

# Surveyed Crowns for RPD Abutments



We're gonna talk about surveyed crowns today, and you're gonna start 18 and 21 today. And I

always have to reorient myself on these. Here's our two abutments, and you can see they're very thoughtful and trying to wrap their heads around this new topic.

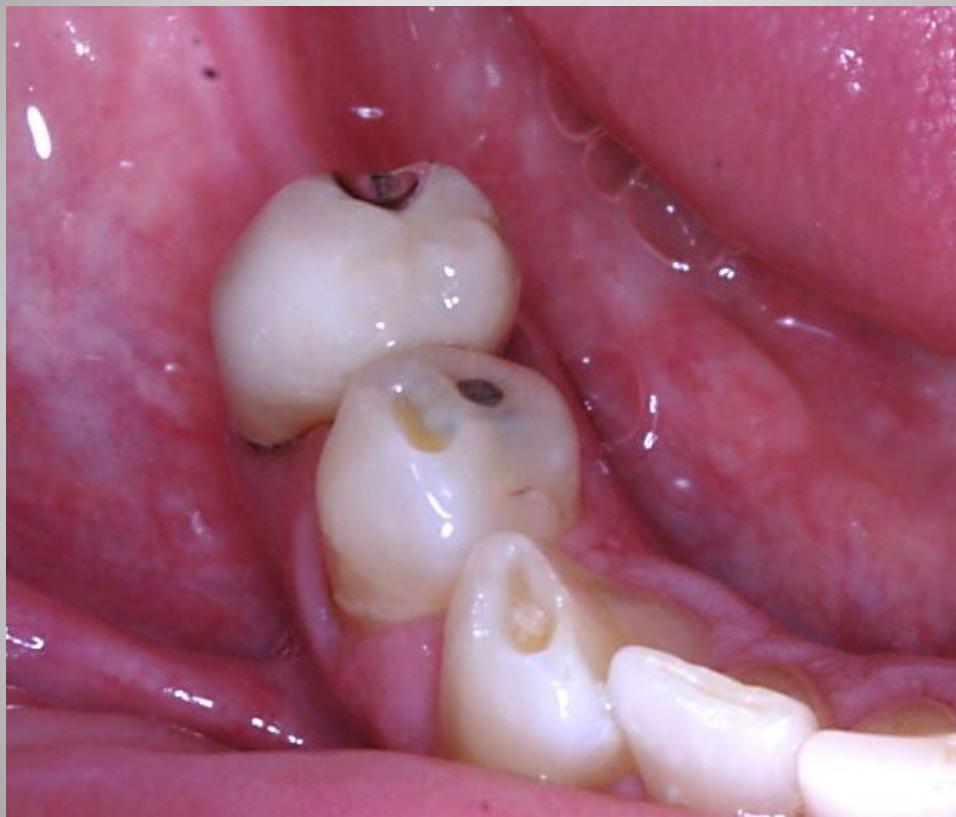


I just want to show you, needs must, we are working with Dentoform, Dentoform teeth, Dentoform Ivorine teeth, Dentoform stone models a lot in this class. But when you get to clinic, when you get to real life, those Dentoform cases do not exist. This is what you're going to come up against, and I hope that you can, it's not just this tooth that's the problem. Here you can see that it looks like it's super erupted, but is it really super erupted? Yes, it is super erupted, but has it super erupted from its PDL and from its bony home? It's pulling the bone with it. We've talked about dentoalveolar extrusion before. To me, super eruption is truly the tooth erupting from the bone, but a lot of times it will instead pull the bone with it. Now, that means that the tooth still. Maybe periodontally, it doesn't look so bad, but it creates all other kinds of problems besides just whether this tooth has a good bony substructure or not. When teeth are lost in here, I think that this is the third molar, two molars were probably lost here, but you wouldn't think that that's such a big deal, but it has caused the collapse of this entire left side of the patient. And when teeth are lost and we don't have the normal relationship, **we don't have a static environment. It's very dynamic.** The body keeps responding, and actually this, the **body was trying to maintain occlusal contact** here. So it was trying to maintain a stop there, even though there was nothing for it to stop against. So the body keeps trying to accommodate, and we get things like this. Can you see that we've got a very, very deep bite here, lots of vertical overlap? And we can see that this of course, is not a good situation. We're starting to have a periodontal problem here because this tooth is mesially drifted and we definitely, this should look very familiar, this should be what your number 18 looks like in your case that we're working on now.



Looking in the mouth, here you can see, this happens a lot. We will lose premolars or molars in the posterior on the mandibular, and we know that the mandibular teeth already tip lingually. I think I've said that ad nauseam, so that you should remember that, but **when we have nothing in front of them and they start to move, they tip mesially and they further tip lingually**. Can you see that this one's really tipping lingually? So when things start moving, unfortunately. So when 18 starts to have a mesial drift, unfortunately it doesn't drift bodily standing up straight, it tips. So not only do we have a problem with the space here, but now we've got a problem with the slant of the tooth. And we talked about that a little bit last time about when we start prepping this, **you don't prep with your burs parallel to the long axis of the tooth, you really want to prep it standing up straight** the way we want it.

So here we've got a great example of molars that are doing things we don't like them to do, and we want to think about doing an RPD. Here you can see. What do you think **this** is here? It's a surveyed crown with a DO rest seat. So this is porcelain, here you can kinda get a hint of the margin down here, and here is your DO rest seat in metal, which should be, I heard this in the elevator on the way up, 1mm beyond where the rest is going to be, so that it's sitting all in metal.



And there you can see it a little bit more clearly.

# Prospective abutment teeth may need surveyed crowns.

- **Malposed teeth.**
- **Large or inadequate existing restorations.**
- **Caries.**
- **Endodontic therapy.**
- **Unsuitable contours.**
  - Not all undesirable contours can be dealt with simply with enameloplasty.

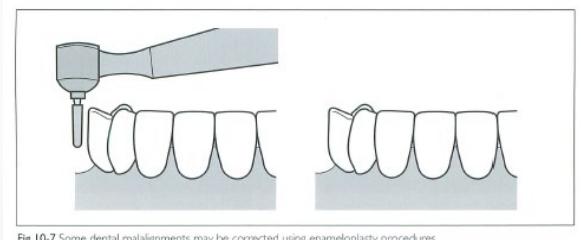


Fig 10-7 Some dental malalignments may be corrected using enameloplasty procedures.

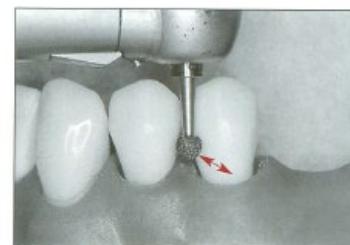


Fig 10-36 A gentle depression is prepared using a round diamond bur in a high-speed handpiece. The bur is moved in an anteroposterior direction (arrow).



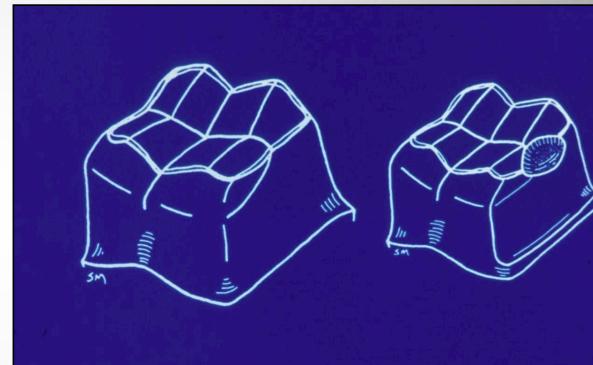
Fig 10-37 The preparation is smoothed using a carbide-impregnated rubber point in a low-speed handpiece. Care must be taken not to obliterate the depression.

Okay, so when we're talking about abutment teeth, they have, besides just the normal requirements or indications for a crown, sometimes **abutment teeth, we require, we're asking a little bit more of them than just a normal tooth in the arch**. Sometimes the teeth are malposed and such that we need to straighten them up, like number 18. Sometimes they have. If you want, if you have a posterior abutment on a premolar and it's, you want to do a wrought wire on it, but it's got a large DO amalgam or it's got a DO composite, a large DO composite, **you need to think about doing a surveyed crown**. If it's got a large restoration, we're asking that tooth to provide support somewhere for the rest seat, and we know that the retentive clasp also puts some stress on the tooth. So if there's any question about it, it's better to go ahead and do the surveyed crown and not have the tooth fail after you've done the RPD and then you try to explain it to the patient. You know why? Now, we have to go back and do a surveyed crown and do a new RPD.

Obviously, if we have tooth with a lot of caries that would require a large restoration. Endodontic therapy, you've covered this, right? About teeth with root canals, they're more brittle and they require coverage. Right? Okay, so if you have a tooth that's had a root canal and you're asking it to be an RPD abutment, that's pretty straightforward. Now, we've talked about adding undercuts and adjusting survey lines. If you don't have an undercut, you can do the dimple, we've talked about that. And we've also talked about survey lines, what the requirements are besides just guiding planes on the distal or mesial of a tooth, but we also know we've got reciprocation, that we've got a lower survey lines in the shoulders for suprabulge retainers. And you can't always deal with all of those issues just by enameloplasty. Sometimes the tooth is more malposed than that, and so sometimes we need to do a surveyed crown to really change what our contours are. So that's one of those things that in your designing RPDs handout where I talk about the clinical issues you need to look for. A lot of those things say now we need to do a surveyed crown.

# Surveyed Crowns: Preparation

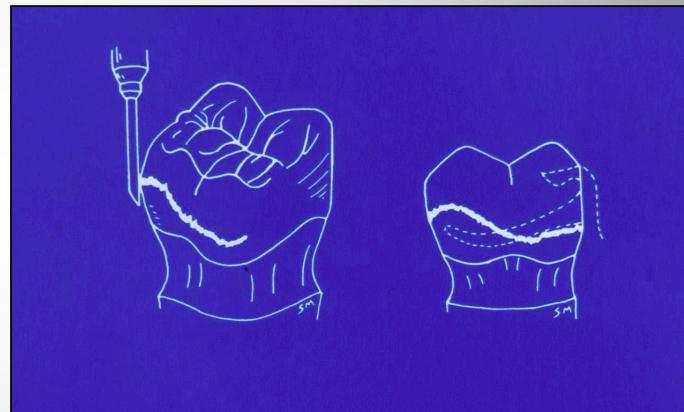
- Allowances in crown preparation must be made for guiding planes, ideal survey lines, and particularly adequate reduction for rest seats.



Okay, so let's talk about surveyed crown preparations. So the ones we're going to be doing in class, I told you that you should just think of them as a full gold crown veneer. Nothing fancy, no PFM's or anything, just cut it for a full gold crown with a chamfer all the way around. And of course, that may or may not be clinically what you need, but **you start your gold crown preparations after you've done a preliminary RPD mouth prep.** And I think we talked about that. We talked about that last week so that everybody should understand that. You wanna go ahead and put the rest seats in, you're gonna go ahead and put a guide plane on, even the mesial of 18, even though it's gonna be really short because the tooth is so tipped, because that's gonna help you orient your crown preparation. I'm gonna show you what happens if you don't do that first. Now, if this were just a full gold crown prep, this looks fine. If we wanted to do a rest seat, and in my opinion, this is not a good picture. **In your crown prep, you don't wanna see stark, well-defined edges of a rest seat in your crown prep. You're just gonna lower your occlusal reduction here to account for carving that rest seat in the wax.** So this is from a book, I don't think it's very good. So you have a deeper crown preparation here, but you don't wanna see this sharp edge here. Why do you think? Because if you're carving your wax and you get a little bit wide, you're gonna hit the tooth there. So this is just a very subtle further reduction here, not a well-defined demarcated one.

# Surveyed Crowns: Fabrication

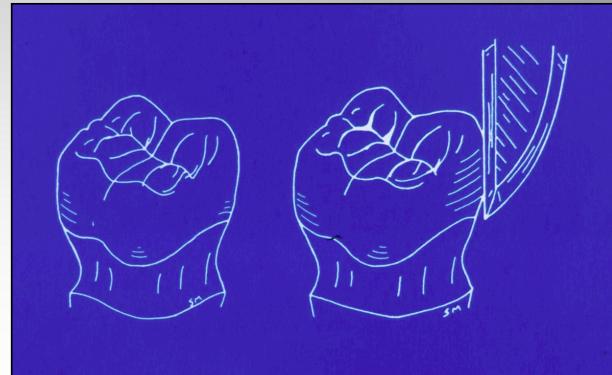
- Full contour wax up.
- Height of contour marked, and adjusted in wax.
- Undercut of 0.010" or 0.020" in correct location (usually at the mesial or distal line angles).



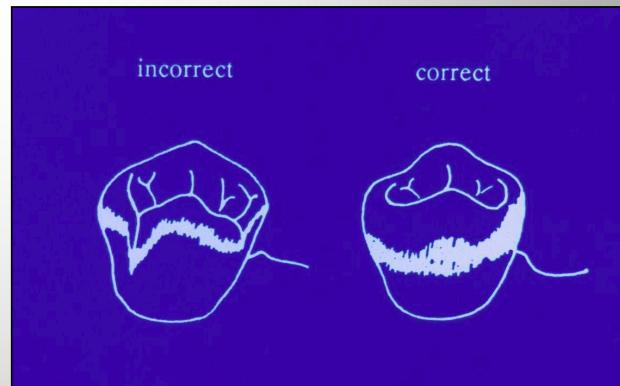
So your crown preps are gonna be just normal crown preps, 18 is gonna be uprighted. We talked about that. You're gonna hold your axial reduction bur parallel with 21, not along the long axis of the tooth of 18.vWhen we're doing our wax-ups, you're gonna be waxing right to the Ivorine teeth. We're not gonna make an impression and pour up die cast or anything like that. Don't put die lube on the Ivorine teeth, we don't wanna take the wax patterns off. We just want to see the wax pattern on the cast on the surveyor, with powdered wax on and the survey lines dusted or with the analyzing rod, we're gonna put powdered wax on, we're using dark wax, and the analyzing rod will mark a survey line in the wax. Okay, that's how we're gonna grade them. So obviously, here's your wax pattern. We've got a guiding plane here, it looks straight from the lateral view. If we've got a cast circlet, we want the shoulder. The survey line for the shoulder is low. And then we want this build up back here, so we have an undercut, depending on the undercut is either one stripe or two stripe, ten-one-thousandths of an inch or twenty-one-thousandths of an inch. We're not doing wrought wires on this ones, so **both undercuts that you're gonna be waxing are gonna be ten-one thousandths of an inch.**

# Surveyed Crowns

- Guide planes refined using a wax knife in the surveyor.



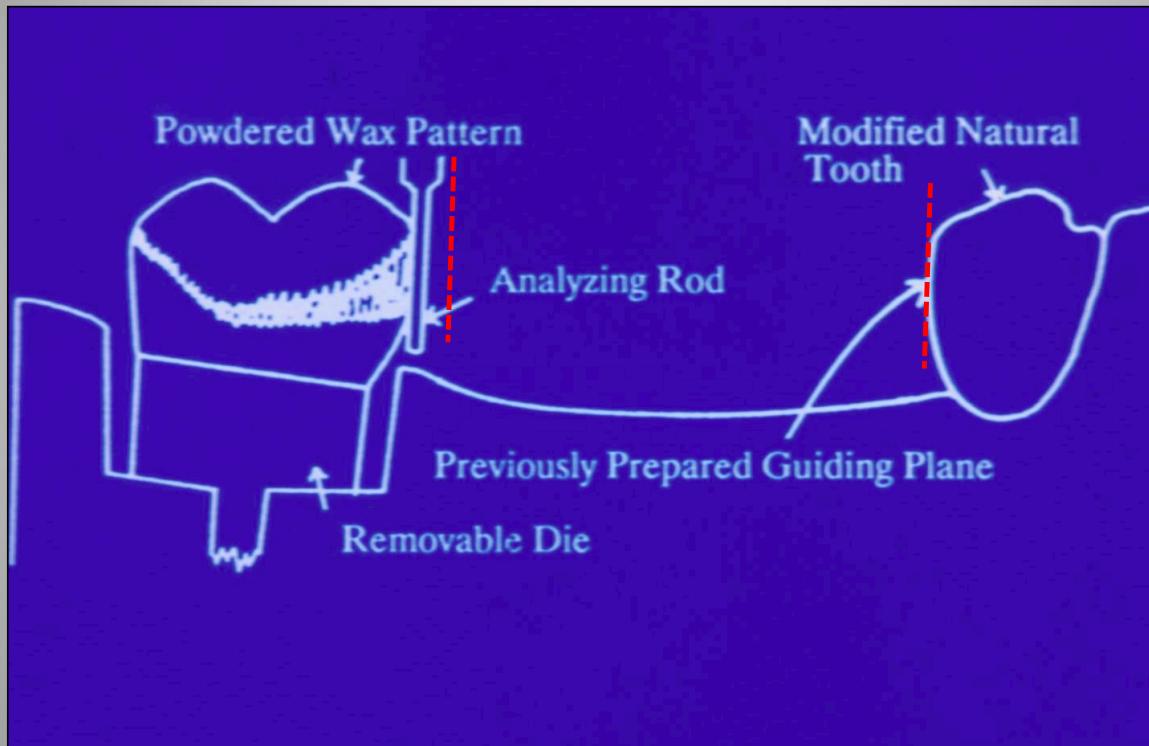
- Parallelism of surfaces with other guiding planes in arch such as lingual GP for lingual clasp.



Now, you're gonna use guide plane, that thick black, guide plane, a wax knife to cut your guide plane, the thick black tool with your surveyor, and you're going to use it to do your guide planes. So we're gonna do a guide plane on the mesial of the molar, on the distal of the premolar, and

we're gonna do a lingual guide plane on the lingual of the molar as well. And I'll talk a little bit more about how to use that in just a minute.

