



Maddie's Institute

Recognizing and Treating Common Dental Conditions in Dogs and Cats

Dr. Peralta

Video Transcript

July 2014

This transcript has been automatically generated and may not be 100% accurate. This text may not be in its final form and may be updated or revised in the future. Please be aware that the authoritative record of Maddie's InstituteSM programming is the audio.

[Beginning of Audio]

Dr. Peralta:

Thank you. Thank you very much for the invitation, and thank you for coming. So I'm going to start immediately. We have a bunch of slides to go through. The learning objectives of this part of the two-hour lecture, or the two lectures, will be to review the points of dental disease in dogs and cats. It will be also to review the basic aspects of the diagnostic and therapeutic steps involved in regards to dental disease in dogs and cats, and to review the basic tools necessary to practice good quality dental work.

So the basic setup, in order for us to do dentistry on small animals and dogs and cats, obviously we're going to need an anesthetized patient. Unlike in humans, everything that happens, even the diagnostic process, is mostly performed under general anesthesia. And we're going to need a few basic tools as well. We're going to need the diagnostic instrument, which applies to most situations will be the periodontal probe, which is used to recognize the most common dental pathologies. Also a dental explorer is a common instrument that we're going to need. These are two very affordable and easy to use instruments, yet they provide a lot of very useful information.

And we're going to need a chart as well, to record everything that we find in the mouth. Everything needs to be recorded, because there's a lot of parameters that we're going to acquire, and we need to record so they allow proper diagnosis. And we're going to need intraoral radiology, which is critical in regards to diagnosis of dental disease. The clinical aspects of dental disease recognition, the data that we acquire with the probe and the explorer will be complemented by radiographs. So the two will allow proper diagnosis.

And we're also going to need a dental unit, which is fundamental to do the work itself after we have come up with a diagnosis. We will need to execute a treatment plan which will require a dental unit, typically an air-driven unit, although there's also electrical-powered units. But typically it will be an air-driven one. And we're going to need a few basic instruments that usually include basic surgical instruments, like scissors, scalpel handle, needle holders, et cetera, but also will require luxators or elevators for when it comes to extracting teeth, forceps to deliver the tooth.

So in regards to the patient itself, first of all we need to recognize why dental disease is important. First of all, dental disease is incredibly common. It is by far the most common type of pathology in dogs and cats, above any other kind of disease – digestive, respiratory, et cetera. It is by far the most common. And it can be painful, so it will affect the quality of life of the animals. And also it represents a source or a site of chronic inflammation and infection that will not only have local consequences, but will also have potentially systemic consequences. So in regards to the general health of an animal, it's really important to recognize disease in the oral cavity, disease that affects the teeth, and diagnose and treat them properly.

Like I said, we can have serious functional consequences. Typical ones include, for example, pathological fracture of the mandible is not rare, especially in small animals that have advanced disease. It can be so severe that it can compromise the jawbone itself and lead to pathological fractures, which will be a bit more serious to treat, or difficult to treat. And it can also, just an example, for example, of an odontogenic infection, a chronic one, clearly, that led to infection of the jawbone.

And this is a case of osteomyelitis. This is simply a very severe periosteal reaction due to the chronic infection. And like I mentioned, this will have an impact on quality of life. And in regards to animals at the shelter, it will most likely end affecting the adoptability of these animals.

How does the diagnosis occur? It starts in the exam room. It will require, ideally, if it's available, a proper history, a complete history. It will be important to know the duration of the problem, the clinical signs or the symptoms of certain – by the previous owners. A physical in a normal exam will reveal some useful information. However, these two are typically very limited in regards to revealing extent and severity of dental disease. And sometimes the nature of the dental disease.

So, like I mentioned a minute ago, the thorough and complete and final diagnosis will come only with the animal anesthetized. And it will include a clinical part, where we do a visual inspection of all the extra and

intraoral areas. But we will also require the probing that I mentioned, and intraoral radiography. These three will lead or allow a proper diagnosis on a tooth-by-tooth basis. And if we have this information, we will be able to put together a coherent, logical treatment plan that will provide true, actual, clinical benefits to the animal.

In regards to the history, some problems have an acute presentation or an acute course. And they may be very obvious, like, for example, an avulsed tooth will be very obvious upon visual inspection. Dental or velar trauma in general will have other concurrent signs. If there's dental or velar injury it will either look like an avulsed tooth or a luxated tooth, and there will be likely associated soft-tissue injuries, and potentially other maxillofacial injuries as well.

Other signs of when, for example, there's an odontogenic infection, it can reveal acutely by the animal suddenly having a swollen face, or the appearance of a draining tract. Typically the draining tracts, it is the extraoral ones that are obvious to the clients, the owners, or clinicians, or anyone involved. But oftentimes these draining tracts are inside the mouth, so they will not be easily recognizable.

The more chronic disease will have a little bit more subtle presentation, sometimes very hard to recognize. The most common manifestation will be halitosis. This is by far the most common reason why at least client-owned animals come to see a professional is because they can no longer tolerate the smell. But more subtle signs could be present as well. If there's dental pathology there may be some degree of discomfort or pain, and the animals, even though they manifest them very suddenly, they hide these signs very well, as probably an instinctive – the result of animal instinct.

