Periodontal Prognosis

Joseph V. Califano, DDS, PhD

Objectives

- Describe the types of prognoses
- Describe factors contributing to case and tooth prognosis
- Describe the prognosis classification systems
- List factors associated with Favorable, Questionable, Unfavorable, and Hopeless in the Kwok and Caton prognosis classification system

What have you learned so far about periodontics?

R

- PER 711
  - Normal periodontium in health
  - Comprehensive periodontal examination
  - Periodontal instrumentation- scaling and root planing
  - Patient education, oral hygiene instruction

If you do perio, need to do OHI during initial tx. Disclose, see-show-see

- PER 712
  - Classification of Periodontal diseases-gingivitis and periodontitis
  - Etiology of gingivitis and periodontitis- microbial biofilm, inflammation, Immunopathology
  - Risk factors for periodontitis: genetic predisposition, occlusion, tobacco, local factors, diabetes, obesity

Prognosis

What is prognosis?
You might think its a guess at how the patient will do after we provide them with treatment

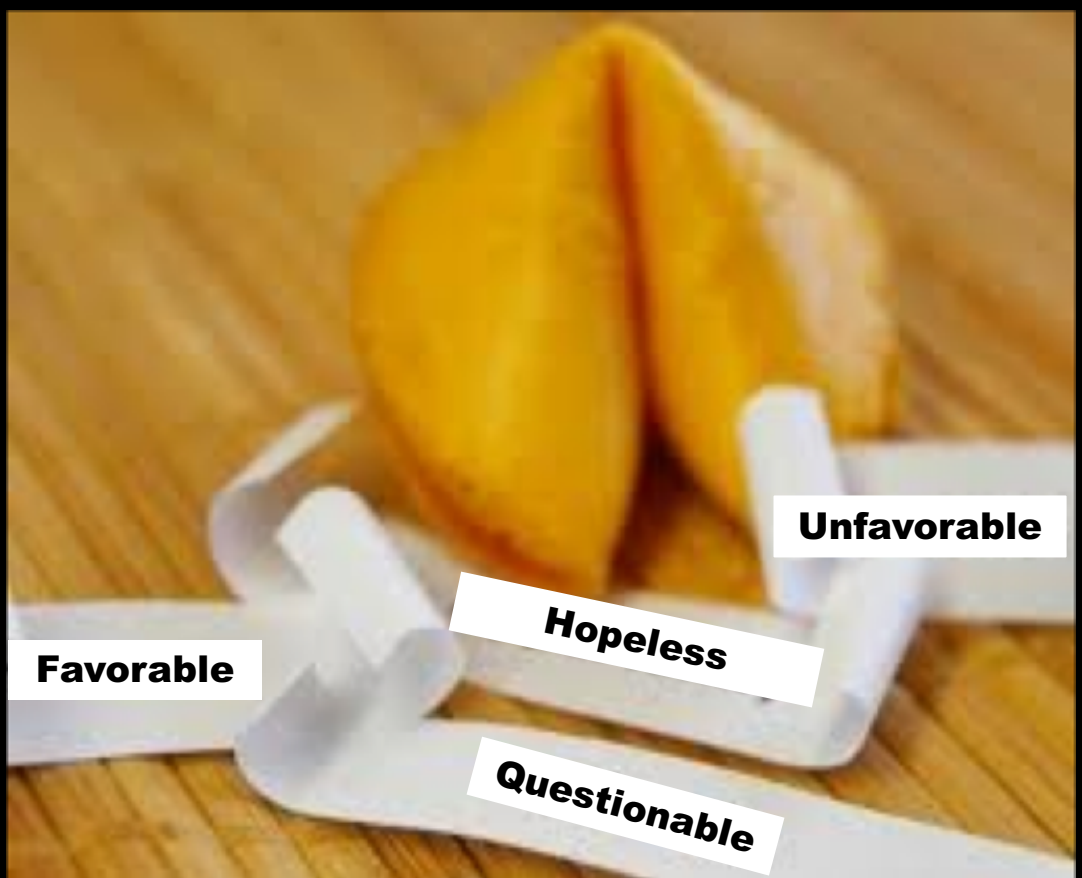
Prognosis


Oh, OUIJA®, can we take the car?
Shall I become a model, or fashion designer?
What college will accept me?
Who's Debbie's date for the Prom?
Are flying saucers for real?
Should we go steady?


QUEEN OF WANDS
THE MOON
THE SUN
TEN OF CUPS

Prognosis

Prognosis



But with prognosis we aren't talking about guessing how a patient will do we really want to focus our knowledge about disease and past experience with patients to make a judgment on how our particular patient might do throughout therapy

Prognosis

- Definition:
  - a prediction of the course or outcome of a disease or disorder

There are different types of prognosis we might make

The probability of something happening

Periodontal Prognosis

Example: one tooth has 60% attachment loss and no mobility. Another tooth has 40% attachment loss and class II mobility. But the first tooth has better prognosis. Occlusal forces aren't traumatic to the first tooth yet.

- Types:
  - Short term (<5 years), long term (>5 years)
  - With treatment? without treatment?
  - Case prognosis, individual tooth prognosis
  - What outcome measure:
    - Tooth mortality (e.g., McGuire, Becker, Hirschfield)?
    - Tooth stability (e.g., Kwok & Caton)?

Usually with tx
In clinic, develop therapeutic prognosis

E.g. what will happen to #2 if there is class I mobility, attachment loss, etc?

"What's the prognosis in the next 5 years?"

What is the probability that after tx, the tooth will be stable? Even though it lost attachment, it won't lose any more

We can talk about the timeline that we are thinking about, prognosis can be short term which we usually think is less than 5 years or long term more than 5 years

We can also say with. Or without treatment typically though we are assuming we are going to treat the patient and they will accept our treatment so when we are doing that we say therapeutic prognosis, assuming patient will participate and receive therapy we recommend we have therapeutic prognosis which gives idea of how patient will do assuming they have our treatment

We can also say an overall case prognosis how is this patient going to do overall throughout their mouth and particular considering a wide range of things like overall systemic health or ability to cooperate, their compliances with our care, maybe even things like finances as to whether they can execute all the types of procedures and therapies we recommend, but we can also have individual tooth prognosis and take each tooth in the mouth and look at various aspects about tooth and th eperiodontium that supports it and decideee about prognosis for the individual tooth base don a variety of issues

And also we can use different outcome measures so that many of the prognosis schemes or categories of prognosis and systems of prognosis that we will talk about uses an outcome measure of tooth mortality so that when we do that we use McGuire Becker or hrischfield any of those prognosis. Schemes we are looking at probability tooth might be lost whereas the prognosis scheme by Kwok or Caton talks about tooth stability so there we are looking at whether or not the tooth will be stable and will maintain attachment even though say a tooth had periodontitis a and there is some attachment loss we are deciding with therapy will that tooth maintain its current attachment or will it continue to lose attachment so that's the outcome Kwok and canon look at

So what factors do we consider when we are assessing prognosis? And particular for an individuall tooth prognosis whatt factors do we consider?

Periodontal Prognosis

- Factors to consider for individual tooth prognosis:
  - Amount or % of attachment loss
  - Amount or % of bone loss
  - Type of bone loss: horizontal or vertical

    May get bone back for vertical defects w/ regenerative tx. But for horizontal, you can't bring it back up.
  - Presence of furcation involvement?, severity?

    Class II furcation (horizontally probes) - hard to fix. Calculus can get in b/t roots of multi-rooted tooth. Even worse prognosis for class III furcation
  - Mobility

    Bad prognosis. Traumatic occlusal forces present and tooth can't withstand it.
  - Crown : root ratio

    Related to bone and attachment loss. Consider canine (longer) vs premolar (shorter) root

So we can talk about the amount of percent of attachment loss of the overall root length, how much of that attachment is lost, has been lost
The amount of percent of bone loss so radiographically how much bone loss has occurred around the totoh
Also the the of bone loss, horizontal or vertical, in many cases with vertical bone loss you have a chance with therapy and regenerative therapy to regain bone and attachment but with horizontal probably cannot improve the level of attachment or bone level with therapy and really focus on maintain what is remaining

Is there furcation involvement? What is the severity of furcation involvement> that impacts prognosis

Is the tooth mobile? What is the cron root ratio?
You might as you look at these and there will be a few more factors to consider, think about this, these are not all independent things you might measure, they are interrelated, so the more attachment loss you have the more bone loss you might have, if you have lots of attachment loss more likely to be more mobility, crown root ratio more likely to less favorable so these are all interrelated factors that relate to severity of periodontitis and each contribute to understanding of prognosis of a particular tooth

Periodontal Prognosis

- Factors to consider for individual tooth prognosis:
  - Root form:
    - conical?, fused?
    - root trunk long? short?
    - developmental grooves?
  - Pulpal involvement, caries, root fracture
  - Tooth position and occlusal relationship

For a given amt attachment loss, roots that are wide and separated are less likely to be mobile than tooth that has fused or conical (worse) roots

From CEJ and apocalyptic, when do we get to furcation? Person w/ short root trunk who has periodontitis is more likely to have furcation involvement.

