London College of Animal Osteopathy

SEPTEMBER 2023

Manual osteopathy treatment can help dogs with coxo-femoral dysplasia issue

INTERNATIONAL DIPLOMA IN ANIMAL OSTEOPATHY

WRITTEN BY

Florence DE RADIGUES

Table of content

I. Introduction

This thesis is written to study the possible contributions of osteopathy to a well-known pathology, coxo-femoral dysplasia in dogs. Coxo-femoral dysplasia is a widespread orthopedic disorder in dogs, especially in some breeds and particularly in large breeds.

It is a developmental abnormality that consists of a variable degree of hip laxity, causing progressive reshaping of bone structures and inevitably the onset of osteoarthritis.

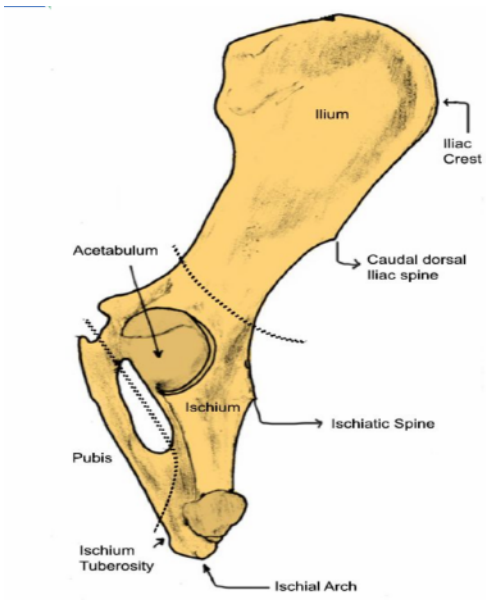
The main question asked during the writing of this research was: What are the indications and benefits of osteopathy in the management of coxo-femoral dysplasia? To answer this question, let's have a look at the anatomical and theoretical bases. Then, the etiology of coxo-femoral dysplasia, its diagnosis, and possible management.

II. Anatomic description of the coxo-femoral articulation

Knowledge of the anatomy of the coxo-femoral joint is an essential condition to understand the coxo-femoral dysplasia

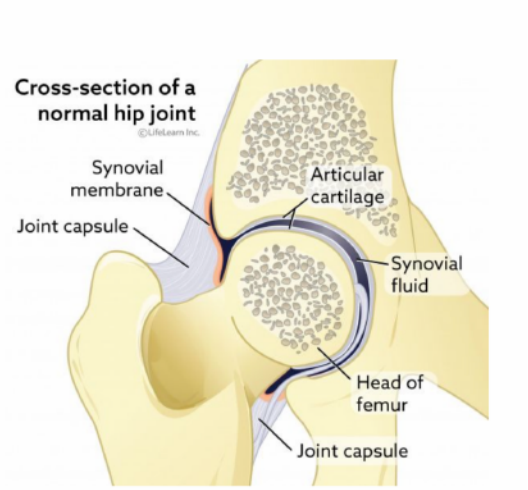
A. Osteology

« The coxo-femoral joint consists of two bones: the coxal bone and the femur. The coxal bone consists of three bones welded together: the ilium, the pubis, and the ischium. These three bones converge and unite on the joint center, called the acetabulum. The acetabulum is intended to support the femur. » The right and left coxal bones are united by an ischiopubic symphysis. Bound together, the two coxal bones form with the sacrum bone, the pelvis.
« The acetabulum is a pit formed by the reunion of the ilium, the ischium, and the pubis. This pit is concave and covered with cartilage to facilitate movement within the joint. Around this pit, there is the acetabular labrum forming a rim encompassing the femoral head to avoid its dislocation. The femoral head is spherical and has a shallow ligament fossa where the femoral head ligament is inserted. » (Barone, 2010)



B. Arthrology

« The hip is a ball and socket joint, it allows ample movement. However, this joint has the ligament of the femoral head. This ligament is thick and short, connecting the acetabulum pit to the femoral head. His role is to keep the femoral head in the joint to avoid abnormal movements or even dislocation. A thin articular capsule surrounds the whole to ensure good support » (Bassin et sacrum du chien - vet4care s.d.)

