The role osteopathy has in the treatment of ruptured cruciate ligaments and subsequent arthritis.

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Introduction

During this paper I would like to discuss and look at the issues faced by a great number of dogs. Its not a sole issue, but unfortunately one that goes hand in hand with another. We're talking about the cruciate ligament ruptures and the inevitable arthritis that follows this damage. I will start this paper looking at some information about the dogs knee joint, how it works, how things can go wrong and then ultimately the end result. Moving from this I will review arthritis – what it is, what it means and what sort of impact it has on the dog's life. I will consider treatment options and some case studies discussing how much of an impact this issue can have on the dog's mobility. This will eventually lead to discussing how osteopathy for dogs fits into this issue, what benefits it can have, how and when it should be implemented.

THE CANINE STIFLE

First, we want to look at the dog's knee joint (or stifle). The knee joint is a complex joint in the rear leg of the dog. This joint is made up of several bones including the large femur bone, which connects to the hip as well, the tibia which along with the fibula form the lower portion of the leg, and the patella (which is the equivalent to our knee cap). It is made up of the femoropateller joint which connects the knee to the femur, and the femorotibial joint which connects the knee joint to the tibia. Within these joints are the fibrous ligaments which hold the three bones together. The patella sits in ridges on the femur, and it moves up and down when the knee is bent and straightened. Another important function of the patella is to stop the forward movement of the femur and tibia. The total knee joint is also surrounded by a capsule that holds joint fluid. This provides protection but also shock absorption.

Knee injuries are unfortunately becoming more and more common and these are caused by the rupture (either partial or full) of a ligament or dislocation of the patella. Usually (this can

be due to a trauma or congenital defect in the structure – in this instance the ligaments aren't damaged but this does need to be treated as leaving it long term will create permanent defects). This issue is also far more commonly seen in smaller breed dogs. There are other minor injuries like muscle or tendon strains but for the purpose of this paper, we are focusing on the ligaments. The main ligament damaged is the cruciate ligaments which are found at the back of the patella, in a x position. These ligaments can be damaged in a variety of ways, from trauma to running, turning fast to simply getting up wrong. There have been many instances where a dog is simply getting up after laying down for a while and suddenly, they're in pain and not putting a rear leg on the ground.

The rupture of a ligament means that the bones are no longer aligned correctly and this creates pain, inflammation and instability in the joint. It will also cause cartilage damage within the knee and sadly you are guaranteed the development of arthritis. There is really no sure way to diagnose this other than surgery, as while a veterinarian can do a drawer test while the dog is sedated, it does not show the full extent of what damage is within the joint. It seems to be not common knowledge that x-rays do not show ligaments, and you can not palpate every ligament to assess them. The arthritis development in the injured knee can be slowed by surgery, but it certainly wont stop it.

Treatment for ligament ruptures (full or partial) can be handled by a conservative management plan which means no surgical repairs, but managing the injury with alternative treatments like swim and laser therapy. These choices enable the muscle building to maintain stability in the absence of a ligaments support, but also provides pain relief, an anti-inflammatory effect and stimulates healing. This option is chosen by people for many reasons ranging from the cost of surgery, to simply being unable to ensure adequate rehabilitation post surgery. Important to note that smaller dogs are more suited to this option than larger dogs, mainly due to the larger body mass and structure of the joints in larger breeds meaning

that this option can sometimes not give as good results as with smaller breeds. Recovery times after surgery can be many weeks of restricted movement and it certainly isn't an easy process.

The other treatment plan is to carry out a surgical repair. There are three different surgical choices – the best outcome is acknowledged to result from Tibial Plateau Leveling Osteotomy (TPLO) but this is unfortunately also the most expensive operation. Secondly would be the Tibial Tuberosity Advancement (TTA), and finally the Extracapsular Surgery (or banding). The downside with the extracapsular surgery option is the high failure, but the cost to perform this surgery is comparatively low. One important thing to note with the banding option is that it is more successful in smaller dogs, larger dogs just don't have the same success rate with the banding. Whichever option is chosen, there is a guarantee of resultant arthritis in the joint, and sometimes in the second other healthy leg which is required to complete a substantial more amount of work and weight bearing during the injury including rehabilitation process. The other consideration is the ligament damage that can often happen in the other leg as well. Whether you chose to conservatively treat a rupture, or chose a surgical option, you would be well advised to also add in some complimentary therapies to ensure the body is supported. Options include swimming for muscle maintenance and to help avoid more severe atrophy in the damaged leg, laser therapy for inflammation and healing and also serious consideration should be given to incorporating osteopathy which has a range of benefits for rehabilitation.