## Surveyed Crowns

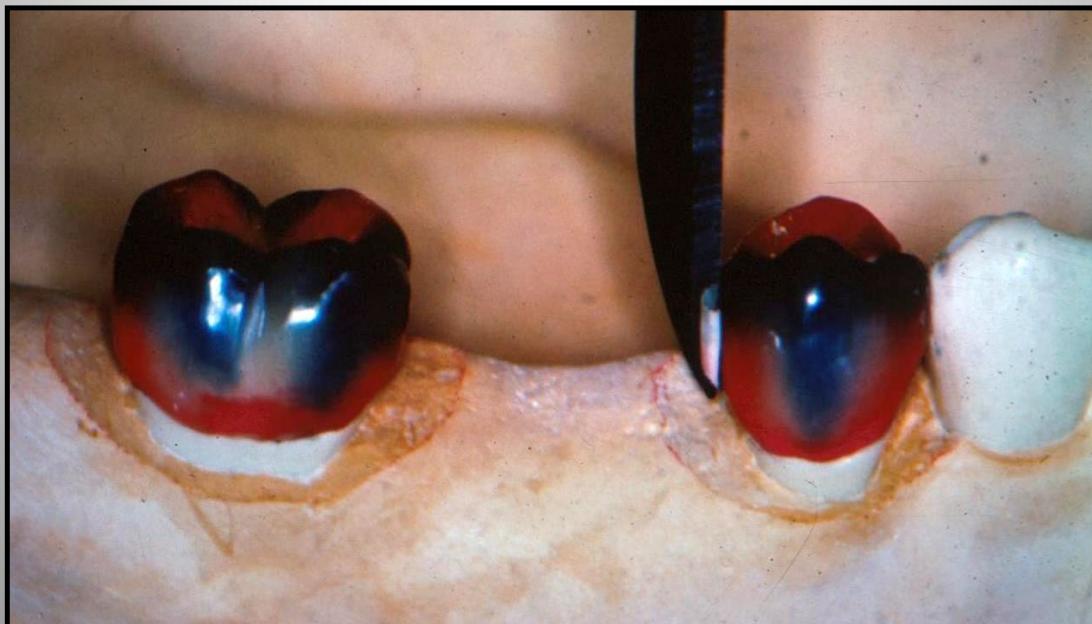


So while you're waxing, you're gonna put your cast on your surveyor and line it up, and then the mesial of this is gonna match the distal of the premolar, plus it's gonna match the other guide planes that you've already prepped. **It's very important that the guide planes on the teeth that aren't receiving crowns, that they are already cut, and that while you're fabricating your crowns, it's easy to make the wax match the other guide planes that have already been cut**

in the arch. I'll say it's easier to do that than to cement crowns and then try to cut guide planes in the rest of the arch on the natural dentition. I hope you can appreciate that.

## Surveyed Crowns

- Guide planes refined using a wax knife in the surveyor.
- Parallelism of surfaces on opposing sides of the dental arch.



So this is a little bit different wax knife but it works just like yours, and you can see that it's cutting a little bit of wax here. The wax we're gonna be using is dark, it's dark, dark blue, so that when we put the powdered wax on it and then move the analyzing rod around, those survey lines will be evident. The wax is not ideal, it's a little bit brittle, so if you try to carve too aggressively, it's going to break chunks off. So when you're carving, do it delicately and just do a little bit at a time, and especially with the knife. Has anybody ever used a microtome for microscope specimens? You just shave a little bit off. Same thing here, you just shave a little bit off. If you try and get your guide plane done in just like two swipes, this will chunk off and you'll have to re-wax. So this is in the surveyor, and this is on the table. So that, this is automatically and then when you turn around and do this one, these are going to be lined up. These are gonna be parallel, and hopefully, when you put your cast on the survey table, you oriented it so it also matches, it's gonna be parallel with your other guide planes.

# **Surveyed Crowns**

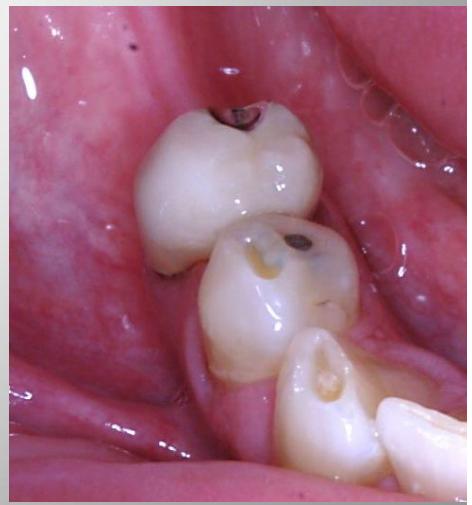
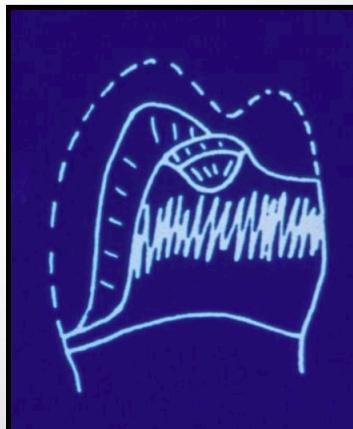
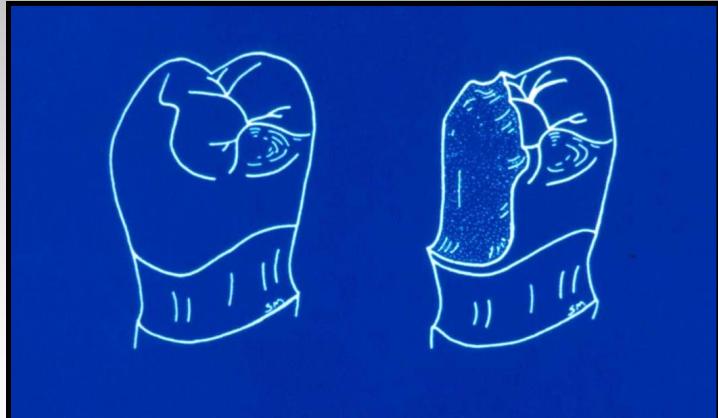
- Once wax pattern fabricated, casting is done using regular technique.
- Cast crown then returned to master cast, and re-surveyed at the correct tilt, verifying
  - Correct undercut depth and location
  - Rest seat positivity and occlusal clearance
  - Parallelism of guide planes, and
  - Appropriate survey lines.

Once surveyed crowns, once the wax pattern is fabricated, casting is done using a regular technique, and then you put the cast crown, return it to the master cast, and you want to look and make sure that the critical aspects are still there, that you got what you want. What are the aspects? You've gotta have undercut depth, you've gotta have an undercut, your retentive undercut, the rest seat is positive, and if you have opposing dentition, if you've got an opposing denture, it's not quite so critical, but if you have natural dentition, you've gotta make sure that your occlusion is right, and that it's not gonna be in hyperocclusion, parallelism of the guide planes and appropriate survey lines.

Now, it happens that just two weeks ago in clinic, we had students that had number 29 and 31 surveyed crowns, there's an edentulous space in between, and they wanted to cement their surveyed crowns. And they, before the appointment, they came to me and they said, "We may have some problems." So we looked at it, there was an MO on 31 rest seat, and there was a DO rest seat on 29. 29 was a PFM, and we had, it was in metal, but neither rest seat was positive. That means it was a inclined plane. It didn't hook and it wasn't deeper on the inside. And on 31, we got a gauge and measured how thick was, it was less than a millimeter thick, so we couldn't take a bur and just deepen it to make it positive, so that's a problem. There was a cast circlet, a retentive clasp on the buccal planned, but the MO survey line was really high, so we would have had to cut the metal down and then repolished it to lower the mesial buccal, I wish I'd taken. Why I didn't take a picture, I don't know. So that was wrong, and the lingual survey line was almost up to the occlusal table of 31. So the survey lines were wrong, the rest seat was wrong, on 29 we could have deepened the rest seat ourselves and gone ahead and cemented it, but the distal buccal survey line was too high, we would have had to adjust that in porcelain and then repolished it, which is no fun. Repolishing porcelain is no fun. So those crowns got sent back to the lab and I hope you can appreciate the fact that when you get anything back from the lab, you don't just put it on the shelf and take it out and look at it for the first time on the day of the appointment for the patient. Because the patient came in, and we did nothing for the patient because we had to send it back. You should always look at what comes back from the lab. Labs have very fine technicians and what would we do without them? But you cannot rely on what you get back to be correct and what you asked for. And I looked at their lab slip, it was fine, they asked for the right things, but the lab didn't understand or for whatever reason, okay? **So surveyed crowns are, there's a lot of requirements and you don't want to cement them and then when it comes time to survey your final master cast, there's no undercuts or there's no guiding planes or there's no positive rest seats. The patient pays extra for surveyed crowns, so it takes more work on your part to make sure that it's right.**

- PFM's:

- Rest seats and guiding planes should be in metal.
- Metal borders of rest seats extend at least 1mm beyond the borders of the proposed rest.
- PFM junction not at the point of the opposing occlusal forces.

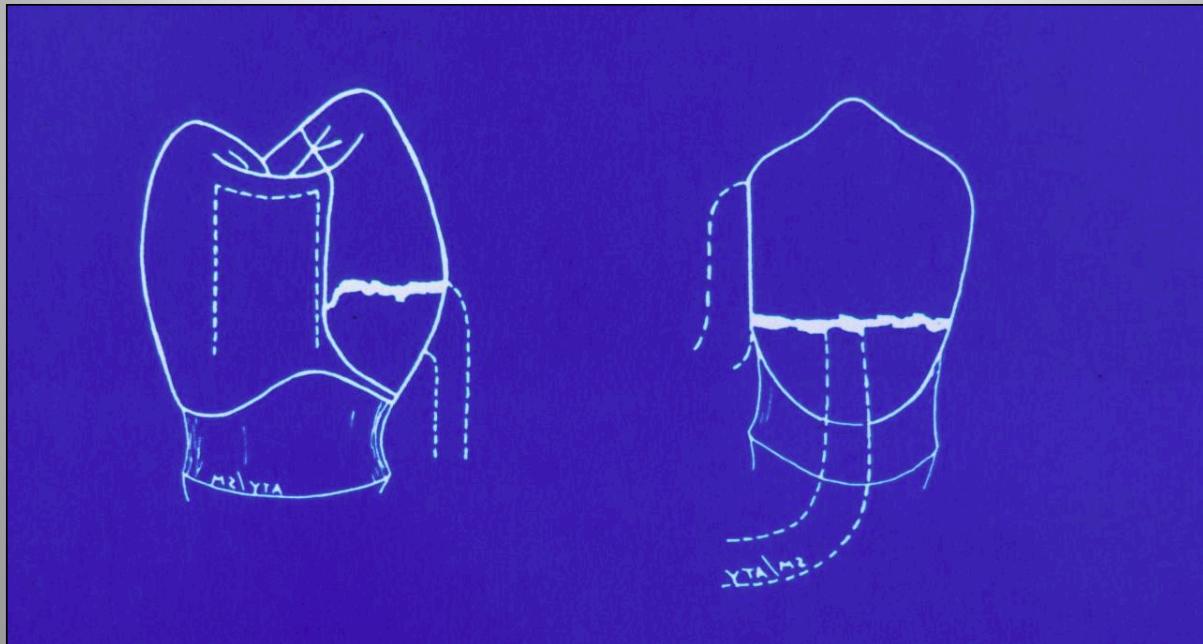


And so what we did is we wrote up a pretty detailed lab slip about what was wrong, and I asked the students to make diagnostic wax-ups of the two crowns just like you're doing, in blue wax with the powdered wax, surveyed to send to the lab this time. And I think **diagnostic wax-ups should always be sent for surveyed crowns**, just like you're doing with this case. So it's hard enough to communicate with the lab and if you're just using words, it's really hard. Something, a model to hold in the hand is always better. Okay, that was a long dissertation on that.

Okay. Rest seats. This just shows PFMs, you do a full wax-up and then you cut back for the porcelain. Here you can see the rest seat, so this is leading the rest seat in metal and also the guiding plane.

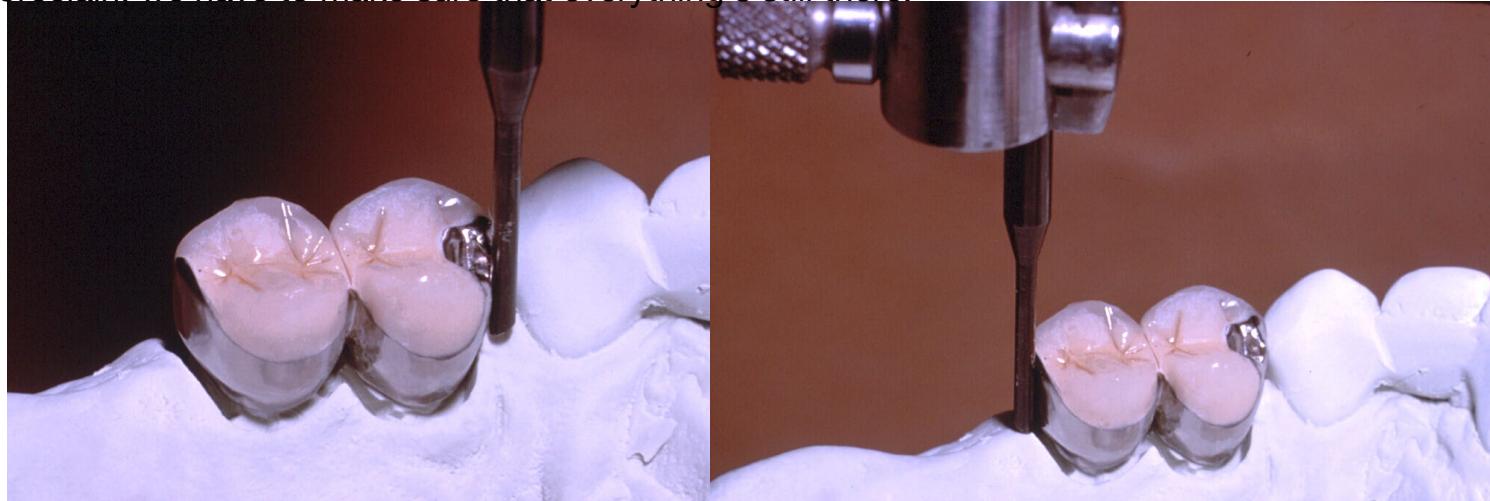
# Surveyed Crowns

- After the ceramic has been added, re-surveyed to check depth of undercut.
- Care with finishing and polishing.



And then sometimes in that porcelain, you have to re-check the survey lines again, they might

have been there in the metal but after you did the cut back and the lab did the adding the porcelain, we have to make sure that everything's still there.

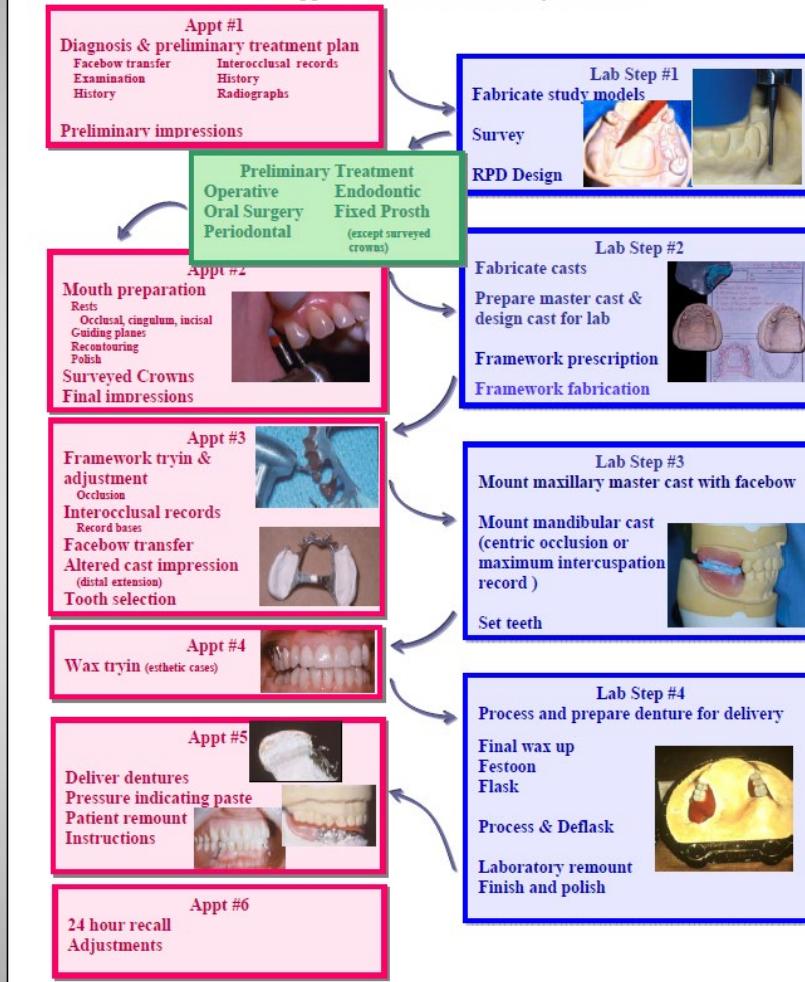


Okay. These are kinda weird pictures because we've got luted, and there really should be a rest here but because these are one piece, I guess. But please just look at what I'm talking about, the metal and where the rest seat is. The rest seat is in metal and then we've got metal here and metal for the guide plane, you can see this metal here. So can we do, for all porcelain, CAD-CAM? No. Will we be able to do it in the future? I have no doubt we will. But **for right now, the policy is if you're doing an abutment for an RPD and you want porcelain, it needs to be a PFM and we're planning the guide planes and the rest seats in metal.**

# **Before starting a surveyed crown... Must do other (RPD Mouth) preparations first!**

Before starting a surveyed crown, you must must, must, must do other RPD mouth preparations first, okay? What in particular are we worried about, what rest seats, what rest preps? Guide planes.

## Removable Partial Dentures: Clinical Appointments and Laboratory Task Sets



So here, this is our flow chart and here's RPD design, it's just one little line there, but it's this huge subject. But anyway, we go on and then we take care of everything else, any other issues and treatment all has to be taken care of first. Then we do the mouth preps and then we do the surveyed crown. Surveyed crown is the last thing, because everything has to work together and it's a lot easier for you to do the mouth preps and ask the lab to match the crowns to what's in the mouth, rather than you just ask the lab to make the crowns and then you try to go back and adjust guide planes to fit the crowns. You see that that's really hard? Okay. It's hard enough.

