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Today, we will talk about partial denture design.

We do the design for certain reasons and there are certain rules which must be taken into consideration.

\*One of the basic principles is to have the least amount of force and movement later on; because there is something called (tolerance): if we exceed the tolerance (like when we apply forces on the teeth beyond their tolerance), this would result in **periodontal disease, mobility of the teeth, trauma to the soft tissues that will lead to ulceration –redness-erosion-inflammation, and bone resorption.**

So, we must make the design in a way to preserve the tissues .

We can classify the principles of design into general (we apply on whole cases) and specific (there are certain components like clasps, major connectors, that need special requirements).

**First rule**: the most important general consideration is to only treat if the case is indicated and the patient is willing. (For example, if the patient has missing 8s, or has missing upper and lower 7s and 8s, it's not logical to construct partial denture to replace the missing teeth especially if the patient is young or in his twenties).

**Second rule**: Esthetics is very important in addition to function. (Because in RPD (not like fixed), we need to make extensions on the soft tissues like the palate and ridges.)

So we must be careful not to make the denture too bulky, but at the same time not too thin.

The appropriate thickness is 1.5-2 mm. If it was less than 1 mm it would fracture easily especially in lower dentures; more than 2 mm is too bulky.

Also, there are no cases with only one design; they have more than one design. You may go to a doctor and he would give you a design and go to another and he would give you another design for the same case, this does not mean that this is wrong), but there are major rules and major characteristics we must follow.

The design that contains all the components and follows all the rules, this will be the right one.

**Another rule**: we must have the least amount of forces as mentioned earlier.

Try to be as far as possible from gum coverage or bracing especially free gum or free gingival margin). We should try not to cover it, but if you had to cover it, try to cover it by:

1-less amount (as minimum as possible).

2-cross it vertically.

3-passive fitting without compressing it.

\*\*Usually ,rests are connected to the major connector by minor connectors that are placed between the teeth (interproximally), if I put it on the lingual surface ,the patient will feel it with his tongue .

Also, when you put it interproximally , be careful so as not to do wedging (pushing the teeth ), so we need passive fitting .

\*\*the major connector must be away from the free gingival margin by 6 mm in upper arch.

\*\*In the lower arch, it must be away from the free gingiva by 3 mm. It’s not 6 mm like in the upper arch because there is not enough space in the lower and it would be in the sulcus.

**How do you reduce the forces?**

1) Increase number of abutments to distribute the force. (Table rule)

Table rule: whenever we distribute the forces on more abutments, this will reduce the amount of forces and will become more stable. (see-saw movement)

2) Make the force cervically as much as you can.

The doctor showed us a picture about this point:

(I try to put the components as close as possible to the gingiva without causing trauma to the gingiva. For example, if I want to put the I bar clasp, I put it as close as possible to the gingiva but at the same time, I put it away from the gingiva by 0.5 – 1 mm, so as not to traumatize the tissues and not to cause periodontal disease and recession with time. )

3) Reduce the size of the occlusal table (when we reduce the occlusal table-> easier to masticate food-> so less forces needed for chewing) .

So when I need less force, this will lead to less forces transmitted to the mucosa, teeth, bone … So a reduction in gum ulceration, teeth mobility, and bone resorption.

الدكتور اعطى مثال بس ما فهمت شو هو .

 How to reduce the occlusal table?

By using smaller teeth buccolingually

Or I do trimming

Or for example, I put 5 & 6 instead of 6 & 7(3 premolars and 1 molar ) .

4) Try to put the denture in the neutral zone, this would prevent excessive forces from cheeks, lips, tongue. These forces come from the sides.

Some patients have a huge tongue so an increase in the force-> very strong forces on the denture-> resorption of the ridge from the sides.)

Stress breaking : the design that makes stress breaking which is **the RPI system .**

\*\*\*Note : I can use flexible components in the denture or I can change the material to a more flexible one. For example, we can change the material of the clasps or the design of the clasps (like in the gingivally approaching clasp when I want to lengthen the arm, so it will become more flexible than the shorter one) .

 Or I can change all the material like:

 CoCr is less flexible than stainless steel or wrought wire.

Gold wire is more flexible than CoCr.

If a patient comes with a high survey line and you want to put a clasp, it will be very high, so with the movement of the clasp, the tooth will also move! We can do what is called tooth recontouring; I do preparation for the tooth in enamel in a way to lower the survey line or I’ll do a crown or any other type of restorations or even I’ll change the tooth and use another one for retention. If I’m not able to do the previous methods, I can use other materials like stainless steel wire or gold clasp which are more flexible than CoCr and there will be less forces on the tooth.

