

**OSTEOPATHIC FASCIAL TREATMENT
AND CANINE OSTEOARTHRITIS**

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1. INTRODUCTION

Osteoarthritis (OA) is one of the most frequently conditions in dogs, affecting up to 75% of adult medium and large dogs.¹ One company report of OA in dogs estimates a 66% raise in the past decade.² A recent study of OA in primary care practice indicates that the rate of OA was only 2.5%, and the median age at the time of diagnosis was 10.5 years.¹

Alternative medicines and in particular Osteopathy contribute to the integrated treatment of canine osteoarthritis. In my thesis I will specifically investigate the Fascial Treatment applied on canine Osteoarthritis, trying to find scientific materials which can support my positive feedback obtained in the treatment of canine patients with OA.

The value of Fascial Osteopathic Treatment resides not only in analgesia; in fact it has muscle relaxant, anti-inflammatory and articular effects that act on the root causes of disease degenerative joints. Definitely one of the main reasons for choosing the treatment with Osteopathy can be an analgesic therapy devoid of the annoying side effects of the drug , but also to avoid the progression of the disease. Important for the success of the treatment is the removal of risk factors such as too humid environments or an unsuitable diet. The value of the treatment with Osteopathy lies precisely in providing a valid tool for prevention of recurrences.

The treatment of osteoarthritis through Osteopathy neither opposes nor replaces the guidelines of conventional medicine, but on the contrary establishes a virtuous one with them synergy and an extraordinary opportunity also in terms of prevention.

2. FASCIA

2.1 Definition

The fascial system consists of a three dimensional continuum of soft collagen with loose and dense fibrous connective tissue which enters the body; it binds to substances such as adipose tissue, adventitia and neurovascular sheaths, aponeuroses, deep and superficial fascia, epineurium, joint capsules, ligaments, skin, meninges, myofascial circulation, periosteum, retinacula, septa, muscles, visceral fascia and all intramuscular and intermuscular connective tissues, including endo-/peri-/epimysium.³ The fascial system surrounds, intertwines and interpenetrates all parts, muscles, bones and tendons, giving the body a functional structure and providing an environment that provides all access to the system working individually.³

Fascia sustains synthesis, biochemical and biophysical processes between himself and the muscles, bones and organs. Fibroblast is the main cell type of fascia; they synthesize and secrete cytokines and the extracellular matrix of connective tissue proteins such as collagen, fibronectin and others.⁴ It is therefore an envelope that unites all aspects of the body; in face of his omnipresence it has different roles: maintenance of posture, organs container ensuring their anatomical integrity, support of muscle system. It forms the main pathways which lead to the origin of fascial chains, that could be converted in lesional chains. In addition, it has a "cellular memory" that records every effort suffered, correcting where possible; at this stage, the disease or the damage will take place.⁵

“The connective tissue not only connects different parts of the body, but in a broader sense, connects the many branches of medicine” (Snyder); so these the roles of fascia:

- role of support and sustain, maintaining the anatomical integrity of a subject and bearing the nervous, vascular and lymphatic systems process;
- role of protection, protection of structures against stress, tensions, physical attack;

- role of cushioning, given its flexibility, fascia can cushion the tensions suffered by the structure;
- role hemodynamic, make easier the return circulation as a central pump;
- role of defence, by the fundamental substance of the connective tissue, in which it fight pathogens and infections;
- role of communication and exchange, by the various systems of the body which carry out to the fundamental substance the nutritional elements and external message and from there start again with waste products and information from cells.⁵

2.2 Fascial Techniques

The fascial approach is a type of diagnosis and treatment introduced by Andrew Taylor Still and his first students, which uses continuous tactile feedback to gain release myofascial tissue.⁴ Palpation is mechanical inducement (direct or tangential pressure) in static (solid) and hydrostatic (liquid) tissue, within a certain period of time; the tactile perception system collects information about the environment with the help of mechanoreceptors located in the myofascial and joint system.⁶ The hand has special receptors that can be used to determine the size of palpable tissues (Meissner corpus and Merkel cell complex) and to understand the tissues and the skills of this one to change shape upon rapid or sustained contact (the corpuscles of Ruffin and Pacini); palpation can be considered a personal experience memory bank able to locate tissue abnormalities.⁶ The first tissue you touch is the epidermis. As pressure increases, soft tissues such as muscles and visceral fascia that connect or cover all organs in the body, sense the resulting tension.⁶ Fascia is a fluid-solid interaction. The pressure generated during the palpation and absorbed by the tissue creates numerous vectors that spread in many directions above ground and deep.⁶ Various models have been attempted to explain what happens to tissues deformed by mechanical stress, none have a