I consider osteopathy to be a vital addition whether you choose to do the surgery or not. I would treat with Osteopathic Articular Balancing and Functional Techniques for maintenance of movement and balance within the body. We will look into osteopathy further in the paper.

In my time offering therapy to dogs via our swim therapy pool and laser therapy, I have seen many cruciate injuries. Alongside arthritis, it would have to be one of the most common issues seen here. Often people come to me with an overwhelming diagnosis, either having to spend thousands of dollars repairing a knee and then trying their best to rehabilitate afterwards, or choosing to proceed conservatively which has its own benefits and drawbacks. There is no right or wrong answer as to what is the best option to choose but, in my experience, if they can afford it, surgery should be the main option for consideration. This reduces the speed and severity of the arthritis development and also ensures that a veterinarian can internally assess the joint as a whole to see if any other issues are present. Sometimes damage occurs to other important parts in the knee such as the menisci which really only surgery can correct. Sometimes if the injury has been in place for a while and arthritis is already forming, they can surgically tidy some of that up and make the joint as good as it can be. I believe that a lot of these so called sudden cruciate ruptures have been building up for a while, this is especially true in the larger and older dogs. I believe that a small niggle turns into a leg that is not functioning correctly, meaning the structures are not moving as they should be and this in turn puts stress on the joint and supporting tissues. I also wonder if a lot of these issues can stem from issues further up the body, where a dog has compensated for long enough to put undue strain on the rear limb. Clearly there is no way to know for sure what caused a cruciate rupture (full or partial), and while it would be interesting, it really serves no purpose apart from being able to assess if this reason may cause issues after the repair has been done but could also provide information that could be used in research aimed at preventing these injuries occurring in the first place. This is certainly a point to notice, which is why doing a thorough Osteopathic assessment would be a useful addition. This will also highlight any other problem areas that may be present. It can

also then aid in protecting the other knee, which as we know is under a lot more load and therefore has a higher chance of rupturing its ligament.

A study was performed at the Animal Medical Centre (Buote & Fusco & Radasch, 2009). The objective of this study was to assess the rates of the other rear limb suffering a cruciate rupture. They assess this based on weight, age, sex, the tibial plateau angle and wanted to assess if Labradors that ruptured their cruciate ligament earlier in life (4 years or under) were more likely to rupture the Anterior Cruciate Ligament in the other leg. What they found was there seemed to be no significant difference between age, sex or weight when determining whether or not the other Anterior Cruciate Ligament would rupture. They found that the time frame for the other knees ligament to rupture was on average 5 ½ months. In the study they found that approximately 50% would rupture the other ligament but details of age, sex, weight and the angle of the tibial plateau were not indicators of who would suffer from one. This study does show that especially for larger dogs, the chance of the other limb suffering a rupture is reasonably high. This is certainly a great reason to look at rehabilitation options that allow the body to reset itself too as normal as possible. My experience with this issue is that the sheer loading the other limb takes while the injury is active, means that the limb is not moving as it should therefore the dog changes the weight distribution and angles of the body to better compensate for the injured leg. This has a ripple effect actually, not only in the other leg, but up the back and even into the front limbs which are forced to carry more than the normal amount of weight forward.

Some breeds are more prone to cruciate ruptures – such as the Labrador, Rottweilers, Mastiffs, Staffordshire terrier and Golden Retrievers – however this doesn't mean they're the only breeds that suffer from it as Anterior Cruciate Ligament ruptures occur in almost all breeds, sexes and ages