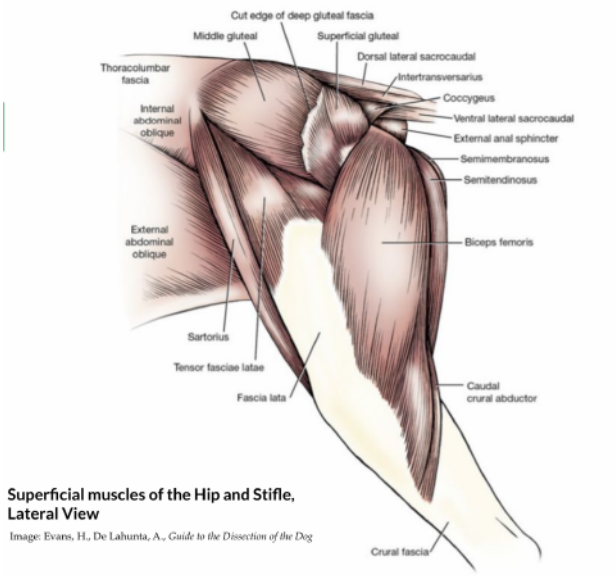


C. Myology

The pelvic limb has the strongest muscle in the dog's body. As mentioned and briefly described below, powerful muscle masses of the pelvic limb add strength to the hip joint:

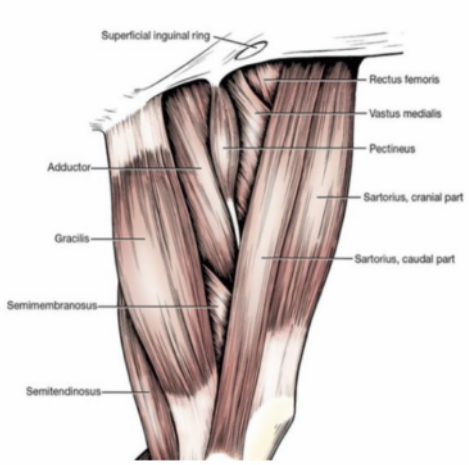
- Iliacus: flexes the lumbar spine and the hip
- Superficial gluteal: extends the hip joint and abducts the leg
- Middle gluteal: extends and abducts the hip joint and rotates the limb medially
- Deep gluteal: extends and abducts the hip joint and rotates the limb medially
- Fascia lata: hip flexor
- Biceps femoris: stabilizes the hip
- Semitendinosus: extends the hip
- Semimembranosus: hip extensor and adductor
- Quadriceps femoris: strongest extensor muscle of the stifle joint
- Internal obturator: hip extensor, supinator and stabilizer
- Sartorius: flexes the hip while moving the limb forward, extends the hip while standing
- Gracilis: adducts and extends the hip
- Pectineus: adducts the hindlimb
- Adductor: adducts and extends the hip

(Barone, 2010)



Superficial muscles of the Hip and Stifle, Lateral View

Image: Evans, H., De Lahunta, A., *Guide to the Dissection of the Dog*



Muscles of the Hip and Stifle, Medial View

Image: Evans, H., De Lahunta, A., *Guide to the Dissection of the Dog*

D. Biomechanic of the coxo-femoral articulation

Different forces are exerted on the coxo-femoral joint. When they neutralize each other, the joint is in balance.

« The main extrinsic forces are the weight (vertical and oriented towards the ground, it is proportional to the weight of the body), the reaction of the ground (transmitted from the ground to the articulation through the pelvic limb, it is related to the weight carried on the limb), and the reaction of the sacro-pelvic joint (the spine also exerts a force involved in the balance of the coxo-femoral joint). The intrinsic forces take their origin in the joint and the muscles, and allow the balance of the system » (Tobias et Johnston, 2012)

« Muscle contraction is added to form a force, perpendicular to the joint, which tends to reduce and stabilize the femoral head in the acetabulum during the support phase of the limb to the ground. However, during the support phase of the limb, the transarticular muscles active in the protraction of the pelvic limb produce a force, proportionally lower, but oriented parallel to the axis of the femur. This orientation makes these muscles candidates to cause subluxation in a lax hip. » (King, 2017)

In a healthy and congruent joint, during support, the forces are distributed in an equal way at the whole surface of the cartilage of the acetabulum.

