

- 1  **A DYING ART: REMOVABLE PARTIAL DENTURES**  
W STUART DEXTER, DDS
- 2  **WHY REVISIT AN OLD TOPIC???**
- 3  **A GREAT QUESTION!**
- 4  **IS THERE STILL A NEED? YES!**
  - Not everyone can afford implants
  - Multiple teeth replaced economically for the patient
  - Hygiene is simplified compared to an FPD (important for older patients) and a factor to consider
  - May include and benefit from the use of implants
- 5  **COURSE OBJECTIVES TODAY**
  - 1  • Indications for RPD's
    - A review of how edentulous situations are classified
      - Kennedy Classification (I-IV)
      - Applegate Rules
    - Breakdown of the components of an RPD
    - Levers – a very brief overview
  - 2  • Impression materials to use
    - How to deal with distal extensions
    - How to use a surveyor
    - Planning
    - Rotational path RPD's
    - A few interesting ones to share
- 6  **WHAT ARE INDICATIONS FOR RPD'S?**
  - Decreased masticatory function due to tooth loss
  - Edentulous spaces cannot be restored with conventional FPD's (space too large, teeth compromised)
  - Lack of bone for implant placement
  - Medical contraindications for surgery
  - The cost factor
- 7  **A FEW MORE**
  - Ablative surgery (cancer, ameloblastoma)
  - Trauma

- Cleft palate
- Hygiene difficulties FPD'S are not always the solution
- 

8  **RPD'S ARE OFTEN A NEGLECTED OPTION, BUT THEY ARE A GOOD ADDITION TO OUR TOOLBOX**

- Can be very functional
- Comfortable when properly fitted
- Esthetics is generally a minimal issue as most components can be hidden
- Helps to stabilize the dental arches
- A better long term choice than all acrylic or flexible-base partials

9  **USED IN SITUATIONS WHERE OTHER RESTORATIVE OPTIONS WILL NOT WORK**

10  **WEBER FERGUSON INCISION**

11  **THE DOWNSIDES**

- They are removable
- Require a learning curve to insert and remove properly
- Can get lost - A worthy point to discuss with the pt and guardian
- Metal may be visible at certain vantage points
- They can break
- But, better than no teeth

12  **WHAT CAN HELP MAKE RPD'S EASIER?**

- Your surveyor is your friend, helps to see solutions and problems
- Be aware of occlusal factors and use them to help in the design process
- Generally use conventional clasps vs attachments
- Keep the design as simple as possible, easier for you, helps the patient
- Add components purposely (by the DR, not the lab)
- Be aware of how our design can transmit stress

13  **A CONFUSING SUBJECT IN SCHOOL?**

- Yes!
- One of the most common comments I hear from graduates

- So, the goal today is to clarify and simplify
- We are going to break this into necessary components and organize the planning process

14  **WE ARE GOING TO MAKE IT BETTER**

15  **IT'S REALLY ALL ABOUT BEING ABLE TO EAT!**

16  **WHAT WE WON'T DO**

- Cover every scenario possible, I still see new situations
  - But, there is a common approach
- Overload with too much theory, but enough to help
- 
- 

17  **NONE OF THIS TODAY!**

18  **LET'S GO**

19  **GETTING CALIBRATED**

20  **HOW WE CLASSIFY PARTIAL DENTURES**

- Kennedy Classification
  - Applegate rules
- 
- These get us all talking the same language

21  **APPLEGATE RULES**

- Classification is based on status following extractions
- A missing third molar is not a factor in classification
- If a third molar is present and is going to be used as a supporting abutment it is used in the classification
- Just like third molars, if second molars are missing and not to be replaced they are not considered
- Just remember, the determining space for classification is always the most posterior space

22  **APPLEGATE RULES**

- Additional edentulous spaces are known as modifications
- Independent of the number of teeth missing
- Is based on the number of spaces (mod 1 for one space, mod 2

for two spaces) or sometimes A or P

- There are no modifications for a Class IV, any posterior missing spaces would then determine the classification