Identifying an issue in your dog is often something that isn't as simple as it sounds. If the cruciate has been under stress for a long time and/or the dog has had a partial tear in it without treatment for a while, owners can simply not notice until the dog is symptomatic. This of course means the other issues that can form within the knee are likely to be already developing, such as arthritis. Sometimes people put off seeing the veterinarian as they think the dog has just pulled a muscle or strained something which is not a great move when we consider what happens within the body. Over the time frame of a week or so, the body starts to reduce the inflammation that it's created to support and try repairing the injury, sometimes resulting in temporary lameness reduction. Owners may suddenly think that their dog is getting better but they're not. The ligaments are not a very good healers left alone to do so, so the chances of the ligament in a partial tear actually repairing itself without outside interaction (such as laser) is pretty slim. Especially as owners will assume the dog is getting better and then allow them to resume normal activities, which considering we are talking about a now unstable but important joint, it can be a recipe for disaster. That being said of course, there are many stories of people going to their vet for consultation following their dog becoming lame, walking or sitting differently. As ligaments issue are not visible on x-rays, they're often treated for a muscle strain, given anti-inflammatories, told to keep the dog quiet to allow recovery and to come back in a couple of weeks. This situation is understandable if it wasn't obvious to the vet from the consultation that a ligament rupture was likely as it is the least invasive way give the body a chance to settle down. However, people do not understand the importance of carefully following their vets advice to keep their dog restricted for the best chance of recovery and often simply do not give the knee a chance to heal. I think whenever we are dealing with hind limb lameness, we should almost always expect to be working with a cruciate issue, arthritis or both in a majority of cases unless there is a prior injury history of another cause of the symptoms in the area. Arthritis is a condition that is likely to affect older

dogs more than younger ones. With this in mind, it would make sense to also look at doing an x-ray to see if there are arthritic or structural changes. Again though, this isn't going to diagnose a cruciate rupture, so it is best to follow the vets advice and keep your dog quiet, reassessing after the prescribed timeframe. At which time, if the issue is still present, it would be prudent to do the drawer test to assess the joint stability. Because a dog needs to be sedated for this, it's a rather invasive procedure should it simply be a muscle strain.

There is a lot of mixed information out there about whether doing surgery is the best option or not, if the ligaments can and cannot heal from a partial rupture (obviously not in terms of a full rupture as the ends are no longer near each other). The main concern about whether you believe this or not is that you have no way of knowing if the ligament is a full rupture or a partial without having an actual internal look at the joint itself. A lot of people get put off by the recovery phase where the dog needs to be crated or contained for a substantial period post surgery, but they don't realise even without the surgery to allow the alternative therapies to be of assistance, you also need to keep your dog restricted and quiet. The issue with not doing surgery means that the knee is never fixed, you are managing it forever. Whereas with a surgery, the chance of a relatively normal life is very high. The issue is of course the ever present risk of arthritis forming however, following surgery at least the knee is stabilised and repaired. There is a study that was conducted and it was looking at the clinical results following non-operative management for rupture of the cranial cruciate ligament in dogs (Vasseur, 1984) where they looked at 85 dogs, who all had the same instructions to lead walk only for 3-6 weeks, and pain relief (as well as weight loss if suggested would be beneficial). The dogs that had a smaller body size of under 15kg "recovered" much faster, when compared to the over 15kg group. These percentages were 85.7% of the smaller dogs versus 19.3% in the larger dogs that were considered to be back to "normal" in a clinical sense. These re-assessments were done over different time frames as well – so the smaller dogs

were reassessed after 3 years, whereas the larger dogs were reassessed after 4 years. What this study does show is that not repairing the ligament and managing it conservatively is more successful in smaller dogs.

ARTHRITIS

With all this information in mind, it is clear that when a ligament ruptures in a dog's knee, one way or another it is highly likely arthritis will eventuate. What do we know about arthritis? It is inflammation in the joint which causes pain and stiffness. It is easy to see how early onset arthritis can be mistaken for a dog that's "tweaked a muscle" or ran too much during their walk. We talk to a lot of our clients who are surprised with an arthritis diagnosis for their dog when they say symptoms of the lameness occurred quickly, even spontaneously. There are usually small signs of the issue that could have been observed earlier but these are often overlooked by owners. With this joint inflammation in mind, changes or damages can occur in the cartilage within a joint (whether than be hip, knee, elbow etc). These changes mean that the cartilage isn't as smooth so the bones in the joint rub together. A vicious cycle then starts where the rubbing creates more pain which in turn then creates more damage to the cartilage. Because of this increased friction and damage, the body then starts to lay down more bone around the joint to try and protect it, but all this does is to make the joint stiffer and harder to move (this is called degenerative joint disease). This is why dogs suffering from arthritis begin to have trouble moving after lying down for some time. Some of the other symptoms of arthritis are licking of the sore joint – you may see signs of staining from excessive licking or simply catch your dog licking a lot more than usual, mood or behaviour changes – likely due to the pain and discomfort, not wanting to move or do usual activities. When talking about arthritis though, its not an issue than can be cured, cartilage rarely repairs itself and so what you choose to do after diagnosis will make all the difference. With arthritis there are many things that you must think about such as weight, diet, supplementation for