But when they do manifest it, it will be by signs like pawing at the face, or they may come to you with a little bit of drool, sometimes bloody salivation. And if you pay close attention to these animals, they sometimes also will have signs like difficulty chewing. They will drop the food as they try to eat, or be clearly hungry but get really frustrated when they try to pick up the food. And jaw chattering is common in cats. Cats are very sensitive to certain dental pathologies, like tooth resorption will oftentimes be associated with jaw chattering. And some of these animals don't show any other sign but just behavioral changes. They become aggressive, or they become withdrawn. And sometimes it's purely dental pain.

The visual inspection or the oral examination that we can perform with the animal is not under anesthesia is very limited, as I said, and it will allow a very tentative diagnosis. Oftentimes it will not be even close to revealing

the real severity and extent of the disease. It won't allow you to put together a specific treatment plan, especially not a tooth-by-tooth one. In client-owned animals, it does allow you to provide a rough cost estimate. In order to get the most information out of it, it is good to have routine, use a very systematic approach where you make sure – it's almost like a list that you check step by step, to ensure that you're not missing on anything that is more subtle, and that you're not paying attention to just the obvious. And by that I mean you can establish your own routine. That may include, for example, I start first on this side, and then I move on to this area of the mouth, and then I move onto this third area of the mouth. And try to be systematic, and stick to the routine.

And also, it's good to go through categories of dental disease. And by that I mean, for example, when I do an oral examination I am looking – the first thing I do is an extraoral exam. Then I palpate the lymph nodes. I palpate the facial structures, bones, look for swelling, any asymmetry, et cetera. Then I go in the mouth, and the first thing I look at is the way that the animal occludes the bite. Because when the animal is under anesthesia and the tube is in place, you won't be able to assess the occlusion anymore.

Then I look at the periodontal status, where I look at the periodontal tissues that are visible to the eye, and that is basically the gingiva. I look for signs of periodontal disease that would include gingival recession, gingival bleeding, root exposure, furcation exposure, anything that suggests that there's inflammation or loss of periodontal tissues.

I then go on to another category. That is the endodontic or endodontal status, where I look for signs of pulp disease. And we're going to talk a little more in detail about periodontal and endodontic disease in a minute. But this is just to give you an example of how I go through categories, so that I don't miss out on anything. I also pay attention to the anatomical aspects. If there's missing teeth, if there's super [*inaudible*] teeth, malformed teeth. And finally, I leave a category for things that I don't think really fit into any of those, and I list them there. And everything, I try to, you know, write down. So I have an initial idea of what's going on.

Then, when the animal is under anesthesia – oh, sorry. This is kind of what I was telling you about, the extraoral occlusion, anatomical, developmental, periodontal, endodontic. Also look at the soft tissues to see if there are signs of, for example, chronic stomatitis, or alters in the oral mucosa, et cetera. And then we will – this is supposed to be anesthetized. We'll move onto the anesthetized part of the exam, where the animal is under anesthesia. We will again do a visual inspection of the entire oral cavity. And we will be able to focus on a tooth-by-tooth basis using the periodontal explorer or probe. We're going to be able to probe

around every single tooth, checking for mobility, loss of periodontal tissues, etc. And everything when the animal is anesthetized will go in the chart.

These are the parameters that we typically look at when we examine each tooth. And those include mobility, which can be graded in a 0, 1, 2, or 3, which we will explain in a little bit. Sulcular probing is inserting the probe in the sulcular space to check for increased depth in this area. Gingival recession is like shown here on this photo. When the gingiva migrates apically down the root in this case, obviously, that leads to root exposure, which is a sign of loss of tissues or periodontal tissues. The gingival index is not a very useful one in terms of what you're going to end up doing with that tooth.

Furcation is a very important one, and that is osseous defects in the area where there's two or more roots. And anything other than just not periodontal, but say, for example, fractured teeth, discoloration of a tooth, et cetera. Whatever else is abnormal, you will want to record. Interoral radiography, like I said, complements your clinical examination. It is essential to fully diagnose dental disease. This is just an example of what a full mouth study looks in a dog. The way it is mounted on the view box, if you're doing conventional film radiography, is what's called labial presentation, where everything is displayed as if the animal was in front of you with the mouth open. So all these in this area of the screen are the right maxilla. This is left maxilla, left mandible, and right mandible. So this is the typical way to display the radiographs.

This is just to show you an example of what it would look like in a cat. Very similar, just probably less radiographs needed. In dogs the number of radiographs to get a full mouth study varies, anywhere from 10 to 20, typically. In a cat, you can get away with just 10 or 12 radiographs. Now, this sounds a little bit absurd, I know, in the setting of a shelter, but it's actually not. Because even though the time factor shouldn't prevent you from getting radiographs, if that's going to allow you to come up with a precise diagnosis. Because with a little bit of practice, you will be able to get a full mouth study and a little bit of help, somebody processing the film. You'll probably be able to have a good quality diagnostic set of radiographs in 10, no more than 20 minutes.