- 
- 

23  **KENNEDY CLASSIFICATIONS**

Thankfully there are only 4 of them

24  **CLASS I**

- Bilateral Edentulous Spaces
- Located posterior to any remaining teeth in the arch

25  **MAXILLARY**

26  **MANDIBULAR**

27  **CLASS II**

- The edentulous space is unilateral
- Remaining teeth on the edentulous side are anterior to the space

28  **MAXILLARY**

29  **CLASS III**

- The edentulous space is located unilaterally
- There are remaining teeth both anterior and posterior to the space

30  **CLASS III**

31  **CLASS IV**

- A single connected edentulous space
- Crosses the midline
- Located anteriorly to remaining teeth
- No modification spaces possible, would change the class
- 

32  **CLASS IV**

33  **HOW WOULD YOU CLASSIFY THIS?**

34  **CLASS III WITH A MODIFICATION**

35 36  **THE COMPONENTS OF A PARTIAL DENTURE**

- This is how we can simplify the process, since there are just a few
- Breaking things into component choices makes it easier

37  **MAJOR CONNECTORS**

- The component that holds everything together
- “The part of a removable partial denture that joins the components on one side of the arch to those on the opposite side.” *Glossary of prosthodontic terms*
- A limited number of possibilities

38  **MAXILLARY MAJOR CONNECTORS**

- Full palatal coverage
- A-P bar ( A-P strap)
- Horseshoe
- Palatal bar or strap

•

39  **FULL PALATAL COVERAGE**40 41  **ANTERIOR-POSTERIOR BAR**42  **PALATAL STRAP**43  **HORSESHOE**44  **STUFF IN BETWEEN - WHAT WOULD THIS BE? CLASS I STRAP?**45  **MANDIBULAR MAJOR CONNECTORS**

- Lingual bar
- Lingual Plate
- Modified lingual plate
- Labial bar (rare)- only used with severely lingually tipped teeth

46  **LINGUAL BAR**47  **LINGUAL PLATE**

48  **CUSTOMIZE IF NEEDED**49  **CLASS?  
DISTAL EXTENSION LOOKS LIKE A DENTURE**50  **MODIFIED LINGUAL PLATE**51  **NEXT UP: REST PREPARATIONS**

- Properly prepared can add strength to prosthesis
- Important for stabilizing the clasp assembly
- Require certain contours to correctly do their job
- Can act as INDIRECT retainer in Class I and II cases

52  **REST PREP POSITIONS**

- Choose ideal locations relative to your edentulous areas when possible
- Factor in occlusion to make position changes as needed
- Don't choose locations that compromise your design, it just means rests may require more preparation to accommodate occlusion

53  **REST PREPARATION POSITION TIPS**

- Do you need to modify the opposing occlusion for space?
  - Plunging cusps?
  - Vertical overlap? Especially canines
- Has there been any super-eruption to correct?
- The more rests, the greater the stress distribution
- Must also allow space for the minor connector to prevent fracture
- 

54  **TYPES OF RESTS**

- Occlusal
- Cingulum
- Distal-incisal
- Situations may result in modifications

55  **ANATOMY OF A REST PREP: OCCLUSAL**

- Rounded contours
- Is not a precision attachment, no inlay preps
- Center of prep is deeper than marginal ridge (grabs tooth)
- Has to be deep enough for strength and occlusion

- Must allow for a transition to minor connector

56  **OCCLUSAL VIEW                      CROSS SECTION**

57  **DEEPER IN THE CENTER OF THE REST**

58  **INCORRECT    VS    CORRECT CONTOURS**

59  **OCCLUSAL RESTS FOR INTERPROXIMAL CLASPS**

60  **SPACE PROVIDED FOR STRENGTH**

61  **NOT IDEAL**

62  **ANATOMY OF A REST PREP: CINGULUM**

- Again, rounded edges
- Deepest in the center
- Chevron shape, but can be modified
- For maxillary canines be aware of occlusal contact positions to not change VDO or excursive pathways