The doctor showed us a picture of a free end saddle area with distal abutment, when we have forces on the free end saddle, the clasp will try to engage the undercut pushing it to the outside, with time it would act as extraction forceps, and the same thing if the clasp is extended from the mesial side, it will also act as an extraction forceps, so the solution here is to use an RPI system. (Very common question in VIVA).
Another solution is to use a combination clasp, I can make the occlusal rest and guiding plane from CoCr and the retentive arm from wrought wire; after the metal try-in we send the metal framework to the lab, to add the wrought wire clasp by inserting it in the wax so as it extends from the acrylic and not as a part from the metal framework, like in acrylic RPD. There are other types of combination clasps; the retentive clasp being welded to the occlusal rest instead of being casted; it’s done by wire-bending the clasp and then welding the top part to the occlusal rest.

**\*How does the RPI system act as a stress breaker?**

When we look at the tooth, it’s convex anteroposteriorly and superioinferiorly, one point they meet at; which is the maximum bulbosity or the height of contour, you put the tip of the I-bar in this area buccally, with the occlusal rest mesially and the guiding plate distally, when forces are exerted on the denture it will lead to disengagement of the clasp and the tip being in the mesial half, so with movement of the clasp, there is no movement of the tooth, and the opposite occurs when the denture is removed from its place, the clasp tip will be in the distal half and not touching anything and it will be removed without exerting any force on the tooth, in this way it acts as stress breaker, also the mesial rest, any force on it will pull the tooth mesially or forward and the tooth infront of it will prevent it from moving. Also the guiding plane and plate are only prepared 2-3 mm not the whole height of tooth, when the denture is fully seated, the plate will be moved downward not touching the tooth making a stress breaking effect, while if it’s touching it will affect it and might cause movement.

\*We only have to know that guiding planes are 2-3 mm and in special cases only we reduce it more sometimes to touching points only and sometimes I increase it, for example in bounded saddles if it increased to 4 mm it’s okay, but in free end saddles it’s reduced because there is movement and sometimes if the teeth are weak, we reduce it even more.

As we previously said, we have general and specific guidelines; general ones are necessary for every case.

Surveying is a necessary thing! From the surveying I can locate the undercut position and path of insertion and removal.

The doctor shows a picture with model in zero tilt and other in inclination or tilt; we have anterior and posterior tilts.

\*Why do we do tilt?

We actually don’t create undercuts with tilting; we only provide a way to keep them! The most important thing that the tilt provides me with is determining the path of insertion, to distribute the undercut on the denture, in patient’s mouth it’s always zero tilt but you do tilting in the models.
One case to understand this, is when we have an anterior saddle and we want to replace it we always do posterior tilt and by that the patient will be inserting it in an angle or tilt as what was done in the model instead of inserting it straight or vertically and by that I will prevent formation of black triangles, having a thick flange raising the lips, and also I will prevent cutting this flange which might lead to loss of retention, instead with the posterior tilt, the flange would fully engage the undercut.

What is the main goal of surveying? To determine path of insertion.

Guiding planes also can be used to determine the path of insertion, by having parallel guiding planes, I would limit the path of insertion to one path.

It’s easier for the patient for insertion and to prevent distortion of the components by having one path of insertion especially in old people with manual dexterity problems.

Goals of guiding planes in addition to the above:

-Ease for the patient

-Retention and bifraction (I’m not sure guys but the doctor says eno ra7 nens2al 3leeh in the exam ) 26:10

There are different systems for making a design in the RPD :

1. OSCAR .
2. Another system used by British people include:

First step: determine the edentulous area.

Second : support components .

Third : retention and reciprocation or bracing .

**(The difference between bracing and reciprocation )**

Reciprocation .. on the teeth

Bracing .. on every other area

(This means that reciprocation is a specific bracing designed to resist the retentive component of the clasp.

So, the reciprocation is the resistance of the tooth movement during the insertion of the clasps or movement of the clasp over the tooth.

While bracing is the resistance of the denture movement in the horizontal area or other area.

Does the clasp provide bracing? Yes for sure

Do the reciprocal components of the clasp give bracing? Yes for sure .

Any rigid component in the denture which prevents the denture from movement, we consider it as bracing component.

So every reciprocal component can be bracing but not every bracing component can give reciprocation.

