**Sheet No. : 12
Refer to slide No. : 2
Written By: Louai Haddad and Noor Khadeeri
Corrected By: Louai Haddad and Noor Khadeeri**

\*\*Slides packing and curing: (In those slides I only wrote the extra information the doctor said, so please refer to the slides).
Slide 1:
\*General requirements for the ideal denture base material:
-Any material that is used intra-orally has to be biocompatible.
-Impact Strength means the resistance of fracture when a sudden high force is applied to the material.
-Craze = Cracks
-Creep (deformation) means that a low force can cause changes in the material, so the material should have high creep resistance.
-High thermal conductivity means that the material should have good heat conduction, so that the patient doesn’t burn himself when drinking something hot, (high thermal conductivity in order to feel heat).
-Low density, which is very important to have a low weight for the material especially for the upper denture, because gravity will act on the upper denture to bring it down, so the material should have low density.
-The material should not be softened at low temperature, and should be accurate, as well as maintaining its stability.
-Acrylic has the best adhesion with teeth and with denture liners among other materials.
-The material should be easily handled.

Slide 2:
-Heat-cured polymethylmethacrylate is the most commonly used material for complete denture base materials and also is used for partial denture base materials. Why? Because it has favorable working characteristics, acceptable aesthetics, physical and mechanical properties, easy to fabricate, inexpensive, but it's not ideal! (There is no ideal denture base material).
-Acrylic in general absorbs and loses water.
-They act as insulators for the underlying tissue, so when the patient drinks something hot, the patient might burn his lips because he doesn’t feel the hot drink from inside his mouth due to the insulation property of the acrylic which is a disadvantage to have low thermal conductivity.

Slide 3:
-The initiator of the reaction has to be within the powder component.
-The liquid is the methyl methacrylate monomer which will react to produce polymer chains
-We have inhibitors, so that the liquid does not react on its own, and to increase the shelf life of the material. \*The doctor said this sentence but I didn’t understand, this is extra information from Wikipedia ….
" As a polymerization inhibitor, hydroquinone prevents polymerization of [acrylic acid](http://en.wikipedia.org/wiki/Acrylic_acid), [methyl methacrylate](http://en.wikipedia.org/wiki/Methyl_methacrylate), [cyanoacrylate](http://en.wikipedia.org/wiki/Cyanoacrylate), and other monomers that are susceptible to radical-initiated [polymerization](http://en.wikipedia.org/wiki/Polymerization). This application exploits the [antioxidant](http://en.wikipedia.org/wiki/Antioxidant) properties of hydroquinone".
-The benzoyl peroxide which is found in the powder, when its mixed with the monomer, it will be activated somehow depending on the type of acrylic and then it breaks into free radicals, those free radicals binds to the monomer and initiate the reaction, and that’s how benzoyl peroxide initiates the reaction.
-Memorize the percentages.

Slide 4:
-Additives like Rubber are added mostly to improve the mechanical properties of the material.

Slide 5:
-Compression molding technique is the most commonly used technique.
-Its very important to stick to the ratios.
-Once you mix the powder and the liquid, the material will pass through different stages.. The first stage is the sandy stage, all the powder particles are mixed with liquid, then it passes through tacky fibrous or sticky stage, here the material will stick to the spatula and then it reaches the doughy stage, which is the stage where we can mold and shape the material and the stage where we should use the material. And the last stage is the stiff rubbery stage; here the material is no longer usable because here if the material is stretched it will go back to its original shape so we can't use it. The doctor said they are actually five stages sandy, tacky or sticky, doughy, rubbery then stiff.
-Voids will appear if you exceeded the boiling point of the un-reacted monomer.

Slide 6:
There are different cycles you can use in this technique:
-Long cycle: temperature is 74 degrees not more, because evaporation will occur if the temperature is more than 74 because also the reaction itself is exothermic.
-Short cycle: 74 degrees for 2 hours and then boiling for 1 hour at 100 degrees. This is not enough and reduces the amount of polymerization, and increases the residual monomer and the end product which results in inferior mechanical properties (disadvantages).

Slide 7:
-Injection molding technique: we do the mold, and the acrylic material is made pourable to inject under pressure inside the mold. It results in less polymerization shrinkage and better results but it's more expensive.
-Chemically activated resins/chemically cured/self cured/cold cured those are all the same: The breakage of benzoyl peroxide into free radicals is activated by certain chemicals like tertiary amines in a chemical reaction.
This type is definitely not recommended for denture bases.
-Microwave activated: comparable properties to heat-cured (PMMA).