63  **DO WE SEE A PATTERN?**

64  **REST AND RETENTION**

65  **ANATOMY OF A REST PREP: DISTAL-INCISAL**

- Not used very often
- Not a very esthetic option
- Requires enough reduction to blend to contours to not become an interfering occlusal contact
- Normally only for mandibular canines
- 

66

67  **MODIFICATIONS WE MAY NEED TO MAKE**

- Circumstances of occlusion, may dictate a change of position
- Anatomic variations
- BUT, keep in mind that rules are still rules, if we understand this, we can make changes that do not compromise our outcome

68  **MODIFICATIONS STILL FOLLOWS THE SAME PRINCIPLES**

69  **CROSS SECTIONAL VIEW – THEY ARE ALL THE SAME**

70 71  **MINOR CONNECTORS**

- An easy one
- Simply the transition from the major connector to a component
- Often a point of fracture when the minor connector has inadequate space
- Create space when preparing rests
- Beware occlusion

72  **PROVIDING CLEARANCE**73  **ADEQUATE ROOM FOR STRENGTH AND OCCLUSION**74 75  **RETENTIVE ARMS**

- Cast – round and half round
- Soldered to framework (wrought wire) - not used very often
- Retentive tip ends in a specified undercut
- Also called a direct retainer because it retains against vertical forces

76  **TYPES OF RETENTIVE ARMS**

- I Bars (infrabulge), starts below height of contour
- T Bars, J Bars
- Cast circumferential (Akers) (suprabulge), starts above height of contour
  - ½ round
  - round
- Reverse clasps
- Interproximal clasps

77  **RECIPROCATING ARMS**

- Designed to counter the forces of the retentive arm
- Stabilizes against the tooth as the retentive arm flexes and engages into the undercut
- A plate can be used to the same effect
- They can also be round or half round
- Located above the height of contour



78  **GUIDE PLANES**

- Help line up and guide the partial to place
- Ideally contacts tooth in the occlusal third
- Follows B-L contours
- Allows for physiologic movement of framework
- Critical part of clasping assembly

79  **REQUIREMENTS OF THE CLASP ASSEMBLY**

- Must contact 3 points on the tooth ( rest, retentive arm, reciprocating, and guide plate )
- Must be greater than 180° of the circumference ( prevents tooth from walking away from the clasp)

80  **ALL THE COMPONENTS**81  **FACTORS TO CONSIDER WHEN DESIGNING THE FRAMEWORK FOR THE RPD**82  **LEVERS AND HOW THEY AFFECT RPDs**

- This is simply a beam that rotates around a fulcrum point and in which forces are applied
- The type of lever depends on the location not only of the fulcrum, but how and where the load and effort are situated
- These are how we can decrease stress and create INDIRECT retention
- Multiple fulcrum lines possible

83  **CLASS I LEVERS- VERY EFFICIENT AND NOT WHAT WE WANT TO CREATE**

- 1 • Think of a teetertotter
  - Others are pliers or a crow bar
  - Efficiency depends on the location of the fulcrum as it relates to the load and effort

84  **CLASSIC EXAMPLE IN FIXED RESTORATIONS**85  **A LITTLE TOO EFFICIENT!**86  **CLASS II LEVERS-LESS EFFICIENT**

- 1 • Think of a wheelbarrow
  - The fulcrum is located at the end of the bar, the effort is at the other end and the work or load is between those two points

- Requires more work input for the task

87  **INDIRECT RETAINERS ACT AS CLASS II LEVERS**

- Occlusal rests
- Lingual plates

88  **CLASS III LEVERS-LEAST EFFICIENT**

- 1 • Good examples are a drawbridge or fishing and.....the masticatory system
- The load is all the way at the end of beam and the effort then is between that and the fulcrum
- 

89  **THE MASTICATORY SYSTEM**

- Is an example of a Class III lever when functioning properly
- This is why cuspid disclusion in excursions is so important because a posterior prematurity can change it to a Class I lever
- We want inefficiency for protection

90

91  **WE ARE MAKING A MECHANICAL DISADVANTAGE**

- The take away, levers can magnify or reduce forces
- We want inefficiency to protect teeth
  - A cantilever prosthesis is a Class I lever example. They have to be used cautiously
- Identified in the design process

