Osteopathic Manual Therapy for the Management of Canine Hip Dysplasia

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Introduction

Canine Hip Dysplasia is a skeletal condition of the coxofemoral joint resulting in deterioration of the ball and socket joint over time. While typically seen in large breed dogs given their size and fast growth rate, all breeds have the potential to develop the condition, with the percentage of reported impacted dogs at roughly 14.3% of the canine population (Neighbourhood Veterinary Center, 2024). In some cases, statistics as high as 70% in breeds such as bulldogs, pugs, mastiffs and german shepherds have been reported (Schachner & Lopez, 2015).

Evidence suggests both a genetic and environmental association to the laxity of the joint, and although there are a number of widely accepted surgical solutions, little research exists to support the efficacy of early muscular intervention and regular manual therapy treatment as a means of pain management. Although the abnormal development of the femoral head or acetabulum (socket) cannot be reversed without surgery, or a global genetic overhaul, is there enough theoretical evidence to suggest alternative solutions, besides invasive surgical procedures, that would aid in the discomfort dogs diagnosed with canine hip dysplasia face? Can osteopathic manual therapy intervention successfully slow down the progression of the condition by supporting the development of compensatory muscles creating a more favourable, less invasive strategy? This thesis aims to take a closer look at the anatomical structure, clinical symptoms, currently accepted surgical options in Canada, and how osteopathic manual therapy may slow down the progression of canine hip dysplasia and be an effective tool in pain management.

Comprehensive Overview of Canine Hip Dysplasia

Anatomical Structure of the Canine Hip

The canine hip, scientifically referred to as the coxofemoral joint, is a ball and socket joint made up of the femoral head of the femur bone centered on the triradiate cartilage of the acetabulum enclosed in a fibrous capsule (Frontiers, 2021), as shown in figure 1.0. A thick ligament, the round ligament spans the center of the joint holding the femoral head in place (Brooks, 2005). Synovial joints, such as ball and socket joints, are highly mobile due to a cavity filled with synovial fluid (lubricant), and when healthy allows the limb to move in flexion, extension, abduction, adduction, circumduction and full hip rotation.

When the femoral head is misshapen, incorrectly centered, or acetabulum too shallow, this can cause a lack of congruency leading to inconsistent wear of the cartilage cushion (ACVS, 2024). As the cartilage breaks down from the abnormal movement, scar tissue, remodeling of the bone, and osteoarthritis may begin to form in the joint (ACVS, 2024). Pelvic muscles such as the pectineus, iliopsoas, and gluteal muscles, along with the larger muscle groups like the hamstrings and quadriceps in the hindlimb can shorten or atrophy as a result of the dysfunctional movement, and the round ligament will likely tear (Brooks, 2005). Furthermore, imbalances in the above muscle groups may lead to twisting of the pelvis and spinal column, which will be described in greater detail in the clinical symptoms section of this paper.

Figure. 1.0

Radiographic image of a non-dysplastic dog hip.

(Elmwood Vet, 2025)

Depending on the severity of the laxity, some patients may experience symptoms of dysplasia as early as four months old, while others may go undiagnosed until much later in life when osteoarthritis begins to cause significant lameness or pain indicators, which can often be confused with typical signs of aging.

Contributing Genetic and Environmental Influences

Research suggests that at birth, the hip joints of all dogs are anatomically correct and it is within the first sixty days of life that is critical for the development of the joint (Ginja and Gasper, 2015). Genetically, canine hip dysplasia can present due to poor conformation or how closely it conforms to breed standard in terms of physical appearance, cartilage susceptibility to pressure, factors associated with hormones and the quality of soft tissue development (Ginja and Gasper, 2015). However, given the variability in physiological contributing factors, there is not *one* gene with a positive association to dysplasia, making genetic selections during the breeding process next to impossible.

Adding complexity, a variety of environmental factors have been documented to alter the expression of contributing genes. Nutrition, weight, exercise, desexing procedures and growth rate are just a few environmental examples known to result in higher instances of hip dysplasia. While all will not be explained in detail, a select group will be described to emphasize the importance the environment has on joint health. Nutrition directly impacts growth rate, both from an unbalanced diet lacking in proper nutrition negatively impacting bone/tissue development as well as diets too high in protein leading to increased growth rates that may lead to weaker joint formation or early onset arthritis. In senior dogs, weight management becomes

increasingly important for those predisposed to dysplasia, as obesity puts excess pressure and stress on joints (AKC, 2024). Weight management examinations suggest for every one pound a dog is overweight, it is equivalent to four pounds of pressure to a joint (Arthritis Foundation, 2025).