Slide 8:
-Mechanical reinforcement of resins like fibers is to improve the mechanical properties of the resins.
-Improves radiopacity so that it would be easy to locate broken pieces of the material in the patient's mouth for example.

Slide 9-17:
In the compression molding technique that we are going to do you have to:
-Wear gloves, because the material is irritating, and some people might be allergic to the material.
-You mix the powder and the liquid in a jar until it’s doughy as we said before(should be in the doughy stage to be used), and then you roll it and cut it into pieces and you pack it in the upper half of the mold because it’s the part that has space which was previously occupied by the temporary base, and then you place a polyethylene sheet, then close the flask and place it under pressure(around 3000 Psi), and then all the excess material has to be removed. You have to have excess material, because if there is no excess this will have the possibility that there is insufficient material in certain parts which will result in deficient areas. After that you re-do the trial closures until there is no excess material coming out, then you place it in a special handle and then you put in the oven. Now because it need to be placed for a long time, you leave it overnight for example, and you come back to it the next day because it needs about 12 hours of processing.
Then when you take the dentures which are inside the mold in the flask, you leave them to bench cool for around 15-30 minutes to relieve the stresses and then you try to do the de-flasking.

\*\*Slides Packing and curing 2/3/4/5/6:
\*De-flasking of the denture is very important to be done carefully why?
Because, first of all you have to retrieve the denture safely without breaking them, because there are poures inside them that are hard to locate, and at the same time we need the dentures to stay off the casts, because we need the casts to do laboratory remount. That’s the whole purpose of doing de-flasking.

\*There are different techniques of de-flasking:
-You can remove the lid, you remove the third pour, then you place it in a special ejector, there are keys on the sides of the flask where you can use instruments to open it, and then actually you retrieve the two poures that are surrounding the denture and the cast, of course there are different ejectors that you can use but the important thing is to get the perfect mold that we want.
Sometimes, you can use a hammer if it gets stuck. As we remember, the first pour (around the cast) was mainly made of plaster, so, you can knock on it with a hammer until it breaks, but be careful, we should retain the cast! Of course if you used the isolation(separating) medium and if you have done the whole process carefully, it should be separated without breaking the cast.

So, remove the layer around the cast and then you can make small saw cuts in the plaster with special saws and then you break them off gradually, keep in mind that you can locate the place of the denture because if you removed the third pour first, you can easily locate the incisal edges and the cusp tips of the posterior teeth because the second pour doesn't cover them, if you remember. And in that you'll get the clean denture with the cast (the master cast) and the indices. Now, if you remember, we removed the casts and we retained the mounts.

 By the way, the mountings of the case we have (the patient's) we can actually separate them from the articulator and you can use the articulator for another patient for example if you need it, but now for this case, if we relocate the casts on the mounts, we stick them with a sticky wax or a super glue and you relocate them on the articulator we can actually locate the dentures in the exact same location or place if it was before we do the flasking.

Now, there are so many reasons why you get an occlusal (inaccuracies) on the anterior teeth at the final denture and why do you have to do selective grinding for the denture.

You can refer to the slides to see the mounts and the dentures with the casts, all what you have to do, is to replace the mounts, tighten the screws , stick the master casts to the mountings and do the (Can't hear the word) but I think she meant the "checking".

Those are not all the reasons but they are inclusive of most of the sources of the occlusal inaccuracies in the final dentures and that's why you need to do (can't hear the word), you need to do laboratory remounts and in so many cases you should do clinical remounts also :

1-there could be changes in the state of the TMJ from the time you started till you finished which is not really a very common reason.

2- your occlusal registration or interocclusal records might not be accurate from the start, or the transfer of these records and the mounting on the articulator might not be accurate.

3- the bases that we used might be ill-fitting or instable, this could result in occlusal inaccuracies.

4- changes in the vertical dimension of the articulator.

5- incorrect arrangement of the posterior teeth. (or the anterior).

6- the festooning might have done many changes and damages.

7- failure to close the flask completely during the processing.

8- too much pressure.

9- expansion of the investment material, as we know, the plaster and the stone they expand when they set.

