

## Endodontic Disease

### Client Information Sheet

#### Do horses need root canal therapy (RCT)?

Sometimes!

Horse's teeth, just like our teeth, have a central area called the pulp cavity where the blood vessels and nerves live. This is the vital part of the tooth and cells within the pulp (odontoblasts) continually lay down dentin throughout the life of the tooth. If the pulp dies (which can happen for a number of reasons, see below), then the odontoblasts can no longer lay down the new protective layer needed over the pulps to protect them as the tooth erupts and the surface layer is worn away with attrition. As such, with time the pulp cavities become open to the oral cavity and feed material and bacteria enter the pulp cavity causing infection within the tooth and a painful tooth root abscess.



#### Why would a tooth die?

There are a number of reasons that the tooth can become non-vital:

- **Anachoresis** - infection via the bloodstream. This often happens in younger horses. As the teeth are erupting, there are often mild impactions as the teeth are trying to squeeze up into the mouth. These impactions can cause inflammation and an increased blood supply around the root and if there happens to be a few bacteria floating around in the blood stream they can lodge in these areas of inflammation and take hold. In some cases the infection can overwhelm the immune system in the tooth and can kill the pulp system. This can happen at any age but is more common in younger horses.
- **Fracture involving the pulp cavity** ('complicated crown fracture'). This is where the tooth fractures into the pulp cavity, allowing feed and bacteria to enter the pulp system and kill the tooth. If found straight away, a 'vital pulpotomy' can be performed to seal off the pulp and hopefully save the tooth but needs to be done within a few days of the fracture.
- **Excessive reduction of a tooth.** If too much tooth is removed and the protective layer over the pulp cavity is removed, exposing the pulp tissue then feed and bacteria can enter the pulp and kill the tooth.
- **Thermal damage from motorised instruments.** While powertools allow us to perform precise, less traumatic, quicker odontoplasty (floating), we do need to be very careful not to overheat the teeth, particularly when large reductions are performed on individual teeth. You will notice at Dental Vet we stop very frequently to cool the teeth with cold water to prevent overheating.
- **Extension of decay from infundibular or peripheral/ occlusal caries.** Decay in horse's teeth can get very severe and if it extends into the pulp cavity and allows bacteria to enter the pulp system then it can kill the teeth.
- **Periodontal disease** - If periodontal disease (infection around the tooth) is allowed to progress the entire way to the tooth root, it can infect the inside of the tooth and kill the pulp system.

## What are the signs my horse has a dead tooth?

External signs that your horse has a tooth root abscess are usually minimal- most horses will continue to eat (generally on the other side) and appear normal externally however owners often remark on the significant change in behaviour of the horse once that pain is taken away after treatment. Many behavioural changes have been associated with dental pain that resolved once the pain was taken away<sup>1</sup>. Horses are prey animals and very stoic so are very good at hiding pain, and with minimal 'specific' dental signs, temperament changes are often assumed to be 'bad behaviour' or 'just how they are' and are unfortunately often missed. This further highlights the critical importance of your (at least!) yearly thorough oral examination, so these subtle signs can be picked up and the pain addressed. Signs that may be picked up at your dental examination include:

- Asymmetry of the temporalis musculature on their forehead- muscle loss on one side often indicates they are chewing more on the other side.
- When examining inside the mouth, if all the feed staining is only on one side, it may indicate they are only chewing on that side.
- During the examination of the occlusal surface of the teeth, the protective layer over the pulp cavities may be gone on the affected tooth, leaving open holes packed with rotten feed where the pulps should be. These 'holes' are generally around 2mm diameter and there are over 140 pulp cavities to check in every mouth so a very thorough examination is required to pick up these very subtle, yet highly consequential signs!
- Occasionally a draining tract may be seen- where pus and infection are dripping back into the mouth from the infection.
- If there are signs of an issue orally, x-rays will be recommended (or occasionally a CT scan) and infection can generally be seen at the root on radiographs.

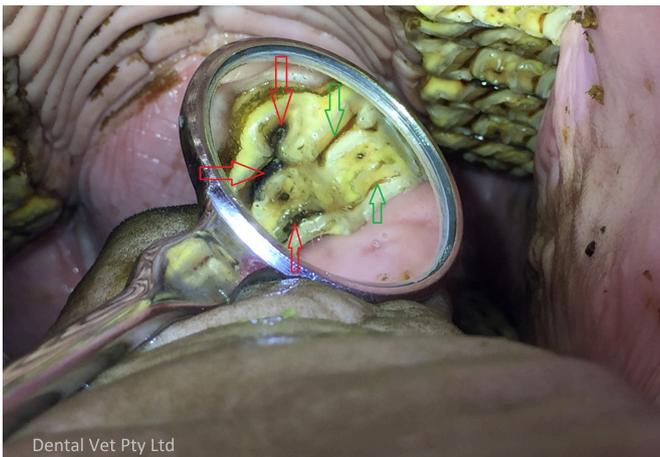


Image shows open, infected pulps (red arrows) and normal healthy dentin overlying the adjacent pulps (green arrows). Also notice the staining on the roof of the mouth- only on the offside as the horse was only chewing on that side to avoid the painful tooth root abscess.

## What happens if I don't do anything about it?

Even if we ignore the obvious welfare issues of leaving a horse with a painful tooth root abscess, this issue isn't going to go away! Left untreated, the feed material rotting inside the pulp cavities demineralises and weakens the tooth from the inside and these teeth will often shatter years later (leading to a much more difficult and expensive extraction and much higher rate of complications than if picked up and treated early). The infection can also spread to the sinuses causing a sinus infection, which again makes treatment much more complicated and expensive than if it were picked up and treated earlier. This is definitely a problem that is much better picked up and dealt with as early as possible for both your horse and your bank account!