Just to highlight the importance of dental radiography a bit more, this is a chart where somebody looked at the diagnostic value of dental radiography in dogs and cats and concluded that this is a list of clinically relevant findings on the radiographs that were not revealed on clinical examination. And some of these are quite high. So, you know, 1 out of 3 you will probably miss on just purely clinical examination. So this, like, I

said, it's not redundant to take radiographs and do a thorough exam. It's just very complementary, one with the other.

Another common question is, can I use conventional medical radiography instead of dental radiography? And unfortunately, the answer is not really, because the amount of detail and information that we get from dental radiograph is not even close to what we would get on a skull radiograph. So skull radiographs are pretty much useless when it comes to dental pathology. This is, again, just to highlight the importance of this is just to show you how much detail we can get on an intraoral radiograph. We can assess periodontal status clearly by evaluating the alveolar bone, periodontal ligament space around the roots, the shape of the roots, if there's signs of lysis around the apices of the root, et cetera. None of these we would be able to recognize in a skull radiograph. Why? Because the contrast is not good enough, and there's a lot of superimposition of structures. So no, it's not, unfortunately, useful.

A general rule of radiology, and I insist a lot on this, because I think even in shelter settings it should be implemented. This is kind of one of the main messages I want to get out there. And I'm going to explain how or why it's feasible even though it does require specialized equipment. You need a dental X-ray generator. You don't necessarily need sophisticated digital technology for it. So obviously there's digital systems available, DR and CR. They are expensive. They are delicate. So, I mean, if you can have them, great. But if you have film, film is incredibly valuable. I can tell you that for example when I was at Cornell we were using film until probably a year ago for dental disease. We moved onto DR and CR recently, but film was still considered very useful. And it's, to me, I think the minimal everyone who does that X-ray should have.

And at least in private practice, there's a justification for the cost of the equipment, because first it's not that expensive, and second the return is really high if you start using it. And the only downside, I would say, is that there is definitely a learning curve. You will have to take a lot of radiographs before you get proficient at it. But it's just a matter of learning the technique and practicing it a lot. So even that shouldn't be an excuse. In regards to the equipment, the biggest part of the equipment will be the generator. And there's different types of generators. There's wall-mounted, there's similar ones but just on wheels, floor-mounted. And there's also portable hand-held ones, which have, at least this particular model, the Nomad, has FDA approval, is safe to use if using the proper safety measures. And it is very, very practical and easy to use, and it will, you know, you'll be able to carry it around rooms, buildings, or even facilities.

The cost of this generator, for example, I checked yesterday online and I think the latest generation, the latest model, is probably around \$8,000.00, I think. And the way in which the film or radiographs are processed, if you're doing film, there's different sizes. The most commonly used ones are the occlusal sizes Size 4. That will allow you to take a big area of the mouth. Then there's the periapical, so-called periapical film, which is a Size 2. That will allow you to take groups of two, three, or four teeth. And in small animals, these don't really fit in the mouth. So you may have to use Size 0, especially in cats or small dogs.

And you can either manually process them in a little chair-side darkroom, which inside contains the chemicals necessary, which are developer, fixer, and water, or if you are doing a lot of them, you can get an automatic processor, which is really easy to use, very nice and convenient to have. And the cost of this equipment is probably around \$2,500.00. The digital equipment will range in terms of cost between \$10,000.00 and \$20,000.00, depending on the specific model and make that you get.

Anyway, going back to the patient, there's also anesthetic. When you do dentistry, there's important anesthetic considerations to keep in mind. First, dental procedures will require a diagnostic and a therapeutic portion. Typically everything gets done during the same event, during the same session. It wouldn't make sense to anesthetize just to gather information and then to treat. So everything gets done at the same time, and therefore they tend to be relatively long procedures. They could last anywhere from one hour to five hours. So especially if there's advanced, severe, and extensive disease present.

And therefore, obviously we will have to provide the proper environment for the anesthetized animal, where we are able to control things like temperature of the animal. They tend to get really cold very fast, because we're using a lot of water. The power equipment typically is irrigated by water, so everything gets wet. They lose temperature very fast. The animals can be positioned in lateral or dorsal recumbency. It's up to you. I like dorsal recumbency, because I don't have to be flipping back and forth. And obviously provide adequate anesthesia or analgesia to the animals. Anything that gets done in the mouth that is potentially painful will ideally be locally anesthetized or regionally anesthetized, to be more precise. And that will allow you to have a pre-emptive approach. It will allow you to use lower levels of anesthetic, and it will have a much more comfortable, faster recovery in regards to the patient.

Okay. So now, talking about specifically dental disease, like I said, we're going to focus on periodontal disease and endodontic disease, which are the two most common diseases in dogs and cats. So let's start by defining periodontal disease. Periodontal disease is anything that results in the inflammation or loss of periodontal tissues. It is typically a disease that

will progress if we don't intervene, and if the factors that initiate disease are still present or allowed to continue, will result in progression of disease invariably. It is disease that is preventable, because at least one of the critical factors involved we can control. That is dental plaque. And like I suggested a few minutes ago, it is a very high prevalence.