Anterior or canine guidance….no lateral forces, which is good.
But if you have interferences, lateral forces will be on teeth —> parafunction.

So other factors to consider as far as individual tooth prognosis, the root form so is the root conical, is it fused, o are for a multi rooted tooth are the roots rather separated rather than being fused together and conical so that's a factor we can consider

Is the root trunk long or short, the longer the trunk the later in the disease process we might have a grade 2 or 3 furation, class 2 or 3
So long root trunk can be helpful for multi rooted tooth in terms of delaying within that disease process in terms of as we go through time the chances of getting furcation involvement will be less

Are there developmental grooves, very deep grooves that go very far apically can render a tooth hopeless, we will see examples

Is there plural involvement
Is there extensive caries, perhaps the caries are so extensive tooth is not restoratable which affects prognosis

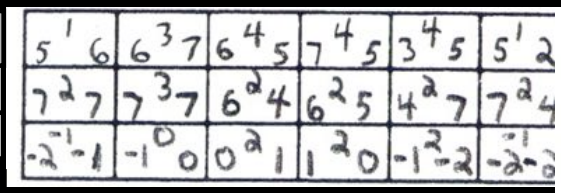
Is there a vertical root fracture? That cn certainly impact prognosis of tooth

What is the tooth position in the arch? What is its occlusal relationship and do either of those factors cause the tooth to have an unfavorable occlusal contact or have traumatic occlusal forces to bear
Those are certainly things to consider

Will go through these various points individually

% or Amount of Attachment Loss & Bone Loss

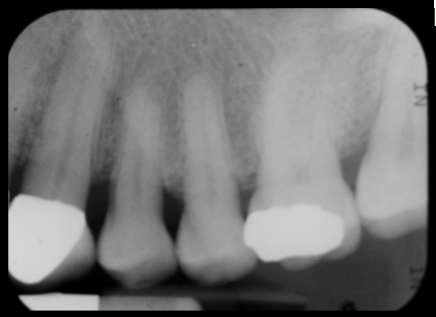
PD	4	1	3	3	2	3	3	3	3	6	3	3
CEJ	-1	1	-1	-1	1	-1	-2	0	-2	-2	0	-1
CAI	3	2	2	2	3	2	1	3	1	4	3	2

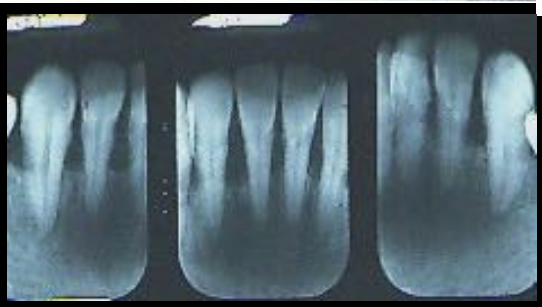


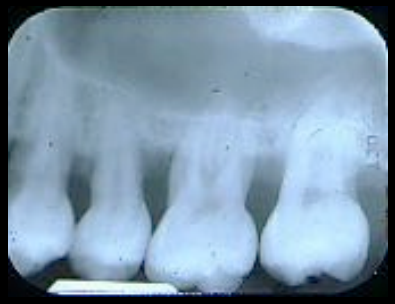
CAL

PD

CEJ







So here's some examples of clinical images along with the probing depths, the FGM to CEG measurement as well as the attachment level and we can then see radiographically the amount of bone destruction and so we can make decisions then about the percent or amount of attachment loss and bone loss so those are certainly critical issues you can see for example that if we look at the images for the sextant all the way to the left as you face the screen, the first molar crown root ration is pretty good for that tooth, the amount of attachment loss not all that dramatic there is a bit but not much so that tooth is probably pretty stable whereas the 2nd molar has some considerable attachment loss on the mesial but if you look in the middle panel you can see that these lower incisors have a dramatic amount fo bone loss probably 60-70% of the bone lost and considerable amount of attachment loss, 6-7mm on some surface so that's certainly critical issues for those teeth, similarly if you look all the way to the right that posterior sextant there's a patient whose lost again 607-70% of the bone and attachment around all the teeth, you can see the first molar has a widened PDL so there's certainly a lot of destruction there so % or amount of attachment loss and bone loss an important issue

Type of Bone Loss

Vertical

On distal of 1st molar

Look at adjacent CEJ

Horizontal - parallels CEJ

Horizontal

As he mentioned the type of bone loss is certainly a point and lets define again how do we determine if bone loss is horizontal or vertical? In some sense one might have general idea how that boney crest, interdental boy crest relates to the occlusal plane say, in mind that generally the first way we think about it but actually by definition its how does that bony crest relate to the line connecting the adjacent CEJs and that line connecting CEJs may or may not be parallel to occlusal plane depending on how neighboring teeth might be erupted or super erupted relative to one another

So on the right panels, in red he connected the CEJs of third and seance molar and second and first molar and you can see the line connecting CEJ is not quite parallel with occlusal plane, it tips a bit so we expect without any bone loss at all that that bony crest should parallel that line connecting the two CEJs, now if you measure from the CEJ to the bony crest and its greater than 1-2mm we can say likely there has been some bone loss there we certainly see that but that since that bony crest parallels the line that connects the 2 adjacent CEJs we say that bone loss by definition is horizontal

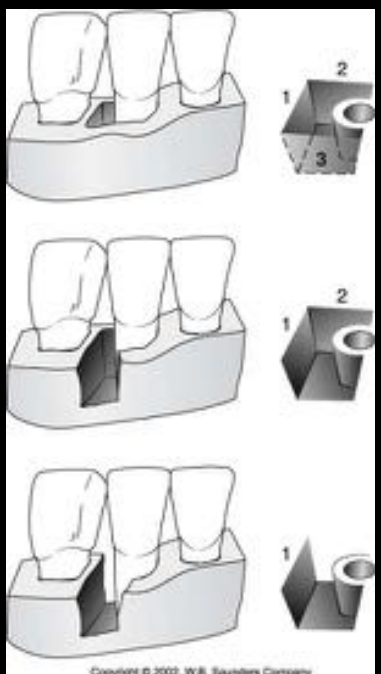
In left panel that bitewing where he marked the bony crest has a very angled appearance that is certainly not parallel to line connecting CEJs so clearly there is vertical bone loss, on the distal of first molar and the bone loss on the mesial of the second molar would be horizontal the vertical bone loss is the deeper side of that angle

And the important thing about prognosis when we talk about whether the bone loss is horizontal or vertical , vertical bony defects often times they can be rather significant in amount of bone destruction but have potential for generation to get back some bone and attachment loss, when you have horizontal that is not amenable to regeneration so we can't regenerate that

This next slide will remind you

Type of Bone Loss

- For a given amount of bone loss (mm or %) a vertical defect with more walls has a better chance of regeneration with treatment than one with fewer walls



- **Three-wall defect**
  e.g. 3 walls of bone, but 1 doesn't have. More walls = better regenerative potential = better prognosis
- **Two-wall defect**
  Crater is an example
- **One-wall defect**

We talked about before and will talk about in future when we talk surgical treatment of periodontal diseases but the number of remaining walls when you have a vertical defect will have an impact on prognosis and particularly on chance of regernation whether you can regernate attachment and bone around that tooth where the bone loss and attachment loss occurred

So if we look at the top image here you can see there is a vertical defect on the distal of that incisor and there is a buccal wall, a lingual wall, and a proximal wall so that's what we call a three wall defect and that is the most amenable, most likely to have regeneration because we have three bony walls to contain graft material we might place there during regenerative surgery and also providing blood supply to that healing site and help support a clot to form in that area which also helps support healing so there's a greater chance there also because there is a three walls every wall as it meets the tooth there is some periodontal ligament space so the length of PDL space as each wall touches that tooth is a much longer or much more PDL space available and those the PDl is the source of. Many of the cells we need to regenerate new attachment

If you look at middle picture you see buccal wall is missing but we have a proximal wall and lingual wall so that is 2 wall defect, it is certainly possible to missing to have a buccal and lingual wall and no proximal wall that is also 2 wall defect and that is intermediate level of chance of regenrton

And bottom panel with only 1 wal, the proximal wall and missing buccal and lingual is one wall defect so the more walls you have the better chance you have of regerneating that site