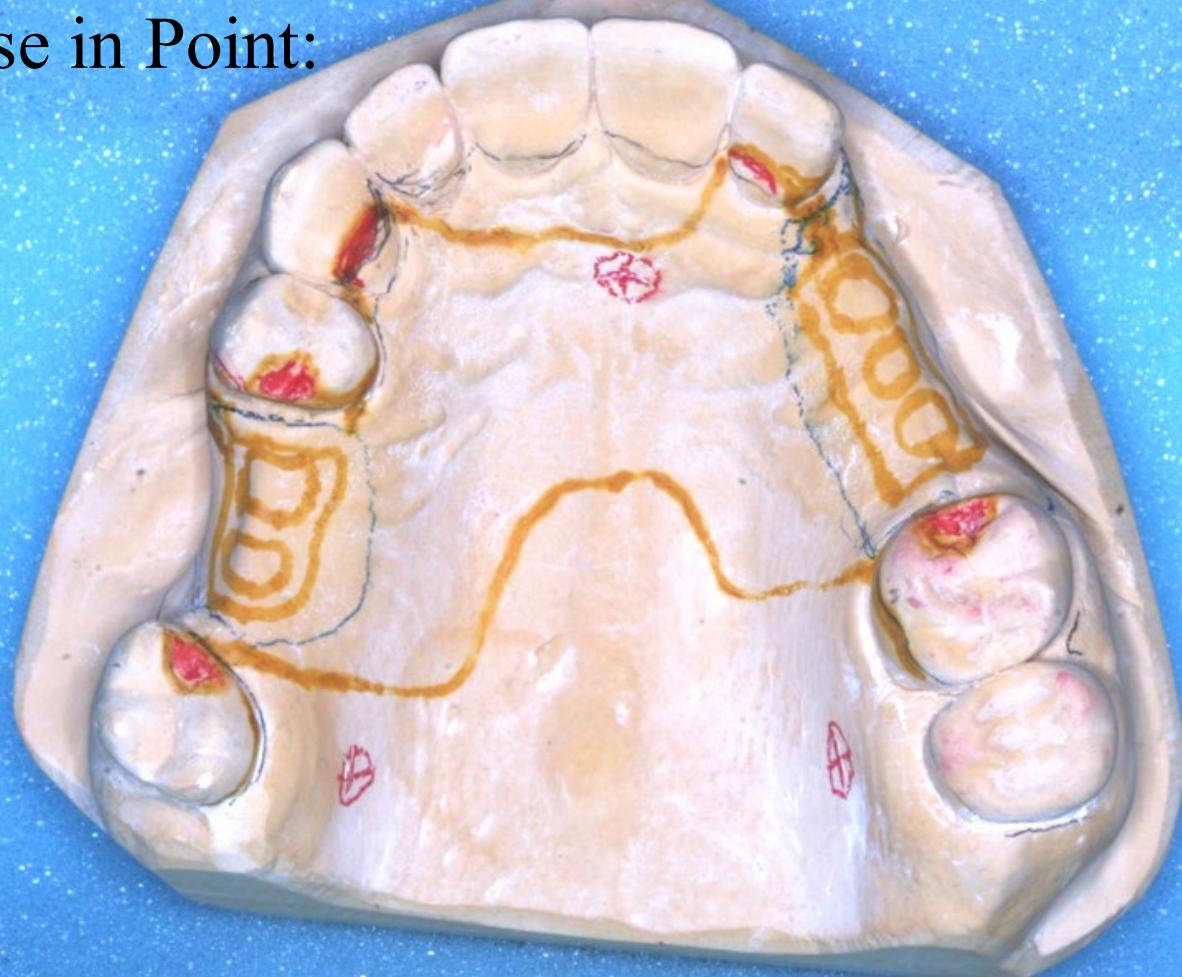


If you don't,  
there are  
consequences...

If you don't, it may not get you the first time but it will eventually, and you will fall off a cliff,

because I have this case to show you.

## Case in Point:

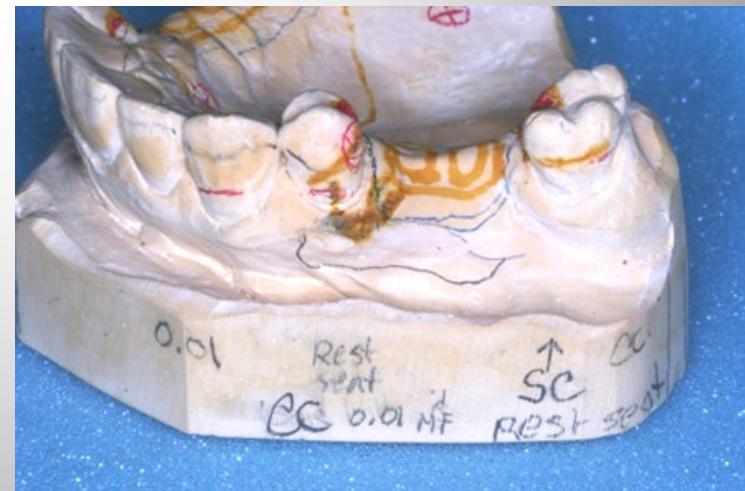


This is a case from the clinic several years ago. It's a Class III Mod I and we have two molars, a

pre-molar and a lateral.



- Cl III RPD, mod 1.**
- 4 guiding planes**
- Surveyed Crown #2**
- Nicely prepared study model.**



And what I wanna show you is that we needed a surveyed crown on number two, and I think this is

nice planned. I'm not sure what's going on here. It looks like a circlet and an I-bar, but let's just talk about number two. Okay.

## VIEW FROM MESIO-BUCCAL



**Design requirements for buccal retentive clasp:**

- low MB SL for shoulder
- high DB SL for retentive undercut

You can see that number two, these are pretty well lined up but you can see that number two

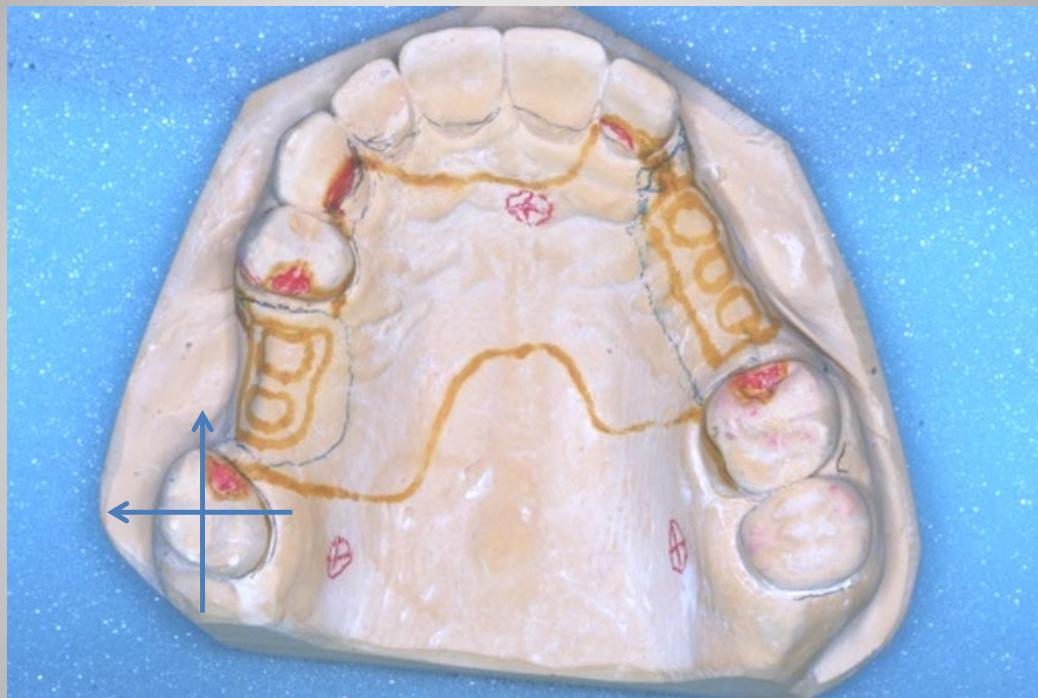
looks different. If we want a circlet clasp here, we want what? A shoulder [here](#). So we want a low mesiobuccal survey line, we want an undercut back [here](#).

## VIEW FROM DISTO-BUCCAL



But this is what it looks like, I hope you can appreciate the fact. Again, maxillary molars tilt buccally, and this has had a little bit of mesial drift, so it's drifted mesially, and the buccal tilt is more pronounced. So whichever way they're tilting when they start drifting mesially, they get more that way.

## OCCLUSAL VIEW—PATH OF INSERTION, PERPENDICULAR TO OCCLUSAL PLANE

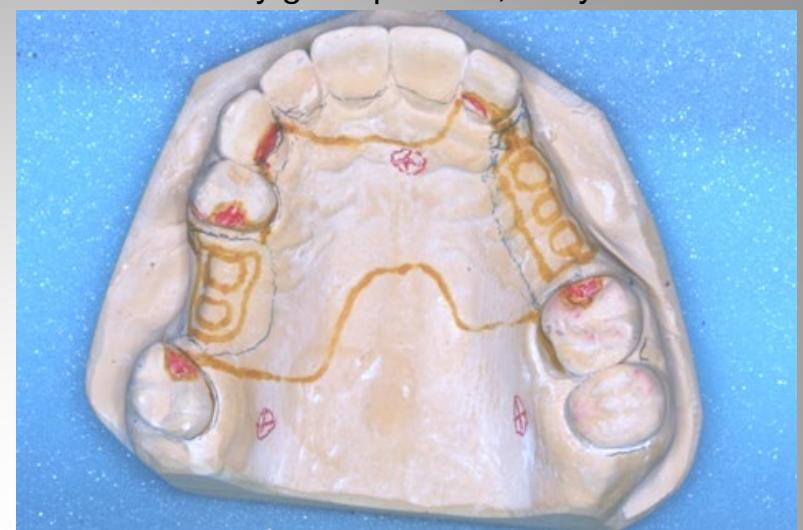


Long axis of 2 is not parallel to path of insertion. It has shifted mesially and buccally.

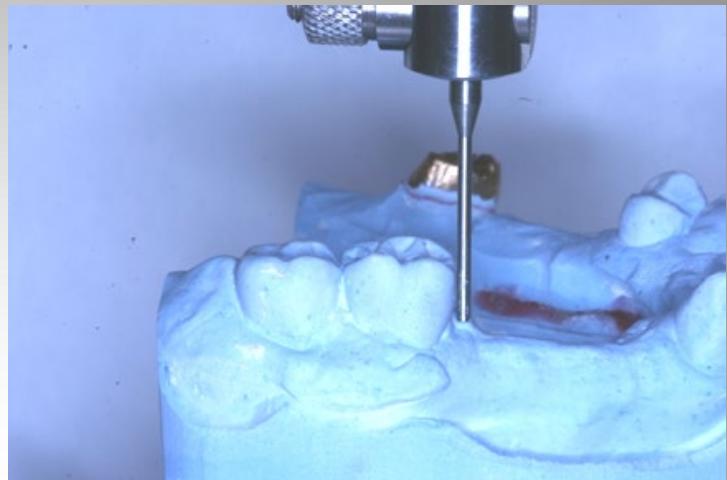
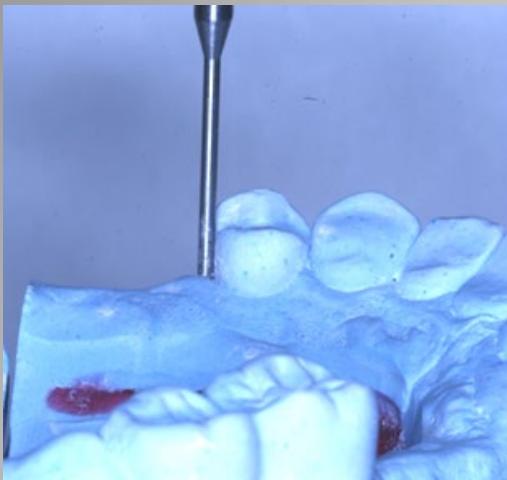
So the long axis of two is not parallel to the path of insertion, not parallel and not perpendicular to the occlusal plane anymore, whereas these still are in relatively good position, but you can see that this one has kinda tilted this way.

- In this case, no RPD mouth preparations were placed on other teeth in the arch.
- Specifically, guiding planes on 5, 10, and 14 should have been prepared before crown started on 2.
- A guiding plane on 2, parallel to other guiding planes, before starting the crown preparation would have ensured proper orientation.

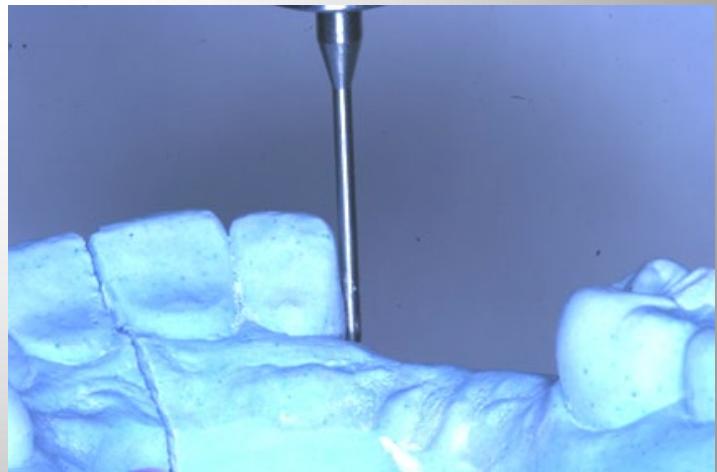
However, 2 was prepped according to long axis of tooth.



But in this case, no RPD mouth preps were placed on the other teeth in the arch. Specifically, this guide plane is gonna have to match this guide plane, this guide plane and this guide plane, and these teeth are fairly stable. This tooth has moved, so its long axis now is kind of skewed, so we should have already prepped this guide plane, this guide plane, this guide plane, and then cut our crown prep according to those guide planes. However, two was prepped according to the long axis of the tooth.



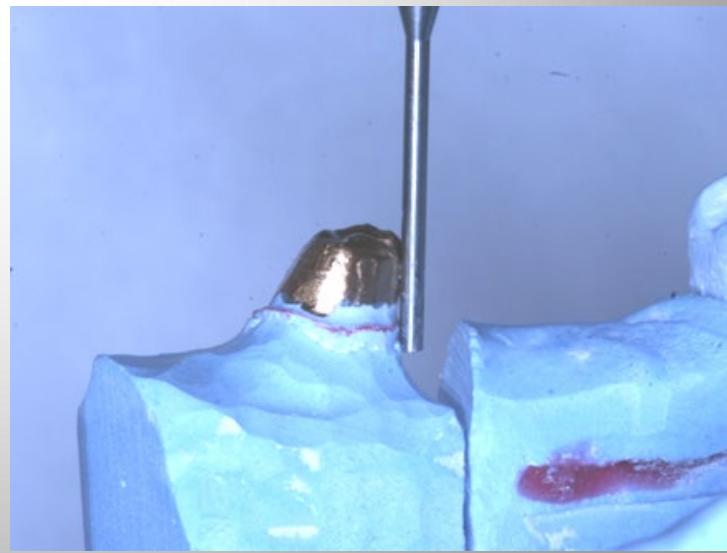
- Surveyed crown has been prepared and this is the master die cast for crown fabrication.
- No guiding planes have been prepped.
- No path has been developed yet.



Okay. guide planes have been prepped, and here you can see the prep on two.

- Orientation must be determined by analyzing all abutments needing guiding planes, and presence of retentive undercuts.

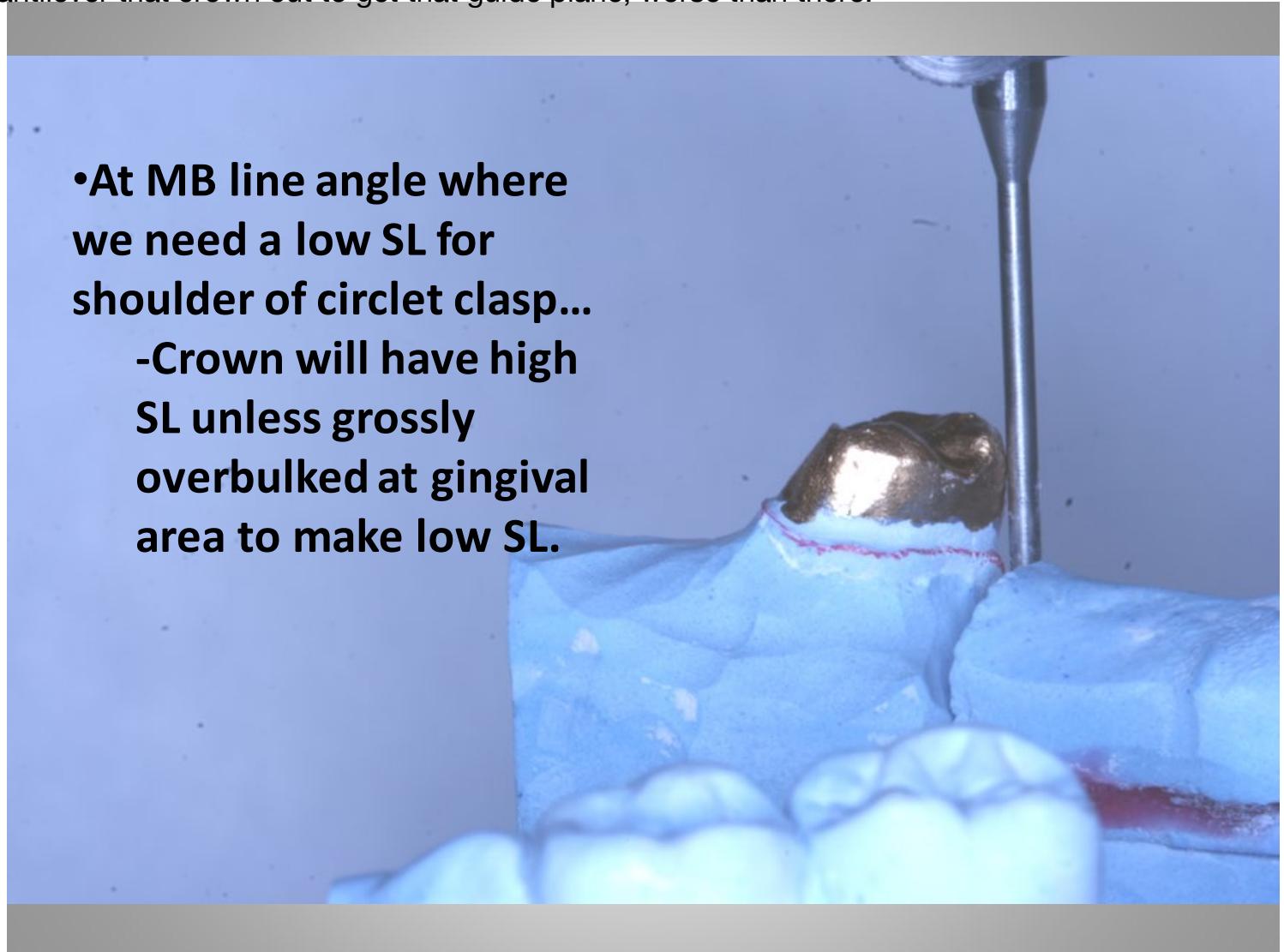
- At orientation determined by other abutments, preparation has been done at wrong angulation.



So we need a guide plane along this parallel, and you can see that this prep is oriented this way.