So what are the periodontal tissues that I just mentioned? Basically four tissues involved in periodontal disease: the gingiva, or the gums, the underlying alveolar bone, which is what supports everything around the tooth, the cementum is a thin layer of tissue that allows the periodontal ligament to connect between the root and the surrounding alveolar bone. So these are the four tissues that are typically involved in periodontal disease. One of the critical factors involved in initiation and progression of disease is dental plaque. Dental plaque is – I have a slide that explains better what it consists of, but it's a thin, sticky, transparent typically, almost invisible layer of material that accumulates on pretty much any hard surface that is in a humid environment, like the mouth. And it won't come off easily unless it's mechanically removed. You can actually remove it with – the most effective way to remove plaque is the use of a toothbrush. That's why tooth brushing is recommended, to prevent periodontal disease. Because this sticky layer will come off. Don't think that this yellowish, rougher material is plaque. It's more this whitish substance. There's so much accumulated on these two teeth that it's almost visible. But typically you don't see it.

And this plaque, if allowed to sit there for more than 24 to 72 hours, will start to capture minerals from the environment and become mineralized material, and that's when it turns into calculus, which is what you more easily see clinically. This is an extreme case of calculus accumulation, where you can't even see the teeth anymore. They're pretty much connected. They're bridged together by calculus. Now, interestingly, calculus is not directly responsible for periodontal disease initiation and progression. Contrary to common belief, it's only indirectly related. It's indirectly related in the sense that because it's a rough, irregular surface, it promotes or favors accumulation of plaque. And plaque, which is a substance that contains a lot of things, among them millions of bacteria, are – plaque is the one that actually is involved directly with disease. But not calculus. At least not directly.

And because of that, it correlates very poorly with severity of disease. And this is another important concept that I want to transmit, and that is never base your diagnosis, or at least your impressions of severity and extent of periodontal disease based on the amount of calculus accumulation. There will be cases where you have minimal calculus present and severe disease, and the opposite will also be perfectly

possible, where you have plenty of calculus accumulation, yet minimal or not necessarily severe stages of periodontal disease.

Now, in regards to pathogenesis of periodontal disease, this is the stages or steps through which disease goes through. The first stage is purely inflammatory condition of the soft tissue of the gingiva. So in this illustration we're showing plaque accumulation in this area. This is the critical area, by the way, which I forgot to mention, that everything in regards to periodontal disease happens right here, in the sulcular space. This is where the gingiva kind of meets with the tooth, and it's supported by alveolar bone. So all the disease will start and progress right here, in this sulcular space.

If there's plaque right here, present, it will lead to a host response, an inflammatory response, and we have gingivitis. If we are constantly removing this plaque from here, this gingivitis will resolve, will reverse. So gingivitis is considered reversible, especially if we are able to control plaque. It will typically completely reverse, and the animal will not have permanent damage of the periodontium.

If the plaque is allowed to sit there, to stay there, and is not removed mechanically with a toothbrush, then in some cases – not all, but in some cases – it will start to cause destruction, loss of tissues. And this is when we reach the periodontitis stage or phase of the disease. This one is irreversible, because what we lose here, the alveolar bone, once it's lost and other periodontal tissues, they will not come back. You can stop the progression of the disease if you remove the inciting cause, the plaque, and indirectly calculus. But you will never, no matter how much you treat, you won't come back to this status.

And if left untreated, it will continue to progress. Eventually there will be so much loss of tissue that the tooth will – the end result is natural exfoliation of the tooth at some point. But that could take months, years. Periodontal disease typically is a very slowly progressing disease. There are forms of disease that are considered of rapid progression. But typically it's a chronic disease. This is just to illustrate what the plaque, or how the plaque looks on the tooth. These are typically clusters of a matrix fluid, nutrients, oxygen, et cetera, and clusters of bacteria that can be easily removed from the surface of the tooth with a toothbrush. Anything else that is not mechanical, say rinses, sprays, antiseptics, et cetera, will, at best, stay on top and will actually penetrate. So the only and best way to control plaque is by mechanical means. And that is the toothbrush. And because everything is in the sulcus, or at least the part we worry about, then tooth brushing is the best tool because the bristles of the toothbrush will actually be the ones that reach this area. Things like chews and treats will probably help remove plaque from the crown of the

tooth, but not in the sulcus or sulcular space. So tooth brushing is by far the best way to control and prevent disease.

And this biofilm – or, you know, plaque is actually a biofilm – is a very complex and organized ecosystem. And the bacteria involved, you know, there's hundreds and hundreds of different bacteria that can be present here. Some are considered more virulent or pathogenic than others. But ultimately what determines which animals develop disease and who doesn't will depend a lot on the host itself. So susceptibility is a big factor involved here, because we may have the inciting cause present, the plaque, the bacteria, et cetera. But if we have a host that is not necessarily susceptible, then disease will always be relatively mild or won't be present.