Fourth step: then I need to connect the components so here we use (minor connector and major connector), I use minor connecter to connect other components to the major connector.

This is the simple way of design.

In the lower denture : we determine the edentulous area first, then we determine the support component then the retentive component ( note: in most patients, in the lower denture, we put the retentive arm lingually because the undercut in the lower teeth is lingual but in the upper the undercut is buccal) , then the reciprocation and bracing and finally minor and major connectors .

Regarding support components : we have cingulum rest , occlusal rest and incisal rest.

About the incisal rest: the patients don’t like it because they are esthetically bad and can be high. (We can’t used them in forced occlusion .. I’m not sure about this information).

Why do we prefer to prepare rest seats?

* To prevent the disocclusion (not to interfere with the occlusion).
* To direct the force along the long axis of the tooth.
* To not interfere with tongue movement.

Note: if we have tight contact and we need space for the clasps to go buccally for example, I do something called **tunnel**; we cut between the two adjacent teeth in order not to interfere with the occlusion especially if the patients have heavy contacts .

Do we make a unilateral denture?

No, because we need cross arch stabilization .

**\*Specific things about the major connectors and minor connectors :**

-must be rigid

-the alloy is compatible with the soft tissue (does not irritate the mucosa) .

- Not to interfere with the tongue.

-passive fitting.

-crosses the gum at a perpendicular angle (covers as minimum as possible).

-away from the gum 6mm in upper and 3mm in lower.

-able to support other components.

-can aid in retention sometimes (Like in full palatal coverage, it may give physical forces: adhesion, cohesion).

Q) What are the physical forces that help in retention?

A) Adhesion and cohesion, neuromuscular control, capillary pressure (negative suction).

Capillary pressure (negative suction) خاصية الضغط الاسموزي : لما تحط قلم داخل اسطوانة فيها ماء, ارتفاع الماء راح يصير اعلى من السطح الثاني.

**- The point where the major connector meets the minor connector must be rounded without an angle (not sharp angle).**

-the major connector must avoid the bony region (any bony exostosis or torus mandibularis or torus palatinus must be avoided), in upper we can use ring design to avoid the torus, in lower we can put it from labial side like labial bar.

-the major connectors are many types but you must know this rule:

**In maxilla,** major connector of choice is palatal strap.

If I have missing posterior teeth, it will extend more and become full coverage.

Torus palatinus, we use ring design or anterioposterior palatal strap.

U shaped or horse shoe is the weakest one and we use it when we have severe torus palatinus extended to the soft palate.

 Single Palatal bar is canceled from the rule.

**In mandible,** lingual bar is the first choice.

If I don't have enough space, we use lingual plate

If I have spaces between the teeth, it's not logical to use lingual plate but I can use it and make trimming to the area between the teeth.

If I can't use the plate because of severe periodontal disease for example, I can use sublingual bar, the problem of sublingual bar is it is flexible in a vertical dimension and the thickness anterioposteriorly is 4 mm and superiorinferiorly is 2 mm, so it may get distorted.

If I have severe torus mandibularis—> I use labial bar

-or I can use dental bar

 -or kennedy bar (continuous bar) which needs long teeth so the connecter does not show, it should be put 2 mm away from incisal edge and 2- 3 mm away from gingival margin and the thickness is 3-4 mm so it needs long teeth.

 To avoid the weakness of sublingual bar, some people say to add the dental bar to sublingual bar, but the problem with this is the patient will feel discomfort (metal – space – metal) .

Minor connectors (saddle area, finish line, tissue stoppers…)

**Clasps :**

Usually for posterior teeth we use **occlusally approaching C clasp or three arm clasp.**

If I have a single molar, I can use **ring clasp** for stabilization from anterior and posterior.

If I have a premolar or an anterior tooth, I use **I bar clasp .**

If I have mesial undercut which is more preferable than distal undercut 43:00 + 44:00

**Always** in partial denture clasps, pay attention to the esthetics, so it’s not logical to put occlusally approaching clasp on the 4 because it will be visible, so we use I bar.

According to the appearance, there are tooth colored clasps which are made from polyoxymethylene clasp (not found in Jordan)

Last point: **dimpling** , if there are no undercuts and the patient is not willing to make filling or crown , we make something called dimpling (we make small depressions in the enamel and when we do casting for the clasps , the end of the arm of the clasp is something going out like a ball, when we insert it on the tooth , this part would engage the depression .

Thank you ☺

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