joint health, pain relief, encouraging movement safely – a note on this is that the more a dog doesn't want to move, the more the joint retains its stiffness and reluctance to move. With arthritis, moving the joint is actually beneficial. This is the reason therapy options like hydrotherapy are so successful as it is possible to provide movement in a safe environment that does not aggravate the complaint. This is also another reason why offering a therapy like osteopathy is also advised. Using the Osteopathic Articular Balancing and Functional Techniques can aid the return to some normality for dog and owner – as well as keeping the other body functions healthy as well.

So when a dog ruptures their ligament, there are clearly many considerations to how to move forward. It is apparent with what we now know of both issues focused on in the paper (cruciate ligament and arthritis) that one is not far from the other so these two issues come hand in hand. This is discussed on the website caninefitness.com where they consider the conservative approach to managing cruciate ligament issues. This article discusses the fact that without a doubt dogs that do not have a surgical repair will suffer from arthritis. But more than that, there is a risk of meniscal injury. Comparatively though, there is also arthritis that forms on the surgically repaired knee, as well as the expected atrophy of muscles. Studies also show that the unaffected knee is susceptible to arthritis. With this in mind, it is clear that despite the decision made on whether to have a surgical repair or not, arthritis will form. It will be worse in a dog without a repair, but will still be present in one that has had a repair done. Osteopathy provides needed mobility and stretching, motion and release allowing the dog to be as normal as possible – whether repaired or not.

In my own business, I have had a multitude of dogs come in with cruciate issues, some have had surgery, some have not. What I do see though is the rehabilitation effort is incredibly important. The sooner the body can be restored to some form of normal movement and structure, the better it is for arthritis development and not only in the injured limb but for over

the whole body. This statement is certainly backed up when you look at the research published in November 2014 by the Department of Equine and Small Animal Medicine, Faculty of Veterinary Medicine, University of Helsinki, Helsinki, Finland (Mölsä, Hyytiäinen, Hielm-Björkman, 2014). In this study they looked at 47 dogs that had a mixture of surgery types on their cruciate ligament ruptures as well as 21 healthy control dogs. They studied a range of things to be able to evaluate the long-term surgical outcome. These things included orthopaedic examinations, physiotherapeutic examinations such as the active range of motion, symmetry in the ground thrust, symmetry in muscle mass, evenness of weight bearing and force plate examinations. This study was very thorough in its evaluations. The results showed that over the course of a couple of years whilst there was no substantial difference between the control group and the surgical group with reference solely to the ground reaction forces however there was a significant difference when looking at the other study factors. A large (30%) number of dogs in the surgery group had decreased weight bearing when the symmetry of weight bearing was observed. 40-50% of the surgical group suffered from a decrease in the range of motion in a sitting position, and two thirds of the dogs showed weakness in the thrust from the ground. There were indications that the flexion and extension of the dog's knee was certainly subpar compared to a healthy knee joint, coupled with the reduced active range of motion and the ground thrust that were often shown. This study shows that even despite doing surgery, owners are still going to be faced with a dog with a leg that isn't working as it should. Adding in therapies such as swim therapy and osteopathic treatments can ensure the joint and the limb and the whole body itself can return to as normal as possible to help balance and support the body correctly.

A study was also undertaken in February 2010 by Department of Veterinary Clinical Medicine, University of Illinois (Gordon-Evans & Dunning & O'Dell-Anderson & Knap & Griffon & Johnson, 2010). This study looked at the arthritis development and compared to

the difference surgical techniques. They looked for the presence of arthritis before surgery and 2 years after surgery. The result they found is that the radiographic scores in all dogs had significantly increased in the 2 years prior to surgery.

Another study was done by the Department of Small animal Clinical Science, Columbus, Ohio (Hoffmann & Miller & Ober & Lanz & Martin RA & Shires PK, 2006) where they were looking at the tibial tuberosity advancement surgery and the results after the surgery. Within these results is the notation that whilst the surgery itself was considered a good alternative in the management of cruciate ligament disease, there was still 67% of dogs that showed radiographic progression.