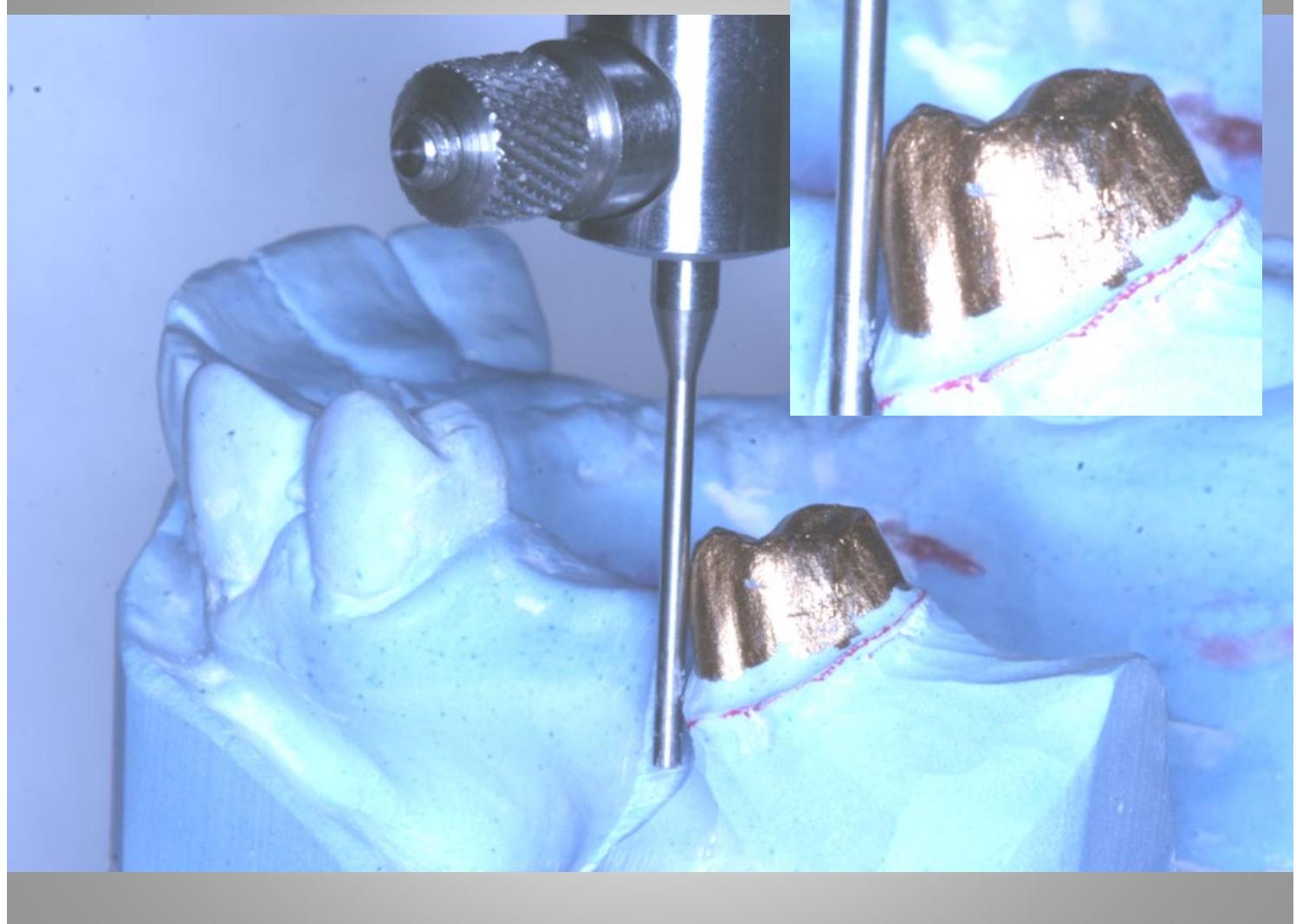
We've got no room for a guide plane. It would have to be bulked out here. You'd have to really cantilever that crown out to get that guide plane, worse than there.

- At MB line angle where we need a low SL for shoulder of circlet clasp...
  - Crown will have high SL unless grossly overbulked at gingival area to make low SL.



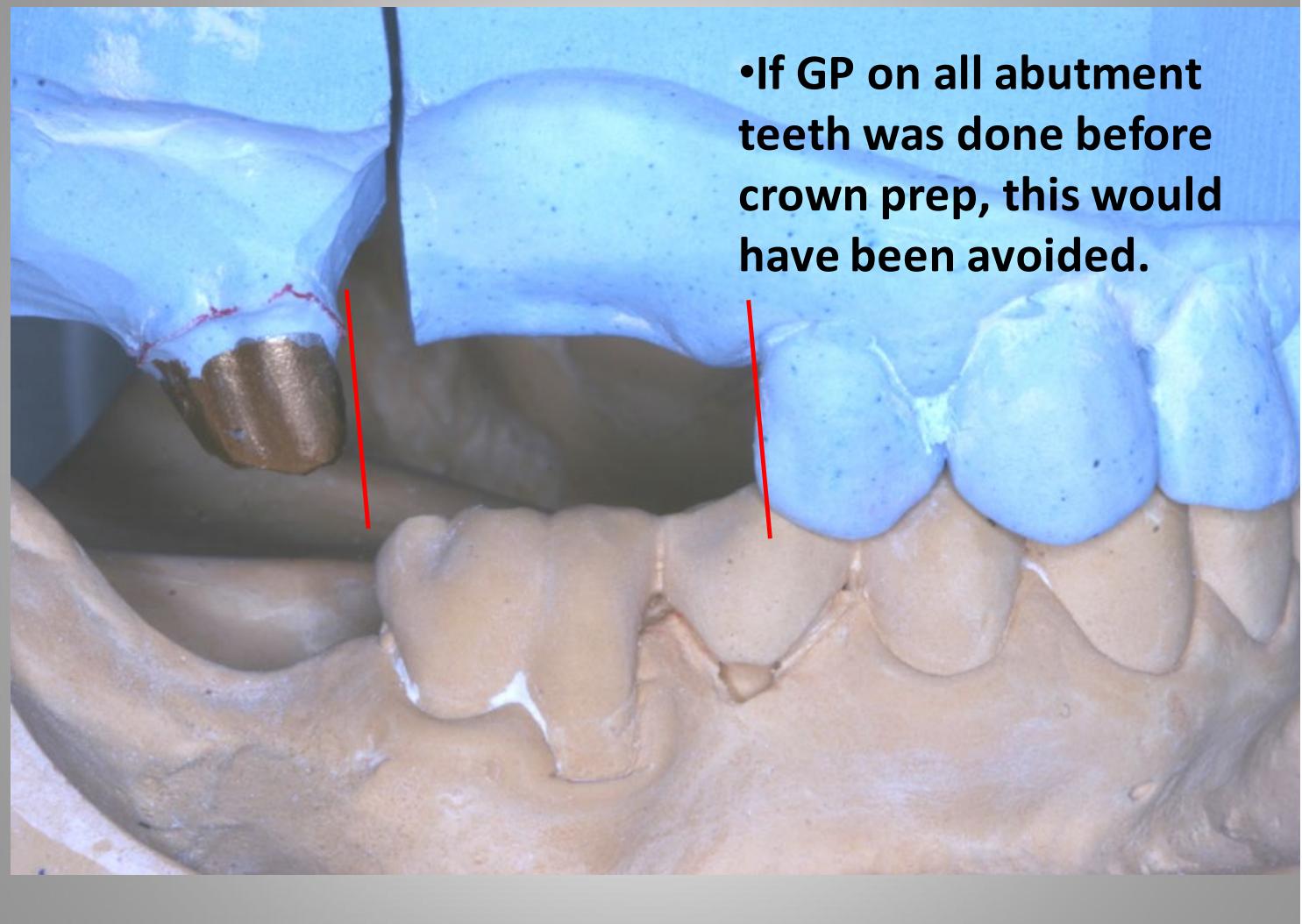
Remember, mesiobuccal, we need a low survey line for the shoulder of the clasp. And look, it is

completely displaced there, you would have to cut, you would have to bring this crown way out like this with a low survey line and then bulk it out like this, so it's grossly not cut according to what the needs are of the crown.



What the needs are for it to be an abutment. So unfortunately, this crown prep was done and

impressed and ready to send off to the lab, but then when we get down to filling out the lab slip for what is required of it, all of a sudden we see that the crown prep is not gonna work. So you're gonna have to go back in.



- If GP on all abutment teeth was done before crown prep, this would have been avoided.



So you may think things are going just fine, but don't look over your shoulder because it's gonna

get you.

**DX wax up for  
all RPD  
abutment cases  
should be done.**

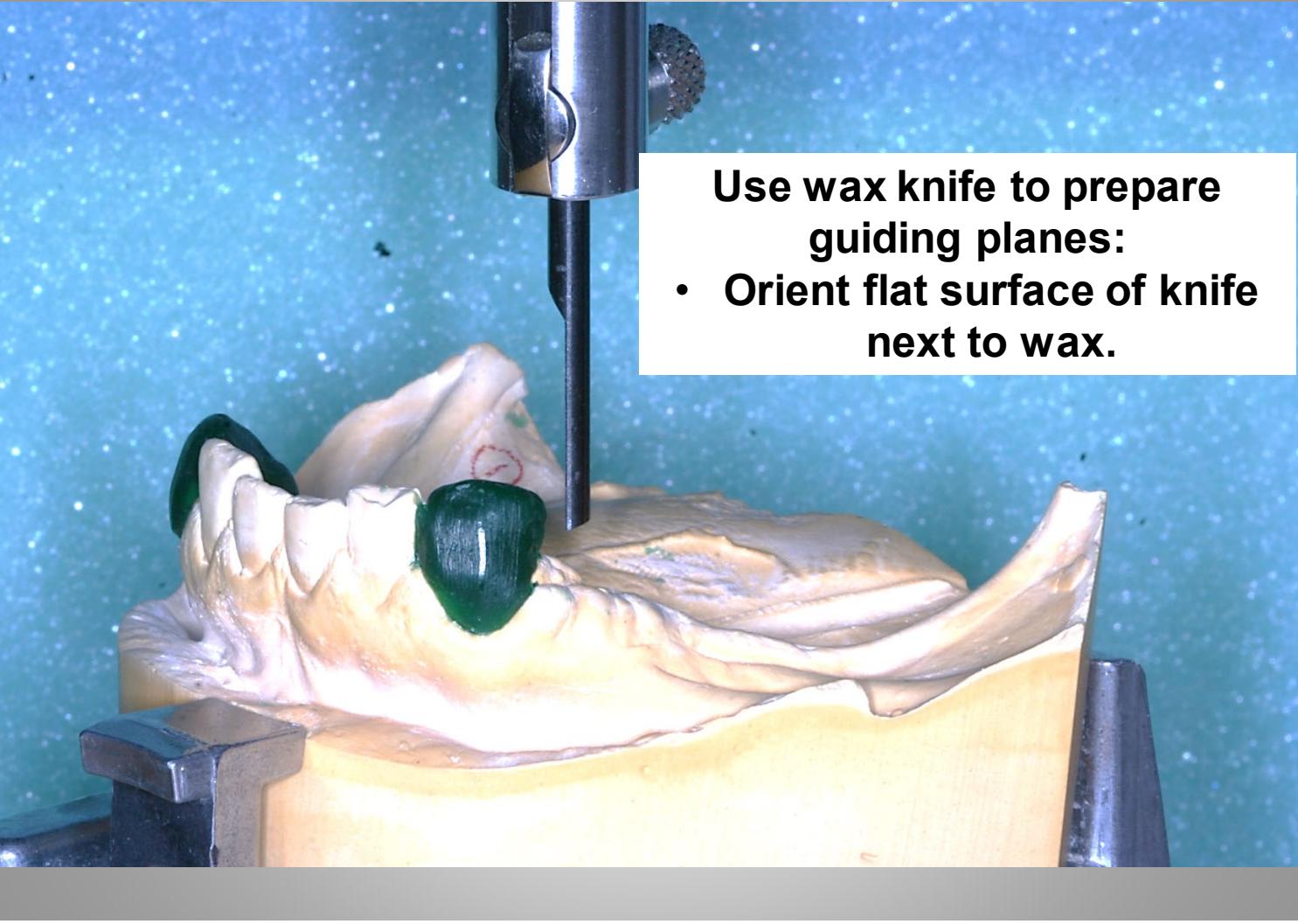


**Diagnostic wax up for surveyed  
crowns 22 and 27:**

- do full contour waxed pattern.
- on cast at specific orientation, tripoded.



Okay. I wanna show you another case, where rightly so, we requested the student do diagnostic wax-ups before he even started the crown preps, because you can work this out if you know what you're, if you have a clear view of what your final product's gonna be like, it may help you with your crown preps as well, as well as showing the lab exactly what you want. This is a nice green wax. It's nicer but we don't have it anymore. Okay. So we want a diagnostic wax-up, we want surveyed crowns on 22 and 27, First, you do just a full contour of, and this is just a duped cast from a diagnostic cast, you do a crown prep on the stone, and then we're just gonna add wax and we're gonna see what exactly we want.

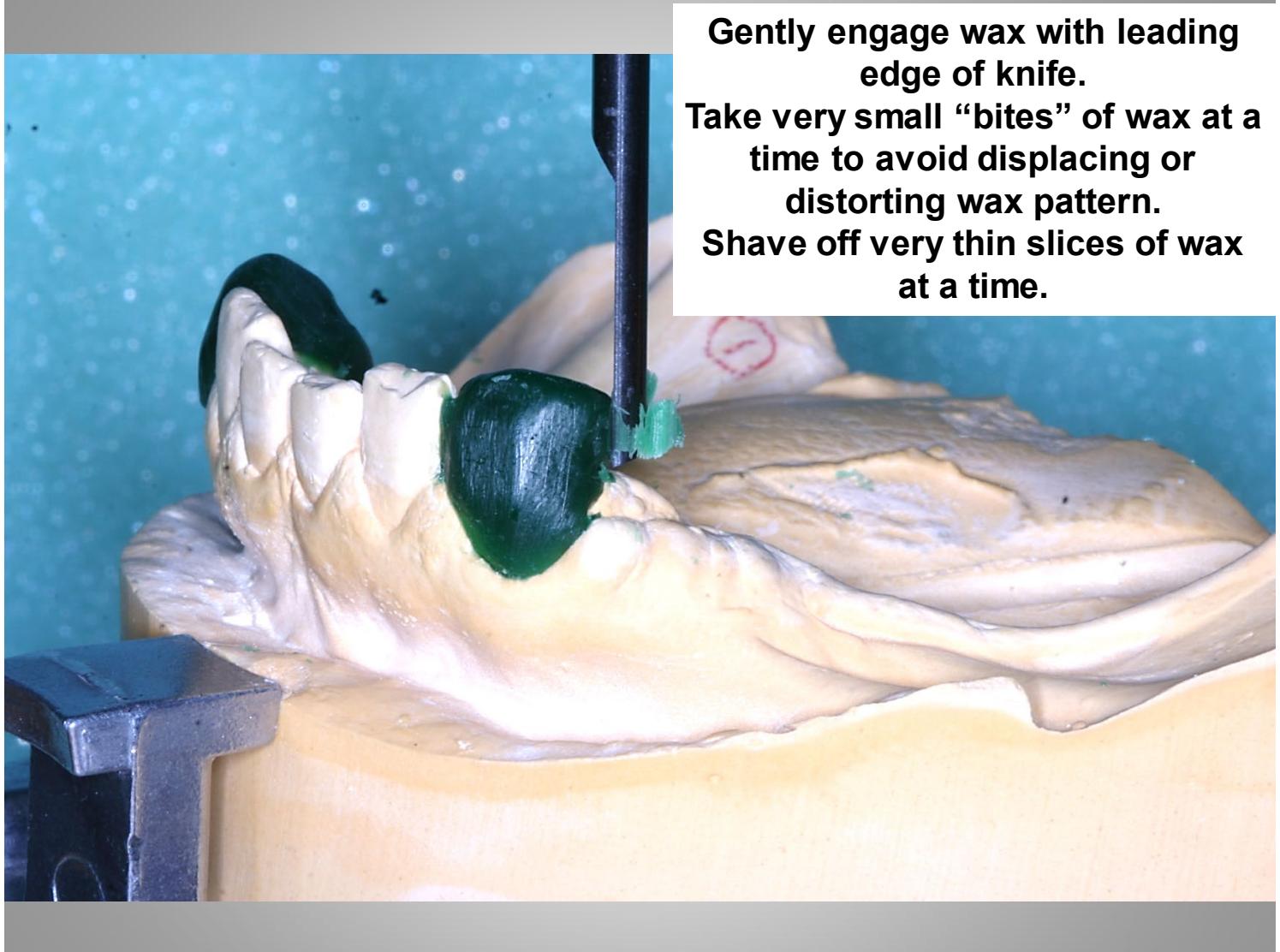


**Use wax knife to prepare  
guiding planes:**

- Orient flat surface of knife  
next to wax.

And you need to put it on a surveyor then. You're gonna use your wax knife, this is like yours, to

prepare the guiding planes, and you can see it's on the table, and here's our surveyors vertical arm.

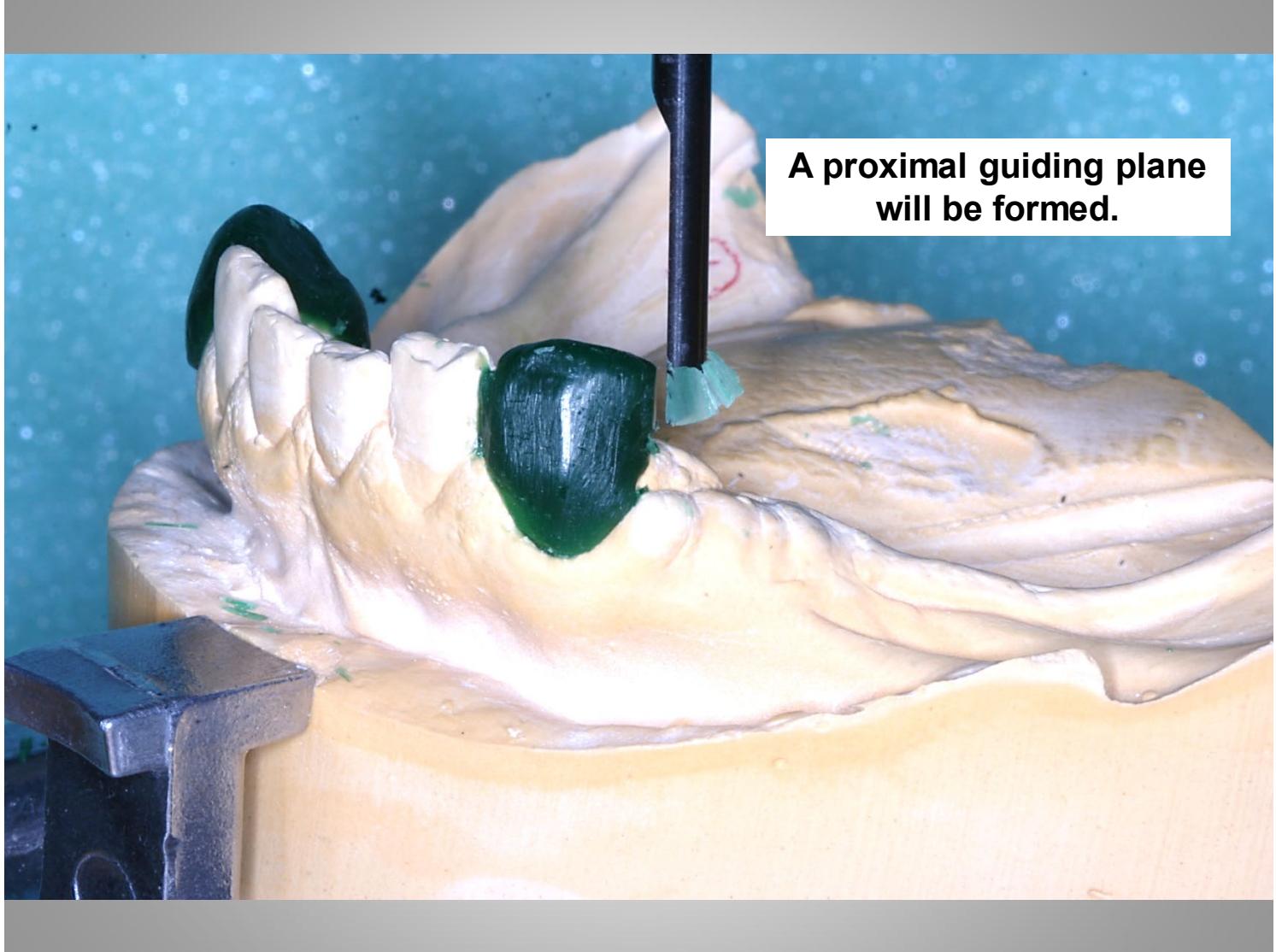


**Gently engage wax with leading edge of knife.**

**Take very small “bites” of wax at a time to avoid displacing or distorting wax pattern.**

**Shave off very thin slices of wax at a time.**

And there, we're preparing our guide planes with the wax knife, just a little bite at each time.