## What can be done about it?

Once the pulp system is dead, unfortunately we can't put new blood vessels and nerves in there, once it is dead, it is dead. As discussed above, eventually the pulp cavities will become exposed to the surface and feed material and infection will fill these chambers. The pulp canals then effectively become a tunnel between the mouth and the bone at the base of the root, funnelling feed material, bacteria and infection to the tooth root creating a painful tooth root abscess. So we basically have 2 options:

1. Remove the 'tunnels'- i.e. extract the tooth.
2. Remove all the rotten feed material and infection from the canals and fill and seal them, preventing the feed material from entering the pulp system and allowing the infection to heal- root canal therapy (RCT).

## Can't you just give them antibiotics?

When you think about what the problem is- a tunnel of infection funnelling bacteria from the mouth to the bone, putting them on antibiotics may make them feel a bit better while they are on them but as soon as you stop the antibiotics you are back at square one! You haven't addressed the cause of the infection so until the 'tunnel of infection' is either removed or cleaned and sealed, the infection will continue.

## What are the pros and cons of RCT vs extracting a tooth?

Once you extract a tooth, it is gone and this has long term implications for the horse:

- Once a tooth has been extracted, the teeth on either side start to drift together to close the gap. This often creates gaps between the rest of the teeth leading to feed packing between the teeth and secondary periodontal disease.
- With nothing to wear down the opposing tooth, it becomes very tall as they continue to erupt whether they are worn down or not. Left untreated they will continue to erupt through the opposite jaw. Also as the teeth migrate together, the arcade becomes shorter, leading to hooks at the front and back of the opposite arcade. So more frequent (generally 6 monthly) dental treatments will be required following extraction to prevent these overgrowths.
- You are reducing the horse's chewing capacity. While a single tooth is unlikely to have a huge effect, once multiple teeth are lost, particularly as they get older, this can become a serious issue and affect their ability to masticate their food and maintain condition. Every tooth is important and teeth should be preserved where possible.
- There is also a relatively high complication rate with extractions, ranging from 13.6% to 80%<sup>2-5</sup>, with many of these cases requiring multiple surgeries and prolonged recovery periods.
- Also with extractions they require at least a few weeks off work while the socket heals, where with endodontics they can be ridden within 1-2 days.
- The advantages of extractions are that generally as long as all goes well with no complications, then 'once it is done it is done'- there is minimal monitoring required afterwards other than more regular dental treatments to keep on top of the opposing teeth.

So what are the advantages of a successful root canal treatment?

- You are keeping the functional tooth in place. This prevents the secondary issues above of overgrown teeth and periodontal disease, reduced chewing capacity and it also has a lower complication rate.
- While the procedure itself is slightly more expensive than extracting the tooth, long term it will likely actually end up cheaper as needing to see the horse twice/ year rather than just once/ year in most cases after RCT, any savings will quickly be lost in more frequent dental visits.
- Long term the difference is stark. Having been performing cheek teeth endodontics since 2018, we have had the opportunity to observe the effect of keeping these teeth in the mouth and the effects of being able to keep a beautiful, healthy, balanced mouth that is pain free and very functional, vs the constant feeling of 'putting out fires' after extractions with reducing overgrown teeth and managing the ongoing periodontal disease.

What are the disadvantages of performing RCT?

- A CT scan is usually required prior to treatment to gather information on the anatomy of the pulp system of the affected tooth (which can vary in every tooth in every horse and change with age!). This is pretty critical to the success of the procedure but does require an external cost.
- Some monitoring is required to ensure that the canals remain sealed and there is no infection at the root. This generally involves radiographs initially every year but once settled every 2 years is usually fine (and these are done at a reduced rate).
- The restorative layer on the surface of the RCT will need to be replaced, generally every 2-4 years. This is a fairly simple procedure and can generally be done within the time allowance of a routine dental appointment.
- While uncommon, if the RCT fails, the tooth would require extraction.

So there are significant benefits to performing RCT and if successful can have long term benefit for the horse (and owner with less frequent dental visits!). If there is an opportunity to save the tooth, we will always present all options as we really do feel there are significant benefits. "If you extract the tooth you have failed, you have failed to save the tooth!".



Image shows open pulps with feed material packed in there.

1. Pehkonen J, Karma L, Raekallio M. Behavioral Signs Associated With Equine Periapical Infection in Cheek Teeth. *J Equine Vet Sci* 2019;77:144-150.
2. Dixon PM, Kennedy R, Reardon RJM. Equine "Idiopathic" and Infundibular Caries-Related Cheek Teeth Fractures: A Long-Term Study of 486 Fractured Teeth in 300 Horses. *Front Vet Sci* 2021;8.
3. DIXON PM, DACRE I, DACRE K, et al. Standing oral extraction of cheek teeth in 100 horses (1998-2003). *Equine Vet J* 2005;37:105-112.
4. Kennedy R, Reardon RJM, James O, et al. A long-term study of equine cheek teeth post-extraction complications: 428 cheek teeth (2004-2018). *Equine Vet J* 2020;52:811-822.
5. Caramello V, Zarucco L, Foster D, et al. Equine cheek tooth extraction: Comparison of outcomes for five extraction methods. *Equine Vet J* 2020;52:181-186.