There is an older study done in 1992 (Vasseur & Berry,1992) where it does show that often owners are somewhat oblivious to the effects of arthritis. This study looked at 21 dogs and the examination range varied from 1-47 months, usually was around a year though. This study showed that all owners believed the surgery had improved their dog's condition due to the decrease in the frequency of lameness. BUT the study did show that there was palpable instability and joint swelling found during examinations and radiographs showed the progression of osteoarthritis.

This then leads me to the fact that ultimately even if you choose to do the best surgery you can, arthritis will form. The joint will forever be affected and arthritis only worsens as time progresses.

WHAT CAN BE DONE TO HELP?

The use of therapies after an injury or surgery is becoming more and more common. The option of physical therapy, swim therapy, laser therapy and acupuncture are being suggested and even offered by some veterinarians more often. These are all great options and certainly can help a dog deal with issues such as the cruciate ligament rupture. Osteopathy therefore is

a modality that allows for similar benefits to physical therapy, in a much gentler and relaxed way. No sit/stands or cumbersome braces, or exercises owners just don't do, or aren't confident to do. Osteopathy can provide movement and mobility to the limbs, back and neck ensuring that the whole body is benefiting as chances are the whole body is affected by this injury. Often, we find issues in other areas of the body from the stifle where you might ask the question, why are they limping now on the front left leg, when the issue was in the rear right? Consideration to the balance of weight distribution and the compensation by the body to make things more comfortable is given here. It is clear that this hypothetical issue presented due to the dog changing the way it moved, the way weight was distributed, and likely has injured the front leg as a result. This is more of how osteopathy can be beneficial – by providing relief throughout all the body, we can minimise issues arising like this – especially whilst the dog is recovering.

USING A BRACE?

It is prudent to discuss the various braces and support devices that are readily available for people to buy to support the knee and the joint movement. These devices are actually used a lot in dogs where the owners have elected not to pursue surgery as of course the knee is very unstable once the ligament ruptures. Braces provide external support, meaning the dog can maintain normality. The only problem with braces and support devices in general is it enables people to be lazy – to not offer therapies they may normally have looked at, to think that the dog is ok given they can exist without any issues during a walk. The missing factor here is that the supporting muscles that we work during therapy treatments are not being used. When the brace then comes off, the joint/limb is actually worse off that what it was before. We then enter a vicious cycle of using the brace to support the knee, having the muscle lose more of its supporting strength meaning that we then need to use the brace more, which in turn means the joint will lose more stability of which there wasn't that much to

begin with. Personally, these items should be used in very limited ways. To ensure they actually work as they're supposed to, they need to be fitted properly (usually by a vet or physio) and can be very expensive. A survey (Hart & May & Kieves, 2016) published in the August 2016 issue of JAVMA, dogs that underwent the TPLO surgery option were compared to those who elected to use a supporting brace. It was found that 98% of owners in the TPLO group said that the outcome was excellent/very good/good, and that 98% of them also confirmed limited lameness or none in their dogs. When compared to the group who used braces for support, 86% of this group reported satisfaction. When this group was asked about the lameness, 88% reported low or no lameness. There was also the finding that only 5% of the operation group noted post surgery complications, compared to 46% of the group using orthotics which noted skin problems directed related to the use of braces. In this study it was also noted that we cannot communicate to our dogs to see if they like and will tolerate the use of a brace. This means the long term results from wearing the brace may vary as dogs that do not like it, will ultimately change their gait causing other complications. The other issue with braces found in this study was that while there was a low percentage that wouldn't tolerate the brace (7%), there was 19% that did not want to put on and wear the brace. With this in mind and the fact that the brace was custom fitted to each dog, when we look at the fact that 46% of the wearers had skin complaints whilst wearing the brace of which and a large 32% required veterinary attention, the suitability of brace use should be questioned. Furthermore, in the study it was noted that the use of a brace has an as yet unknown effect on arthritis. Add to this, the chance of meniscal damage on a ruptured ligament is high and the fact that damaged meniscus does not fare well in a brace situation. It is then my conclusion that braces should be only used in instances where the joint is required to be stabilised during walks and not used long term. In my opinion it would be preferrable for them not to be used at all and people choose to get surgery and follow this up with swim therapy and osteopathy.

The more we take away from the bodies own ability to adapt, the more we become dependent on external support and the more we can't exist without it!