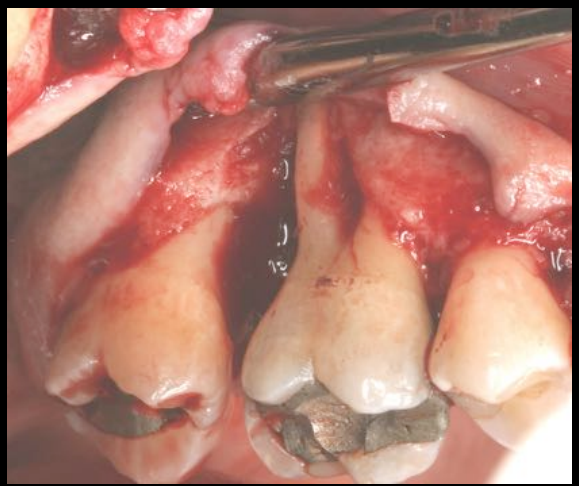
Type of Bone Loss

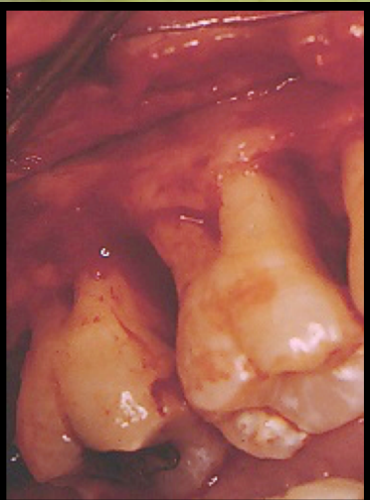
- a site with horizontal bone loss has minimal or no chance of regeneration.

And as he mentioned before if you have horizontal bone loss there's minimal or no chance of regeneration so that's not going to be a site you typically expect to get much regernation or new attachment

Furcation Involvement

Class I -> Class II -> class III





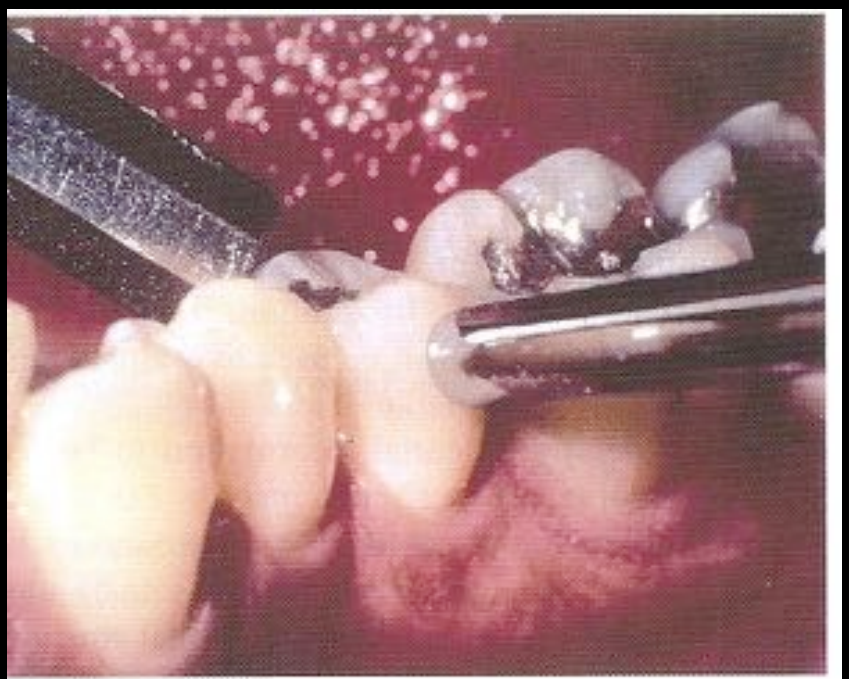
Lets talk about furcation involvement, so you remember from discussions in patient examinations that one thing we look at is the furcations to see if there is furcation involvement so you see in upper left panel there's 3rd molar, 2nd and 1st and each one has a different degree of involvement of furcation where 3rd molar has a class 1 furcation involvement so if we have our naber probe and probed in crevice we would feel it just barely go into that but it doesn't go horizontally into furcation

The 2nd molar not only would we feel it dip into that furcation area but we could actually probe horizontally between the two roots and feel a roof to the furcation so a so called class 2 furcation and finally the first molar there shoews there is bone missing through and through you could put probe all the way through that furcation so when we have a class 3 furcation in first molar that is really not a particularly successful site for regeneration whereas with class 2 we have a good chance of ragenreation, there's a number factors to consider in whether or not a particular class 2 would be a good site to regenerate but many o them can be regenerated and grade 1 really doesn't t need a regenreative procedure usually are focused on if we are treating surgically on deriding root surface really well but not so much on regeneration

In this there is anumber of images showing furcations that ar involved to varying degrees so in lower eleft you can see the second molar the buccal furcation likely a class 2 furcation and whereas the buccal furcation on 1st molar is probably class 1 furcation and in the case of the 2 mandibular molars you see the first molar was probably and that was class 2 furcation whereas the 2nd had only class 1 on those facial furcations similarly if we look all the way to the right lower right panel, that lingual furcation in the first molar that was a class 1 furcation, we talked about just a few moments ago but you can see that the bony defect in between those 1 and 2 molar is what we call crater defect, 2 wall defect she buccal defect, there was a facial wall but no proximal wall he treated this patient so 2 wall defect

Upper right you see there's at least a class 1 furcation on the facial of maxillary 1st molar, it turns out is was a class 3 because he could probe in there on the facial and it would exit out distal and so that was severely involved and the prognosis for that tooth was not particularly good

Mobility



So other factors to consider were thinking about prognosis is mobility, mobility is a big one so when a tooth has lost attachment and lost bone the chances it might be mobile is greater especially if crown root ratio is also poor, those are factors that typically vary together, amount of bone loss impacts the crown root ratio but also what occlusal forces especially lateral forces are being brought to bear on the tooth will also be important in determining whether a tooth is mobile

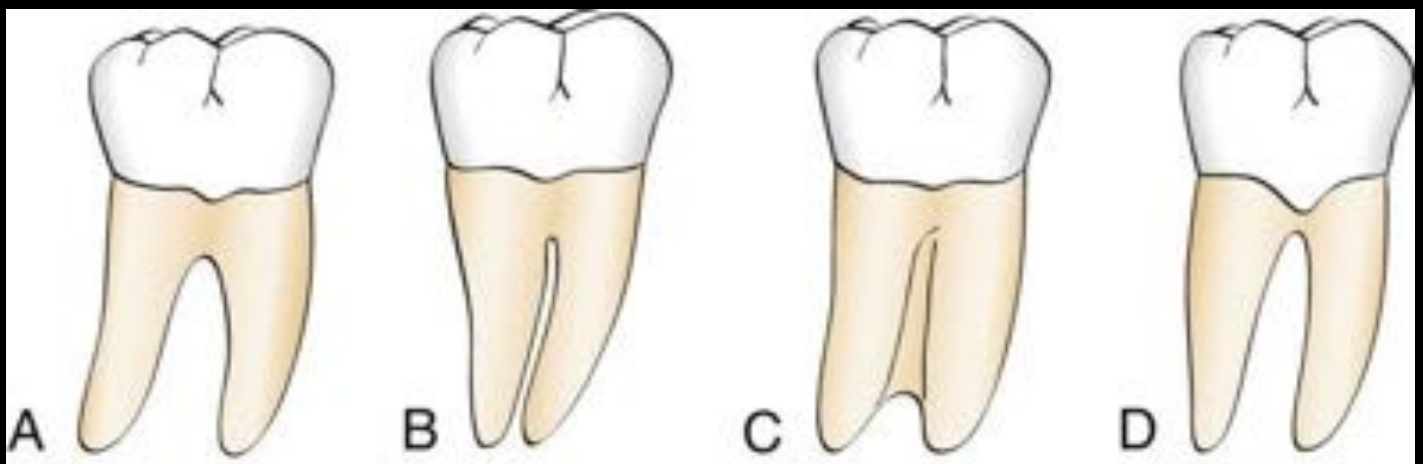
But if a tooth is mobile especially considering bone loss and attachment loss we are more worried about the tooth from prognosis standpoint than if the tooth was non mobile

Crown : Root Ratio 1:2 is what you want

He's already mentioned crown root ratio but as o can see here in this radiographic image we've measured both the clinical crown height and the root length in bone so if you look at 2nd molar and measure from bony crest interdentally down to the root apex and then similarly go from occlusal surface down to bony crest, mention crown height we have a crown root ration of 1.5 to 2

Similarly on 1st molar, it is 1:1
But now on 2nd premolar you can see there is a lot of bone loss particularly on this tooth and som apical root resorption so if we measure from bony crest to root apex and then from bony crest to occlusal surface to get the crown length we can see the crown root ratio here is 2:1 so this tooth has a partricalrly unfavorable prognosis particularly if it was mobile which is likely would be with that kind of crown root ratio

Root Form: Conical? Fused?