single satisfactory solution, but it's certain that tissue palpation and manual manipulation can alter the behaviour of cells in the fascial system.⁶ Morphological alterations of cellular components trigger numerous mechanometabolic and electromagnetic messages. This information influences structures throughout the body, including the palpable area and the remaining non-palpable tissues.⁶ Fascia, a sensitive receptor structure, is the site of a variety of deformities due to traumatic, poor posture, surgical procedures (scars, adhesions), inflammation, accident-related, occupational strain, stress, etc. It happens often that these aggressions, as we have seen, are due to biochemical reactions within the connective tissue that lead to changes in viscoelastic properties. The purpose of the Fascial techniques is to examine the body for abnormalities and provide an effective therapeutic response.⁵ In situations of aggression and changes, Bednar et al. observed degenerative changes in the fascia consisting in separation of collagen bundles and infiltration of lymphocytes and plasma cells to form a mixed tissue. These connective tissue changes affect the sympathetic nervous system and sensory systems; this causes an obstruction of afferent inflow, leading to a medullary-promoting state and creating a self-perpetuating vicious cycle.⁵ The aim of Fascial approach is to end this vicious cycle and correct spasms, tissue inflammation, and fasciitis. The state of sympathetic tone and fascia is fully functional again. So, for example, if the fascia enveloping the joint narrows and remains more or less maintained over a long period of time, a disruption in the lubrication of the joint occurs; this interruption causes degeneration and ultimately leads to premature wear of the joint.⁵ The common rule which is the base of Fascial methods is to recuperate the work of a tissue, that's mobility and motility which is able be taken after by a rebuilding of hemodynamics and nervous tone, and create a "dialogue"; this "dialogue" between the therapist's hand and the fascia, allows us to decipher the messages coming from the fascia.⁵ Therefore, if a failure is detected in the organization, it is important to continue the dialogue with the organization, i.e. to give the necessary support so that this fixation is improved.⁵

3.3 Types of Fascial Techniques

Two types of techniques can be used: direct or indirect. *Direct techniques* identify a restrictive barrier within the fascial tissue and engage it by applying a continuous, directional force until the tissue becomes more soft and movement is re-established.⁴ *Indirect techniques* consist in directional pressure guides the tissue along its state of ease; the pressure on this line provides the least resistance until all tissue is free to move.⁴ Myofascial techniques are effective because they are a compound procedure in which the practitioner's hands touch both the barrier and relaxation points at the same time. These approaches can be used interactively, both directly and indirectly. The following activation forces are used in the Fascial Techniques:

1. An inherent force that takes advantage of the body's natural tendency to maintain homeostasis; intrinsic strength is a rhythmic activity throughout the tissues aimed at improving fluid mechanics and bioenergetic factors around restricted tissues and joints
2. Respiratory force (cooperation/assist) can be used in four ways:
 - a) full cycle respiratory effort,
 - b) particular phase of respiration,
 - c) breath holding,
 - d) coughing or sniffing on command
3. Patient collaboration, the patient is asked to move in a particular direction in various joint's planes to facilitate movement of the restricted area
4. Physician-controlled force: after a barrier or relaxation point is reached, the physician follows an alternating pattern of light movement, moving various tissues or joints one at a time, until the dysfunctional pathway is reversed and released, guide you to a suitable position

5. Springing/vibration, a spring or vibration is applied by placing a hand or percussion hammer over the dysfunction and applying varying degrees of pressure and/or force frequencies, resulting in a spring or vibration within the structure and tissue until release will be activated.⁴

As previously said, fascia is an omnipresent connective tissue that wraps the body in a large bandage and contributes to the form and function achieved by manipulative techniques to alleviate somatic dysfunction.⁷ The muscle-fascia relationship contributes to alternating tension and relaxation, identified as direct and indirect disturbances by changes in range of motion and palpation. Recognizing and exploiting the innate and inherent movements of fascial structures allows for the identification and treatment of movement and movement patterns across proximal and distal structures, the diaphragm, compartments, viscera, and organ systems.⁷ The bioresponsive electrical potentials of the fascia causes significant changes in the movement and ease of the fascia, which is related to the state of the homeostatic internal environment and the biomechanical reaction to the external environment, and also helps in the diagnosis and treatment of visceral diseases and in case of disorders and diseases of the musculoskeletal system.⁷