92  **WHEN WE DESIGN A PARTIAL**

- Potential for one or more fulcrum lines
- We need to be aware of what we are creating
- Minimize the stresses by creating inefficiency, no class I levers, if possible

93  **MULTIPLE LINES OF ROTATION CAN BE PRESENT**

94  **DIRECT VS INDIRECT RETAINERS**

- Clasps vs rests and guide plates
- Axis of rotation are affected indirect retainers

95  **DIRECT RETAINERS**

- Simply the clasping mechanism

- Holds the partial in place under lifting forces
- This is generally what a patient is referring to when they talk about how tight the partial feels
- 

#### 96 **INDIRECT RETAINERS**

- This is where the creation of fulcrum lines and levers must be visualized
- Also activated under lifting forces, but are anterior to a fulcrum line on a distal extension
- Generally refers to rests, minor connectors, and guide plates
- If a lingual plate is used, it must have underlying rests to prevent “tissue-ward” movement

#### 97 **TWO POINTS ON THIS ONE**

- Indirect retainer is the rest on #27
  - But, it must be a prepared rest to be effective, no just a plate
- Retention on #27 is contraindicated unless distal extension is properly monitored

#### 98 **SURVEY CROWNS**

- Simply a crown that is designed to accommodate the needs of the partial denture design
- Normally has all the elements of the clasping mechanism
- Should be clearly stated on the lab script the design requirements
- When you get a survey crown from the lab, modify if needed, they often do
  - Improve rest contours, verify adequate undercut, guide plane
- I like metal to metal contacts, like materials wear better

#### 99 **EXAMPLE LAB INSTRUCTIONS**

- Fabricate PFM crown #30
- MO rest and path for minor connector in metal
- Mesial guide plane in metal
- ½ round cast circumferential arm to 0.01” DL undercut
- ½ round cast circumferential buccal reciprocating arm

#### 100 **LET’S LOOK AT A TYPICAL SCENARIO**

#### 101 **A CLASSIC DESIGN**

- Distal rest and guide plate

- Rotational forces engage the tooth
  - Chewing
  - Tissue-ward movement
  - Clasp moves up and into the tooth
- 
- Result is increased stress on the distal abutment

102  **IMPROVING THE FORCES**

- Mesial rest and guide plate
- Rotational forces disengage from the tooth under function
- Less harm to abutment tooth
- Adding indirect retainers helps on the lifting forces

103  **A VERY BRIEF LOOK AT IMPRESSION MATERIALS**

- We almost universally use alginate (studies support accuracy)
- But use the material you are comfortable using
- Depends on if you are pouring it in office or sending to the lab
- If going to the lab, send surveyed dx model with critical design decisions made and the model to be used for fabrication
- Our models are always poured the same way

104

105  **CASE DESIGNS**

106  **SURVEYOR**

107  **WHAT DOES A SURVEYOR DO FOR US**

- Allows us (the dentist) to determine the best path of insertion
- Ideally this places the occlusal plane close to parallel to the bench top
- Secondly, it can identify the guiding planes (called guide plates on RPD)
- Identifies location and amount of undercuts for retentive arms
- Provides a guide for where and how much to modify teeth
- Identifies and communicates this position to lab