OSTEOPATHY – THE PERFECT ANSWER

This then leads me to talk about the benefits of osteopathy and how it can fit incredibly well into not only the recovery of a dog suffering from a cruciate rupture, but also one that is experiencing the inevitable arthritis development within the joint. Whilst this is a human related cruciate website (Health & Balance Osteopathy, n.d) it does translate across to our canine companions for the benefits and gains to be made from Osteopathic treatment of the joint and beyond. They mention on this website that the osteopathic techniques such as articulation promote blood and lymphatic flow which in turn help reduce pain and inflammation. The articulation of the joint also helps to reduce muscle tension around the joint which also then helps the range of motion and mobility. Following that, it also provides muscle release in structures further up the limb and the body. Further to this website, I also reviewed another Osteopath website (The Osteopath, n.d) where they discuss the benefits of osteopathy. The focus is to restore the natural muscle balance and development to the knee joint, improving range of motion, reduction in swelling of the joint, and addressing any structural imbalance that may come about due to the changes in gait. In considering these facts, it is evident that any injury would benefit from osteopathic treatment, but certainly more obviously in the instance of a cruciate rupture and subsequent arthritic changes in the stifle. It is important to restore the natural muscle balance and motion of the body, improve the range of motion and work towards correcting any imbalances in the body. This in turn would help prevent any other complications arising as a result of the original knee injury.

A very interesting study was published in June 2006 (Gugel & Johnston, 2006). This study was undertaken on a 27 year old man who had suffered an anterior cruciate ligament rupture

a considerable time before looking into surgical options. During these years prior to surgery, the man chose to use a brace for knee support. What was discovered is that the man, when not wearing his brace, would encounter instability in the joint which would ultimately lead to inflammation and pain in the joint. It was during the final year before surgery that he noticed such a regularity to the instability that made him look into surgical options. He was assessed prior to his surgery where it was found that he had somatic dysfunction in the lumbo-pelvic region, along with considerable muscle tension from the injured knee right through to the lower thorax and ribs 6-9. After the surgery, the man received regular osteopathic manual treatments and his progress was noteworthy. There was increased mobility and stability in the lumbo pelvic region and any new dysfunctions resolved quickly with using osteopathy. He recovered enough to be able to return to his regular sports within 6 months.

George W. Northup (Northup, 1954) wrote, the proper function of any one joint area is dependent to a greater or lesser degree upon the proper function of the total musculoskeletal system. One cannot just "treat" a painful knee without considering the totality and interrelationship of body parts and physiologic systems. Considering this, it is remiss of us to look at treating only the knee joint of a dog suffering a cruciate rupture and subsequent arthritis. We need to look at the whole body, but more specifically the parts working around the damaged joint. He added in his study that even if the spine for example wasn't injured or affected in the initial injury, it most certainly would be at some stage in the future.

Using osteopathic techniques for arthritis is also worth considering taking a look at as this is also a viable consideration – do osteopathic techniques actually help arthritis? In a study undertaken in 2019 (Pham, 2019) the effects of osteopathic techniques on arthritis in elderly people who are caused disability because of their osteoarthritis. As this disease is crippling and the usual treatment protocols was to use NSAIDs, pain relief, steroid injections, physical therapy and even hydrotherapy. This study brings consideration to alternative treatment

options outside of the usual ones especially when we consider the side effects to many medications and after all there is only so much any one drug can do. As arthritis causes somatic dysfunction, the primary role of osteopathy is to alleviate and correct somatic dysfunction where possible and put the body back to its "normal" position. The effect of osteopathic techniques on the body and in turn the arthritis would mean that we can increase the evenness of the body (the symmetry), improve the motion and fluidity of movements which in turn aids the body as a whole. Not to mention the benefits in the reduction of pain and improving the flow of body fluids. As we know movement is very important in keeping an arthritic joint as healthy as possible. In this way osteopathy is an essential addition to any recovery to any injury or issue but of course more specifically an issue where arthritis is forming or has formed.