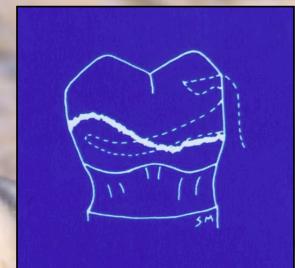


A proximal guiding plane  
will be formed.

You can see we've got a guide plane forming.

In this case a WW clasp is planned.

This requires a low DB SL with high MB SL, and a 0.0020" MB undercut.



This is the powdered wax that we put on, and then you use your analyzing rod. There's a survey line underneath there. We make the survey line with the analyzing rod in the wax, not the graphite on the wax, and we want a wrought wire. So this shows, here's the survey line and it's low for the

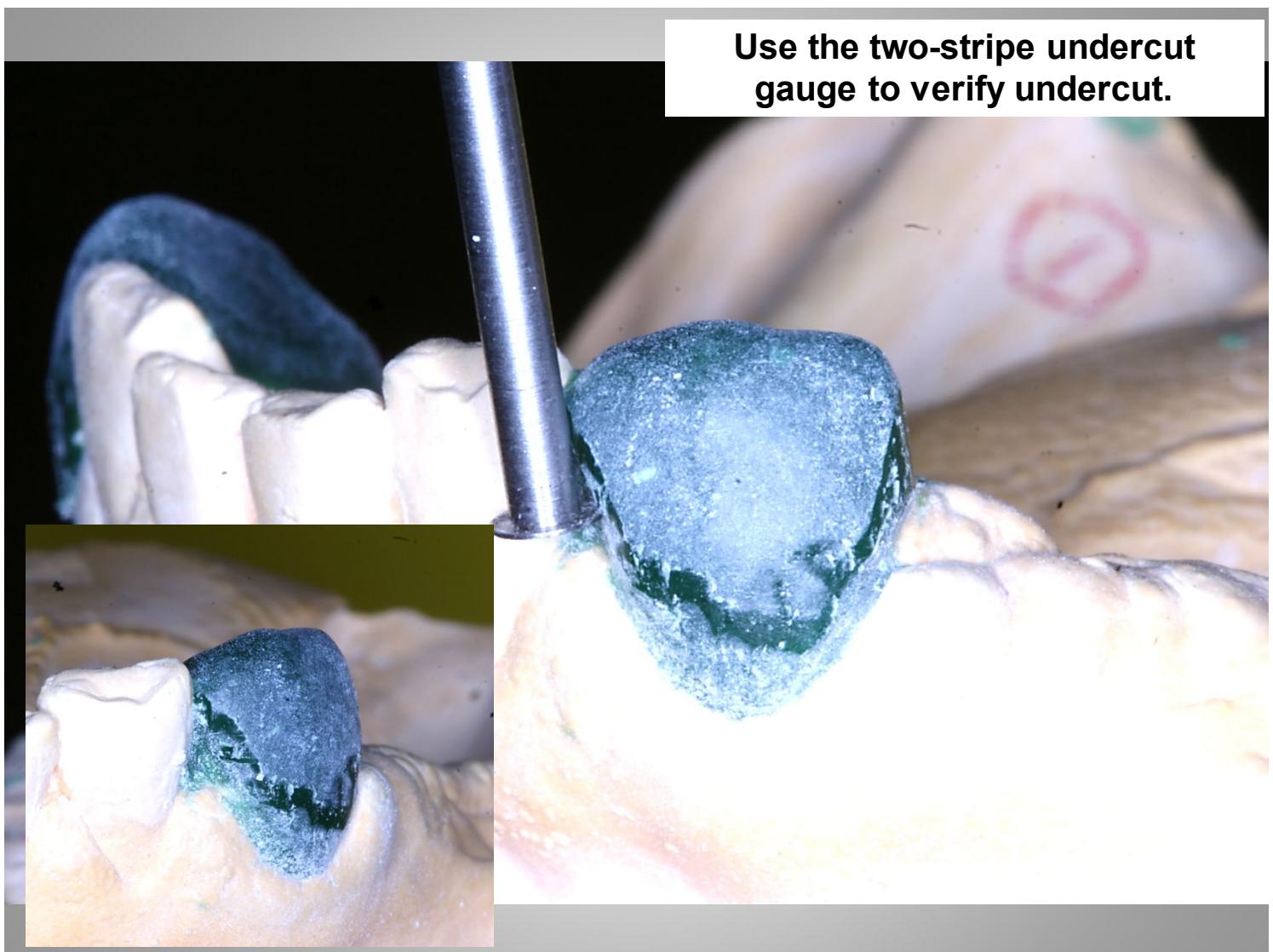
shoulder, and then we have our 20/1000th of an undercut.



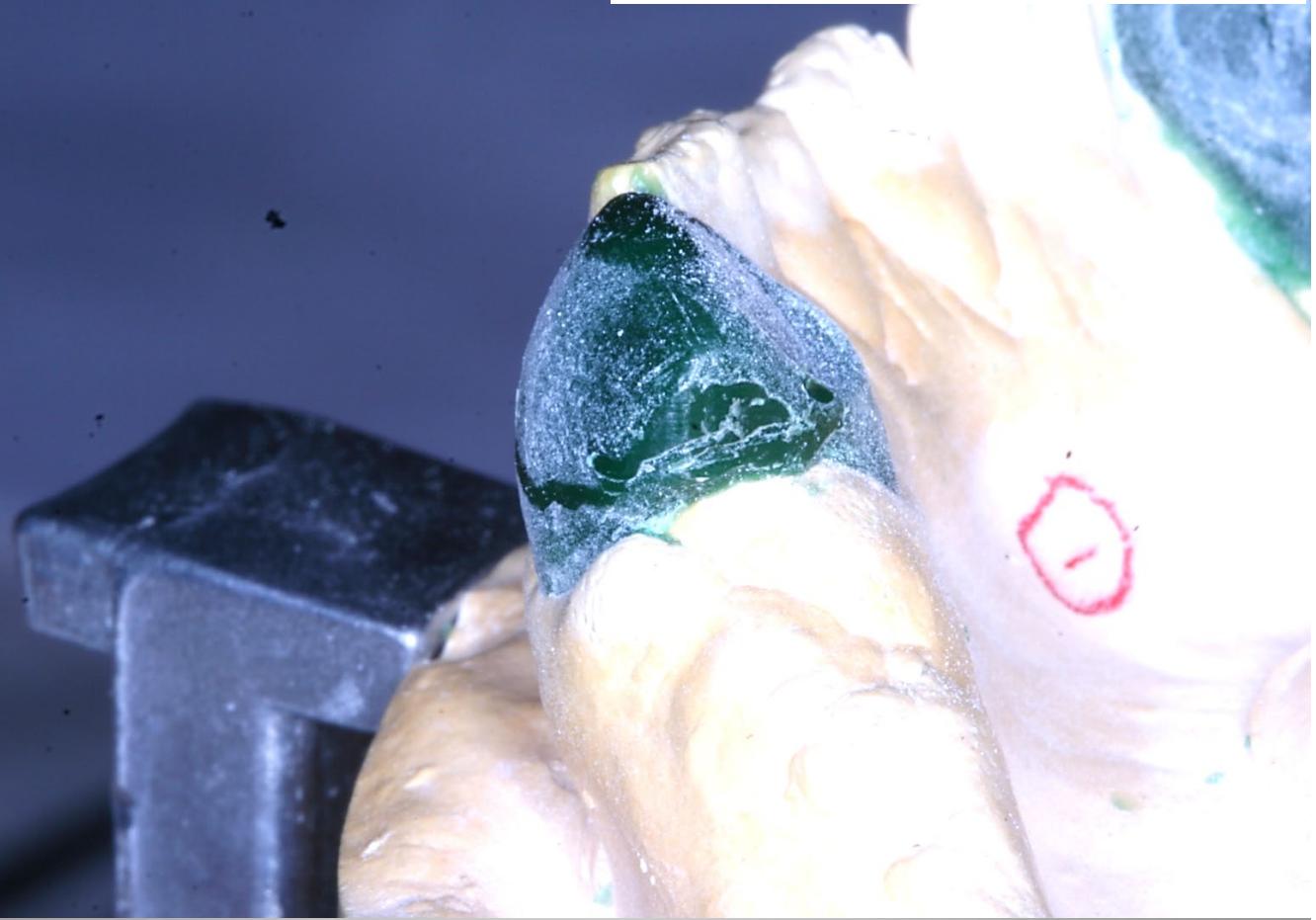
So that's what it looks like. See that little line there? It's a little down too far to the gingiva, but

that's where the 20/1000th of an undercut is gonna be.

**Use the two-stripe undercut gauge to verify undercut.**



**Distal guiding plane disclosed in  
wax powder.**



That's what the guiding plane looks like with, this could be graphite on your stone, or here it's the

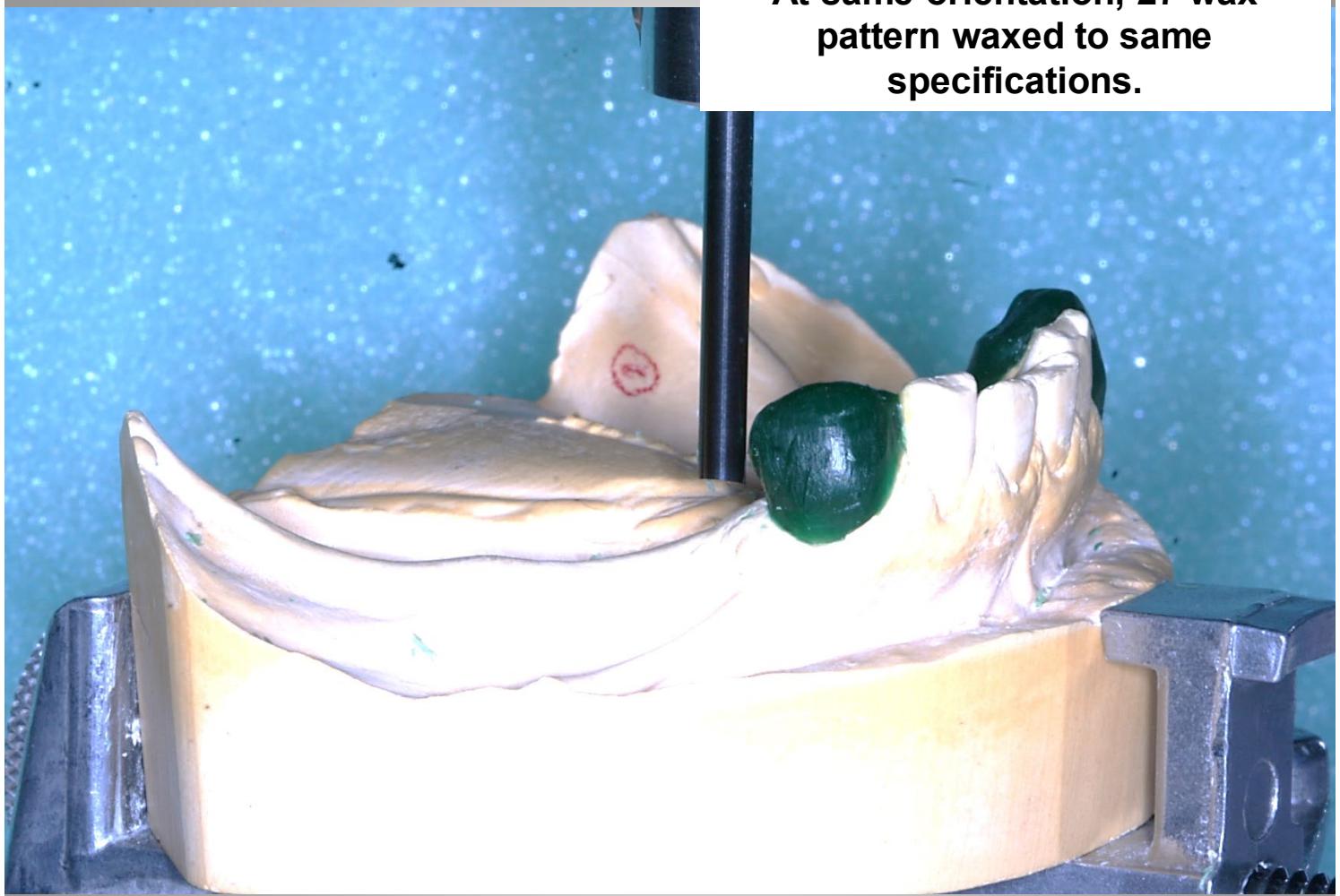
analyzing rod in the chalk, but it shows the smudged area, that's your guide plane.

**Lingual surface with alternative  
cingulum rest seat.**



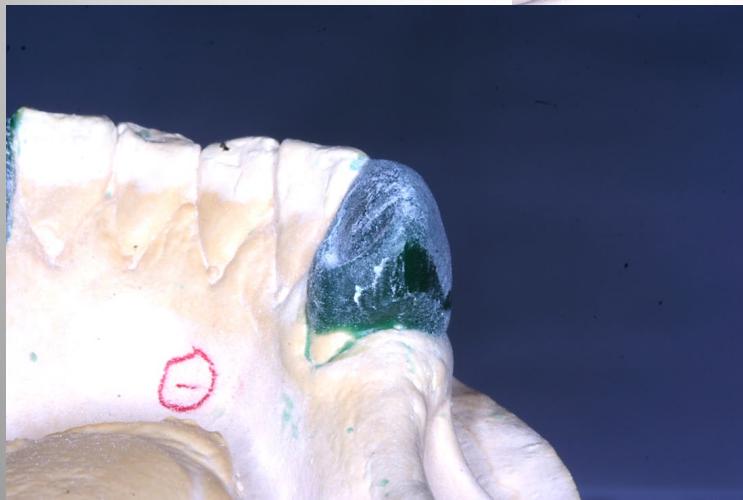
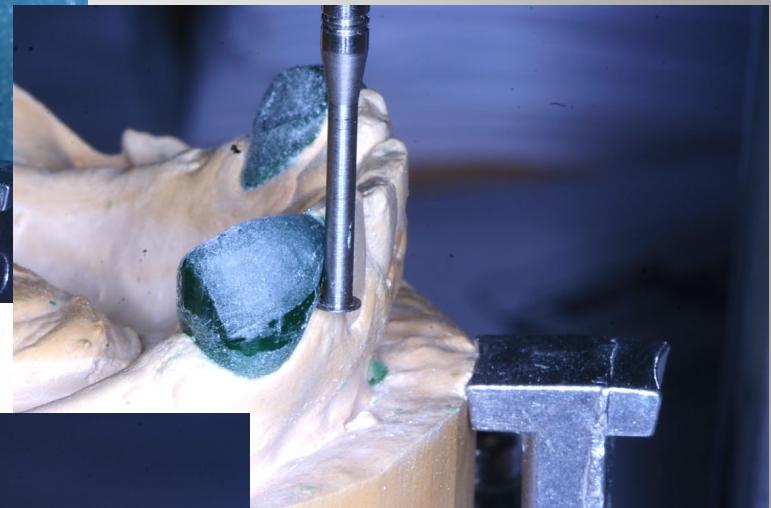
Alternate cingulum in the canine.

**At same orientation, 27 wax pattern waxed to same specifications.**



Now of course, at this very same orientation, you're gonna do the matching tooth on the other

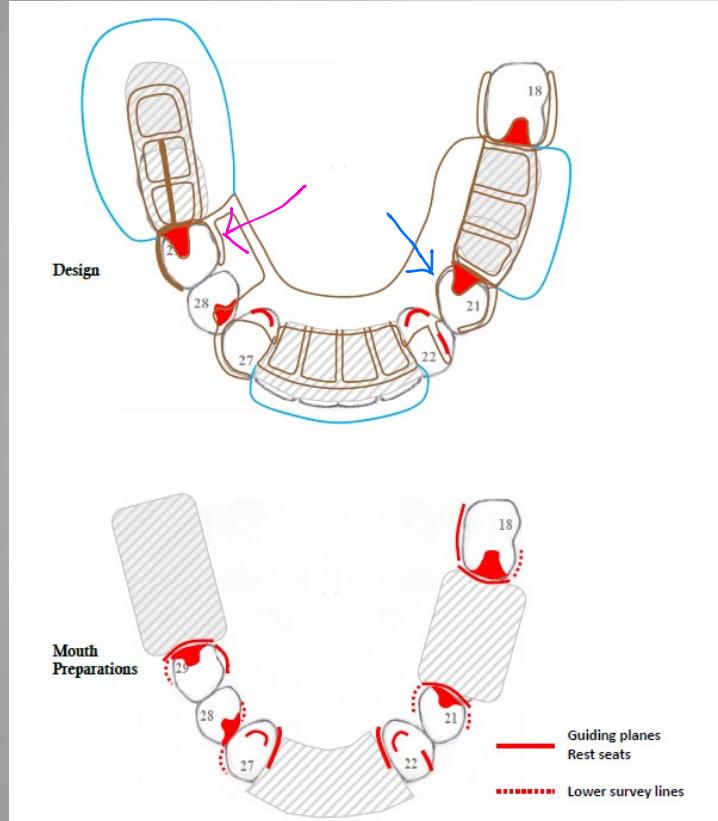
side, so we don't have to worry about any other guide planes in the arch, that's good,



but here you can see your distal guide plane, your undercut. So I hope you can see that sending this to the lab with the request for a surveyed crown, the chances are much, much greater that you're gonna get what you want. When we're talking about, this is a Class I, Kennedy Class I, so we have to be careful of these abutments, right? If this were pre-molar or molar, you would have to get one of those four, right? If you're gonna do a wrought wire, it has to be a DO rest. When we don't have posterior teeth anymore, and we're just talking about anterior, you should still think about your abutments, but the rules are not quite. Well, yeah, there are rules. So if we need to be careful of these abutment teeth, and we don't have much choice about what to do as far as an MO rest or a DO rest, you've got one choice, it's a cingulum rest, which means you've gotta use a cingulum rest and it has to be plated, okay? You don't have to worry about MO, DO, or not plating if it's an I-bar because that's true for premolars but not for anterior teeth, not for canines. So what do you think the possibilities are for this canine? Keep in mind, you've got this long, long, long lever-arm back here. So let's say we've got this situation, we're replacing all of the posterior teeth, we've got all these teeth that are working occlusally, or we have both premolars and we're just replacing maybe one molar. Which situation can exert more stress on the abutment teeth? If you're replacing all the posterior teeth or just the one molar, which is tougher? All of them. So because we're still thinking about levers and if I've got a lever and I'm trying to pry, and you just have a little short lever or you've got a long lever like this, which one is going to displace things easier? The long one. **If you've got a long distal extension, you have the capability of causing a lot more unfavorable stress to your abutment tooth.** Okay.