« Muscle strength generally exceeds gravitational force, especially during exertion.

In a subluxated dog hip, the transarticular muscular strength must increase significantly to generate the greatest moments necessary to compensate for the lateralization of the center of rotation of the joint. In addition, the stress of cartilage is greatly increased in a subluxated hip, as the forces exerted on the articular cartilage are concentrated on a much smaller contact surface at the dorsal edge of the acetabulum. » (Tobias et Johnston, 2012)

Thus, two destructive events accompany the functional subluxation of the hip: the forces exerted in the joint increase, and the surface on which these forces are exerted decreases. This association causes increased stress in cartilage, its abrasion, inflammation of the joint, and osteoarthritis.

III. The pathology

A. Definition

« Dysplasia refers to a disorder of the development of an organ, a tissue or a cell, which is accompanied by a malformation and an impairment of its functioning» (Clayton-Jones, 2011) (Coxo-femoral dysplasia was defined in 1966 by Henricson as a variable degree of laxity of the coxo-femoral joint, allowing its subluxation during the early life of the animal, resulting in a filling of the acetabulum and a flattening of the femoral head to various degrees, inevitably leading to osteoarthritis" (King, 2017).
Thus, coxo-femoral dysplasia is a developmental disorder of the coxo-femoral joint, most often bilateral, initially resulting in joint laxity leading to a defect of contact between the joint surfaces, and secondarily responsible for progressive deformation of joint parts as well as osteoarthritis lesions.

B. Etiology

« There is rarely only one factor that causes hip dysplasia. In general, there are several causes that combine and promote the beginning of the pathology » (King, 2017)

« Dogs of large, fast-growing breeds are predisposed to this disease because they have more weight and need more nutrients to build their bones » (Fry & Clark, 1992a) However some small breeds are frequently affected by hip dysplasia.
Here you will find a small list of dog breeds more affected by dysplasia :

- Labrador
- German shepherd
- Golden Retrievers
- Rottweilers
- Carlins
- Bulldogs
- Dogues de Bordeaux
- Saint Bernard
- Airedale terrier
- Bernese Bouvier
- Border Collie
- Giant Schnnauzer
- Samoyede
- …

« A genetic factor is also involved » (Wang,s.d.) « Some genes carried by chromosomes 1, 4, 9, and 16 are responsible for the conformation of the coxo-femoral joint and can be highlighted » (King, 2017) A gene carried by chromosome 3 can also be implicated because he is responsible for the production of secondary osteophytes.
« Diet is an important component, an excess of food leads to obesity which leads to an overload of weight on the coxo-femoral joint. Calcium or vitamin supplementation causes delayed ossification because it affects osteoclastic activity. Dogs themselves produce

calcium and vitamin D, but their diet must also include calcium and vitamin D to have an adequate intake » (King, 2017) However, an excess of these elements in the diet leads to bone deformities. It is possible to limit the onset or development of this pathology by modulating the diet.
The activity of the dog must be modulated according to his age. Hip dysplasia can become established if structures that are not sufficiently developed, muscular, or ossified are over-stressed. Indeed, too much activity brings, among other things, an over-exertion of the joint which can lead to a modification of the growth and a deterioration of the osteoarticular status of the dog.
« Hormones are suspected to play a role in the development of this pathology but no evidence has yet been provided » (King, 2017) However, it has been observed that sterilized dogs:
- Before 5.5 months have a 6.7% risk of reporting hip dysplasia
- After 5.5 months have a 4.7% risk of reporting hip dysplasia, in general, it is more serious and there is a greater risk of euthanasia.