Widely Separated Roots

More stable

Separated But Close

Fused except apical

Cervical enamel projection

Now lets talk about root form, particularly when it comes to multi rooted teeth we can have widely separated roots as indicated in the illustration for A, we can have those departed but close to one another, a bit more of a conical appearance, we can have them where they are mostly used together but open a bit in the apex or fused all the way and so this is the sort of thing we need to be concerned with

Also cervical enamel projections ais another thing we can be concerned with

So lets look at some radiographs and root form

Root Form: Conical? Fused?

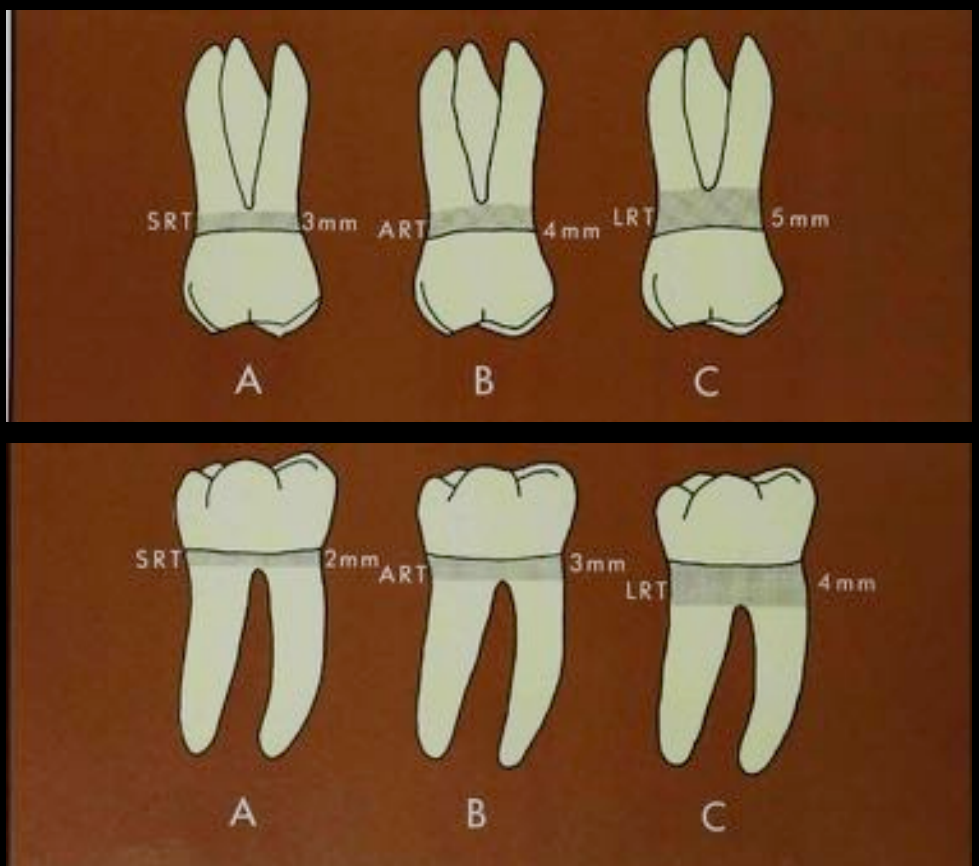
So if we look at the middle series of radiographs all the way to the left we can see that 1st molar has widely separated roots so that's a positive thing fo that tooth and it is typical for 2nd molars, usually less so for 2nd molars so you see in that image all the way to the left those roots are closer together and that's not as favorable as if they were further apart
If we compare 2nd molars to one another, that 2nd molar in the left middle pic and the lower panel and over one you can see that there is that 2nd molar the roots are even closer togetherr and a bit Moree conical than the 2nd molar that he talked in the middle row so you can see how there is a gradation of how widely separated the roots might be or how close or even fused they might be

If you look on top row the very middle image 2nd molar those roots are fused together, same for the top row second image from the left, the third molar roots are completely fused and the 2nd molar are very close together and in both cases fairly conical in appearance

If we look at all the way to right on top the 2nd molar and 3rd molar, fused roots that are conical so that those are all other things equal that is less favorable prognosis wise if that tooth began to loose attachment

As an aside you might think which tooth if you had to extract would be hardest to remove of all these , certainly the impacted 3rd molar but that aside talking bout root form for erupted tooth the first one he talked about the widely separate tooth in middle left is much more challenge to extract all other things equal compared to the top right 2nd molar and 3rd molar, could get elevator and extract without force perhaps just elevate right out so you can see the fact that we can extract them more easily means hat if they started to loose bone they would be more likely to be mobile and prognosis would be less favorable

Root Form: Root Trunk Length



In this illustration you see for maxilla and mandibular molars different levels of root trunk levels so the entrance to furcation is either 3-5mm from CEJ, the farther away that furcation entrance is from CEJ in the natural course of person periodontitis over years having more an more attachment and bone loss the furcation will become involved as in class 2 or class 3 furcation later in that disease process so that's prognosis wise a more favorable thing if we have a long root trunk

Root Form: Root Trunk Length











In top row there are teeth with fairly long root trunks and you notice there is considerable bone destruction around these teeth and yet we have no furcation involvement or a class 1 furcation

If we look at 2nd row now the root trunks all the way to left are a bit shorter and we ve got more chance for furcation involvement all the way to the right in middle row you can see this furcation entrance is closer to the CEJ and in the case of 2ndmolar that has resulted in a lot of destruction a lot of bony destruction so probably short root trunk among other things contributed to the disease getting worse faster for that particular tooth

Bottom row the furcation entrances are almost right at the CEJ so more a concern and not a good for the prognosis of those teeth with short root trunks

Cervical Enamel Projection, Enamel Pearls

Enamel goes down into furcation





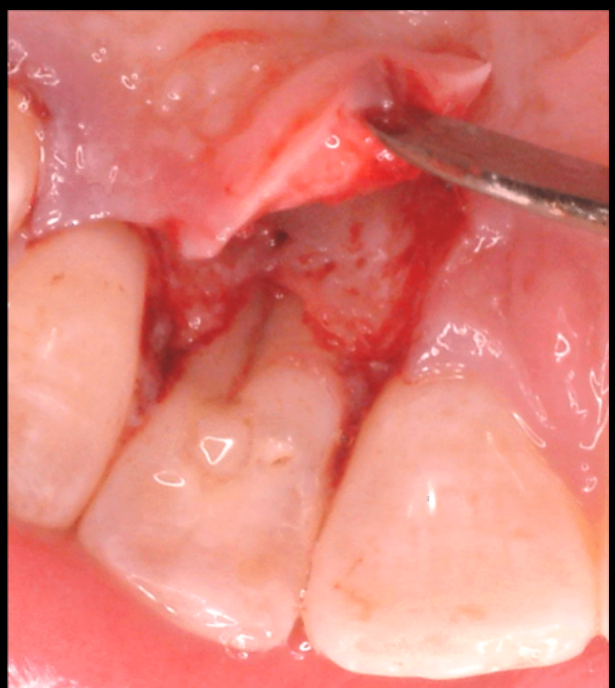
Collects plaque

As you know in the absence of a cerival enamel projection the normal attachment to a root at the CEJ withouth attachment loss is through sharpey's fibers and the sharpers' fibers then go inserted to the bone and when they get to bone they insert into cementum on root surface, if you have cervical enamel projection that prevents possibility wherever there is enamel there cannot be sharpers fiber and you can only have epithelial attachment rather than true CT attachment

In three left images the enamel, if you follow CEJ from mesial to distal, the enamel dips down into the furcation and in varying degrees and they are classified 1, 2, 3 and just like furcation involvements

Right two images are enamel pearls and those are even more significant because if can be a lot of plaque accumulation as well as destruction of CT attachment right in the furcation entrance that would certainly be a very significant factor in prognosis and if we were to treat these teeth the treatment is to remove for these except the left one but if we have a savable tooth with these we take finishing bur and remove that enamel from the surface so we can potential get new attachment to that root surfacve