So what retentive clasp assemblies do you think we have the option of doing here? What about, they're all gonna be cingulum rests and they're all gonna be plated. Do you think a clasp circlet is a good choice here? It's much too rigid and much too rough, even for the canine. Wrought wire? That's what I said for the other side on this. So a wrought wire, and see we've got the two-striper here, and we're measuring to see we got that undercut there. What do you think about an I-bar? Sure, an I-bar would be okay, if we've got a good periodontal situation here and if we don't have a bony undercut, which a lot of times you will, okay, and you can't get rid of bony undercuts surgically, if it's the canine eminence. Yes? [background conversation] That rule about the lingual reciprocation not being there and stepping away from the tooth, it doesn't apply if it's not a premolar, okay. We're in the anterior now. This is really a very good discussion. You can't get away without doing a lingual plate or anything. And it is okay to do an I-bar here. If you were gonna do an I-bar here, you would want to make sure that you had the 10/1,000th of an undercut, just a little bit mesial to the mid-bulge about two-thirds of the way down. Yes? [question] We're on a canine. When I'm talking MO and DO rest on that chart, that's for posterior teeth, usually premolars. Occasionally, you'll have a distal extension where you're just replacing like a second molar, where you've got a molar that's, do we replace second molars? It depends on what is it opposing. If you are opposing a full dentition and you've got a second molar opposing it, yeah, so that you don't get hyper-eruption of your opposing dentition. If it's opposing a denture or something, and there's no compelling reason to add a second molar, then you wouldn't, and it wouldn't. In one case, you've got a distal extension, in the other case, **you don't have a distal extension. You don't wanna add a distal extension if you don't have to.** So that chart where I'm talking about the I-bar must have a mesial rest and no lingual reciprocation, stepping down, we're talking about posterior teeth. When we get to the anterior, you have to have a rest and to have a rest, you have to have a plate on the lingual of a canine. So both rules, the rules apply in that you want to be kind to this tooth, but you can't use. That's why if you look at that chart, it says RCA choices for distal extension in posterior teeth. Okay. When I first made up that chart, I didn't have that on there, and this came up, and so I added that. That's for posterior teeth. But that doesn't mean we don't have to think about this. You would never put a clasp circlet here, that would be way too much stress on this tooth. You could do a wrought wire, you can do an I-bar,

you could do a modified T-bar, okay, but you would not put that really rough class one lever on this, okay?



Steps	Excellent (Score: 9)	Clinically Acceptable (Comments Required / Score: 8)	Standard Not Met (Clinically unacceptable) (Comments Required / Score: 0)	Scores (Comments) Self-Eval Accuracy (Y/N)
1. #22 & #27	<p>1. <b>Cingulum rest seat #22:</b> Proper shape – alternate rest Follows cingulum contour Depth 1.5 mm. Postive, No undercut</p> <p>2. <b>Cingulum rest seat #27:</b> 3 planes, L-groove, Postive Follows cingulum contour, Proper depth, Positive, No undercut</p> <p>3. <b>3rd Molars:</b> Follows contour of tooth, Placed on Mt. Parallel with the path of draw</p> <p>4. <b>2nd Molars:</b> Follows contour of tooth, Placed on Mt. Parallel with the path of draw</p> <p>5. <b>1st Molars:</b> Follows contour of tooth, Placed on Mt. Parallel with the path of draw</p> <p>6. <b>#28 MO Position and shape:</b> In respective fossa Follows gingival, Lingual, Undercut No undercuts</p> <p>7. <b>#25 MO Position and shape:</b> Follows gingival, Lingual, Undercut No undercuts</p> <p>8. <b>#28 DO Position and shape:</b> Spoon shaped, proper size Depth 1.5 mm. Postive</p> <p>9. <b>#25 DO Position and shape:</b> Spoon shaped, proper size Depth 1.5 mm. Postive</p> <p>10. <b>#29 Occlude plane:</b> Dentin, Proper size, 1.2 mm tall, Follows 8/11 contour of the teeth, Parallel with the path of draw</p>	<p>1. <b>Cingulum rest seat #22:</b> Slightly deep or shallow; Slightly less than ideal</p> <p>2. <b>Cingulum rest seat #27:</b> Slightly deep or shallow; Slightly less than ideal</p> <p>3. <b>3rd Molars:</b> Slightly short, tall, deep, Slightly more than ideal</p> <p>4. <b>2nd Molars:</b> Slightly short, tall, deep, Slightly more than ideal</p> <p>5. <b>1st Molars:</b> Slightly less than ideal</p> <p>6. <b>#28 MO Position and shape:</b> Slightly less than ideal</p> <p>7. <b>#25 MO Position and shape:</b> Slightly less than ideal</p> <p>8. <b>#28 DO Position and shape:</b> Slightly less than ideal</p> <p>9. <b>#25 DO Position and shape:</b> Slightly less than ideal</p> <p>10. <b>#29 Occlude plane:</b> Slightly less than ideal</p>	<p>1. <b>Cingulum rest seat #22:</b> Wrong shape, Does not follow cingulum contour, Not positive, Too deep, Undercut</p> <p>2. <b>Cingulum rest seat #27:</b> Wrong shape, Wrong position Follows gingival, Lingual, Undercut, Not positive</p> <p>3. <b>3rd Molars:</b> Too short, Too deep (ledged), Not parallel</p> <p>4. <b>2nd Molars:</b> Wrong shape, Does not follow cingulum contour, Not positive Follows gingival, Lingual, Undercut, Too short, Too deep (ledged), Not parallel</p> <p>5. <b>1st Molars:</b> Too short, Too tall, Flat (occlusal view), Facial, Too deep (ledged), Not positive</p> <p>6. <b>#28 MO Position and shape:</b> Too buccal, Too lingual, Undercut, L/R flare Too tall, Too great</p> <p>7. <b>#25 MO Position and shape:</b> Too buccal, Too lingual, Undercut, Too tall, Too great</p> <p>8. <b>#28 DO Position and shape:</b> Too deep, Too shallow, Too large, Too small, Not positive</p> <p>9. <b>#25 DO Position and shape:</b> Too deep, Too shallow, Too large, Too small, Not positive</p> <p>10. <b>#29 Occlude plane:</b> Too short, too tall (not occlusal view), Too deep (ledged), Not parallel</p>	
2. #28 & #29				
3. MAND RPD MOUTH PREP EXERCISE				

Continued on next page

3. #18 & #21	<p>11. <b>Preliminary prep of guiding planes and occlusal rests PROR to preparation for crowns:</b> #18 Guiding plane initiated #18 MO initial rest seat placed</p> <p>12. <b>Preliminary prep of guiding planes and occlusal rests PROR to preparation for crowns:</b> #21 Guiding plane initiated #21 DO initial rest seat placed</p>	<p>11. <b>Preliminary prep of guiding planes and occlusal rests PROR to preparation for crowns:</b> PROR to preparation for crowns Guiding plane not initiated</p> <p>12. <b>Preliminary prep of guiding planes and occlusal rests PROR to preparation for crowns:</b> PROR to preparation for crowns Guiding plane not initiated</p>	<p>11. <b>Preliminary prep of guiding planes and occlusal rests PROR to preparation for crowns:</b> PROR to preparation for crowns Guiding plane overprepared/ ledged Rest seat overprepared/ ledged</p> <p>12. <b>Preliminary prep of guiding planes and occlusal rests PROR to preparation for crowns:</b> PROR to preparation for crowns Guiding plane overprepared/ ledged Rest seat not initiated</p>	
4. FINISH	<p>13. <b>Smoothness of all prep:</b> Smooth and well finished</p>	<p>13. <b>Smoothness of all prep:</b> Slightly rough</p>	<p>13. <b>Smoothness of all prep:</b> Grossly rough</p>	

If you scored "standard not met" in any category answer the following questions:  
1. Why do you think your work was clinically unacceptable?  
2. What are the steps you will take to improve the future?

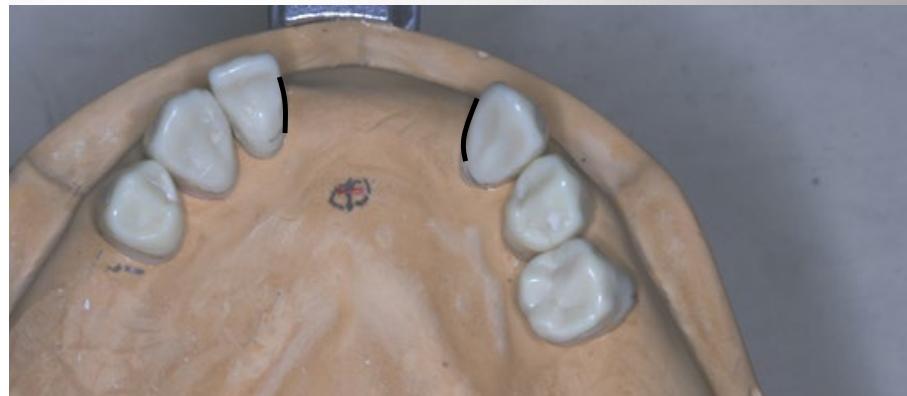
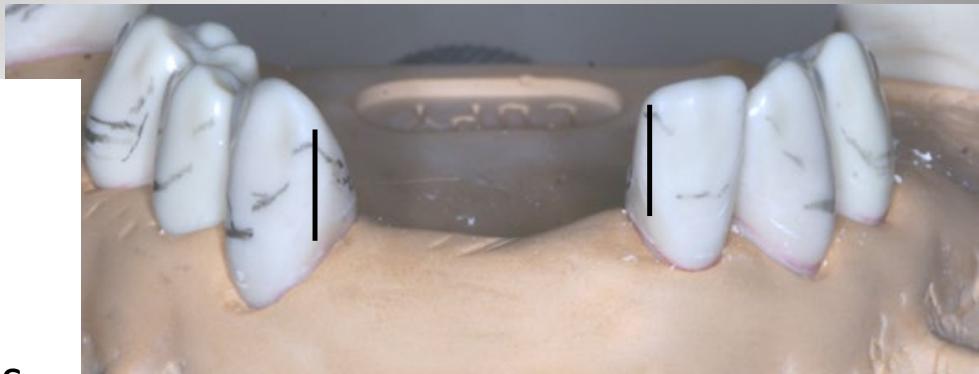
INSTRUCTOR SIGNATURE \_\_\_\_\_ SCORE \_\_\_\_\_ / 39

Facility Evaluations: In Red  
Studio Evaluations: In Blue

Okay, so this is what we're working on now. You should have done or be close to being finished with these mouth preps. And again, this is not necessarily something we usually see, and I threw in an incisal rest, but I just wanted you to have enough to work on. Are you gonna lower the survey line [here](#) or are you gonna put a lingual guide plane on? You're gonna put a lingual guide plane on if you can, because we've got a clasp. Are you gonna put a lingual guide plane on [here](#), or are you just gonna make sure the survey line's low? Just make sure the survey line's low because we've got a plate. And then we're gonna wax in a lingual guide plane on 18, we're gonna wax in a retentive undercut at the distobuccal, which is kind of hard because it's not there naturally, and we're gonna do our alternate cingulum rests, and you should have your design.

# Anterior guiding planes

- Mark proximal extent of tooth visible from facial view.
- Cut guiding planes just lingual to mark.
- Make height as tall as possible, but do not extend all the way to gingival margin.



Okay, now I went through this last time.

29 has clasp instead of plate for reciprocation. Prepare guiding plane, in middle third of lingual surface.



So there it is, the lingual guide plane.

29 is abutment for distal extension.  
Proximal guiding plane should be only  
 $\frac{1}{2}$  height of distal surface.



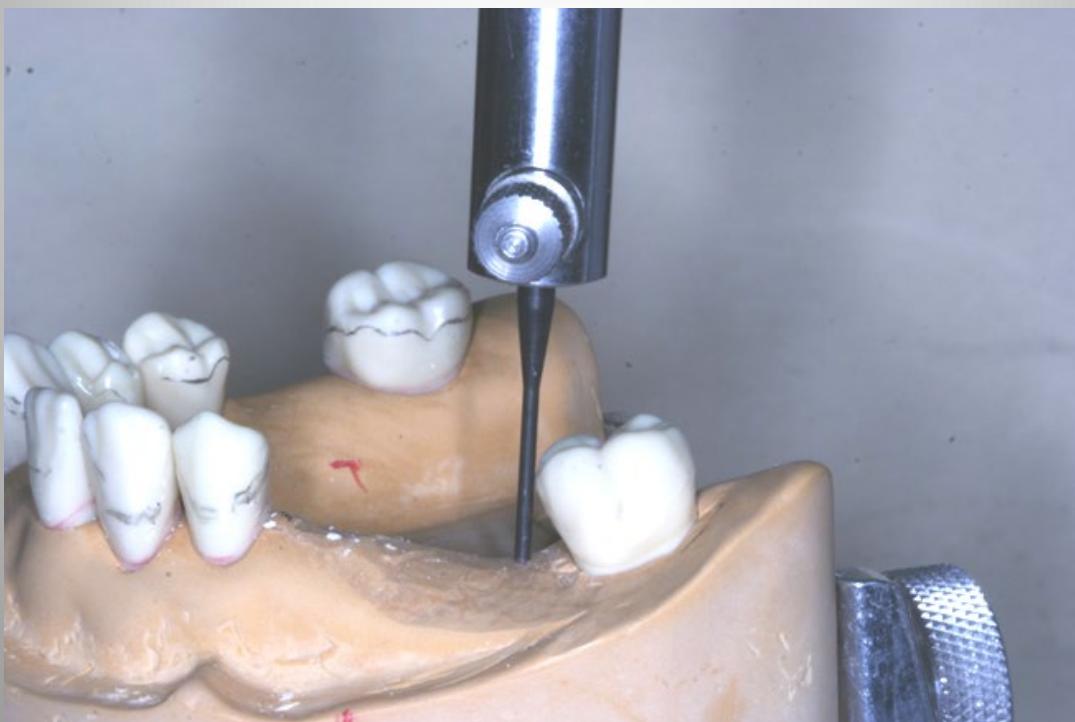
# For surveyed crowns 18 and 21

- RPD mouth preps according to design.
- On 18 and 21, prepare guiding planes and rest seats when you do rest of mouth preps. This will give you an idea of space needed when you do crown preps.
- Get mouth preps graded, grade sheet 3.
- Crown preparations 18 and 21.
  - 21 will be along long axis of tooth.
  - 18 will not be along long axis of tooth. Prep parallel with guiding planes.
  - Occlusal reduction in area of occlusal rest seats.

We went through this last time as well. 21, when you do your axial reduction, it's gonna be easy

because it's along the long axis of the tooth. 18, it's a little bit trickier 'cause we're still gonna be at that same orientation, which is not along the long axis of the tooth.

**Prepare rest seats and guiding planes on 18 and 21 before starting full contour crown preparations.**



Okay, so again, you're gonna be holding your bur for crown. You should have already cut a mesial guide plane here, but this is the orientation, you're gonna cut your crown prep. I have to say something about this. And you can see that the distal is tipped up and the mesial is tipped down, and so **we wanna equalize that occlusal plane there**. So when we're making the crown prep in the area of the DO on the premolar, you're gonna make sure that you go down and reduce enough that you've got enough space in the wax to carve your DO rest. Here, you're gonna do occlusal reduction. Because this is already kind of lower, so you wanna smooth this off, but you're not gonna have to. You're kind of correcting this orientation, so you're not gonna need to remove that much for the MO rest on 18. Does that make sense? But you don't wanna leave that rest that you've already cut, that rest seat, you wanna smooth it up. Well, that's the advantage of going ahead and doing your RPD mouth preps. Did you already cut a DO in this? Okay, so now you're just gonna do your depth reduction. Do you do depth cuts in your occlusal reduction? Okay, so you're gonna cut down into that DO area so that you've got enough space. You're just gonna pretend like that's the way the tooth is, and so it's gonna be deeper here, than it is here.  
[background conversation] How deep is the enamel? How deep is the dentin? Probably not. No, it may seem like that, but usually that's not a problem.

# When prepping 18 for crown, don't orient bur along long axis of the tooth.

- Try to keep bur perpendicular to path of insertion of RPD.

