Cast Circlet (Akers) Clasp
2. Combination Bar

Clasp Assemblies - Tooth borne

1. Cast Circlet (Akers) Clasp
2. Combination Bar
Clasp Assemblies – Tooth Borne
3. Embrasure Clasp

Clasp Assemblies – Tooth & Tissue Borne
1. RPI Clasp

Functional Movement of the RPI Clasp
Selection of Components and Design Considerations for Removable Partial Dentures

**Design Criteria:**
- Minimal Tooth and Tissue Coverage
- Equitable Distribution of Forces

**Tooth Borne RPD's**
1. Anterior Palatal Strap
2. Sublingual Bar
3. Lingual Plate
4. Anteroposterior Palatal Strap
5. Modified Palatal Plate
6. Complete Palatal Plate

**Tooth & Tissue Borne RPD's**
1. Lingual Bar
2. Posterior (mid-palatal) Strap
3. Anteroposterior Palatal Strap

**Clasp Assemblies:**
1. Cast Circlet (Akers)
2. Combination Bar
3. Embrasure Clasp
4. Combination WW Clasp

**Combination WW Clasp**
1. Embrasure Clasp
2. RPI
3. RPC
4. Combination WW
Introduction

- Intake Interview & Clinical Assessment
- PARP Form
- Treatment Planning & Clinic Forms
- Treatment Sequence for RPD’s
  - tooth borne RPD’s
  - tooth mucosa borne RPD’s
  - combination C/D & RPD
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1st Clinical Appointment
-Evaluation for RPD’s

- Clinical Assessment
- Making Diagnostic Cast Impressions
- Getting Casts Ready for Mounting
  ✓ Making Record Bases
  ✓ Placing Wax Rims

- Getting Casts Ready for Mounting
  ✓ Making Record Bases
  ✓ Placing Wax Rims

2nd Clinical Appointment
- Recording Maxillomandibular Relations
  ✓ Interocclusal Record
  ✓ Facebow Transfer
**2nd Clinical Appointment**

- Recording Maxillomandibular Relations
  - Interocclusal Record
  - Facebow Transfer

**Cast Mounting & Framework Design**
- Mount Maxillary Cast
- Mount Mandibular Cast
- Design RPD’s
- Record Design

**The Survey & Design Sequence for RPD’s**
- Survey Cast
- Rests & Minor Con.
- Major Connector
- Clasp Arms
- Retentive Network
- Ext. Finish Lines
- Int. Finish Lines
- Fill Out Forms
Definitions:

Dental Surveyor - A Paralleling instrument used in the fabrication of a Removable Partial Denture.

Surveying - The procedure of analyzing and delineating the contours of the abutment teeth and associated structures before designing a Removable Partial Denture.

The Survey Process:

- Secure cast to neutral tilt
- Identify guiding planes
- Adjust anteroposterior tilt
- Identify potential undercuts
- Adjust mediolateral tilt
- Index the cast
- Draw survey lines
- Mark depth of undercuts
- Indicate modification areas
- Draw design

The Survey & Design Sequence for RPD’s

- Survey Cast
- rests & Minor Con.
- Major Connector
- Clasp Arms
- Retentive Network
- Ext. Finish Lines
- Int. Finish Lines
- Fill Out Forms

-Cast Mounting & Framework Design

- Mount Maxillary Cast
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- Record Design

3rd Clinical Appointment -Rest Seat Prep. & Master Impressions

- Rest Seat Preparation
- Master Impressions
Mouth Preparation for RPD’s

- Diamonds
- Burs
- Polishing Instruments

Modifications of Tooth Contour
Sequence of Treatment

- Guiding Planes
- Height of Contour
- Retentive Grooves
- Rest Seats

Review of Mouth Preparation
with Patient

- Patient’s Study
- Cast with Design
- Models

Problem:

- Lack of Proper Mouth Preparation

Solutions:

1. Mouth preparation check list
2. Verify tooth modifications before final impressions
   - Alginate Impressions
   - Quick Set Stone

Final Impressions for RPD’s
Trouble Shooting
Removable Partial Denture
Framework Misfits

- Framework Does Not Fit Cast
- Framework Does Not Fit Mouth

Framework Does Not Fit Cast

- Casting Inaccuracies
- Damage During Finishing

Framework Does Not Fit Mouth

- Impression Errors
  1. Improper Tray Selection
  2. Impression Materials/ Technique Error
- Distorted Cast
- Tooth Movement