Type and amount of exercise during critical growth periods are also vitally important to the proper development of canine joints (AKC, 2024). Research suggests negative implications associated with repetitive and high impact movements, while not definitively correlated to the development of canine hip dysplasia, potential damage to the cartilage can speed up the progression or expression of the condition (Better Pet, 2025). Examples not typically thought of as repetitive movement, homes with wood or tile floors that cause slippage, repeatedly jumping in or out of cars, onto furniture, and excessive amounts of stairs are all environmental factors that will impact a dysplastic dog's quality of life. In a similar fashion, young dogs who do not get enough exercise or who are confined to a crate for long periods of time can develop imbalances or lack of muscle development which may exacerbate the impacts of a dysplastic hip (Better Pet, 2025). Additionally, lack of exercise could lead to unhealthy weight management in older dogs, putting additional strain on the impacted limb as previously discussed in correlation with nutrition.

Although not as widely researched, desexing procedures conducted prior to the age of two years, particularly in male dogs, has shown to have an increased risk of hip dysplasia due to the lack of sex hormones on bone growth and development resulting in slower closure of growth plates (Scott, 2022). Testosterone production stops after a de-sexing procedure with the removal

of the testicles, however testosterone plays a large role in maintaining muscle mass and bone density (Animal Care Center of Castle Pines, 2022). Without the proper bone density, the joint would lack stability, exacerbating the effects of dysplasia.

While none of the above examples guarantee the result of developing hip dysplasia or not, a balanced diet, lifestyle, and appropriate exercise routine in relation to the age of a dog all aid in the promotion of healthy joints and muscles.

Clinical Symptoms and Comorbidities

Abnormal movement inside the coxofemoral joint leads to progressive changes to the joint and compensatory muscles to activate. In some cases, the impacts of this condition can be seen as early as four months of age in severe cases, while others do not receive their diagnosis until much later in life when secondary conditions, such as the development of osteoarthritis, mobility issues, and lameness present (AKC, 2024). The degree of laxity in a joint varies by individual, impacting their presentation of the condition. Below is a list of clinical symptoms according to the American Kennel Club observed at rest, in motion, and post activity found in dogs diagnosed with dysplasia from mild to severe:

- Pain and stiffness - including vocalizations such as whimpering and whining;
- Abnormal gait - lameness in the hind end, swaying, or ‘bunny hopping;
- Decreased activity - including running, jumping, ascending or descending stairs and a reluctance to rise or play;
- Decreased range of motion or inability to stretch in the impacted limb or supporting limbs;

- Enlargement of the shoulder and neck muscles (compensatory overdevelopment);
- Grating in the joint during movement (popping, clicking, crepitus);
- Muscle atrophy of the hind quarters.

As previously touched upon, a common secondary condition associated with canine hip dysplasia is osteoarthritis. Osteoarthritis is the breakdown of the articular cartilage over time between the femoral head and acetabulum which is designed to cushion the joint. Cartilage is primarily composed of specialized cells called chondrocytes and a matrix containing collagen, proteoglycans, and other proteins. It cushions joints by forming a protective layer between bones, absorbing stress and distributing weight (Fox, 2009). As the breakdown of cartilage does not happen as the result of a direct trauma, the varying amount of time it takes to deteriorate is what deems dysplasia a progressive condition (NIH, 2024). It is this disintegration in cartilage quality that is often associated with a pain response and without a proper cushion in place, bone rubs on bone. Other comorbidities might include chronic inflammation, often treated with nonsteroidal anti-inflammatory drugs, muscle atrophy of the impacted hindlimb(s) due to lack of use, canine cruciate ligament tears in either the affected or healthy limb and skeletal discomfort from repeated weight shifting onto compensatory limbs. A deeper understanding of comorbidities will be discussed in relation to how osteopathic manual therapy can aid in these conditions further in this paper.