Or in other situations, we have minimal presence of plaque but a very susceptible host. We have – there's a pretty good chance that the animal will develop disease no matter how much prevention is implemented. From a clinical point of view, the presentation of periodontal disease typically includes, like I said, halitosis, difficulty eating, *[inaudible]*, gingival bleeding, and loss of teeth. From a radiographic point of view, and when we have the anesthetized patient the sequence of events typically, at least the way I like to do it, is take full mouth radiographs first, and then do the clinical examination. This is just to show what a healthy periodontium would look like radiographically. We have nice alveolar bone covering the entire roots, every single tooth. We have a regular periodontal ligament space, which is this dark, lucent line around each root. So there's really no signs of loss of tissues in this case.

In the early phases of disease, and mild is defined as less than 25 percent of attachment loss. And notice that we're talking about periodontitis, which is a form of disease where loss of tissue occurs. We have less than 25 percent of that alveolar bone gone. *[Inaudible]* is that even though it's early, the furcation area of this root, for example, the furcation is so close to the alveolar margin that even very early stages of disease will seriously compromise this area of the tooth. And this is clinically significant because once we have a through and through defect, that's it for the tooth. It's considered beyond repair or extraction is indicated. And why? Simply because this will be a site permanently filled with plaque. And it will be a permanent site of inflammation that won't be easy to control or keep clean.

So even mild or early forms of periodontitis are already clinically significant. As disease progresses, this is what it would look like radiographically. We have continued bone loss, so furcations are even more involved right here and here. Furcations obviously are not present in teeth with only one root, like this molar. And severe disease, which is

defined as more than 50 percent of attachment loss of alveolar bone loss not only represents a problem for the tooth, but can potentially start to compromise more delicate structures, like the jawbone itself. So this is not uncommon, to see in toy breeds, for example. Mandible has, you know, the small dog, they have disproportionately big teeth in regards to the jaw bones. So even moderate or more severe forms of the disease can seriously compromise the structure of the bones. And this is just one example of what can result from periodontal disease, a pathological fracture.

In cats it's very similar, the situation. We have a healthy cat with normal periodontium or alveolar bone, early stages of disease already starting to compromise furcation areas, moderate and severe forms.

So the clinical examination, just as you will have a lot of very useful information from the radiograph, then the clinical exam will also offer some important information. Tooth mobility is one parameter that you have to interpret with caution. Because just as it can reflect severe disease sometimes, there's not necessarily severe disease, yet mobility is significant. And why that is, some teeth, the smaller teeth with only one root, will develop mobility at a relatively early phase of disease, whereas multi-rooted teeth are big teeth, won't develop mobility until pretty much the final stages of disease. So it has to do with size and number of roots, and therefore it should be interpreted with caution. It should not be used as the only criteria to decide what to do with the tooth.

So more important than mobility are things like sulcular depth. Because if the periodontal probe can reach more than 3 millimeters in a dog, that's considered abnormal. That's considered a pathological change. In cats it's somewhere between .5 and 1 millimeter that would be normal. Anything beyond that would be considered pathological. And it is a very good indicator of how much alveolar bone loss has occurred. So if you have anything beyond these numbers, you can pretty much be sure that there's alveolar bone loss that will actually correlate very well with what you saw radiographically. And not to get confused with pseudo pockets, because when there's enlargement of the gingiva, it will tend to lead to also increased probing depths. But it's not due to loss of alveolar bone, but it's secondary to the growth of the tissues.

Another common manifestation of loss of attachment will be gingival recession. So the gingiva, when the alveolar bone disappears, the gingiva will no longer have the osseous support. And it will sometimes migrate, along with the bone. And that will manifest clinically as areas of gingival recession. This is just an extreme case. And you can also have gingival recession and increased probing depth simultaneously. And that will indicate that the sum of the two, or the clinical attachment loss will

actually be the sum of the gingival recession and the probing depth. So the amount of loss, or when there's attachment loss it can either manifest as gingival recession or probing. Therefore, the sum of the two is what reflects or ultimately indicates how much true bone loss there is.

In multi-rooted teeth, like I said, a furcation area is an important one to check. And you may not necessarily see that there's a lot of recession going on, or deep pocketing, in order to get a through and through defect right here. So I don't know how much alveolar bone loss had occurred here, but it looks like not necessarily much. Yet the probe is already going through. So this tooth, I bet you it's not even close to loose, and pocketing is probably not that significant, yet it's already ready to come out. This is why checking the furcation area is important.

Oronasal fistula is another important consideration in periodontal disease, because first, it's very common, especially in certain breeds, dolicocephalic breeds have a propensity to develop these. They're typically located on the palatal aspect of the maxillary canine teeth. And it happens because alveolar bone loss occurs circumferentially around the tooth, including the palatal aspect of the tooth. And this is just to show a *[inaudible]* that is going right directly into the nose. Well, the fistula is not obvious, because the tooth is in the way. But once you take out the tooth, you will see the big hole.

So I bring this up because they're common, and they are surgically involved. And you have to be properly equipped and adequately trained to do these, because otherwise it will result in a permanent communication with the nose, which has a lot more clinical implications. Just to show you how this tooth would be done, a big pedicle flap would be raised to release *[inaudible]* thickness. *[Inaudible]* and distal and caudal and distal and rostral aspects of the tooth that will allow a relatively atraumatic removal of the tooth. Then the big hole is revealed. That's the nose right here. And everything gets cleaned up, rinsed, debrided. There's typically a lot of granulation, inflammatory tissue around. There's usually a rim of epithelium around this defect. So everything has to be very, very, almost aggressively debrided. And then you can safely close the site up with a tension-free closure. And if done properly, this will have a really good prognosis.