Developmental Grooves



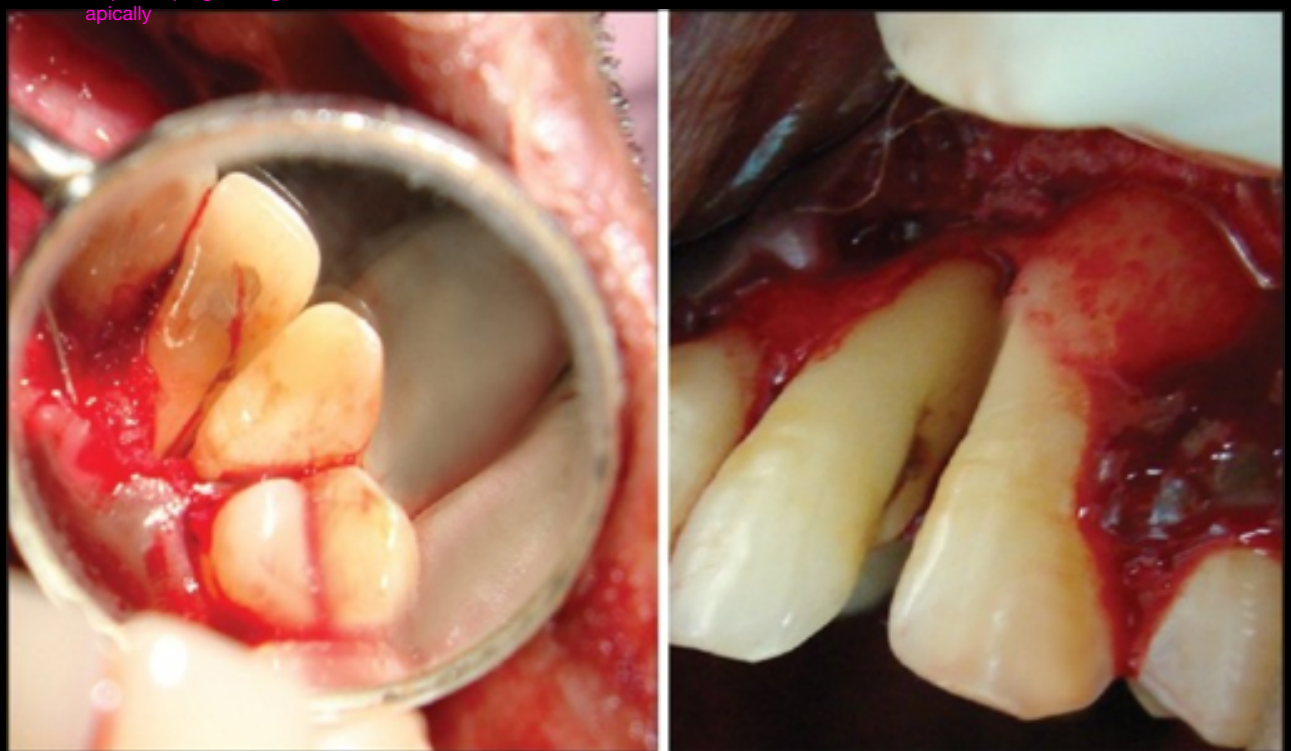
If it goes too far apically, then it might be hopeless. For this image, you can take finishing but and flatten that out

Some teeth have greater propensity to have developmental groove, good example is maxillary lateral incisor, it is particularly frequently has developmental grooves so you can see if you look at this left panel you see there is a bit of anatomical defat in the crown and when we probe there this patient was healthy otherwise so when flap was reflected you see how tides that groove is it goes down to bone so there is bony destruction so its difficult to clean and to keep clean, you imagine plaque will collect in that and then calculus

When you see this you do odontoplasty to try to eliminate it or decrease its depth and make it less likely to accumulate plaque and therefore calculus

Developmental Grooves

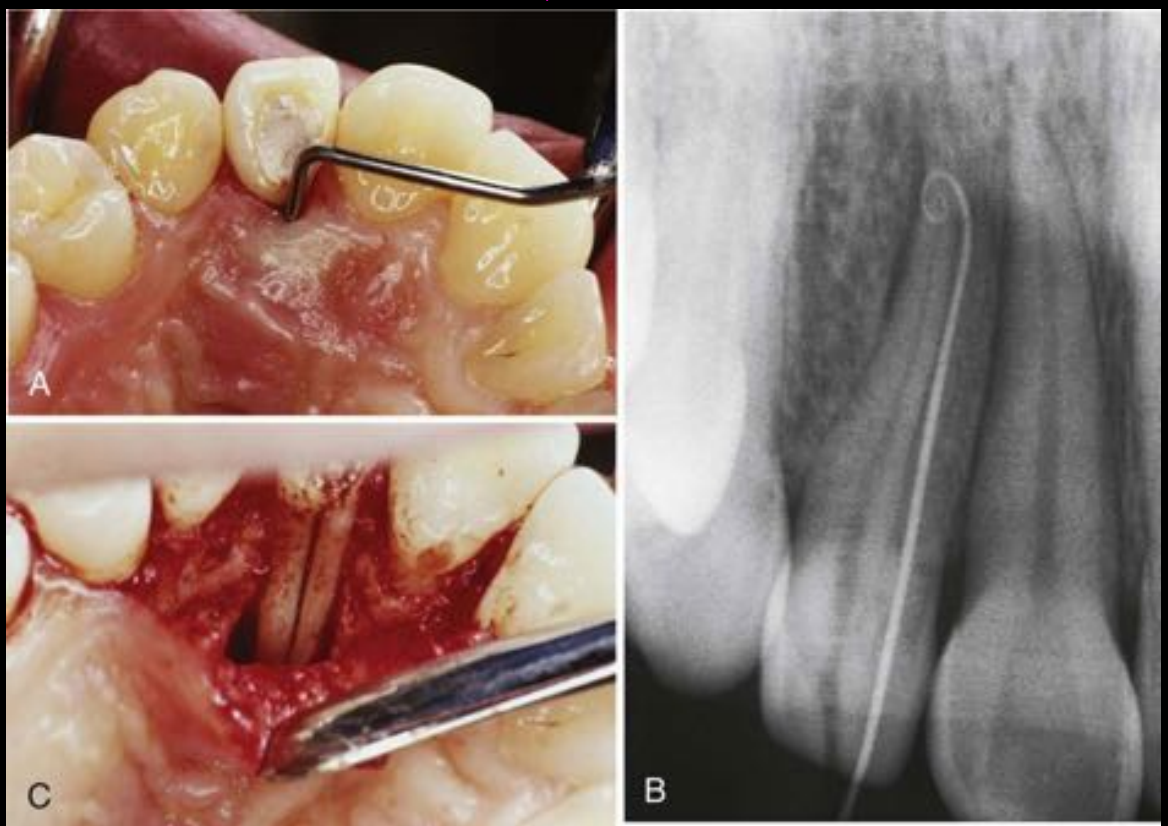
Hopeless prognosis, goes too far down apically



Another lateral that has a fairly deep groove, similarly see on right a canine on distal surface a fairly deep groove and you see the brown material that is calculus accumulated in that groove and notice that along with that groove and there has been a lot of destruction on this one spot on the surface so clearly that groove collected plaque and then calculus that contribute to higher rate of destruction and loss of attachment and bone on the distal that tooth

Developmental Grooves

Hopeless



Carranza 11th ed

heres.a tooth that has such a deep groove that the tooth was rendered hopeless so that not much we can do with that

Look at A and then B you see it probed to the apex and gutta percha would trace down to the apex and if we reflected flap see in C that deep is very deep it goes down to the pulp so couldn't do odontoplasty and eliminate that groove so this particular tooth is hopeless prognosis

Pulpal Involvement?

- If non-vital, can RCT be completed successfully?
  - vertical root fracture?? hopeless
  - calcified canals??

Carranza 11th ed

If a tooth is non vital, what can we do about that and how does that affect prognosis

It depends, if a root canal, therapy can be completely successfully it may not have a huge impact on the prognosis, however if the tooth is non vital because of vertical root fracture that may make it hopeless

If its non vital and canals are calcified and root canal cannot be completed, cannot get the file down the canal to deride I it might render tooth hopeless so certainly plural involvement is something to be considered

Pulpal Involvement?

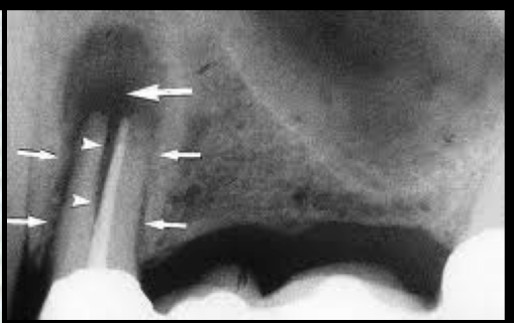
- If non-vital, can RCT be completed successfully?
  - vertical root fracture?? hopeless
  - calcified canals??