Diagnostic Criteria and Scoring

A dog presenting with one or more of the clinical symptoms described above during an examination by a veterinarian would then receive a series of radiographs to accurately diagnose

the degree of dysplasia given they are over the age of twelve months to ensure the skeleton has reached full maturity and growth plates have closed (Soo & Worth, 2014). Figure 2.0 shows the ventrodorsal view of a canine pelvis most commonly used to identify the degree of dysplasia. Dogs are most often sedated for this procedure to ensure the joint can be abducted wide enough without movement to accurately calculate the angles. The radiographs are then used to measure the center-edge angle and Norberg angle to score the degree of severity (Frontier, 2021), as illustrated in Figure 2.1. The Norberg angle is the angle between a horizontal line connecting the centers of both femoral heads and a line connecting each femoral head center to the corresponding craniolateral acetabular margin (the outer edge of the hip socket). While the centre endge angle is formed by drawing a line from the center of the femoral head to the outer edge of the pelvis and a line between the centers of both femoral heads. A reduction in either angle can indicate a lack of proper coverage, potentially leading to joint incongruence and instability (NIH, 2022).

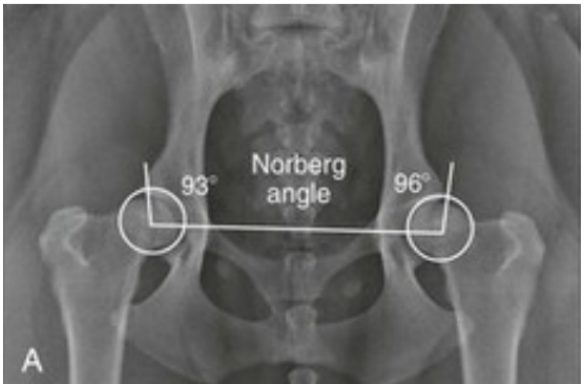


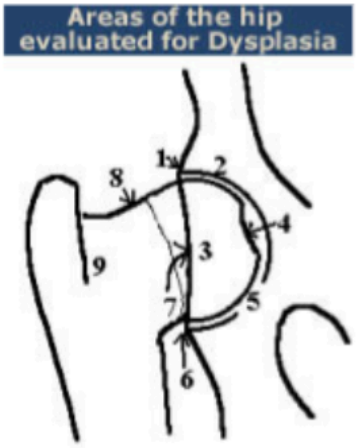
Figure 2.0 & 2.1 - (Veterian Key, 2016).

Ventrodorsal view of a canine hip presenting with dysplasia.

Norberg angle measurement.

The Orthopedic Foundation for Animals classifies canine hips into seven phenotypic categories: excellent, good, fair, borderline, mild, moderate, and severe. Phenotypic scoring is a method accepted world wide by veterinarians for the detection and assessment of hip joint irregularities. Nine areas illustrated below are examined by the Orthopedic Foundation board when classifying the degree of canine hip dysplasia:

1. Craniolateral acetabular rim
2. Cranial acetabular margin
3. Femoral head (hip ball)
4. Fovea capitis (normal flattened area on hip ball)
5. Acetabular notch
6. Caudal acetabular rim
7. Dorsal acetabular margin
8. Junction of femoral head and neck
9. Trochanteric fossa



Surgical Approaches and Rehabilitation Techniques

While alternative approaches such as hydrotherapy, anti-inflammatory medications for pain management, and traditional rehabilitation exercises aid in the reduction of symptoms associated with canine hip dysplasia, the surgical procedures described below are the most common intervention methods to enhance quality of life, alleviate associated pain and restore full function back to the affected limb(s). As early diagnosis and treatment is most effective, the surgical solutions described below are presented in order from those most suitable for young dogs to dogs of any age.

Juvenile Pubic Symphysiodesis

Juvenile Pubic Symphysiodesis is a strategy used to alter the shape of the pelvis in growing dogs less than eighteen weeks old, by using an electrocautery tool to prematurely close the growth plate (cartilage) at the pubic symphysis. The cartilage responds to the electric current by creating scar tissue, filling the growth plate and no longer allowing that portion of the pelvis to grow. As the remainder of the pelvis continues to grow, the hip sockets rotate more outwardly than they would on their own, providing better coverage and a deeper socket for the femoral head to sit into (Frontier, 2021). This procedure is considered minimally invasive, however many cases of hip dysplasia are not caught early enough to perform this surgery (ACVS, 2025). Normal activity can typically resume after two weeks and follow up radiographs are taken eight weeks post surgery.