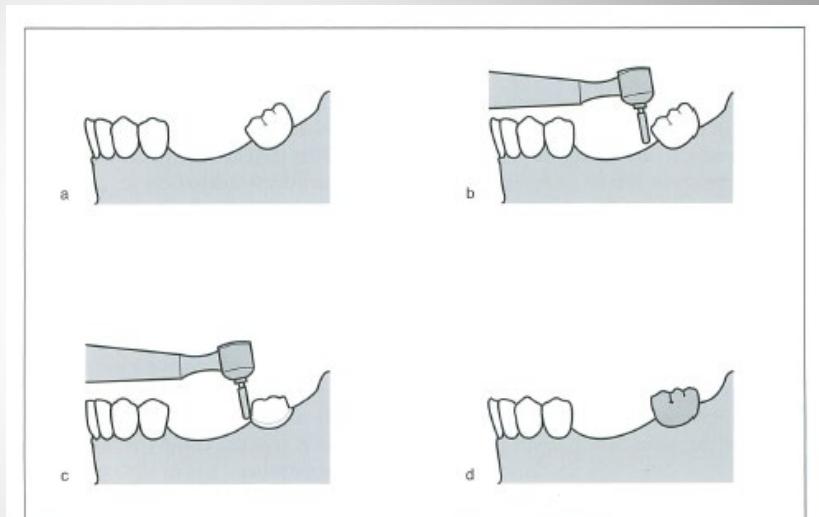
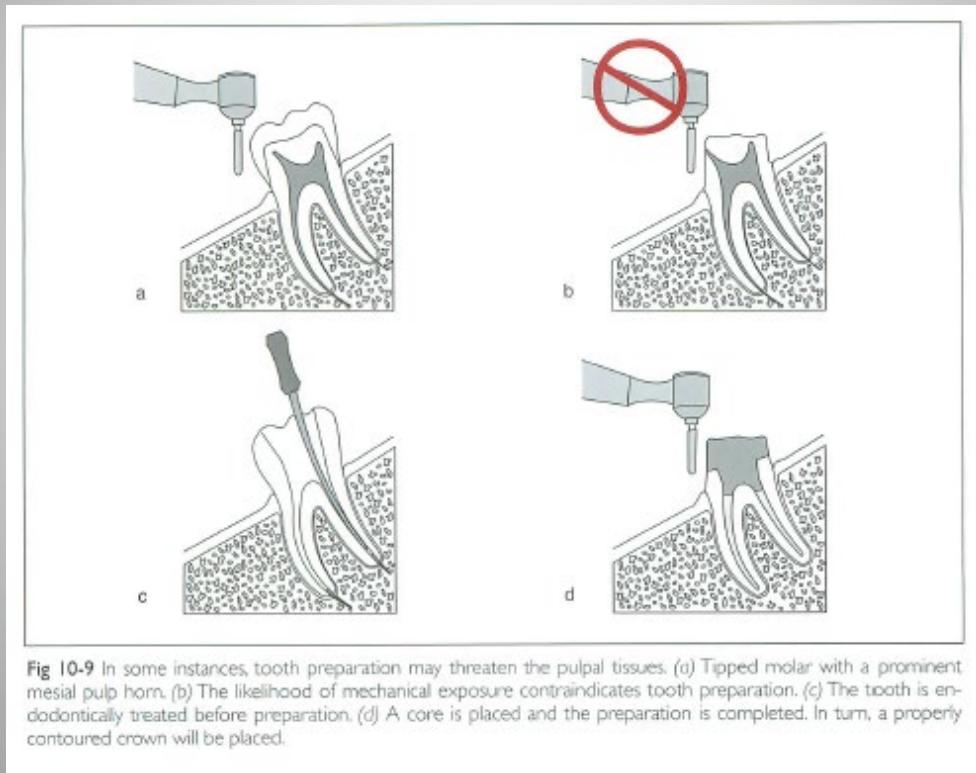


Fig 10-8 Moderate malalignment may be corrected using properly designed fixed restorations. (a) The mandibular left second molar displays noticeable tipping. (b) Tooth preparation is intended to correct malalignment. (Notice the angulation of the bur.) (c) The finished preparation permits placement of a suitable crown. (d) The resultant crown displays the desired angulation and contours.

Okay, and this is just another picture of what I've been talking about, the orientation.

# There is a limit as to how much the tilted tooth can be “straightened”.



Now, what you're talking about actually isn't necessarily pertinent to 21, but if you try to go in and if you've got a really tilted tooth and try to do a crown prep, you have to use your judgment. You could run into a pulp horn here. So it kind of depends on the case, how tipped the tooth is, and

keep in mind that we can't always correct everything.

## Surveyed Crowns



- This case shows wax patterns on dies. For our exercise, we will wax directly to the ivorine teeth.
- No need for die lube.

Okay, so these pictures are really important. I don't have them any place else, they're just in today's lecture. This is actually a case that was waxed up by a student probably eight or nine years ago, and they did such a fantastic job that I just use these to go by. They did a fantastic job, and it was the green not the blue, but you can do it, you can do it. These pictures are all shown on a diecast. We used to do this in conjunction with another class where they were addressing fixed restorations and we did the mouth preps in our class, and then they went to the other class and they did crown preps and made an impression of the Ivorine and made diecast and actually cast up gold crowns. We're not doing that anymore. So these pictures show on a diecast. You're not doing a diecast, this would just be on your Microstone and you're waxing right to the Ivorine teeth, okay? And again, don't use die lube, we don't wanna remove the crowns or anything. We just wanna see the finished product.

# Buccal Survey Lines



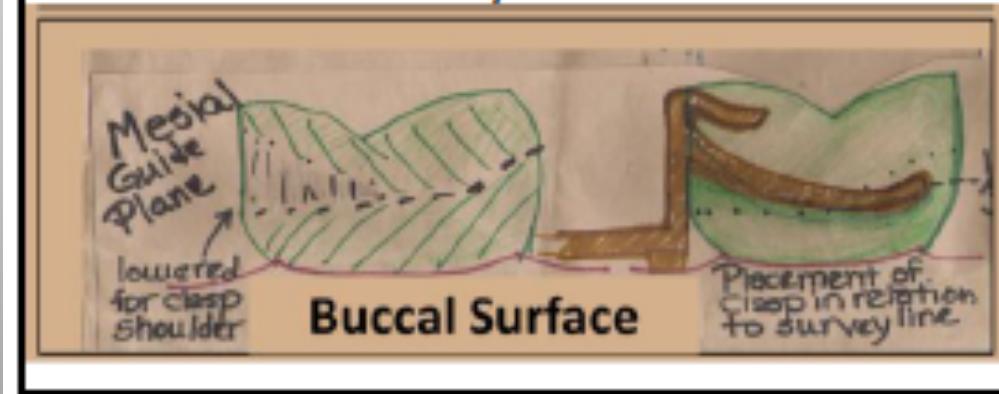
Okay, and please ignore this tooth, this was. We had a bit of a different case, but this is the same.

Okay, so what's happening on the buccal? We want a low survey line here, this is the powdered wax, and this is just from the analyzing rod rubbing up against the wax pattern. So here's low survey line and here's the premolar.

## Rule of Thirds

Think of axial surfaces in terms of thirds:  
occlusal, middle, gingival

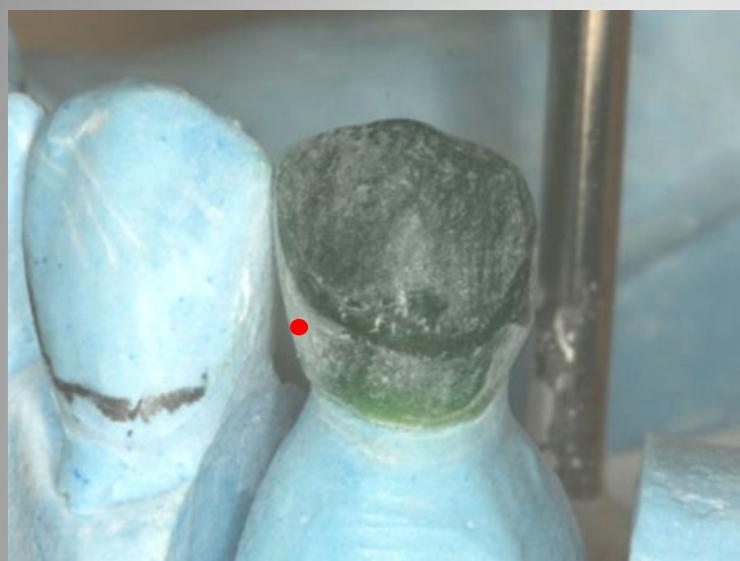
- At junction of middle and gingival thirds:
  - Retentive undercut.
  - Survey lines.



Remember where we would like to have the retention at the junction of the middle and the gingival

third, so we're gonna want a low survey line and then a high survey line.

# Buccal Survey Lines



- 21
  - DB low for shoulder of circlet clasp.
  - Blended with distal GP
  - MB high for undercut
  
- 18
  - MB low for shoulder of circlet clasp.
  - Blended with mesial GP
  - DB high for undercut

So we want 10/1000 of an undercut at the distobuccal line angle of the molar and at the

mesiobuccal line angle of the premolar. And here you can see this is just gonna be a simple circlet too, so we want a low survey line here. So low, high, low, high.

# Proximal Guide Planes:

## Buccal View



- Distal 21 and mesial 18 parallel, and should be parallel with GP of 22, 27, and 29.

We want this guiding plane to be parallel with this guiding plane and parallel with the others in the

arch on the Ivorine teeth.

# Proximal Guiding Planes: Occlusal View

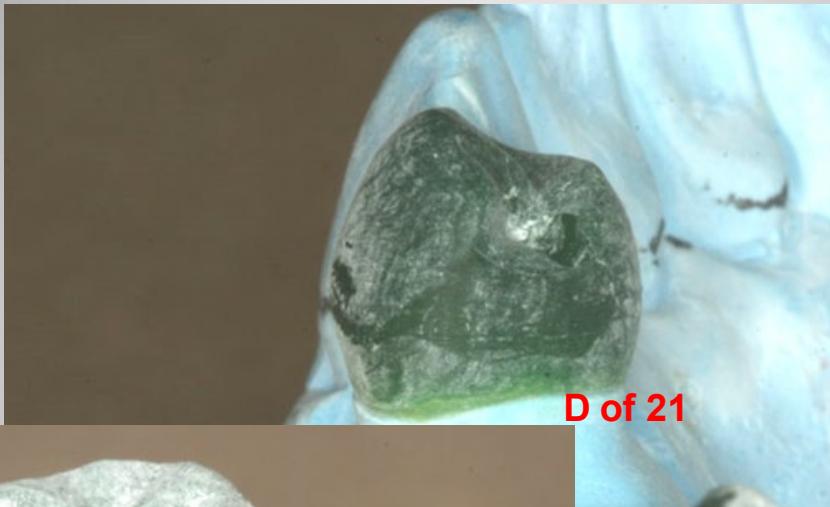


- Follows natural tooth contour viewed from occlusal
- Does not look like straight cut

Looking from the top, you can see that they're rounded. Here you can see the DO rest seat. Does it have a lingual flare? Does it need a lingual flare? [background conversation] Thank you. Does it need a buccal flare? Yes,

because there is a circlet coming right here, so both buccal and lingual flare. Same for the molar, lingual flare, lingual flare. Make sure it's positive. All the things that we've been talking about.

## Proximal Guiding Planes: Proximal View

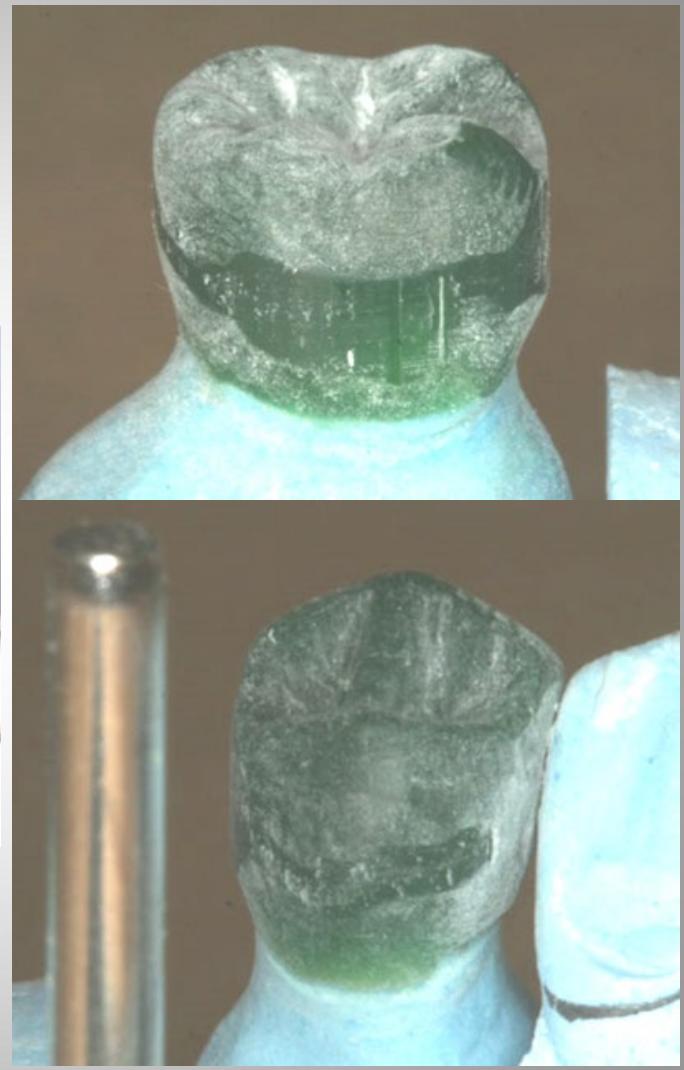


- 2/3 height of proximal surface
- Blends into buccal and lingual surface to lower survey lines.

Here we can see two-thirds the height of the proximal surface. There you can see the rest seat a

little bit, and here you can see the lingual guide plane.

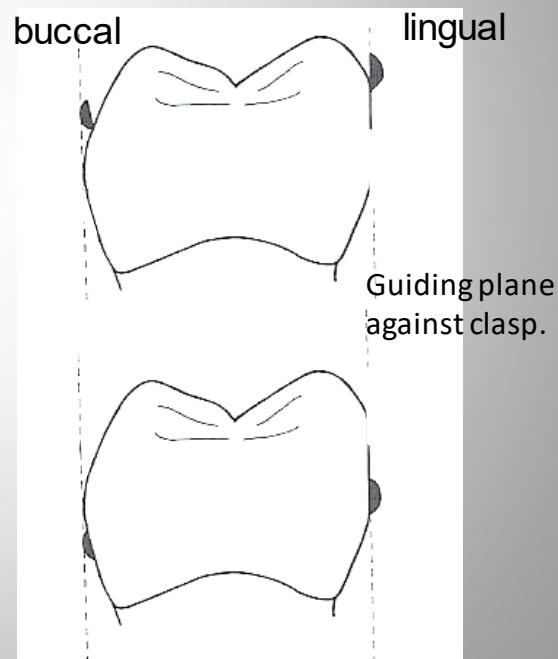
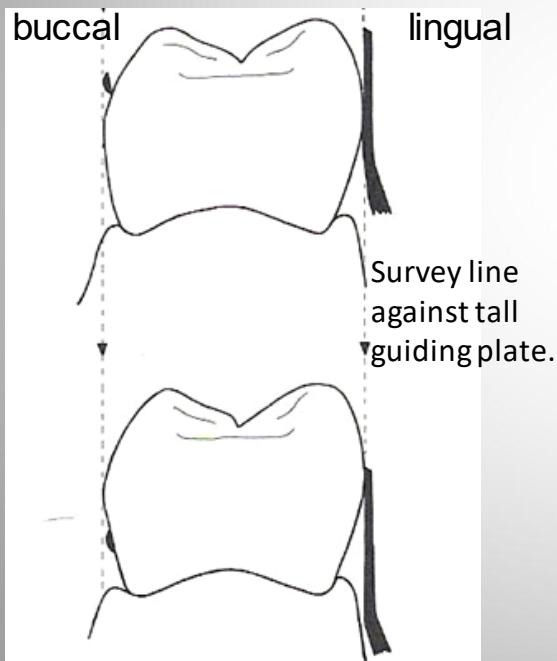
## Lingual GP (18) and Survey Line (21)



# Reciprocation plate vs. clasp: Preparations

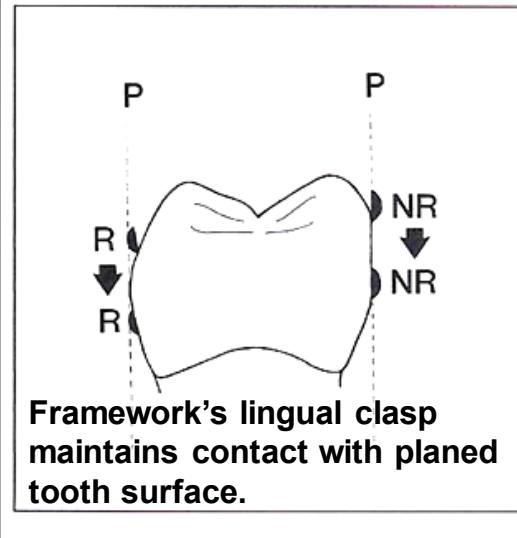
- Plate has taller guiding surface.
  - Survey line needs to be adjusted from extreme occlusal position.
  - Guiding plane on tooth not necessary.
  - Framework provides contact as RPD is seated.

- Clasp has much smaller guiding surface;
  - Therefore contact with tooth for reciprocation must have more specific management.
  - Needs guiding plane on tooth to maintain tooth contact.
  - Tooth provides contact as RPD is seated.

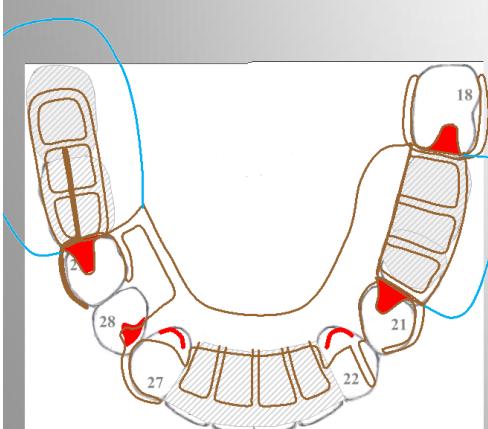
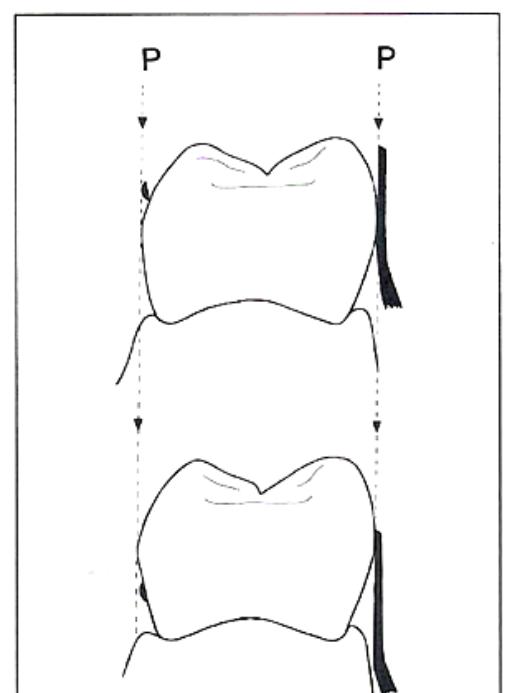


Okay, reciprocate, and when I talked about this a little bit last time, but let's talk about it again. When you have a plate, you just need a low survey line to counteract what's happening with the retentive clasp as it bends over the height of contour. If you've got a clasp, for it to work while this

is bending over the height of contour, you really need an expanse, a plate for it to work against. That's why we're doing the lingual plate on the molar.