As previously stated, I believe it is clear that when dealing with dogs suffering from a cruciate ligament rupture – whether partial or full, that dog will suffer from arthritis in that knee joint. There is a chance of arthritis in the non-injured leg and there has been studies to suggest the chance of a rupture in the healthy knee is also a possibility. A great example of the extra stress and compensation the uninjured limb is put under (not to mention the other body structures also affected by this injury). I also wonder if arthritis forming in the "healthy" knee would then cause a future rupture or stress of the ligament in that joint. Perhaps this is another explanation of why the healthy knee's ligament often ruptures as well. In order to ensure adequate or even exceptional recovery after a cruciate ligament rupture, I believe we have proven that the best course of action in this is firstly surgery to repair the knee. This will then ensure that the knee is stable, therefore not likely to further deteriorate or to damage other parts within the joint. Whilst we know that arthritis is almost guaranteed, the surgery means the onset of this is slowed and will of course prevent a lot of further joint damage to other areas. Once the vet has cleared the dog following surgery, and has declared the ability

to start therapies to help recover any atrophied muscle (which certainly is high on the list in the case of a long term rupture where perhaps the ligament was treated conservatively for a while, but some dogs can lose muscle mass comparatively quickly), it is my belief that we should look at introducing swim therapy to help rebuild the muscle and rebalance the body in a safe fashion, but also utilising laser therapy to help reduce inflammation in the joints (this is a useful tool to use before therapy can be undertaken as it has very powerful wound healing and inflammation reduction abilities). But of course, as I have discussed, the introduction of osteopathic treatment is a further important addition to the post op recover plan. With this treatment being as thorough as it is, it gives the opportunity and ability to look at correcting the imbalance issues where the dog has changed their gait, and/or transferred the weight distribution to compensate for the injured limb. This compensation and gait changes put added stress on other body parts – the other knee, the spine, the front legs. There is another reason why treating only the damage leg is not offering the best to the dog. If we ensure mobility and motion in all parts of the body, we can stave off further issues resulting from somatic dysfunction. If we ensure adequate blood flow and inflammation reduction, we can really make a difference to the dog's overall health and quality of life. As osteopathy is a very well tolerated and gentle technique, most dogs are quite willing to accept it. We know that the sooner we can get the gait and the body back to "normal" for the dog the better. We may be able to protect and prevent issues occurring in the other limbs, more specifically the opposing knee, but certainly the spine does incur a lot of stress especially when trying to redistribute weight.

When thinking about osteopathy and how it fits in with the dog's rehabilitation and recovery process, we must first understand the techniques. Understanding that these techniques are gentle, never forced and offer such incredible benefits for a relatively simple set of movements and checks. In the majority of cases, we would start the process with a visual

assessment of the gait and movement through a range of different paces – walk and trot being the main two. What is worth noting with a cruciate issue is that we really do not want to be doing this full visual assessment. Not only is the gait going to be out, but a dog is usually on restricted exercise and trotting around is probably not a great idea. We can certainly see enough on the way they sit and stand, and the way they walk. You could argue that an adequate assessment could be gained by simply watching the dog walk in for treatment. The important assessment then begins where we are using palpation and articular balancing to check all limbs and back for other signs of dysfunction. Remembering though that finding things in other areas is very likely. Palpation and Articular Balancing offers us the opportunity to check the body's movement, range of motion and for any signs of tightness, heat or discomfort. It would be expected to find tightness in the front limbs, and certainly down the back for example. Articular balancing in particular also provides a treatment in itself and can often be enough to alleviate some of the things found. We then would work through the hind limb with functional technique. The important thing is to be very cautious and mindful of the stifle. If the owner has chosen the conservative avenue, then this area is likely to be inflamed and painful so a lot of the mobility we do there may be best to avoid – we certainly wouldn't want to be using circumduction on an already unstable joint. If they have had surgery and have been given clearance then careful and mindful work throughout the limb would be okay. Functional technique is very subtle and gentle and moves away from the point of bind. So, in essence we would never be putting stress on any of the limbs.

During this paper I have discussed how the knee is quite a complex joint and important joint in the dog's body. This joint is one of the most common injured parts which is predominately related to ligament damage. Ligament ruptures can occur in younger dogs who twist or run or jump in a way that puts the ligament under stress; or it can happen in the older dog where simply standing can cause a rupture. Either way, it is the most common surgical reason dogs