Framework Does Not Fit Mouth

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Alginate Impressions

Alginate Trays
- Stock or Custom
- Plastic or Metal
- Rimlock or Perforated

Tray Selection for Alginate Impressions

1. Rigid Tray (metal or plastic)
2. Perforated for Alginate Retention
3. 4 - 8 mm of Relief (space)

Notes:
- Rimlock type trays require use of an adhesive
- Maxillary trays may require modification of palatal vault
- Use an alginate adhesive on any tray where alginate retention is questionable
- Custom trays usually provide more even relief
Intraoral Technique:

1. Block out large interproximal spaces (undercuts)
2. Wipe alginate onto critical areas (e.g. rest seats, palatal vault and areas of framework contact)
3. Seat tray accurately in mouth
4. Hold tray in position for several minutes after initial set
5. Remove tray quickly with a “snap”
6. Inspect impression for desired detail/artifacts
7. Apply disinfection spray
**Alginate Manipulation**

1. Follow manufacturer’s recommendations for
   a. Water : Powder Ratio
   b. Spatulation Times

**Notes:**
1. *Slight variations in water : powder ratio are permissible*
2. *Mechanical mixers may produce more consistent mixes*

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**Laboratory**

1. Pour impression as soon as possible
2. Store in atmosphere of 100% humidity until poured
3. Pour with vacuum mixed die stone
4. Do not invert impression after pouring with stone
5. Avoid pressure on alginate (“cut off heels”)

**Notes:**
- *Liquids to improve surface hardness may be used*
- *Match stone with alginate for compatibility*

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**Master Cast, Framework & Custom Trays**

- Bead, Box & Pour Master Cast
- Design Master Cast
- Send to Laboratory
- Examine Framework & Make Custom Tray for Altered Cast
-Master Cast, Framework & Custom Trays

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Tx. Plan Form & Work Auth. Form
- Master Cast, Framework & Custom Trays
  - Bead, Box & Pour Master Cast
  - Design Master Cast
  - Send to Laboratory
  - Examine Framework & Make Custom Tray for Altered Cast

- 4th Clinical Appointment
  - Frame Try-in & Altered Cast Impression
    - Framework Try-in
    - Making Altered Cast Impression

- 4th Clinical Appointment
  - Frame Try-in & Altered Cast Impression
    - Framework Try-in
    - Making Altered Cast Impression

- Making the Altered Cast and Record Bases
  - Making the Altered Cast
  - Making the Record Bases
Making the Altered Cast and Record Bases

- Making the Altered Cast
- Making the Record Bases

5th Clinical Appointment - JRR, Facebow & Shade Selection

- Maxillomandibular Relationship Records
- Facebow Transfer
- Tooth Shade Selection

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5th Clinical Appointment - JRR, Facebow & Shade Selection

- Maxillomandibular Relationship Records
- Facebow Transfer
- Tooth Shade Selection

Mounting Casts, Tooth Selection & Set-up

- Mounting the Master Casts
- Selecting Teeth
- Setting Teeth

Mounting Casts, Tooth Selection & Set-up

- Mounting the Master Casts
- Selecting Teeth
- Setting Teeth

6th Clinical Appointment - The Complete Wax Try-in

- Try-in Set-Up
- Verify JRR
- Selection Resin Shade

6th Clinical Appointment - The Complete Wax Try-in

- Try-in Set-Up
- Verify JRR
- Selection Resin Shade
6th Clinical Appointment
- The Complete Wax Try-in
- Try-in Set-Up
- Verify JRR
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- Processing RPD’s Before Delivery
- Prepare RPD’s for Processing
- Laboratory Remount
- Finishing & Polishing

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- Prepare RPD’s for Processing
- Laboratory Remount
- Finishing & Polishing
7th Clinical Appointment
-Delivery & Clinical Remount of RPD’s

- Try-in
- Clinical Remount
- Delivery
8<sup>th</sup>-10<sup>th</sup> Clinical Appointments
- Post Delivery Adjustments of the RPD

- 24, 72 Hour & One Week Adjustments

- Need to Replace Hard and Soft Tissue
- Limited Number/Location of Implants
- Enhanced Support, Stability & Retention
- Eliminate the Extension Base
- Reduce/Eliminate Visible Clasp Arms

Implant Borne “Supported” Removable Partial Dentures
Implant Borne “Supported” Removable Partial Dentures

- Increased expenses: Surgical & prosthetic
- Adequate interarch distance!!!
- Attachment height requirements vary
- Limited path of placement
- Maintenance considerations