3. OSTEOARTHRITIS

3.1 Definition

Osteoarthritis, also known as degenerative joint disease (DJD), is a chronic inflammatory joint disease that causes pain, stiffness, swelling, and lameness due to weakened joint cushions and changes in synovial fluid. which cause pain/soreness, stiffness, swelling, and lameness due to the diminished cushion and changes in the synovial fluid.⁸ Osteoarthritis (OA) has an impact on the entire synovial joint including cartilage, synovial fluid and bone.⁸ The disease is characterized by cartilage and soft tissue degeneration, edge bone hypertrophy, and synovial changes; the joints most frequently associated with osteoarthritis, especially in dogs, are synovial joints, particularly ball and socket joints (hips and shoulders) and hinge joints (elbows).⁸ Synovial fluid within the joint capsule gives nutrition, lubrication, and cushioning to the articular cartilage; articular cartilage, composed of hyaline cartilage, is an avascular tissue composed of chondrocytes fixed in an extracellular matrix of collagen, proteoglycans, and non-collagenous proteins.⁸ Articular cartilage minimizes friction and allows movement of synovial joints painless; hyaline cartilage, which is rich in type II collagen, acts as a shock absorber by distributing load pressure to the subchondral bone. In healthy joints, a delicate balance exists between damage and repair and between chondroblasts and chondroblasts; in Osteoarthritis, this balance can be altereded by overproduction of osteoblasts, causing pain and swelling.⁸

3.2 Pathogenesis

OA is the most frequently type of arthritis in dogs and is the most common cause of chronic pain in older dogs; OA commonly affects large breed dogs, i.e. German Shepherds, Labrador Retrievers, Siberian Huskies and Rottweilers, more than small breed dogs.⁸ Osteoarthritis was initially thought to be caused by wear and tear on the articular surfaces within the joint, but this also appears to be

the case for post-traumatic osteoarthritis. Recent studies have shown that the mechanism is even more complex.⁹ Osteoarthritis is an increasing disease that progresses in four stages: in the *first stage*, small bone spurs begin to develop; when chondrocyte metabolism is impaired and the production of matrix-destroying enzymes, called metalloproteinases (MMPs) increases, the cartilage matrix begins to break down. Cartilage lesions destroy cartilage function and increase friction and inflammation within the joint, causing pain.⁸ *Stage two* is considered the “mild” stage and implied bone erosion due to cartilage injury; this can lead to new bone growth, bone spurs (also called osteophytes), which interfere with normal joint movement. Additionally, proteoglycan and collagen fragments are released into the synovial fluid.⁸ *Stage three* is retained “moderate” OA and when this happens, the cartilage becomes thinner and loses its cushioning properties, narrowing the space between the bones and creating a crunch between adjacent subchondral bones. At this phase, symptoms become more acute and inflammation starts with the production of synovial macrophages containing MMPs and cytokines. These can diffuse back into the cartilage, destroying tissue and also stimulating cartilage cells.⁸ The final *stage four* is called “severe” Osteoarthritis; joint space is critically reduced, cartilage is almost gone, and joint mobility is severely limited.⁸

3.3 Diagnosis

Dogs diagnosed with Osteoarthritis be inclined to be lethargic, have difficulty moving from a sitting or lying position, have cracked and stiff joints, muscle weakness, and visible pain. Diagnosis of Osteoarthritis in dogs starts when the owner observes pain and stiffness when the dog runs, walks, jumps, or gets up from a lying or sitting position.⁸ X-rays can show destruction of the cartilage between the bones and inflammation of the joint; this test, along with a patient's

symptoms and OA risk factors such as age, gender, and BMI, can help predict the risk of rapid and predictable joint damage.⁸

3.4 Treatments

To get it the treatment planning of OA, it is vital to characterize the “disease” and “illness” states of OA; the “disease” is characterized as the quantifiable anomalies which may lead to illness.⁹ The disease can be metabolic and molecular derangements activating anatomical and/or physiological changes within the joint; these characteristics changes are found radiographically as joint space narrowing, subchondral sclerosis, subchondral sores and osteophyte arrangement. The “illness” of OA is characterized as the symptoms which bring the subject to the healing center; the related signs may well be pain or immobility.⁹ Hence, the objective of treatment is to minimizing pain by diminishing the irritation and abating the development of the cartilage harm, protect the physiological joint development and growing quality of life. A multimodal approach comprehend:

- Pharmaceutical management (NASAIDS)
- Dietary modifications (Weight optimization, Glycosaminoglycans)
- Rehabilitation (Environmental modifications, Manual therapy, Hydrotherapy)
- Intra-articular Therapies (Regenerative medicine, Hyaluronic Acid, Corticosteroids)¹⁰

The main goals in treating OA are to reduce pain and inflammation, improve joint function, eliminate or control the cause of arthritis, and even stop the process. Osteoarthritis is more frequently in overweight dogs; a strict diet to promote weight loss can reduce mechanical stress on the joints. Obesity and the lack of exercise, that leads to obesity, can put extra pressure on your joints and cause them to wear out faster.⁸ In addition to a strict diet (high protein, low fat, negative energy balance), it should also create a training plan tailored to the dog in order to lose weight

while preserving freedom of movement and muscle mass. Modifying low-impact exercises such as walking and swimming can also strengthen joint support structures, muscles, ligaments, tendons, and joint capsules.⁸

4. OSTEOPATHIC FASCIAL TREATMENT

As previously said, fascia is a shapable tissue that can adapt to mechanical, thermal, and metabolic stress and can be returned to a physiological state by external manual therapy. Virtually all osteopathic manipulation procedures clearly recognize the consideration of the fascial element, and in some cases make it the focus of the manipulation. Andrew Taylor Still, the founder of osteopathic medicine, is known for the exceptional properties he associated with the centrality of fascia and manual therapy, as well as for his aphorisms ascribed to human nature and the characteristics of disease. “I write at length of the universality of the fascia to impress the reader with the idea that this connecting substance must be free at all parts to receive and discharge all fluids, and eject all impurities ... A knowledge of the universal extent of the fascia is imperative, and is one of the greatest aids to the person who seeks the causes of disease” (Still 1902).

In case of Osteoarthritis, the changes that occur in a single or multiple joint, will affect the whole body system: for example, if a dog's left front limb is affected by OA, the pain and decreased motion, will induce the dog to overload the right front limb. This, over time, will be place to a series of modifications in the entire postural and functional system, inducing dysfunctional patterns which may lead to other disturbances and disease. By this consideration, is easy to understand how much the fascial system is involved; in a biomechanical, circulatory, neurological model. Fascia surrounded every structure of the body, so by this connection, the disturbance originated in an articular structure will involve also the circulatory and neurological structures.

In a study of 2015, “Reflection on osteopathic fascia treatment in the peripheral nervous system” (B.Bordoni, G.Bordoni), can be learn that the right gliding of the fascial structures that compose the nerve and the gliding of the nerve between the different tissues that it passes through and innervates, are the basis for the proper transmission of mechanical loads and its ability to adapt and regenerate. It can observe that nerves blockage of this fascial membrane causes dysfunction and

pathology; so when there is an obstacle to the sliding of a nerve, the stiffness of its fascial structures during articular movement become greater. The goal of Fascial Osteopathic Treatment is to change the mechanical characteristics of the fascia, how its density, stiffness, and viscosity, so that it can better adapt to physical stress. In this way, the osteopath will bring back local tissue release after manually applying force to the tense fascial area. These reports have been described as disruption of fascial crosslinks, passage from a gel to sol state in the extracellular matrix, and other passive viscoelastic alterations in the fascia. Fascial Osteopathic methods enforce long-lasting, low-load load extends to the fascial complex, with the point of re-establishing the ideal length of this complex.¹¹

So, the signs that occur during the development of OA, can be also affected, for example, the peripheral nerves, which are composed of several layers of fascial tissue that can become a source of pain if they fail in their ability to slide; here Fascial Osteopathy can attend to decrease local pain and inflammation. Changes in fascia stiffness due to Osteoarthritis arrangement, reduce muscle biomechanics, alter muscle coordination, cause muscle weakness, abnormal movement patterns, and cause excess pressure on the joint capsule and cartilage and so tissue stress occurs. These changes can exacerbate existing underlying degenerative conditions and cause myofascial pain.