If things are not done properly, the most likely result is that the hole will reappear, and then all the clinical implications of that will occur. How is periodontal disease treated? Treatment is mostly mechanical in nature, and it consists of removal of the inciting cause, that is plaque, and indirectly calculus. And anything that is beyond a certain point or stage of disease typically gets extracted. So in dogs and cats, in animals in general, we don't take heroic measures to try to save a tooth that we know will be

really hard to save in the long term. So anything that is beyond a certain stage of disease typically gets extracted.

The criteria of when to extract the tooth, I'll show you in a slide shortly. In this slide I want to just point out that prophylaxis is inaccurate term when we do periodontal treatment, which is what we sometimes know as prophylaxis. We're most of the times treating established disease. We're not really preventing anything. So I discourage the use of the term prophylaxis. The treatment plan will only be possible when you have collected all the clinical information in the radiographs, and typically will include scaling, performing regional blocks if you're doing extractions. And sometimes there's other work to be done in this mouth, not only periodontal.

Mechanical removal of deposits are ideally done with a power instrument, an ultrasonic scaler. For the sake of efficiency, if we were to do it with hand instruments we would take hours and hours. So we need to be efficient. So everything gets done typically with a scaler, the removal of deposits, at least. And I would say this is a critical slide right here, because this is when at least I typically decide from very objective parameters, when to extract the tooth. And that would be Stage 3 furcation, means a defect that has a through-and-through defect in the furcation. Probing depths of more than 6 millimeters would be another indicator to take the tooth out, and if, radiographically, there's more than 50 percent of attachment loss.

Stage of mobility, like I said, is the less reliable of all the parameters. And if there's anything more serious, like an oronasal fistula, obviously before we can repair the fistula we'll have to remove the associated tooth. These are just examples of after a thorough, comprehensive diagnostic process has been done, what can result. So dentistry or periodontal treatment is not about calculus removal. It's about recognizing the disease and treating it appropriately. And that may sometimes include, for example, having to take out all the teeth sometimes. Another example, it's not about removal of these deposits, which are bothersome to the eye. But clinically they're not that important, because we're leaving behind large areas of alveolar bone loss here. There's this, more than half of the root is exposed here, so through-and-through defect in the furcation area. So the real treatment, if we were to perform it in this thought would be most likely extracting these two teeth.

Another example of how sometimes disease is there, just not manifesting clearly, this tooth has a relatively normally appearing gingiva, minimal calculus deposits. So nothing too exciting, except for a little pinpoint defect right here, which if you were to probe, you would see that it's going through and through the soft tissue. It's a draining tract. And this is the

same dog. The probe sinks all the way in along that root. And the radiograph reveals that there's literally no bone left around that distal root of the fourth premolar. That's the root after it was removed, covered in calculus down to the very tip. So if you implement a thorough, comprehensive diagnostic approach, you will be able to recognize disease and treat it appropriately.

Antibiotics are another sensitive topic, because they are abused, unfortunately. Periodontal disease does not respond to antibiotic treatment. The only way to treat, control disease, is by mechanical, surgical intervention. And there are a few indications for antibiotic use in periodontal disease, but typically they will only apply if there's an active infection, say a swollen face, a draining tract. Or, intraoperatively, if the patient is immunosuppressed and will be the bacteremia that we cause while mechanically manipulating teeth may be of concern if the animal is immunosuppressed. But most of the time, if we have an immunocompetent animal, and we are able to treat in a comprehensive manner disease, antibiotics are not really necessary.

Pulse therapy, which is a concept advocated by some, consists of giving for a few days every month, or every so often, a course of oral antibiotics to control, supposedly, disease. This is not only totally ineffective, but potentially harmful to the animal. So I discourage its use.

We have a very short time to go over endodontic disease. So I'm going to go through these very fast. So endodontic disease is dental disease that affects anything that is inside the tooth. That is the part – endo means inside. So basically we're talking about anything that affects the pulp tissue, in lay terms, the nerve of the tooth. The pulp cavity, which is the inside of the tooth, is divided into three different areas. The root canal is the part that is present in the root. The pulp chamber is the part in the crown, and in multi-rooted teeth that have more than one cusp, there's the pulp horn. It's one here, one here, and one here.

Everything of the three of them together form the pulp cavity. This is where the pulp, which is connective tissue, lives, the vital part of the tooth lives. And the communication between the pulp and the surrounding tissues happens right here in the apex. There's tiny little channels, so-called apical frame or apical delta is present right here. This is where blood vessels and nerves go in and out of the pulp. So anything that happens inside the tooth, if something goes wrong inside the tooth, the inflammatory response will typically happen around the apices, because that's where it communicates with the surrounding tissues.