10- polymerization shrinkage of the acrylic that is around 7% (changes of the volume), they don't affect the fit of the dentures but they do affect the occlusal relationships.

So, It's not normal not to have occlusal changes and the need of the selective grinding eventually is definite.

11- heat generation at finishing and polishing.

12- water sorption and expansion of dentures at use.

So, you have to follow certain steps, if you follow them systematically the selective grinding would be easy, otherwise it will be very hard.

This is about the remounting, we call it laboratory remount because we do it in the lab not in the clinic before doing finishing and polishing and before even lifting the dentures away from the casts because lifting them will destroy the cast and then you won't be able to relocate the whole thing on the articulator at the exact same position they were at before the flasking. So, not because it's done by the technician but because it's done in the lab and also to differentiate it from the clinical remount which is done while the patient is in the clinic.

So, you remount, you make sure that there's no groovement (not sure of the word though) and that the indices are in their places and then you follow the steps.

When we took the setting, we took about the balanced occlusion. Here, what we need to have at centric occlusion is that its coinciding the centric relation and that means that the maximum intercuspation should be in the centric relation position because it's the ONLY reproducible position and we need to have even contacts on the cusps of the posterior teeth (the functional cusps) which are the buccal of the lower and the upper palatal, this is at centric. NO touch in the anterior teeth at centric occlusion, there should be positive overbite, overjetbut there should be no touching between the anterior teeth, at eccentric : on the working side we need the buccal touching the buccal and the palatal touching the lingual and on the non- working side we need the functional cusps touching, which are the buccal of lower and the palatal of the upper, any other contacts on the working or non-working side should be eliminated.

Of course, we don't jump on doing the eccentric movements, first we finish the centric, we perfect them and then we move to the eccentric and you have to remember that on the articulator, the mobile part, is the upper part (the maxillary), so if we are doing protrusion we'd be moving the upper to the back, and if we're doing right lateral movement we'd be moving the upper to the left.

\*The WORKING side: is the side TO which the movement OCCURS.

\*The NON-WORKING (BALANCING) is the side in which the movement occurs AWAY from.

And we should keep in mind that the incisal pin should be touching the incisal table all the time.

Now, after you take the dentures and do the laboratory remounting you will notice that (in most of the cases) the incisal pin is lifted upwards, so the first step to achieve is the incisal pin touching the incisal table, that's why we have to do the centric contacts at first, then we do the eccentric, but in order to refine the centric contacts, we have to do both movements on the articulator, why ?

There's principles that we may and may not understand, so memorize them now hopefully we'll understand them later..

First, you restore the vertical dimension (the first step), then perfect and refine the centric occlusal contact, and then work on the lateral movement and then protrusive (protrusive is the last).

Now, the selective grinding should be done using an articulating paper to mark the area of premature contacts, of course the articulating papers come with different thicknesses and different shapes, we can start on the complete denture with thicker ones then we move to thinner down to 8 microns. The most commonly used ones for the complete dentures is the horse-shoe shaped with two colors one is red and the other is blue (on different sides) and it's around the thickness of 62-68 micrometers which is sufficiently accurate with the completely edentulous patients, because with the loss of teeth, they lost the proper perception, they can't locate the high spots and the premature contacts as natural dentitions.Then you have to grind with small burs that are from carbide or the stainless steel ones that we used to trim the Flanges, we use smaller ones, round, especially for the inexperienced people, you have to use small burs because if we used the big ones we'll remove the whole cusps, there are steps where you need to deepen the fossae or the grooves or marginal ridges, so we can't use big ones. You also need a straight hand piece.

Now, to restore the vertical dimension, you have to close the locks of the articulator because we'll only do the centric first, we don't need it to move, and then you use the horse-shoe shaped articulating material and you can bring a piece of paper and write on it that FOR EXAMPLE : at centric, the blue was facing the upper and red was facing the lower. Then you tap the articulator, just opening and closing the articulator at centric occlusion then you loosen the screws and flip the articulating paper upside down and by this you write that in the eccentric the red is facing the upper and the blue facing the lower and then you do eccentric movements, right, left and protrusion. We are still in the centric but we do both. Why ?because if the cusp was high in both, centric and eccentric movements then you have to reduce from the cusp itself, regarding of the fact that it was a supporting (functional) cusp or not, if it's only high at centric occlusion then you can actually deepen the opposing fossa and this will solve the problem. Now after we do the centric and eccentric and changing the colors, we observe the contacts, the cusp (marginal ridge, whatever) if it has two colors then you have to trim off the cusp but not the tip! Because that way you'll weaken the anatomy of the teeth, so you can remove from the cusp inclines, especially if it's a functional cusp then you'll have to trim as carefully as possible, and if it's high at only centric, as we said, you deepen the opposing fossa , you continue this until you eliminate all the premature contacts and you get even contacts on all lower buccal and upper palatal cusps in this case and of course with no contact on the anterior teeth and by that the vertical dimension will be restored because you eliminated the premature contacts until the incisal pin is touching the incisal table.