## Plate vs. Clasp



- **Line against plane**
  - Survey line opposing lingual plate. (21)
  - Lingual clasp opposing guiding plane. (18 and 29)
- **Line against line (clasp against survey line) does not brace. It has only one point of contact**

And here, we've got a lingual clasp. Here, we've got a lingual clasp, so we'd like to have a lingual

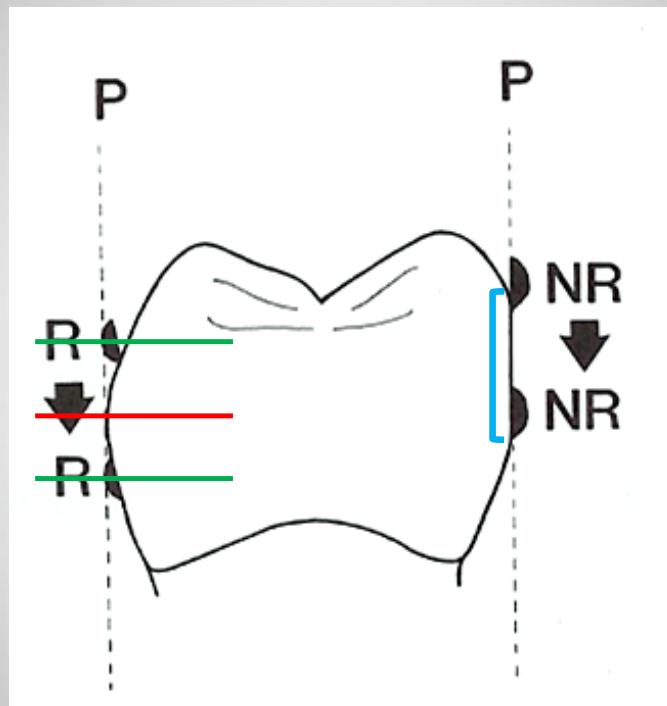
guide plane here and a lingual guide plane here. So if it's a clasp, it'd be nice. It's recommended that you have a lingual guide plane. If you've got a plate, you just need to make sure the survey line is low.

## Surveyed Crown # 18

Retentive tip is **passive** before it flexes over the height of contour.

Retentive tip is **active** as it flexes over the height of contour.

Retentive tip is **passive** after it flexes over the height of contour and resides in .010" undercut.

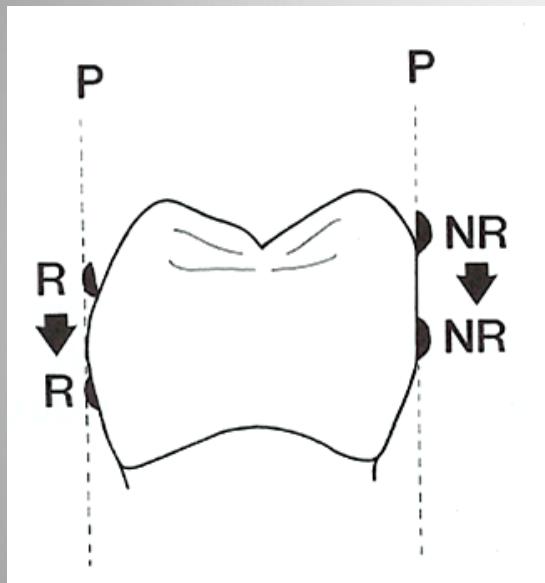


Reciprocation **braces** as the retentive tip is active and pushes against the tooth.

Okay, and the idea is to have something reciprocating or bracing while the retentive clasp. Before

it gets to the height of contour, it's passive, but as it passes over the height of contour, it's active, meaning that it's flexing and we need something to hold the tooth on the other side till it gets back to passive in the undercut.

## Surveyed Crown # 18



- Retentive clasp tip resides at 2/3-1/3 junction.
- Guiding plane for reciprocating clasp roughly in middle 1/3 of lingual surface.
- Preserve natural contour of occlusal 1/3.
- Preserve natural contour of gingival 1/3.

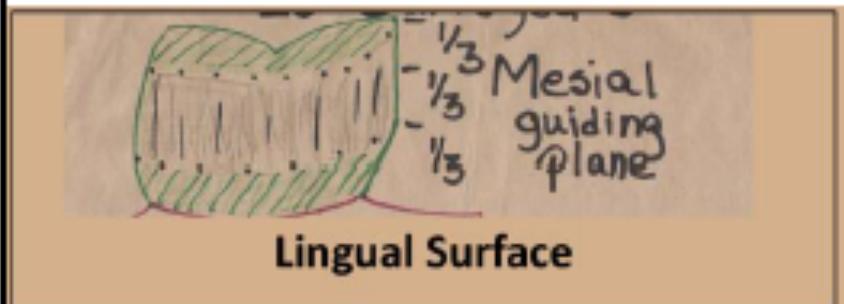
And so you're gonna have a lingual guide plane, but it's important that you have a natural contour

down below it, so confine it to the middle third.

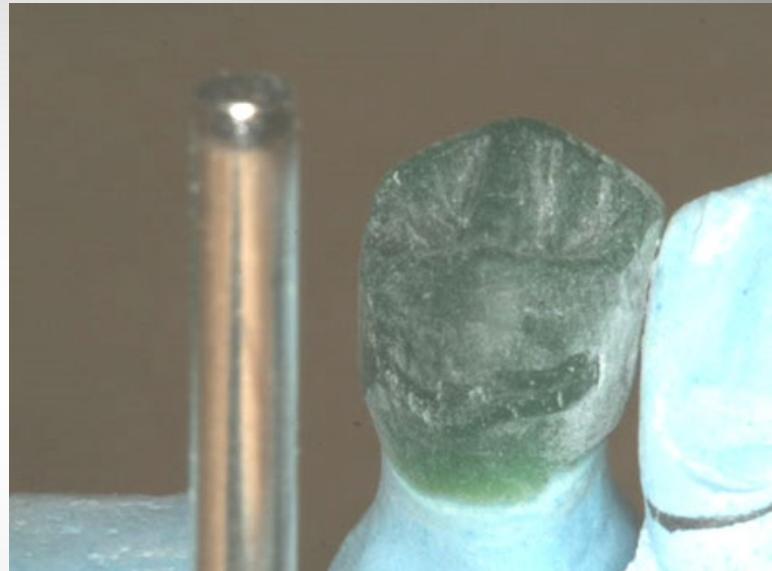
# Lingual Surface

Think of axial surfaces in terms of thirds:  
occlusal, middle, gingival

- At middle third:
  - Plane for reciprocating clasp.



# Lingual GP and Survey Line



- 18 has guiding plane from top to bottom of middle 1/3 of lingual surface.
- 21 has low survey line at junction of middle 1/3 and gingival 1/3.
- Gingival third has natural tooth contour.

Okay, we got talked about that enough.

# Changing orientation of 18 with SC

- Guiding plane prep of 18 could have been only a few mm.

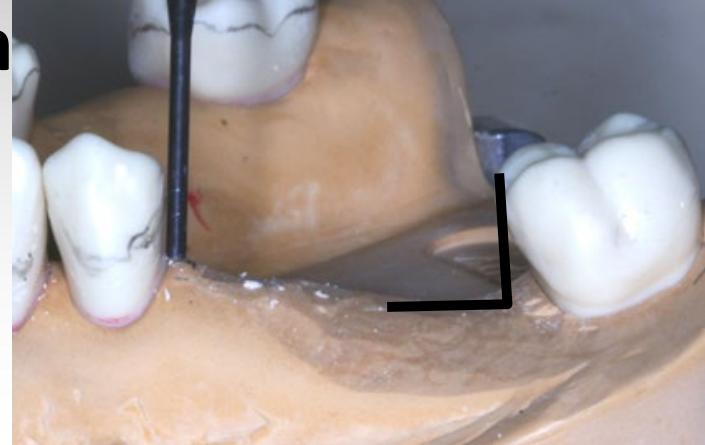
Okay, to that question we had before, so here we're changing the orientation of 18 with a survey crown. Are we really changing 18? Not really because it's still at an angle, but can you see how this is cantilevered? The clinical crown is really cantilevered out over the mesial, so we are making that better.



# Changing orientation of 18 with SC

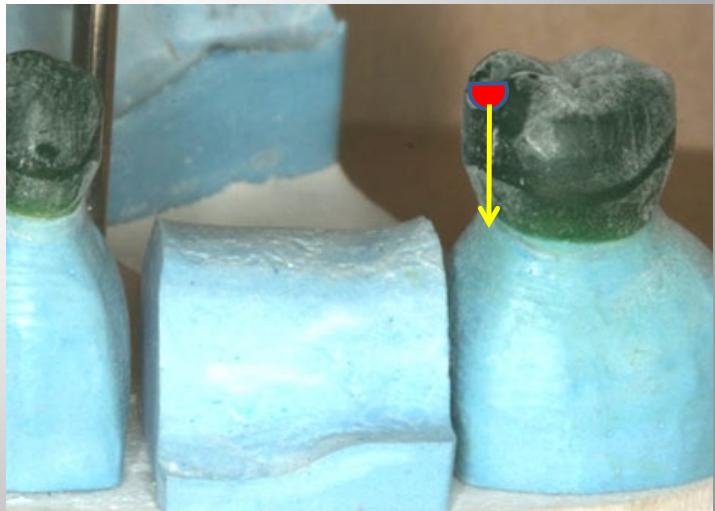
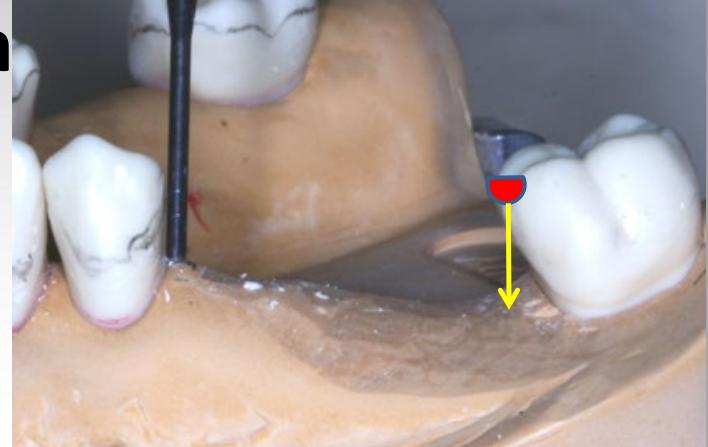
- Guiding plane prep of 18 could have been only a few mm.
- This would have left a large gap between proximal plate and tooth.

And plus, if we just did an RPD like this with a short guide plane here, this is a great place for debris to collect and for a periodontal defect to get started, so we've eliminated that.



# Changing orientation of 18 with SC

- Guiding plane prep of 18 could have been only a few mm.
- This would have left a large gap between proximal plate and tooth.
- MO rest cantilevered and exerts non-vertical stress on tooth.
- SC redirects stress closer to center of tooth.



And if we had this cantilevered out here, it could really cause this tooth. And remember this is for support, so that means it's pushing down, so we're really kind of asking this tooth to be a cantilever like this and to provide support. Here, we've got the rest seat closer to the center of the tooth, closer to its support, so it's much better.

Did that answer your question? It's still not perfect because it's still. I mean, the root in the bone is still at that angle, we haven't, the only way you could correct that is orthodontically to upright the tooth, which I should say is an option, which is always an option, but most people, when they get to this point don't avail themselves of the orthodontic choice.

**REMOVABLE PARTIAL DENTURE  
TREATMENT PLAN FORM**

**Comments:**  
#29 & 30 : Existing PFM Survey Crowns with cast rest seats for embrasure clasps.

**PROPOSED TOOTH PREPARATIONS:**

Guide Plane locations		Direct Retainers	
tooth	surfaces	tooth	surfaces
20	M + P	20	To DB
22	M + P	29	To MB
23	M + P	30	To PB

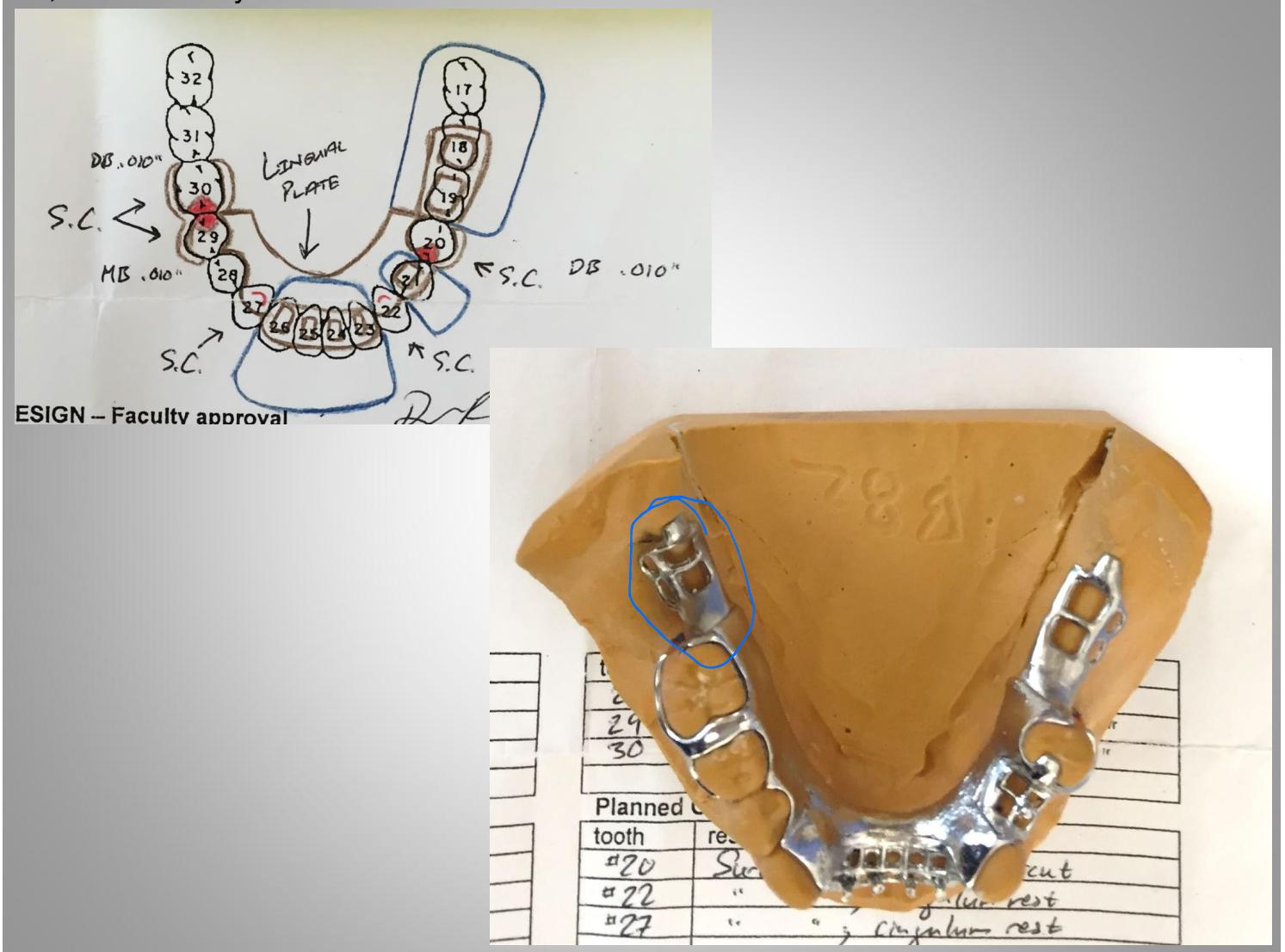
Survey line modifications			
tooth	surfaces	tooth	surfaces

Rest preparation locations		Planned Operative/Fixed Pros Procedures	
tooth	surfaces	tooth	restoration
20	M P	#20	Survey PFM; DB undercut
22	C	#22	" " C Lingual rest
23	C	#23	" " C Lingual rest

Opposing tooth modifications		Kennedy classification:	
tooth	surfaces	CLASS II Mod II	
		Axis of rotation: #20 → 30	
		Major connector: Lingual Plate	
		Extra design concept: (rotation path, metal-back, facing, etc.)	

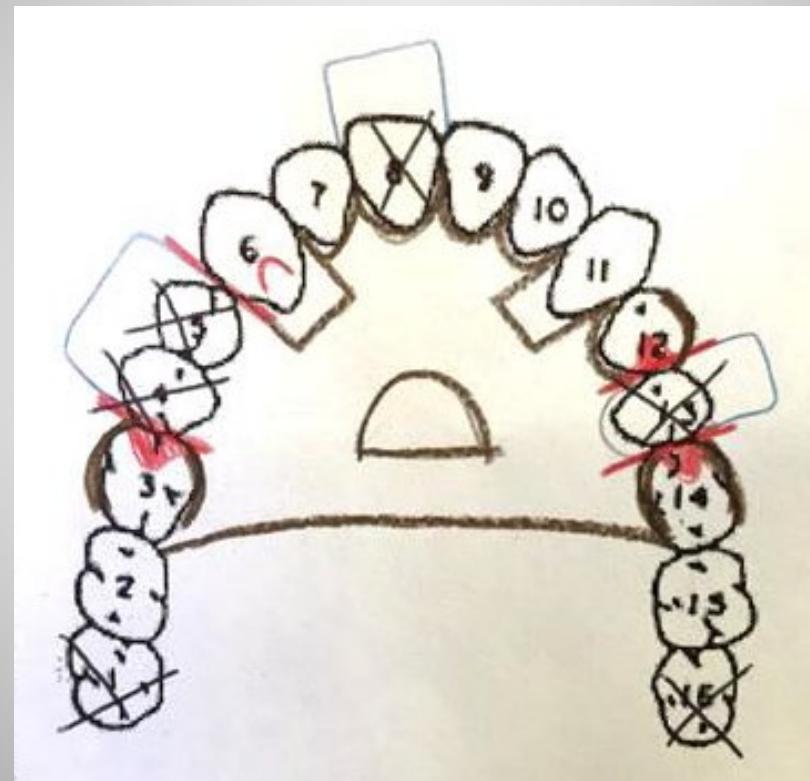
I want you to look at something. I know it's kind of long, but look at this design. This is from clinic, it's a real life case. So here, we didn't have a second molar but we're not gonna add one. This is

what was requested. Here's our, you know, lingual plate. This is a reverse circlet, so that's, you know, for that. Okay.



This is what we got back from the lab. What do you think? You're gonna put that in patient's

mouth? Reverse circlet, check, lingual plate, check, check, check. What the heck is this? Where did that come from? It's supposed to be a lingual clasp and that's it. And they've added a whole distal extension on. Don't know, you have to check what the lab sends you back.



This is recent, this was actually sent to the lab and asked for a framework from this. Can you tell me what's happening at six? Can you see that's screwed up? First of all, they put a cingulum rest here and then. But there's no framework. What's the lab supposed to do with that? I mean, it's very convenient to complain. Well, the lab didn't do this right, and the lab didn't do that right, but have you ever heard of garbage in, garbage out? And what is this? Remember, for anterior teeth when you plate, it should be drawn halfway up on the tooth. The lab hopefully would know not to put it at the gingival margin, but what if they didn't and they just put. You know. And then why step away from this? It pretty much defies description.