In another study, “Effectiveness of fascial manipulation on pain and disability in musculoskeletal condition. A systematic review” (K. Arumugam, K. Harikesavan), fascia is reported as a workable tissue that can adapt to mechanical, thermal, and metabolic stresses and can be re-established to a physiological state by external manipulative treatments.¹² Changes in fascial tension are also observed by manual therapists when performing Fascial Treatments; this is to target hard areas within the dysfunctional line to improve balance and optimize its activation pattern.¹² Application of Myofascial Techniques with manual pressure stimulates the central nervous system (CNS) and the autonomic nervous system (ANS); the CNS alters global muscle tone, the ANS response includes vasodilation, changes in tissue viscosity and global muscle tone, and intrafascial smooth

muscle decreased in cellular tone. This allows the free nerve endings to flow more freely, allowing new deposition of collagen and elastic fibers that relieve pain.¹² It will allow the free nerve endings to slide more freely and allow new deposition of collagen and elastic fibres, which reduces the pain.¹²

Another study, “Effect of massage therapy on pain and quality of life in dogs: A cross sectional study” (L. M. Riley et al.) establishes that the association of some OA symptoms, such as gait problems, muscle weakness, muscle pain, localized tremors, and changes in posture, can result in the formation of myofascial trigger points (MTPs), which limit movement ability and block sensory input, and the quality of life decreases with debilitating pain. Fascial Treatment’s goal is to repair damaged soft tissues.¹³ Moreover, they found that this treatment mobilized endogenous basal mesenchymal stem cells into the circulation and is associated with an anti-inflammatory response and relieving of hip osteoarthritis.¹³

4.1 Kinetic myofascial lines

The organization of myofascial kinetic lines is likely present in most mammals, with modifications to accommodate different mammalian anatomy and movement patterns. According to major publications, the seven lines are¹⁴:

- The Superficial Dorsal Line (SDL), that is engaged with flexion of the hind limbs and extension of the hip, back and neck; therefore, the SDL contraction causes the animal's back to lengthen and the neck to become excessively high.
- The Superficial Ventral Line (SVL), that involves the extension of the hind limbs and flexion of the hip, back and neck, therefore the SVL contraction induced a flexed back and neck. SDL and SVL work as antagonists, and this marks the relationship of the back and abdominal muscles; these lines are unified at the distal phalanges of the hind limb and in

the masseter muscle on the mandible. This underlines that the temporomandibular joint has a fundamental role in movement and balance of the animal.

- The Lateral Line (LL) is implied in the lateral flexion of the body; the left and right lines work as antagonists and must to be balanced in order for the animal to stand and move straight.
- The Functional Line (FL), that is an helical line, so it is engaged in the axial rotation of the body; it has a dorsal and ventral parts that begin and finish in the axillar region, cross over the midline and meet on the contralateral hind limb, distal to the stifle.
- The Spiral Line (SL), that is also this one an helical line which starts from one side of the head and ends on the contralateral side. These two helical lines play an important part in the diagonal lameness.
- The Front Limb Protractor Line (FLPL) that begins in the muscle pulling the dorsal part of the scapula in a caudal direction and the ventral part in a cranial direction and ends on the dorsal surface of distal phalanges.
- The Front Limb Retraction Line (FLRL) starts in the muscle and fascia conducting the opposite rotation of the scapula to the protraction line, ending to the palmar surface of the distal phalanges.



Figure A-B: The Superficial Dorsal Line (SDL, yellow), The Superficial Ventral Line (SVL, blue) and the Lateral Line (LL, green), are shown on a dog in motion. Dotted segments of the lines indicate they are running deep to the scapula.

The knowledge of these fascial lines is important to understand which structures and what kind of patterns could be altered after a trauma or a degenerative process as OA. Together they act as a three-dimensional network controlling the posture and locomotion of the whole body; in this way a perturbation originates from a joint, will bring a series of modifications in these fascial lines affecting the whole balance. There are precise anatomical locations where the lines coincide, making them key areas for treatment; these areas comprehend: the atlanto-occipital region (near the mastoid process of the head), the thoracolumbar fascia, the coxal tuberosity region, and around the carpal and tarsal joints.¹⁴ Studies have shown that treatments in these areas are especially effective.¹⁴

5. CONCLUSION

There are still few scientific studies which support the effectiveness of Osteopathic Fascial Treatment in degenerative or painful condition such as Osteoarthritis in canine patients, and currently OA is treated or managed by invasive as well as non-invasive means. However, is established that manual therapy can be really helpful to decrease pain, inflammation and stiffness in dogs; so the use of Osteopathic Treatments as a therapeutic approach for OA can be increasingly considered as a non-invasive, natural and free of side effects therapy.

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