C. Pathogeny

« The origins of the pathology are not yet very well known. It seems that there is a hereditary cause but also an environmental one. These two factors may interact or promote hip dysplasia independently of each other. Some puppies are born with hyperlaxity of all joints and therefore have a greater risk of osteoarthritis » (King, 2017)
The laxity of the joint can cause laxity of the ligament of the femoral head, the synovial capsule, and an increase in the amount of synovial fluid. The latter is produced by blood dialysis at the intracapsular vessels, the plasma is then modified, rich in ions, hyaluronic acid, and proteins. The amount of this fluid is regulated by the intracapsular veins and lymphatic circulation. Normally the stretching of the joint capsule during the movement stimulates the receptors that signal the stretching thus causing a contraction of the surrounding muscles. During this pathology, excess synovial fluid causes pressure that stretches the joint capsule. As a result, more stretching is required to return information and allow muscle contraction. This causes a delay and therefore greater movement is allowed.
« Joint laxity and excess movement lead to osteoarthritis » (Syrcle, 2017) The effusion of synovia installs the inflammatory process that leaves cells responsible for releasing proteins. There is then a change in the oncotic pressure and balance of Starling.

D. Clinical signs

A dysplastic animal of the hips does not always present symptoms otherwise they are often a little pathognomonic of dysplasia. Symptoms usually appear between 5 and 12 months or later. It is a degenerative disease so there is a risk of worsening over time.
In dogs less than one year old, it is observable:
- Episodes of lameness and acute pain
- Unilateral or bilateral lameness
- Lameness accentuated by exercise or trauma
- Difficulty getting up, walking, climbing stairs
- Pain

In adult dogs in general there are only signs of lameness. Older dogs may show:
- Weight on forelimbs and a sub-position to limit weight on back-hand

- More developed forehand muscles
- Posterior amyotrophia
- A dandinate gait with weak posteriors
- Difficulties with exercise, they prefer to sit
- Unilateral or bilateral lameness

E. Diagnosis

At first, it is the clinical signs that make it possible to suspect hip dysplasia.
The signs are lameness, a difference in the dynamics before and after exercise, a gait abnormality in 93% of the cases, and shortened strides.
Then, palpation is performed to find additional information as :
- Pain
- « Different kinds of tests like Ortolani, Barlow and Bardens » (La dysplasie de la hanche chez le chien., s. d.), (Fry & Clark, 1992a) (which I will not develop here)
- « Under anesthesia, movements of the joint are performed to see stability, symmetry, and presence of crackling or not. The veterinarian also checks the amplitude with a goniometer. The amplitude of the coxo-femoral joint is normal at 110°, it can be reduced up to 45° » (Fry & Clark, 1992b)
- « Forced extensions are performed to see if it reveals pain » (Fry & Clark, 1992b)
- « Pressure on the back and the pelvis: during dysplasia, there will be little resistance, the dog may even sit down » (Fry & Clark, 1992b)
- « Hip x-rays are used to detect this disease. This screening cannot be done before 1 year of the dog in the majority of breeds. Regarding the big breeds, it is not done before 18 months » (Butler & Gambino, 2017b)

If we focus on young dogs, the first clinical signs are detectable between five and twelve months of age. Before six to eight months, the puppy has only a laxity of the coxo-femoral joint and is generally not painful. It has mainly gait disorders. Between six and eight months and about ten to fourteen months, micro-fractures of the subchondral bone, synovitis, and capsular distension appear. The dog then typically presents pain, as well as more or less severe lameness.

IV. Physiological processes involved in hip dysplasia

A. Muscle contraction

Actin and myosin are proteins. Nutrition must provide the essential amino acids for the production of these proteins. If this is not the case, there will be a defect in the composition of these proteins and thus disorders of muscle contraction. If the muscles can no longer perform their work, the hip joint will not be well maintained, and this will lead to parasitic movements that encourage the development of hip dysplasia.
The same is true for calcium. If calcium is lacking, muscle contraction cannot be achieved. Hip dysplasia may once again be favored.
These elements are supplied by the food. This is important to avoid the onset of hip dysplasia or to limit its development. But it also requires a good functioning of all the systems that have a role in these elements. (Taoufik, 2018)

B. Nerve conduction

Sodium and potassium play a major role in the transmission of nerve impulses. The concentration defects of these ions can lead to a nervous message disorder. If the nervous message is wrong, motor functions will be affected. The animal will exhibit poor mobility, uncoordinated movements, and poor joint maintenance. Dysplasia can therefore be favored by an imbalance of these ions. (Physiologie de l'influx nerveux, s.d.)