108  **CASE DESIGNS –MANDIBULAR CLASS I  
ANTERIOR-POSTERIOR ORIENTATION**

109  **BUCCAL – LINGUAL ORIENTATION**

- 110
- 111  **ADDING SURVEY LINES FOR LAB**
- 112  **CHOOSE A MAJOR CONNECTOR**
- 113  **DETERMINE REST POSITIONS**
- 114  **RETENTION AND RECIPROCATION**
- 115  **FRAMEWORK IS THOUGHTFULLY DESIGNED BY YOU, NOT THE LAB**
- 116  **CASE DESIGN – MAXILLARY CLASS I A-P ORIENTATION**
- 117  **BUCCAL-LINGUAL ORIENTATION**
- 118  **CHOOSING A MAJOR CONNECTOR**
- 119  **DECIDING UPON RESTS**
- 120  **RETENTION AND RECIPROCATION**
- 121  **FRAMEWORK DESIGNED BY YOU FOR THE PATIENT**
- 122  **CASE DESIGN – CLASS II**
- 123  **CAST ORIENTATION**
- 124  **LATERAL ORIENTATION**
- 125
- 126  **MAJOR CONNECTOR AND RESTS**
- 127  **RETENTION AND RECIPROCATION**
- 128
- 129  **CASE DESIGNS - CLASS III**
- 130  **CASE DESIGN- CLASS III A-P ORIENTATION**
- 131
- 132
- 133  **BUCCAL LINGUAL ORIENTATION**

- 134  **UNDERCUTS**
- 135  **MAJOR CONNECTOR**
- 136  **REST POSITIONS**
- 137  **RETENTION AND RECIPROICATION**
- 138  **FRAMEWORK- YOUR DESIGN**
- 139  **CASE DESIGNS CLASS IV A-P ORIENTATION**
- 140  **ROTATIONAL PATH ORIENTATION**
- 141  **ANTERIOR RETENTION**
  - Framework is seated front to back
  - Once it engages posteriorly, the anterior retention locks in
  - Posterior retention is 0.015"
- 142  **MAJOR CONNECTOR**
- 143  **MAJOR CONNECTOR AND RESTS**
- 144  **POSTERIOR RETENTION AND RECIPROICATION**
- 145  **FRAMEWORK- THEY ARE NOW HOW YOU DESIGNED THEM**
  - Fewer surprises
  - You have controlled the forces on the teeth
  - Possible esthetic and occlusal problems avoided
- 146
- 147  **HOW TO ADJUST FRAMES THAT DON'T FIT**
  - Rouge and chloroform
  - Fit checker
  - High speed and a fine diamond
  - Just like adjusting a crown that isn't seating completely
- 148
- 149
- 150  **HOW TO DEAL WITH DISTAL EXTENSIONS**
  - This is how to really improve your final result
  - Requires a bit more time on the front end

- A learning curve to pour up correctly
- Only done on mandibular arches

151  **THESE ARE CLASS I OR II MANDIBULAR CASES**

- Why is there a need to handle these differently?
  - Teeth only allow about 0.25mm of movement
  - Tissue allows around 2mm of movement
  - This needs to be factored into our treatment
- What is the best technique and why
- Are there alternative techniques?

152  **IDEAL TECHNIQUE**

- Once the framework is tried in and the fit verified
- Custom trays made on the distal extension areas
- Just treat as if this is a denture in this area
- The edentulous area is impressed using the framework for support

153  **WHY IS IT NEEDED?**

- We know hard and soft tissues react to impressions differently
- Corrects the hard tissue to soft tissue relationship
- You will notice a gap under the frame after correction
- Will be more accurate because the extension will not depress under occlusal load for a bite record or during wax try in
- Prevents getting a partial back with heavy posterior occlusion

154  **PATIENT BENEFITS**

- Improved posterior support and function
- Decreased movement under load
- Less stress transmitted to abutments

155  **HOW IT IS DONE**

156  **ONCE THE FRAME IS TRIED IN ADD CUSTOM TRAYS**

- Extend just like a denture tray
- Must not interfere with seating the framework
- Do not distort peripheral tissue
- Soft tissue undercuts blocked out and allow for mylohyoid movement (floor of mouth)

157

158

159

160  **SAME THING IF ONLY ONE SIDE**

161

162

- Removing impression flash
- Allows for seating back on model

163  **CUTTING WHEEL**

164  **MODEL READY FOR POUR UP**

165

166  **POUR UP COMPLETED**

167

- Dictates extension and shape
- No guessing by the lab as to contours

168  **CHANGE IN FRAMEWORK TO TISSUE RELATION**

169

170

171

172

173

174

175

176

177

178

179  **ACRYLIC ADDED FOR SUPPORT**



- 
- Stabilizes for bite record
- We use repair acrylic so it does not need to be removed