This is for centric contacts, after you achieve even simultaneous contacts on the functional cusps of mandibular and maxillary teeth, and you have the incisal pin touching the incisal table, you have to do the lateral movements.

Also, on the lateral movements, you have to write down, you move the upper to left so that the mandible is relatively moving to the right, and the contacts should be between buccal with buccal and palatal with lingual (on the working side) . Now, the non-working (balancing) the functional cusps should be contacting (the upper palatal with the lower buccal).

If there are premature contacts of the working side preventing balancing side contacts, then you have to trim from the working side (the BULL rule)we reduce the upper buccal and the lower lingual (the non-functional) if you have the option, and preferably you should trim from the lower lingual for the sake of esthetics.

Again, the BULL rule is mainly eliminating premature contacts of the working side preventing balancing contacts on the other side.

And you actually remove from the lingual inclines of the upper buccal cusps and the buccal inclines of the lower lingual cusps.

You continue the process until you achieve at least some contacts on the balancing side.

Now, on the balancing side if you do the right movement for example and there are contacts on the balancing side but there is no proper contacts on the working side for example, then we have to trim from the functional cusps which are causing the premature contacts (upper palatal or the lower buccal) we reduce from the lingual inclines of the lower buccal and the buccal inclines of the upper palatal until we achieve working side contacts on the other side, and of course we should reduce from both of them if there was plenty of premature contacts but its preferable to do from the lingual inclines of the buccal cusps.

Finally, when you achieve good working and balancing contacts on both sides or both movements, you work on the protrusive relation. As we remember, upon protrusion, you need to have edge to edge contact between the anterior teeth and you need to have balancing contacts between the posterior teeth, there must be contacts posteriorly, at least few. Because otherwise, the denture will drop, will be unstable. Here, there are two conditions, one of them is having premature contacts on the anterior teeth preventing balancing contacts of the posterior teeth, in this case, we need to reduce the anterior teeth (the palatal inclines, you can notice the movement, you can slide the lower teeth on the palatal inclines of the upper teeth until you achieve edge to edge contact OR the incisal edges of the lower teeth) preferably from the palatal inclines of the upper because they are invisible.

Now, if there is heavy posterior contacts with no anterior contacts (no edge to edge relationship anteriorly) then, there is premature contacts, posteriorly, what we do is that we reduce the distal inclines of themaxillary cusps and the mesial inclines of the mandibular cusps, why ?

Because, to move to a protrusive movement from the centric occlusal position, you move the lowers, to edge to edge, so the distal inclines of the upper will become in contact with the mesial inclines of the lower cusps, so we remove from those inclines (in the case of premature contacts posteriorly) until we achieve incisal edge to edge contact.

Eventually, after you're satisfied with occlusion, we have to make a smooth transition from centric occlusion to eccentric movements, you can use a paste a carborundum paste (apply it on the occlusal surfaces of the teeth) and do all the lateral movements and protrusion, it makes the surface smoother and it'll make the gliding movement from centric occlusion to protrusive or lateral movements easily done. This is done after the selective grinding, and then you wash it, and then, just before starting to separate the dentures from the casts (because now the whole relationship will be lost). Later on, because we'll do clinical remounting again, to preserve the the relationship between the maxillary denture with the articulator ( a base to record) because as you know it should not be parallel to the horizontal, it should be following compensating curves, so what we can do to preserve this relation is to place the occlusal table and then make an imprint with plaster, close the articulator, and then when it dries off you can actually use this mold later on if you place the denture and try to mount the upper denture on the articulator for the laboratoryremount. And you preserve it for later on because otherwise you'll not be able to relocate unless we did a (can't hear the word) again, so this way we preserve the already recorded relationship of the articulator for the clinical remount later on to be done.