The pulp is, like I said, connective tissue with a lot of innervation and *[inaudible]*. And an important cell type in the pulp is the odontoblasts,

which are the cells that produce the hard tissue of the tooth, the dentin. And the dentin, on the other hand, which is in this diagram this is enamel, the outer layer of the tooth, dentin, and this is the pulp cavity. The odontoblasts have these extensions that penetrate into the dentin. And therefore, dentin is porous. Enamel is not porous. It's really hard. But the underlying dentin is somewhat softer than compared to the enamel and is porous. So if there are areas of dental exposure, they will at least indirectly allow communication with the pulp cavity. So even if you don't have direct communication from a trauma, say a fractured tooth, with the pulp cavity there's the risk of injury to the pulp via these small openings.

Like I said, when disease in the tooth happens, it manifests around the root. This is what this area of the root, the apex, would look like in a diagram, all these openings. And this is what clinically or radiographically inflammation around the apex looks like. It's this typically round, sometimes round, sometimes ill-defined area of bone lysis. And then this is the result of infection in the root canal, or in the pulp cavity, and the corresponding close response, inflammatory response around the apex.

This is clinically relevant because it is the source of pain. It is the source of inflammation and infection, sometimes so severe that will manifest a pretty ugly draining tract somewhere in the face or inside the mouth. Manifestations of endodontic disease can be also very subtle. Sometimes you won't even suspect there's endodontic disease present. But sometimes they do manifest with obvious signs like the ones we mentioned, or more subtle signs, like subtle signs of pain, or you may identify upon visual inspection a broken tooth. A discolored tooth is also a sign of endodontic disease. But many times, it's mostly asymptomatic. Extraoral exam may reveal areas of swelling along the face and ultimately the diagnosis will only happen upon oral examination and radiographic examination under general anesthesia.

This one, I think is a common situation. A discolored tooth is pretty common. I'm pretty sure most of you have seen one. And 90-plus percent of these teeth are actually dead teeth. The pulp tissue is dead. And therefore they require intervention. Intervention, when you have a dead pulp, will either be in the form of endodontic work, say a root canal treatment, or extraction of the tooth.

In fractured teeth, if you have pulp exposure that is confirmed upon visual inspection, like right here, these are considered complicated fractures. Whenever there's pulp exposure, you invariably have endodontic disease. The pulp is either dead already or in the process of dying, if the exposure happened recently. And this will, no matter what is going on or what stage of necrosis this pulp is, it will require root canal treatment or

extraction. So whenever you see a broken tooth, even if there's no clinical manifestation of disease, you will have to address it.

Another situation, common one, is when you have a tooth fracture that involves the root. That is not only an endodontic issue, but also a periodontal one. Because the fact that it goes into the root means that it's altered the periodontium. And this is not going to be easy to fix. You can potentially address the endodontic part, by doing a root canal treatment, reconstructing the altered periodontium will be a surgical challenge. So whenever you have situations like this, fractures that extend into the root, I would say that in a shelter setting, where you probably won't have the capacity to do root canal treatments, you should probably just extract the tooth.

So issue that clinical science may be, like I said, very silent, or they may be very significant, like draining tracts or inflammation. Examples, a draining tract right here, pinpoint. Very hard to identify. But there. And here's the culprit, a broken second premolar. This is the exact – the severity of this process is the exact same one as in this one. It's just the main difference is that most likely this is going to be missed, and this point is going to be identified.

Another example, a draining tract under the eye. Look in the mouth. It doesn't look horrible. It may be like there's a little fracture right here with pulp exposure, but not clear, because the tooth is covered in calculus. But a good oral exam under general anesthesia and a radiograph will confirm the problem. Radiographically, typically, like I said, there can be a lucent area, a halo around the root. You can see a discrepancy in the pulp cavity width, which will reflect nothing else but death of the pulp. Because the normal process is for the walls of the tooth to become thicker and thicker as the animal ages. This one no longer got thicker because the pulp died a while ago. So it stayed the same width it was when it died.

A few more examples. A chronic draining tract along the ventral margin of the right mandible in this dog. Take a radiograph, and here's the source of the problem. Root canal treatment is basically removing the pulp, the chronic pulp, cleaning out the canal, and filling it with materials that are biocompatible and prevent bacteria from reaching this area. It's typically something that is done by specialists, so not something that I would recommend doing in a general practice setting or in a shelter. But just to point out that it is quite effective. It's certainly a valid alternative.

I'm going to skip this one, because I think we're pretty much out of time. Oh, actually that was the last one. So never mind. And when you have an acute fracture of a tooth, when it just became exposed, you have the option of doing an emergency treatment, which is putting a little filling material

over the pulp cavity or over the exposed pulp in hopes that the underlying pulp will survive. But the success rate is only 80 percent, and you will have to follow up because it will only be possible to say if it was successful or not by taking a radiograph.

Yeah. So I think we are out of time. If there's any questions? Yes?

Question: We have the capacity in our field [inaudible]. We don't have the capacity to [inaudible] radiograph. So do you have any guidelines as to [inaudible]?