C. Growth

Several factors are essential to growth:
- Quality of food
- Quality of life
- Influence of other hormones
-…
(Os croissance, s.d.)

D. The pain

Pain is a real or possible injury. It is also an experience, a memory, an emotion. Chronic pain (or non-adaptive pain) is defined after 3 to 6 months of evolution. During its journey, the painful message undergoes exciting and inhibitory influences. These come from other peripheral nerves or central structures.

V. Osteopath intervention on dysplasia dogs

The osteopath interferes in two cases :
- As soon as possible to limit the progression of the disease as much as possible.
- After dysplasia surgery.

A. Osteopathy and pain

In osteopathy, we must take into account the animal's dysfunctions and lesions as well as its emotional state. In lesions, there is an activation of receptors present in the tissues. The painful message is modified during its journey.
It is important to assess the perceived pain of the animal by asking the owner the right questions:
Does the dog have trouble getting up?
Does the dog have trouble walking?
Does the dog have difficulty getting up or down the stairs?
Does the dog show stiffness after exercise?
Does the dog spend more time lying down?
Does the dog always show the same enthusiasm to go for a walk?
Is the dog always so enthusiastic when you arrive home?
…

This allows us to assess the stage of pain of the dog and whether it has passed to chronic pain. It is then up to us to adapt our session and our techniques.

The osteopath must mainly take over the mechanisms that induce pain by excess of nociception. Using functional techniques, nociceptive messages are inhibited. Reflex techniques decrease pain by involving the neurovegetative system. Direct or indirect muscular, articular techniques reintroduce the receptors reviving movement.
Regarding the emotional aspect of the animal, when the pain is managed, let the dog take the position of his choice. Indeed, he will tend to put himself in a posture that minimizes muscle, ligament, and fascial tension. The skin is an essential barrier that must be lifted in our practice to be able to act fully on an animal.
All these techniques inhibit pain and then re-inform the animal's body.

B. How does an osteopathic session take place?

- On a dog that has not undergone a surgery :

Initially, the canine osteopath will watch the animal move to understand how its body reacts to the presence of the pathology.

He then looks for the different points of tension that have a direct or indirect link with dysplasia to give the animal maximum mobility. Sometimes there can be consequences at the other end of the animal's body.

Finally, the canine osteopath will work on the affected joint if it is not too painful to check the condition of the subluxation and relax the peripheral muscles. The muscles are often amyotrophic on the side of the lesion and hypertrophied on the other side as the animal compensates. This will relieve and prevent your dog's pain related to dysplasia.

However as said before, no osteopathic treatment will cure the disease, an osteopathic session will only help the dog in his daily life and limit the progression of the desease of the articulation as much as possible.

A regular check from the osteopath and adapted to each animal is often necessary.

- On an operated dog: In post-surgical surgery, the canine osteopath will intervene only when the incision will be well healed, usually 2-3 weeks are needed for it. He can then help the animal to regain its full mobility through rehabilitation. At the same time, he can work on the tissues around the scar to reduce tissue adhesions that could prevent the animal from moving properly.

In general, the dog compensates for his hip pain, changes his posture and biomechanics. This is why we often find blockages in the pelvis and lumbar. By removing these blockages, the osteopath allows a better innervation and vascularization of the pelvic limb, slowing down the degeneration process and promoting muscle development, essential for maintaining the hip.

The new general equilibrium proposed by the osteopath will also restore its possibilities of compensation in order to manage better its pathology.

The Osteopath will also perform a work of physiotherapy, which will have to be repeated in the first months. It will be a soft decoaptation of the joint to temporarily remove the contact between the femoral head and the corresponding cavity to make the synovial fluid circulate again, improving its quality to nourish the cartilage. Slight circumduction movements will then be beneficial, always with the intention to restore mobility to the joint and relax the muscles around it. Osteopathy can be combined with hydrotherapy to develop and maintain a good musculature that will hold the hip, thus limiting evolution and pain. After osteopathic treatment, nothing better than swimming as a rehabilitation!