Double or Triple Pelvic Osteotomy

Double or Triple Pelvic Osteotomy surgery is most often performed on dogs under ten months of age prior to skeletal maturity (Frontier, 2021) who have early onset clinical symptoms impacting quality of life.. This reconstructive surgery involves cutting the pelvic bone in two or three locations (ilium, pubis and ischium) and rotating the segments to improve the function and fit of the ball in the socket. Medical advancements with plates and screws is making Double Pelvic Osteotomy surgery more commonplace over Triple Pelvic Osteotomy and less invasive as the additional hardware keeps the pieces in place without the need for an additional reshaping. When the bones heal, the socket firmly secures the femoral head restoring proper function to the joint (ACVS, 2025). Recovery time is typical of a broken bone at six to eight weeks with strict restriction in activity and follow up radiographs required to ensure proper coverage has been achieved.

Total Hip Replacement

Total Hip Replacement surgery involves the complete replacement of both the ball and socket portions of the joint using artificial parts, most often with metal or plastic implants secured with bone cement, restoring full range of motion to the limb when successful (AKC, 2024). Given the mechanics involved, the patient is required to have reached skeletal maturity, typically over twelve months of age (Hunter, 2023). Recovery for this procedure is around twelve weeks, however it is the most effective treatment at restoring full function of the joint and implants are designed to last the lifetime of the dog.

Femoral Head Ostectomy

While not a solution that restores the hip to full function. A Femoral Head Ostectomy procedure involves the removal of the femoral head leaving an empty socket, often referred to as a ‘false’ joint. The surrounding pelvic muscles will compensate to form a sling to stabilize the hindlimb, along with scar tissue to form a cushion between the femur and acetabulum (ACVS, 2025). This surgery can be performed at any age however, is generally recommended for dogs under sixty pounds who no longer have plans to participate in higher activity level jobs, such as working dogs as they may still have an abnormal gait following the procedure. Recovery time is six weeks for this procedure and no follow up radiographs are necessary since the healing is muscular. (AKC, 2024)

Typically following any of the above procedures, the patient will still require a period of time on anti-inflammatory and pain relieving medications, along with instructions for post operative care. Amount and type of exercise will be restricted and introduced again slowly, and

may involve rehabilitation to strengthen the muscles impacted by the procedures. Those dogs who do not seem to recover within the expected time frame may be introduced to hydrotherapy, swimming, conditioning exercises and hill walks to regain muscle mass (The Canine Fitness Center, 2025).

Osteopathic Management of Canine Hip Dysplasia

Osteopathy Overview

Osteopathic manual therapy in humans has been used for thousands of years to treat musculoskeletal conditions. Specialized techniques were created with the help of veterinary professionals to adapt the same principles and bring them to the animal world (LCAO, 2023). The four main principles of osteopathy include:

1. The principle of body unity;
2. Inter-relationship between structure and function;
3. Self-regulatory and self-healing systems;
4. The rule of artery is supreme.

These principles play into the treatment of any patients exhibiting painful symptoms associated with hip dysplasia by recognizing all body systems are connected, mutually dependent upon other areas of the body and able to self heal given the appropriate support. The goal of an osteopathic session is to identify and correct dysfunction by bringing the body back to homeostasis, creating a favourable environment for self healing. Osteopaths are trained to detect somatic dysfunction in the body by means of tenderness, asymmetry, restriction in range of movement, warmth and even the most subtle tissue changes (Roberts, 2022). By appreciating all systems impact each other, addressing structural changes through osteopathic manual therapy

can improve overall function of both the impacted area and the entire structure. Hands-on techniques such as joint manipulation through osteopathic articular balancing, myofascial release, stretching, functional techniques, and craniosacral therapy target the nervous, lymphatic, immune, vascular, and musculoskeletal systems to restore function.

Manual Therapy Techniques and the Role of Fascia

To fully understand how osteopathic manual therapy can aid in treatment, a brief overview of each of the relevant techniques as they relate to the treatment of canine hip dysplasia are explained below:

- Osteopathic Articular Balancing: a gentle, rhythmic movement of a joint used to both identify and treat dysfunction;
- Functional Technique: Uses a stationary hand on the abnormal tissue or point of tension, and a motor hand mobilizing the joint away from the bind, towards the direction of ease, taking into consideration the origin point and insertion point to release a muscle;
- Myofascial Release: identifies tension in tissue and using gentle movement at a fascial layer, removes dysfunction and restores order;
- Stretching: uses gentle pressure and manipulation guiding impacted areas back into alignment;
- Craniosacral Therapy: utilizes the cerebral spinal fluid that originates in the brain and travels down the spinal cord. Gentle pressure and the utilization of the body's natural flow of cerebrospinal fluid aims to reoptimize the rhythm to clear dysfunction.