Dr. Peralta: Right. So yeah, that's a good question. Because basically you're wondering if there's any way to screen animals, because the implications of doing dental work are so big, in anesthesia, costs, time, etc. So unfortunately, oral examination is the only tool you'll have. And I say unfortunately, because like I mentioned at the beginning, oral examination is very limited. So severe dental disease can be very obvious sometimes upon oral examination, but sometimes it's very, very difficult to identify just on visual inspection. So I think that's pretty much what you have available to screen animals, the oral exam, and hope that that will – you'll be so good at it that you will be able to pick up on the ones that really need intervention. That's – I can't think of anything else.

Or the other thing you could potentially do, if you have an animal under anesthesia for any other purpose, say spay/neuter, or any other minor surgical intervention, then that can also be a good time to at least probe and inspect and do a good oral exam under general anesthesia. And if there's anything that would suggest pathology, then take the time to radiograph. Yeah?

Question: [Inaudible] and I have the scaler, [inaudible], low-speed drill, I do a radiograph. [Inaudible] what you said, I should [inaudible] or what?

Dr. Peralta: Well, yeah. It sounds like especially in cases where there's clear, established disease, the tools and the setup that you have will not allow you to diagnose and treat appropriately. So sounds like you may have the tools to at best do calculus removal, and maybe identify obvious disease. But likely you won't be able to treat animals with severe disease. You will need the proper tools. And that reminds me, I should have said that the focus of these talks wouldn't be so much on the surgical technique, which would be really useful for you guys, right?

So but I think it's also really important to understand the basis of disease, the rationale of when you have to extract a tooth before you actually know how to extract it. And the extraction technique, which is also quite involved, and requires a lot of skills and training, I think are these skills

and training is best acquired through more practical experience. So I encourage you if you're doing a lot of dental work to attend wet labs and workshops that have some practical portion, where you get to practice your surgical extraction technique. Yeah?

Question: Just curious, [inaudible] 2003 [inaudible] and then [inaudible] is it getting better? Because [inaudible] 1 percent of our entire [inaudible]. Is it any better, given the fact that [inaudible] issues?

Dr. Peralta: Right. So, yes. I really appreciate your comment and question, because it is – that reflects the reality of not so long ago. But it also helps me to highlight the fact that it's like you kind of suggest, it has very rapidly evolved and changed. Right now it's changing dramatically. First curriculums of the vet school have – most if not all – incorporated some degree of dental education in their programs. And some vet schools actually have in their clinical program in the fourth year the possibility of offering proper training. So it's rapidly shifting, and we're getting there. And the times of dentistry consisting of removing calculus are almost gone. Not completely gone, but almost gone. Yes. And there's a lot more involved. So like you said, it's a big medical and surgical field that requires a lot of knowledge and training. Yes?

Question: How do you feel about [inaudible] and then all the other dogs that might actually [inaudible]?

Dr. Peralta: Yeah. So two things about it. I think that limiting a dental procedure to removal of calculus without properly documenting disease is at best a cosmetic thing. So if there's actual disease behind this calculus, then it will be unrecognized, and you'll be potentially misleading the new owners. And second, combining surgical procedures, especially if abdominal cavity is involved and dental work may not necessarily be a good idea because of the bacteremia that you generate in the mouth can put at risk your other surgical site. So let me try to rephrase that. The benefits that the animal will obtain from just the calculus removal without a proper diagnosis and potential treatment of disease are minimal.

Will that have an impact on the [inaudible] a positive impact or a negative impact, I can't really speak to that. I don't know. Yeah. Yes, go ahead?

Question: [Inaudible] dogs that come from puppy mills, adult dogs, we will see [inaudible] severe dental disease in very young dogs, like even 4 and 5-year-old dogs, you'll see [inaudible] most of the time [inaudible]. Why do you see that in puppy mill dogs? [Inaudible]?

Dr. Peralta: Yeah. I suspect there may be multiple factors involved. So certain breeds are for sure more susceptible. So I'm thinking some of these dogs then

from puppy mills are the susceptible breeds, like toy breeds, Maltese, schnauzers, I don't know, pinschers, et cetera. So that may be a factor. Another one, if nutrition and environment are not properly taken care of, that will almost for sure also negatively impact progression of disease. If you don't have a properly fed and properly cared for animal that will put them at risk for periodontal disease as well. And I'm pretty sure prevention doesn't happen in puppy mills, either. So yeah, I think it's a lot of factors involved. The fact that they're highly inbred also doesn't help, because their occlusion is typically messed up. Their immune systems are not the best, et cetera. Yeah?

Question: [Inaudible] brushing teeth as preventative. But [inaudible] the dog's teeth [inaudible]?

Dr. Peralta: No, I don't think that's a practical measure in a shelter. But I think it's important to understand the significance of tooth brushing so you can transmit and inform and educate the clients and the new owners. I think that's the more important part of it.

Question: [Inaudible] recommends [inaudible]?

Dr. Peralta: That would be a great idea.

Question: [Inaudible].

Dr. Peralta: I think that's a great idea. The problem is that if there's disease present, the animal may not tolerate tooth brushing. Yeah. So in the presence of dental disease, no matter how patient you are, or how good the dog is, they're not going to tolerate it. Okay, great. Thank you. Thank you. [Applause]

[End of Audio]