Regular osteopathic monitoring can relieve and support dogs affected by dysplasia in their daily lives by limiting pain (analgesic effect), maintaining physiological joint mobility and thus maintaining a suitable musculature, and treating all problems secondary to compensation on other joints.

VI. Osteopathic dysfunctions

A. Definition and origin of osteopathic dysfunction

« According to Still, osteopathic dysfunction, or somatic dysfunction, is characterized by a restriction of partial or total mobility of the components of the somatic system (skeleton, joints, and myofascial structures), able to condition vascularization and disrupt the action of neurons. It is also improperly referred to as an osteopathic lesion (however, the notion of injury in the medical field implies tissue damage, which can be confusing). It is a reversible alteration of the organism, before all functional, and not lesional. » (Still et Gueullette, 2017)
The best way to describe a somatic dysfunction is to define at least one of these three positioning and mobility parameters:
1. The position of an element of the body, determined by palpation, with a specified contiguous structure
2. The directions in which the movement is free
3. Directions in which movement is restricted.

Anything that disturbs the body's balance can cause osteopathic dysfunction. These dysfunctions are of different natures and depend on the offending structures. Thus sudden movement as a result of trauma, poorly controlled movement, periarticular lesions, fascial or muscular tension, irritation of the viscera, or poor vascularization are all causes that lead to osteopathic dysfunction.
« The osteopathic dysfunction gives as result a local-regional phenomena at the site of dysfunction, but also at a distance in the organ. These phenomena can cause for example hypersensitivity of muscles or bones and joints, a modification of the nature of connective tissue, muscle, and skin, a change in the local circulation with disruption of blood and tissue exchanges, or even changes in vegetative functions. » (Auquier et Corriat, 2000)

« Clinical signs associated with somatic dysfunction are typically described in human osteopathy using the acronym "SART" (Tenderness/pain in palpation, Asymmetry of bone markers, Restriction of passive joint mobility, changes in the texture of surrounding soft tissue). » (Romney, 1975)

« Primary dysfunction causes the greatest mechanical disturbances. They are often the result of severe trauma (car accident, fall, surgery) or repeated trauma (chronic organ disease). » (Fosse et Gimenez, 2008)
Secondary dysfunction appears as compensation for primary dysfunction. An improvement in primary dysfunction results in a compensation change that usually results in a dissipation of secondary dysfunctions. But if a secondary dysfunction becomes too chronic, it can in turn become primary.

B. Most observed osteopathic dysfunction on dysplasia dogs

- Attachment of sacroiliac joints
- A pelvis imbalance
- A lumbar lock located at L5-L6
- A restriction of mobility of the lumbosacral junction (in L7/S1)
- Musculoskeletal tensions
- At the hips
- Dysfunction of the sacrum

(Boisseleau, 2012; Chêne, 2010; Joly, 2018)

VII. Conclusion

In conclusion, osteopathic follow-up helps to reduce the pain of the animal and improve its daily life, osteopathic follow-up is very rarely used alone in the monitoring of hip dysplasia. For example a physiotherapy follow-up helps dysplasia dogs a lot.
According to the experience of a canine physiotherapist, who has seen a lot of dysplasic dogs in his practice, those are the general conclusions un-operated or non-operable dog is relieved in its daily pain and no longer requires pain relievers after 2 months of hydrotherapy follow-up at a frequency of 1 - 2 times a week. The operated dogs find harmonious movement and homogeneous musculature after a month of hydrotherapy at a frequency of once a week.

Ideally, it should be recommended to owners of dogs of breeds at risk to come to consult the osteopath when the dog is between 2 and 6 months to intervene as soon as possible on the pathology if it is present.
Close follow-up of 3-4 sessions at 1-month intervals is recommended in the case of young dysplastic dogs thereafter 2 to 4 sessions a year on adult dogs allows to obtain the best results.
It also shows that regular osteopathic monitoring shows more than satisfactory effectiveness.