Carranza 11th ed.

These are just some other example of where a tooth was the vitality was non vital and root canal therapy was completely and as it was observed over time from A to E once the endodontic problem was resolved, there was attachment gain and some bone actually came back sot hat tooth was in good shape so endodontic therapy can even participate in getting a tooth to healthier situation and ultimately a good prognosis

Pulpal Involvement?

- If non-vital, can RCT be completed successfully?
  - vertical root fracture?? hopeless
  - calcified canals??



Carranza 11th ed.

And example of tooth in radiograph on left it had a vertical fracture that was determined so the tooth was extracted so you can see if the tooth is extracted we couldn't do anything with that except remove it

The right panels show some other teeth with vertical root fractures so typically a vertical root fracture is a hopeless situation

Caries? Restorable?

If the tooth has caries we have to decide if it is restorable or not so he shows some examples the two left panels while concerned about that tooth it was ultimately treated just fine and was able to be maintained but the two teeth the two molar teeth in right pics are examples of teeth with caries so extensive the tooth is not restorable and is hopeless prognosis

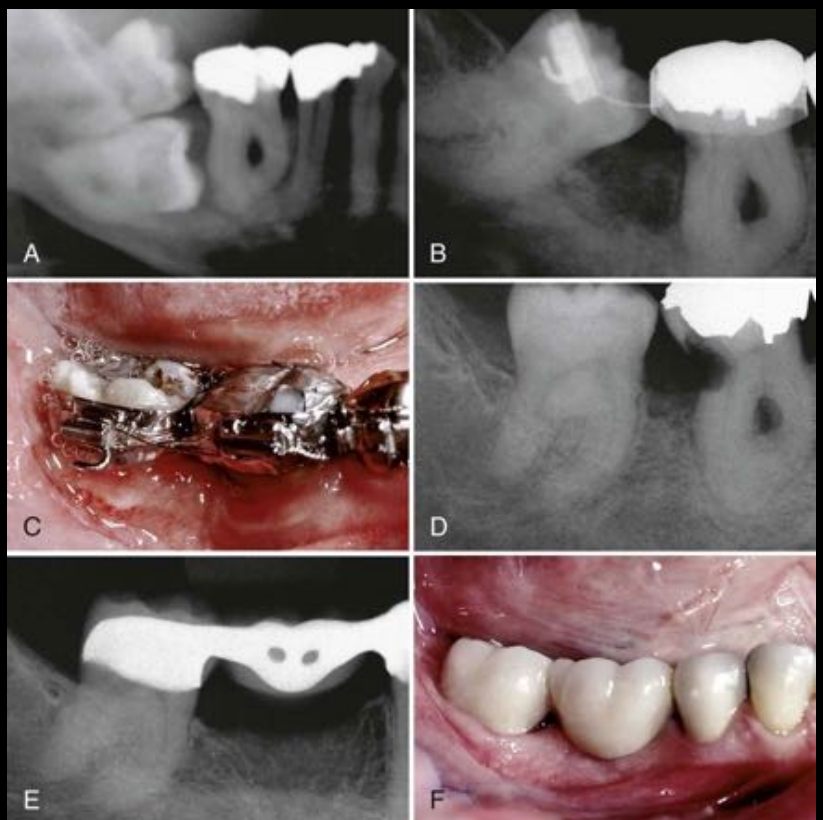
Tooth Position, Occlusal Relationship

- Tooth position
  - Traumatogenic occlusion- occlusal adjustment? restoration? orthodontics?, can it be improved?
  - Root Proximity- accessible root surface?, orthodontics?, root resection? extraction?

So if you have traumatic occlusal forces and occlusal scheme, there's traumatogenic occlusion scheme the question is can we do occlusal adjustment to improve occlusal forces on tooth, can we restore the tooth, would restoration change occlusion, maybe orthodontics can be done and fi we can do any other those things then the occlusal challenge may b resolved and not continue to contribute to unfavorable situation from prognostic standpoint but sometimes there nothing we can do about it and if that is the case then the tooth could even be hopeless depending on the situation

Another issue as far as tooth position besides the occlusal relationship is root proximity so if we have a root proximity that is the roots are close together the question becomes can we access the root surface to deride it, if we can and the patent can keep it clean it may not have huge impact on prognosis but some cases we can't get a curette between the two roots if we can't we can't clean it and the patient can't clean it then it might have significant effect on prognosis so in those situations we might consider orthodontics or might do root resection which means for example if you have a maxillary molar maybe you take distal buccal root off and do endotontics and keep tooth and two of its roots or if its not strategic tooth and have challenge with root proximity maybe the easiest thing to do is remove it you might have to to deal with that situation so different decisions you make

Tooth Position, Occlusal Relationship



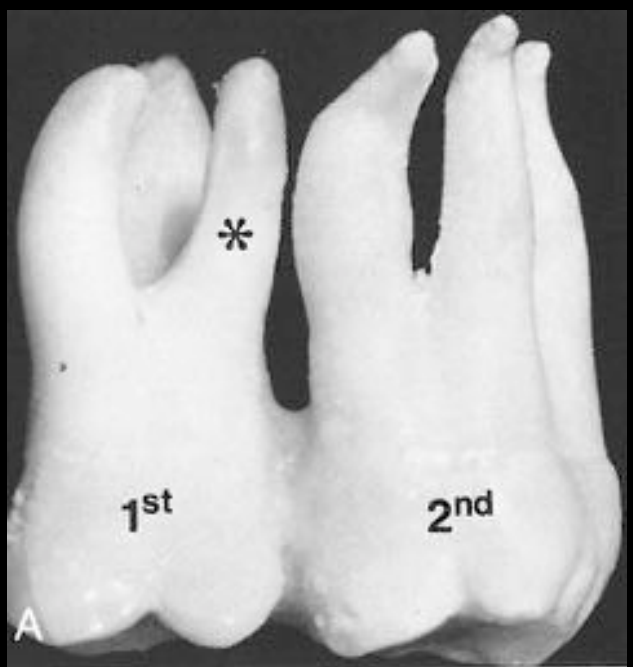
We can see here that we have 2 positions that are unfavorable and so what was done here was the 2nd molar was removed and then the first molar had really severe disease and I think a grade 3 class 3 furcation involvement so it was hopeless but they used it as a bridge to upright the third molar and then once that they did that they removed 1st molar and put FPD in place so that challenge with tooth was resolved with orthodontics and ultimately extraction and prosthodontics rehabilitation

Tooth Position, Occlusal Relationship

Here's another situation where there's an issue of root proximity between the roots of the two molars that we see in panel A and B and so what happened is orthodontics was employed to torque these prowns and roots and get them more parallel to one another and probably a better occlusal relationship also

So in B to E and then clingially from A to F now we have situation that is healthy and maintainable

Tooth Position, Occlusal Relationship

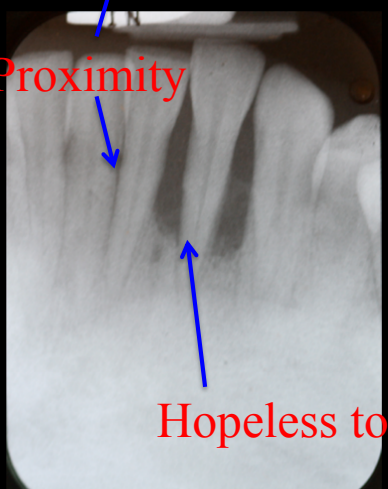


Another situation can occur where distal buccal root of first molar is very close to the mesial buccal root of 2nd molar and so since we have god separation of roots in first molar, one positibility to deal with that problem if there has been perio bone and attachment loss to mid root level fo those two roots we can't really clean it and that is a problem so in some cases we may choose to remove one root and eliminate the root proximity issue

Tooth Position, Occlusal Relationship

Here we have a tooth size arch length discrepancy so there is a lot of crowding orthodontically and also root proximity so blue arrow is pointing where there's two teach that have very close root approximation and its cause one of the teeth to lose a lot of bone loss

Tooth Position, Occlusal Relationship

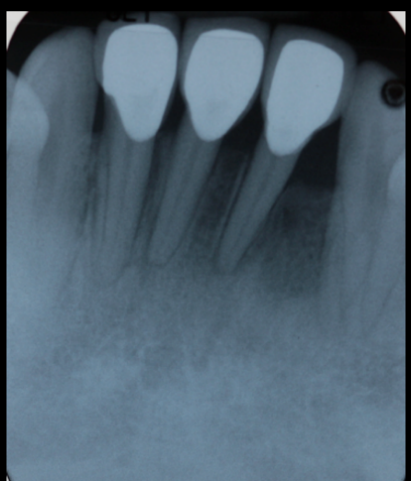


Root Proximity

Hopeless tooth

So then we are radiographically the one of the teeth is lost 3/4 of the bone and its due to that tooth is hopeless and yet 2 other incisors have root proximities so how we deal with that the decision was made since we have tooth size arch length discrepancy we lose the tooth that has lost 3/4 of this bone and that tooth and then reposition the remaining teeth so we get rid of root proximity problem so here is how that case proceeded the tooth with the bone loss was extracted because was hopeless anyway and now we begin to do the orthodontics, teeth were repositioned in the arch and that resulted in some diastema in this case but then the case had some restorations