visit the vet (spaying and neutering aside). Sometimes a dog can suffer a ligament rupture but this isn't treated straight away – often due to the owner thinking it is just a muscle strain or perhaps they haven't noticed a change yet. Maybe they wish to treat the rupture conservatively without looking into the various surgical choices. There are 3 common surgeries that vary in price, but the cheaper of the surgeries does have a reasonable failure rate. Most vets are now encouraging clients to pursue one of the more expensive surgeries given the success rate. As these surgeries come with a rather large price tag, a lot of owners simply can't afford it. The real question is – can they afford not too? I looked into the impact of arthritis following the damage to the ligament. What this means for the stability of the knee, and as a result the damage to the bone and surrounding tissues. It is known that arthritis will happen, its not a matter of if, it's a matter of when. Sometimes in the older dog, they may already have arthritis developing, and maybe even already in their knee. In these situations, the arthritis will become more of an issue faster than those with young healthy joints. The discussion was also had about how arthritis often forms in the second knee joint, and potentially other bony structures that may be impacted by any change in gait or the compensation the dog does to help them deal with the unstable joint. There was then a look into the choice of using braces to support the knee and the fact that this option often creates a more unstable joint when the brace is removed. A brace can also alter the dog's gait even more and can be uncomfortable possibly even causing skin damage. I don't believe for long term recovery or treatment that this is an option to consider. We looked at briefly the other alternative treatments that are being used more and more often for cruciate ruptures and oftentimes these are used instead of surgery. Laser therapy offers cell stimulating which aids in inflammation reduction, pain relief and healing; hydrotherapy provides a safe and weightless environment to safely build up muscle and look to rebalance the body. Acupuncture uses needles to clear stagnant chi and stimulate the body to heal itself.

Physiotherapy looks at using exercise and devices to restore movement and mobility to the body. The only downside with this is often the owners are given exercises to do at home, which a lot simply don't do, or don't do correctly. Osteopathy has a rightful place amongst these therapies. It provides, in a safe, well tolerated way, movement and balancing of the body. By treating the body as a whole, the osteopath looks to restore the dog to as close to normal movement as possible.

CONCLUSION

It is clear that there are many dogs suffering from cruciate ligament ruptures and the subsequent arthritic changes that occur. This is inevitable and no matter what treatment choice is chosen – to operate or not – it is a factor we will have to deal with. We have seen that the ligaments in the knee can really benefit from mobility – certainly proven in the studies undertaken on people which can easily be applied to the canine and the recovery process for their injuries. Osteopathic techniques such as articular balancing and functional techniques offer this in a gentle way and are tolerated very well. For the best results, we need to be working with a surgically repaired knee. Otherwise, the joint will always be somewhat unstable no matter what therapy that is chosen, and it will also cause a lot of issues with the gait changes and compensation the dog will do naturally to minimise the use of the limb. We know that the arthritis formation is likely to be more advanced in a knee that isn't surgically repaired, although arthritis will also form in a surgically repaired knee. I think the argument here is that we can reduce the speed of formation of arthritis and we can minimise the risk of damage to the other parts in the knee, so the sensible choice is to do surgery. The arthritis has also been seen to be alleviated with osteopathy, offering movement and mobility to a stiff and painful joint. There is certainly no fix all in this situation and no matter what happens, the dog will always have this complaint, so ultimately the suggestion and recommendation is to utilise regular osteopathic treatments for the dog after injury/repair.

Whilst osteopathy cannot repair arthritis, there is certainly the benefits that are achieved that will give long-term benefit.

The osteopaths' goal when treating these combined issues is to

- reduce any swelling
- gain or maintain mobility in not only the knee, but the other limbs and the back
- improve the range of motion of the injured knee
- work towards keeping the quadriceps and hamstring muscles strengthen and flexible
- importantly work towards ensuring the proprioception (awareness of the body and muscle movement) control remains.

Whilst osteopathy is relatively new in the treatment of dogs – conversely a lot of the alternative treatments are – when looking at its use and effectiveness in human injuries similar to injuries dogs suffer from, it is clear that it will provide relief and certainly benefit during recovery and beyond. I believe that for dogs in particular, following a limited treatment timeframe like they do with people is a little short sighted. It is proven time and time again that once a dog has "recovered" from its injury and the arthritis is managed, people forget a little bit. The dog is allowed to return to pre injury activities and behaviours. It is my belief that while I think that this is fine to a degree, regular check ins with an osteopath would be advisable once the rehabilitation and recovery time has been completed. This is more for maintenance and monitoring especially with arthritis being a factor.

So, in short, when considering the thesis topic "The role osteopathy has in the treatment of ruptured cruciate ligaments and subsequent arthritis" I believe that 100% this treatment does have a huge role to play in the treatment, protection and maintenance of these issues. Keeping the whole body as healthy as possible, in a safe and gentle way.

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