VIII. Bibliography

- King, M. D. (2017). Etiopathogenesis of Canine Hip Dysplasia, Prevalence, and Genetics. Veterinary Clinics of North America: Small Animal Practice, 47(4), 753-767. https://doi.org/10.1016/j.cvsm.2017.03.001
- Barone. (2010). Anatomie comparée des mammifères domestiques. VIGOT.
- Fry, T. R., & Clark, D. M. (1992a). Canine Hip Dysplasia : Clinical Signs and Physical Diagnosis. Veterinary Clinics of North America: Small Animal Practice, 22(3), 551-558. https://doi.org/10.1016/S0195-5616(92)50055-9
- Fry, T. R., & Clark, D. M. (1992b). Canine Hip Dysplasia : Clinical Signs and Physical Diagnosis. Veterinary Clinics of North America: Small Animal Practice, 22(3), 551-558. https://doi.org/10.1016/S0195-5616(92)50055-9
- Bassin et sacrum du chien – Vet4Care. (s. d.)., https://vet4care.com/bassin-et-sacrum-du-chien-anatomie-osteopathie-animale/
- Wang, S. (s. d.). Genetic correlations of hip dysplasia scores for Golden retrievers and Labrador retrievers in France, Sweden and the UK. 28.
- Syrcle, J. (2017). Hip Dysplasia. Veterinary Clinics of North America: Small Animal Practice, 47(4), 769-775. https://doi.org/10.1016/j.cvsm.2017.02.001
- Butler, J. R., & Gambino, J. (2017b). Canine Hip Dysplasia : Diagnostic Imaging. Veterinary Clinics of North America: Small Animal Practice, 47(4), 777-793. https://doi.org/10.1016/j.cvsm.2017.02.002
- TOBIAS K.M., JOHNSTON S.A. (2012) Veterinary surgery: Small animal. St Louis, Elsevier Saunders
- STILL A.T., GUEULLETTE J.-M. (2017) Autobiographie du fondateur de l'ostéopathie. Vannes, Sully
- AUQUIER O., CORRIAT P. (2000) L'ostéopathie, comment ça marche ? bases historiques, conceptuelles et techniques. Paris, Frison-Roche
- RUMNEY I.C. (1975) The relevance of somatic dysfunction. J. Am. Osteopath Assoc. 74(8), 723-723
- FOSSE F., GIMENEZ N. (2008) Traité pratique d'ostéopathie mécaniste chez le chien et le cheval. Vannes, Sully
- Clayton-Jones, G. (2011). Hip dysplasia. Journal of Small Animal Practice, 52(4), 179-180. https://doi.org/10.1111/j.1748-5827.2011.01056.x
- La dysplasie de la hanche. (s. d.)., https://www.oncovet.fr/fr-fr/les-services/la-dysplasie-de-la-hanche-chez-le-chien
- La dysplasie de la hanche chez le chien. (s. d.). Centre hospitalier universitaire vétérinaire, https://chuv.umontreal.ca/le-chuv/hopital-des-animaux-de- compagnie/ressources/dysplasie-de-hanche-chez-chien/
- La Dysplasie de la Hanche (HD). (s. d.), https://www.centrale- canine.fr/articles/la-dysplasie-de-la-hanche-hd
- Taoufik, D. (2018). Physiologie du muscle. Medicinus. https://www.medicinus.net/physiologie-muscle/
- Os croissance. (s. d.). , http://www.jeanduperrex.ch/Site/Os_croissance.html
- Physiologie de l'influx nerveux. (s. d.). , http://recap- ide.blogspot.com/2014/10/physiologie-de-linflux-nerveux.html
- CHÊNE P. (2010) Dysplasie.. encore... In L'Ostéo4pattes – Site de l'Ostéopathie [https://www.revue.sdo.osteo4pattes.eu/spip.php?article776&lang=fr]

- BOISSELEAU A. (2012) La force de traction médullaire : étude bibliographique. Thèse Méd. Vét., Oniris Nantes
- JOLY Y. (2018) Cas clinique : Noë, Matin Espagnol 1 an 1/2 réformé des courses. In L'Ostéo4pattes – Site de l'Ostéopathie [https://www.revue.sdo.osteo4pattes.eu/spip.php?article1908&lang=fr]
- EVANS, H., De Lahunta, A., Guidé to the dissection of the dog