180  **CLASS II**

181  **READY FOR WAX TRY IN**

182  **ALTERNATE TECHNIQUES**

- A relined impression at wax try phase
  - OR
- Relined after initial processing

183  **SOME PITFALLS**

- May have to deal with occlusal issues due to inaccurate bite relation
- The tissue thickness and mobility will determine impact
- Lack of retromolar pad coverage and poor contour of extensions from the lab
- 

184  **NOW, FOR SOMETHINGS A LITTLE MORE COMPLEX**

185

186  **A DENTURE WITH 2 TEETH**

187  **ALL THAT REMAINS OF THE ORIGINAL MODEL**

188

189  **SINCE THE IMPRESSION IS CORRECTED-  
BITE IS SUPPORTED**

190  **IT'S JUST A DENTURE WITH 2 TEETH**

191  **THE DESIGN ELEMENTS REMAIN THE SAME**

- Class I bilateral distal extensions
- RPI design
- This has to be monitored, ridge resorption will require relined

192

193

194  **ADDING IMPLANTS FOR SUPPORT**

195  **BASICALLY ANOTHER DENTURE, BUT WITH IMPLANTS**

196

197

198

199

200

201

202  **A LITTLE DIFFERENT SITUATION**

- Pt did not like the way things looked
- Difficulty keeping things clean
- Was interested in an alternative
- 

203  **DID NOT LIKE THIS LOOK**

204  **PLANNED CHANGES**

- New maxillary complete denture with minor changes
- Fixed hybrid prosthesis removed
- Replaced with an implant supported RPD
- Locators placed on most parallel implants
- Remaining implants slept

205

206

- Old denture vs new denture
- No major changes
- Borders filled out more

207

208  **I BARS HELPED GUIDE TO PLACE  
BUMPS AID IN REMOVAL**

- 209  **LAB MUST ALLOW SPACE FOR HOUSINGS**
- 210
- 211  **A COUPLE MORE DIFFERENT CASES TO FINISH**
- 212  **REHAB FOLLOWING CANCER SURGERY**
- 213  **INTRAORAL DEFECT**
- 214
- 215  **ROTATIONAL OR DUAL PATH RPD**
- Better esthetics
  - Surveying paths critical
  - Must have undercuts of mesial walls #6 and 11 relative to each other
  - Retentive clasps on posterior teeth must be 0.015 “ instead of 0.01”
  - Cannot have any rotational interferences to insertion path
- 216  **RESTORATION OF DIASTEMA**
- 217  **MIDFACE SUPPORT**
- 218
- 219  **USING ROTATIONAL PATH FOR A BILATERAL CLEFT**
- 220  **POST EXTRACTION AND HEALING**
- 221  **UTILIZE NATURAL MESIAL UNDERCUTS ON CANINES**
- 222  **EXCELLENT RETENTION, NO VISIBLE RETENTIVE ARMS**
- 223  **LATERAL ROTATIONAL PATH WITH IMPLANTS**
- 224
- 225
- 226
- 227  **THE EQUIPOISE SYSTEM**
- Designed to have all the clasp components on the lingual
  - Another way to create a more esthetic result
  - Very lab dependent

228  **THE SURVEY CROWNS**

- Channel rest
- Reciprocating arm is also a function of the rest
- Retentive arm rests on a ledge
- Divot for retention incorporated into the ledge

229  **POSTERIOR SURVEY CROWNS**

- Posterior survey crowns completed
- Pt was not a candidate for implants

230  **FRAMEWORK**231 232 233 234  **THERE IS NOTHING NOBLE ABOUT BEING SUPERIOR TO YOUR FELLOW MEN. TRUE NOBILITY LIES IN BEING SUPERIOR TO YOUR FORMER SELF.**

- Ernest Hemingway

235  **THANK YOU**236  **THANK YOU**237  **SOME CASES ARE A COMBINATION OF MODALITIES**238 239 240 241 242 243 244 245 246

247  **ORGANIC COMPLIANCE**

248