Fascia plays an integral role in manual therapy techniques. Fascia is connective tissue that surrounds muscles, organs, bones and nerves and acts as a spider web holding the body together. It is primarily made up of collagen, reticular and elastic fibers and allows lymphatic fluid to be pumped throughout the body (Krull, 2024). As Krull states in a 2024 paper, " when the fascia is restricted, lymphatic drainage slows down and is less effective, leaving harmful cells and oxidative waste products in the body for longer." Stagnant lymphatic fluid can manifest itself by swelling, restricting mobility, and triggering a pain response.

Osteopathy as an Effective Management Strategy

While there is insufficient research on the direct effects of osteopathy as an effective management strategy for canine patients diagnosed with or exhibiting clinical symptoms of canine hip dysplasia, the principles and techniques of animal osteopathy lend a promising indication. With a better understanding of how the techniques interact with the body, below are specific techniques to symptom examples of the osteopathic approach to treating a dysplastic patient.

Osteopathy is shown to reduce inflammation by increasing circulation. In the initial stages of diagnosis, many dogs are prescribed traditional medication used to treat pain and inflammation. Inflammation is described as the body's response to a foreign object or tissue damage that results in an immune response to send white blood cells to the area to begin healing (NIH, 2001). Osteopathic manual therapy mitigates the tension present in the soft tissue and fascial layers with myofascial work, increasing the circulation in the tissue bringing in oxygen and nutrients, while also removing waste through the lymphatic system. If the connective tissue/fascia surrounding the muscles and joints is disorganized due to tension, the lymphatic

fluid can become trapped leading to painful and restricted range of motion within the joint. By alleviating the tension and inflammation, the muscle can relax, restoring function. This would be particularly related to the compensatory muscles withstanding the added responsibility for the impacted limb.

The forelimbs in a non-dysplastic dog carry roughly 60% of the weight, allowing them to compensate well when the hindlimb is compromised (Frontiers, 2021). A dog with hip dysplasia may put even more weight on the forelimbs as a way to offset the pain in the hind resulting in overdeveloped or enlarged shoulder muscles, and added forelimb, neck and spinal tension. In some cases, where only one hip is severely dysplastic, a more prominent imbalance may occur in the opposite diagonal forelimb, the main compensatory limb. Unilateral imbalances of compensatory muscles can put unnecessary strain or torque on the skeletal system, potentially resulting in additional pain sites. Osteopathic articular balancing aims to keep joints lubricated and restore range of motion to bring the body back into balance. Joint mobilizations and the gentle stretching aim to address asymmetries experienced in the body. These asymmetries may present leading up to surgery, if the owner decides not to proceed with surgical intervention, and following any recovery time. Treatments would be required on a maintenance basis if the hip is not surgically repaired.

Subsequently, while some muscles overcompensate for the discomfort associated with the impacted joint, other muscles may atrophy from lack of use. The lack of use causes a thinning or loss of muscle tissue, resulting in tightening and shortening, particularly in the hamstrings and quadriceps. For some dogs, they may tuck the impacted limb up, completely non-weight bearing,

losing all range of motion. Osteopathic manual therapy can stretch the muscles to overtime lengthen the atrophied areas and re-establishing the neuromuscular connection, a chemical response from the motor neuron to signal the muscle to contract and relax.

Each osteopathic session would include a combination of some or all techniques described as each body will respond more favourably to some techniques over others depending on the level of discomfort. All techniques are very gentle, and the osteopath is trained to move at the dogs pace, never forcing the body. In some causes, the response from the dog may be immediate, while subtle changes may take a couple days as the tissues settle and the body rebalances.

Conclusion

While a global change in genetic makeup of the canine population away from a predisposition to developing canine hip dysplasia is not feasible, canines presenting with hip dysplasia symptoms do not have to lose quality of life. Choosing a reputable breeder, allowing young dogs the time they need for their joints to grow and develop without unnecessary strain, and proper education and intervention can significantly change the painful outcome of a dysplastic dog.. As with many conditions, the earlier the diagnosis, the more favourable the outcome. Given what we know about osteopathy, regular treatments at any life stage or diagnostic level can greatly enhance the quality of life of a dog diagnosed with canine hip dysplasia, giving the body the best environment possible to regain homeostasis and be as pain free as possible.

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