Tooth Position, Occlusal Relationship



Ultimately placed to close the contacts and now we have a situation where these roots can be adequately derided and cleaned and patient can keep clean so this is another way we can change the prognosis of the teeth that the root proximity problem that causes a very difficult situation in terms of prognosis of teeth we can have some therapy and improve prognosis

He's been talking about tooth specific or individual tooth prognosis now he wants to talk about things we consider when thinking about the overall case prognosis

Periodontal Prognosis

- Factors to consider for overall case prognosis:
  - Diabetes?
  - Smoking?
  - Genetics? (e.g., siblings with AP?)
  - Extent of disease, localized? generalized?
  - Rate of progression by longitudinal clinical measurements or infer by severity/extent and patient's age
  - Individual tooth prognoses throughout the mouth
  - Patient cooperation, especially with maintenance

As you know diabetes if uncontrolled and smoking are very important issues in risk factors for periodontitis so if someone is uncontrolled diabetic or a smoker those are very big factors to consider in the overall case prognosis

Genetics, in all types of periodontitis, be it what we used to call chronic and aggressive whith either type of disease that the typical periodontitis we see in many patients or the more rare circumpubertal onset periodontitis formerly aggressive perio, either one there is some genetic components have been shown to the risk of that disease but especially the periodontitis. That starts around puberty there is a strong genetic component of that

And what is the exonet of disease, are all the teeth affected with a lot of attachment loss or is it really localized to a certain area? And there's maybe a local tooth factor causing destruction on one or two teeth maybe the rest don't have any so the exten localized or generalize certainly affects the overall case prognosis

The rate of progression when we look so if we have records for your patient one ra period of time you can have an idea of the rate of progression of disease and if you don't have that you can look at your measurements in initial exam and compare to patients age and have some idea of rate of progression of disease, rate of destruction and that can impact

And today with our new classification system the grading A, B, or C is an assessment of that rate and gives you an idea of prognosis of overall case prognosis

You could kind of take all the individual tooth prognosis made for each tooth in the mouth and take that collectively and that informs ou about the overall case prognosis

Also you want to assess as you begin the patient th patients level of cooperation and especially whether the patient over time is willing to and cooperates and complies with your maintenance plan is key to how the outcome of treatment

Lets talk about different classification systems that is classification of prognosis or prognosis schemes if you will

Published Prognosis Classifications

- Hirshfeld:
  - Assigned a prognosis of questionable if he thought a tooth might be lost, categorized patients as well maintained, downhill, and extreme downhill based on the number of teeth lost during treatment and maintenance
  - Based on tooth mortality
- Becker:
  - Good, Questionable, Hopeless
  - Based on tooth mortality
- McGuire:
  - Good, Fair, Poor, Questionable, Hopeless
  - Based on tooth mortality
- Kwok & Caton
  - Favorable, Questionable, Unfavorable, Hopeless
  - Based on tooth stability, i.e. after treatment will the tooth maintain its attachment in comfort and function

As he mentioned at the beginning of his talk , there's a number of prognosis classificationns, three he mentioned here are based on tooth mortality so that's the outcome measure and then there's kwok and caton that focuses on stability and one of these schemes have their different categories of prognosis and some vary a little bit about how they define each one of these categories but in each case they're considering all the various individual tooth prognosis that the factors that he has been talking about this hole time those are the issues they are looking at when assigning one of these prognosis categories either to an individual tooth or the whole oral case

Prognosis

- All of these classifications consider the factors I have discussed in assigning prognosis
- The assignment of prognosis is an “Art”
- The more experience you have the better you are at it
- We are best at determining a Good prognosis, other prognoses are often wrong
- Prognosis is a dynamic process that is continually assessed as we see a patient’s clinical response to treatment and their level of compliance

Again its assignment of these classifications they consider all the factors he discussed and assignment of prognosis be it for a particular tooth or for a patient is kind of an art its not like physics or math where you put the numbers in and everyone will get sam answer in fact if you have several periodontists in a room they will have slightly different tooth by tooth prognosis assume they will be all in same general direction but there might be differences and it doesn't make one right or wrong but at least it gives you some basis for thought about where you think your case is going and how you think a particular tooth will respond to therapy, the more experience you have clinically, more years in practice you get better at determining prognosis and you have a better feel for integrating all these different factors that he presented over this presentation you can think about them and add them up some may weigh on you more than others and you may take into account more than others in determining your prognosis

If we looked at the literature on prognosis as it turns out clinicians are pretty good at determining a good or favorable prognosis and often times with the test of time other prognosis often times are wrong so where we might have given a particular tooth a poor or unfavorable prognosis sometimes we are wrong and the tooth actually turns out to do much better than we though so with that in mind prognosis is a dynamic process its not you do exam, assess prognosis for all teeth, an overall case prognosis, and that is not in cement then
So you have certain amount of info in first exam but then as you begin to treat your patient and see how your patient responds to the treatment and how the individual teeth and your patient in general respond to treatment you may either improve your prognosis or it may be worse depending on how things go
So we are always re-assessing and reconsidering the prognosis as we go along

Prognosis

- One clinical factor is not considered by itself
- It is an integration of all the factors and how they interrelate
  - examples:
    - Shallow grade II furcation, no mobility, 80y/o=favorable prognosis
    - Shallow grade II furcation, no mobility, 25y/o=questionable prognosis
    - Shallow grade II furcation, class I mobility=unfavorable prognosis
    - Grade I furcation, 60% attachment/bone loss, class I mobility=unfavorable prognosis
    - Grade I furcation, 60% attachment/bone loss, class III mobility=hopeless prognosis

Each factor he outlines is not considered by itself, its an integration of all the factors and how they interrelate with one another so an example of what he means if. He has situation 1, prognosis although usually with grade 2 is not favorable, in this case if the person is 80, no mobility grade 2 he would say favorable because chances are tooth if it made it that long with that type of situation ifs probably going to last as long as the patient needs it

But if you have situation 2, now he might have questionable prognosis because as long as 25 yo has long natural life that tooth is going to have to survive and maintain its attachment stability for many more decades and the chances of that become less so that decreases the prognosis

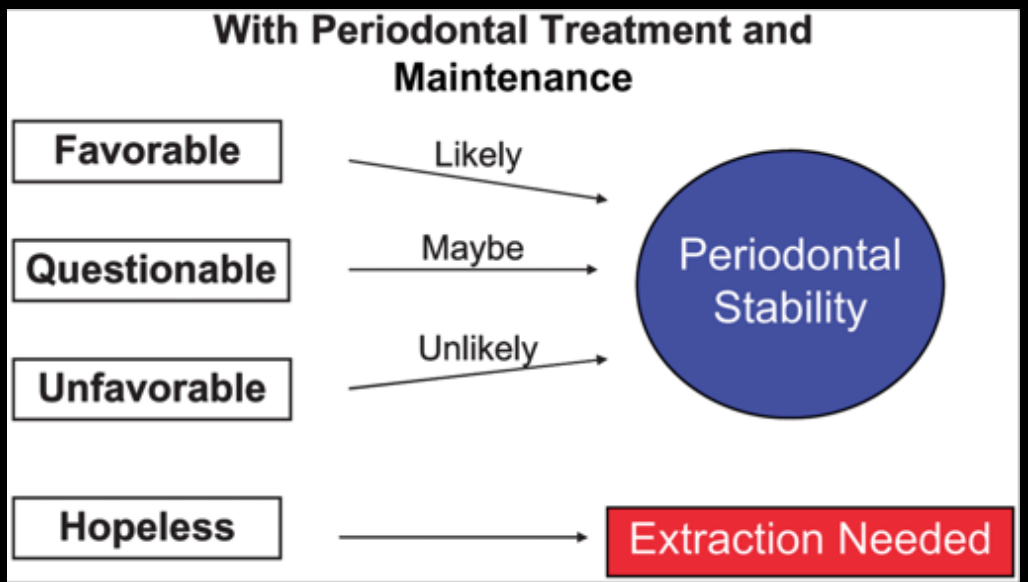
Third case, same age 25, class 1 mobility because if tooth already has mobility and grad 2 furcation together those worry him a lot more than either of those items alone

Fourth, usually grade 1 furcation is not necessarily cause for saying unfavorable prognosis but if in addition has 60% attachment loss and class 1 mobility maybe a poor crown root ratio then now you have unfaivorable prognosis

Fifth, but similarly if you have but class 3 mobility that becomes hopeless so you can see how all those things fit togerth and are considered together

He has mentioned several prognosis schemes, the one that we use at OHSU which he likes the best is the Kwok and Caton

Kwok & Caton



- I like this classification scheme, not too many categories, uses stability as an outcome measure

So this is the Kwok and Caton classification scheme and this is the one that we use at OHSU, what he especially likes about it is that the outcome measure focuses on periodontal stability rather than tooth mortality so looking at tooth over time and we are making a prediction as to whether that tooth will be able to maintain its attachment or what are the chances it might continue to lose attachment so if we say prognosis if favorable we are saying we are likely to be able to control all the factors involved in th periodontitis for that particular tooth and that it will maintain attachment without losing further attachment

If we say questionable we are saying maybe the tooth might be able to be stable and not lose further attachment but there are some factors we are not certain we can control with our therapy and if we can't it might continue to lose attachment

If we say prognosis if unfavorable we are saying there are factors we think we cannot control we are fairly certain we won't be able to control them fully so therefore we have concerns hat we think its a good chance the tooth will continue to lose some attachment

And hopeless is tooth already lost a lot of attachment and there is uncontrollable factors such that the tooth should probably be extracted

Prognosis (Kwok and Caton) **OHSU Department of Periodontology**

Favorable	Questionable	Unfavorable	Hopeless
• The periodontal status of the tooth can be stabilized with comprehensive periodontal treatment • Future loss of the periodontal supporting tissues is unlikely *The teeth are expected to survive with routine professional care*.	• Local or systemic factors exist that may or may not be able to be controlled • The periodontium can be stabilized with comprehensive care if these factors are controlled; if not, future breakdown may occur *The teeth can often be stabilized with adequate periodontal therapy.*	• The periodontal status of the tooth is influenced by local and/or systemic factors that cannot be controlled *Periodontal breakdown is likely to occur even with comprehensive periodontal therapy.*	• Teeth with severe periodontitis that cannot be treated (or non-restorable) with any hope of success. *The tooth must be extracted.*

Short-term prognosis: 1-5 years
Long-term prognosis: 5-10 years

<u>Prognostic factors to consider at the tooth level:</u>

- Mobility
- Amount of remaining attachment
- Probing depth
- Bone loss
- Presence/absence/severity of furcation lesions
- Crown:root ratio
- Endodontic status
- Caries

This is a table summarizing some of the details of the different categories whichever you talk about

You can reference this and look at but this is summarizing th various categories, what they mean, what he just outlines, and lists some fo the factors in the bottom that we would typically consider in determining the prognosis

Prognosis

- Clinical findings consistent with a Favorable Prognosis:
  - Attachment/Bone loss: mild (≤20%) – moderate(>20%<50%)
  - Vertical 3-wall defects (better than 2 or 1 wall, better than horizontal), greater potential for regeneration
  - Furcation involvement: none or grade I
  - Mobility: none or class I
  - Crown:Root Ratio: 1 : 1 or better
  - Root form: long roots, good root separation in multirooted teeth, no developmental tooth anomalies
  - Pulpal involvement, caries: none or manageable/restorable
  - Tooth position, occlusion: acceptable without traumatogenic occlusion or root proximity (or can be adjusted to this), patient is not a bruxer/clencher
  - Good patient cooperation
  - Non-smoker, non-diabetic

So now some examples of particular situations or clinical presentations that would be consistent with each one of the Kwok and Caton categories

So if he says clinical categories consistent with a favorable prognosis, there is attachment and bone loss but its mild, its les than 20% or maybe even moderate, it could be between 20 and 50% as long there are not other things very challenging so vertical three wall defects better than 2 or 1 wall defects, if there is furcation involvement there isn't involved or its grade 1, preferably there is no mobility would be most consistent with favorable or maybe a class 1 but a situation where you think you could adjust it and eliminate the excessive forces on the tooth, crown root ratio 1:1 or better, long roots with good separation for multi root teeth and probably good root separation so no root proximity no development tooth anomalies and the teeth are vital or at least if there's caries or some teeth are not vital its all manageable or restorable or its all treatable, tooth position you know acceptable without tramatogenic occlusion or something can be done to manage this and also that there is not bruxing or clenching or if so then we can have an occlusal guard the patient is willing to wear and good patient cooperation and patient is non smoker and non diabetic so there's a bunch of clinical findings that would be consistent with favorable

Prognosis

- Clinical findings consistent with a Questionable Prognosis:
  - Attachment/Bone loss: moderate (>20%<50%)
  - Vertical 2-3 wall defects (better than 1 wall, better than horizontal), greater potential for regeneration
  - Furcation involvement: grade I or shallow grade II
  - Mobility: class I
  - Crown:Root Ratio: >1 : 1, <2:1
  - Root form: root separation not ideal in multirooted teeth but not fused, not conical
  - Pulpal involvement, caries: none or manageable/restorable
  - Tooth position, occlusion: traumatogenic occlusion or root proximity that can be addressed with treatment, bruxism/clenching
  - Good patient cooperation
  - Non-smoker, non-diabetic

Now if we go to questionable we are going to say there is at least moderate bone or attachment loss and that maybe some defects might be 2 wall or 1 wall but some might be 3 wall, furcation involvement grade 1 or shallow grade 2 so things we think with our treatment we might be able to address but we are not sure especially if shallow grade 2 we are not sure we can regenerate but we think we might have a good shot at it, maybe non mobile, maybe class 1 mobility but we are thinking if we adjust occlusion it will be okay so feeling with treatment we can mage it but we are not sure, crown root ratio different levels but some not as good as less than 1:1, root forms so root separation might not be ideal for multi rooted tooth but its not fused or conical, typically if we say questionable if there is plural involvement or caries it could be we are not sure we can mage or restore but we think there is good chance we can but saying maybe there is an issue and we will have to see as we go through treatment whether we can managed, again tooth position in occlusion we have situations we think can be addressed with treatment, and again good patient cooperation, non smoker, non diabetic

Prognosis

- Clinical findings consistent with a Unfavorable Prognosis:
  - Attachment/Bone loss: moderate (>20%<50%)- Severe (>50%)
  - Vertical 1-2wall defects, or horizontal
  - Furcation involvement: deep grade II
  - Mobility: class I – class II
  - Crown:Root Ratio: ≥2:1
  - Root form: root separation poor or fused in multirooted teeth, conical
  - Pulpal involvement, caries: none or manageable/restorable
  - Tooth position, occlusion: traumatogenic occlusion or root proximity that can't be completely addressed with treatment, bruxism/clenching
  - Poor patient cooperation
  - Smoker and/or diabetic

Unfavorable

Now we have got moderate or severe attachment loss and bone loss, vertical defects not as amenable to regernation or severe horizontal bone loss, deep grade 2 furcations that likely won't be able to be regenerated and mobility class 1 or class 2 and greater that 2:1 crown root ratio so unfavorable crown root ration, root form some tooth might be fused or conical and you might have caries that or plural vomit not easily managed and also you might have tramatogenic occlusion or root proximity that cannot be completely addressed with treatment, maybe not good cooperation from patient, maybe they are a smoker or diabetic

Prognosis

- Clinical findings consistent with a Hopeless Prognosis:
  - Attachment/Bone loss: Severe (>50%)
  - Vertical 1 wall defects, or horizontal
  - Furcation involvement: deep grade II, grade III, grade IV
  - Mobility: class II or class III
  - Crown:Root Ratio: ≥2:1
  - Root form: fused and/or conical
  - Pulpal involvement, caries: vertical fracture, non-restorable caries, external resorption, perforation, failed RCT that is not amenable to retreatment
  - Tooth position, occlusion: traumatogenic occlusion or root proximity that can't be addressed with treatment, bruxism/clenching
  - Poor patient cooperation
  - Smoker and/or diabetic

And then clinical findings consistent with hopeless prognosis would be greater than 15% 1 wall defects or horizontal bone loss greater than 15%, furcation involvement, deep grade 2 or 3 or 4, class 2 or 3 mobility and greater than 2"1 crown root ration, fused conical root form, maybe the tooth has caries that is non restorable or vertical fracture or other problems that are listed here as well as traumatogenic occlusion or root proximity that are big factors that cannot be addressed with treatment dan also poor patient cooperation and person who is smoker and diabetic

These are things especially if you have multiple of them that might render a tooth hopeless

Questions?, Discussion