Osteopathic Manual Therapy in canine osteoarthritis (OMT):

An evidence-based analysis of its role compared to pharmacological treatment

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1. Introduction

Osteoarthritis (OA) is a progressive degenerative joint disease process characterized by cartilage deformation, osteophytes formation and inflammation, causing chronic pain and loss of mobility, highly affecting the quality of life in a considerable proportion of canine population. According to different studies this proportion reaches about 80% of geriatric dogs. Currently, there is no cure for OA in either human or animals, and up to date, management of the clinical signs remains the treatment of choice (Pye et al., 2024).

The management of canine OA is nowadays multidisciplinary and founded on creating a personalized plan specific to each animal using pharmacological treatments and non-pharmacological therapies and strategies such as weight control and manual therapy. By combining these therapeutic strategies under skilled veterinary supervision and strong owner compliance, best results can be achieved to control pain, preserve mobility and improve the quality of life of dogs with OA (Bougherara et al., 2025).

Physical therapists, osteopaths and chiropractors perform mobilization and manipulation techniques for the management of pain and stiffness associated with OA in both humans and animals. However, scientific evidence supporting the use of these techniques in dogs with OA is still limited (Haussler et al., 2021). Osteopathic Manual Therapy (OMT) techniques like passive joint mobilization, manipulation and neuromuscular facilitation techniques are increasingly being incorporated into clinical practice. Thus they have become more commonly cited in the veterinary literature (Hesbach, 2014). OMT uses articular, myofascial, neural, vascular and lymphatic techniques, which makes categorization of the manual therapy type used in a specific study more difficult (Haussler et al., 2021).

2. Canine Osteoarthritis

Osteoarthritis is the most diagnosed osteoarticular disease in dogs (Doit & Dean, 2016). Estimates from North America report age-specific prevalence values ranging from 20% in dogs older than one year up to 80% in dogs older than eight years, based on radiographic and clinical data from referral settings. While it can develop at any age, osteoarthritis is commonly considered a disease of aging and the most commonly reported sites affected by osteoarthritis in the dog include the stifles, hips and elbows (Anderson et al., 2018).

Osteoarthritis (OA) is a disease of movable joints characterized by deterioration of articular cartilage, osteophyte or new bone formation and bone remodeling at joint surfaces or margins, changes in periarticular tissues, and a low-grade inflammation of variable degree (Johnston, 1997, p. 1). Canine patients presented with OA are usually presented for lameness, avoiding activities like climbing stairs, jumping. Lameness is generally observed after long rest times, its intensity decreases after a few minutes of activity. Aggravating factors are cold, damp conditions, obesity and prolonged exercise.

Degenerative joint disease is the term preferred by many clinicians because it indicates a pathological process that is not always associated with inflammation (Vaughan-Scott & Taylor, 1997). The term osteoarthritis (OA) appears to be the most used in veterinary medicine literature and will therefore be used in this thesis.

pathophysiology

Like in humans, osteoarthritis is a multifactorial disease which is influenced by genetics and external factors such as diet and exercise levels (Anderson et al., 2018).

Obesity has been shown to be an important predisposing factor to developing OA in large breed dogs (Clark & Comerford, 2023). OA can be classified as primary or secondary. In primary osteoarthritis, multiple joints are generally affected, and breed predisposition may play a key role in the development of the disease. This form is usually associated with aging and progressive degeneration of the articular cartilage over time.

Secondary OA is the most usual form of OA in dogs and involves injury or underlying disease (Anderson et al., 2020). The primary cause is generally abnormal joint stress or another joint disease such as septic arthritis or immune-mediated inflammation. Abnormal joint stress is generally due to abnormal joint conformation such as dysplasia or defective intra- or extra-articular stabilizing structures such as joint capsule ligaments and muscles (Vaughan-Scott & Taylor, 1997). Common primary joint abnormalities leading to secondary OA include cruciate ligament rupture, patellar luxation and elbow or hip dysplasia (Anderson et al., 2018).

Articular cartilage has a complex structure. It is composed of chondrocyte cells and a matrix composed mainly of water, collagen and proteoglycans. The matrix is synthetized by the chondrocytes themselves. This structure is optimal to absorb pressure applied to the joint (Vaughan-Scott & Taylor, 1997). Collagen is the predominant protein found in articular cartilage representing over 50% of the dry matter. At least 16 types of collagens exist, Type II collagen accounts for 90% to 95% of the total collagen in articular cartilage, type I collagen is present in tiny amounts in articular cartilage. A non-collagenous protein is also synthesized by chondrocytes and thus found in the intermediate cartilage layer. The synthesis of the non-collagenous protein is increased in early osteoarthritis (Clements et al., 2006).

Proteoglycans form complexes with hyaluronic acid and function as osmotic traps that hold water between collagen strands. Articular cartilage should be seen as a dynamic tissue, with chondrocytes constantly synthesizing products that repair aged or damaged cartilage (Vaughan-Scott & Taylor, 1997).

Predisposing factors increase liberation of prostaglandin E2, cytokines, including interleukin-1, interleukin-6 and tumor necrosis factor (TNF) which stimulate the synovial cells and chondrocytes to produce enzymes involved in cartilage degradation thus impeding cartilage regeneration by increasing catabolic processes and decreasing anabolic processes causing a loss of proteoglycans, hyaluronic acid and to a lesser extent collagen causing cartilage degeneration (Vaughan-Scott & Taylor, 1997). Over time, articular cartilage degenerates with fibrillation, fissures, ulceration, and eventual full-thickness loss of the joint surface (Tellegen et al., 2019).

Clinical signs

OA causes clinical signs in over 80% of geriatric dogs (Tellegen et al., 2019). The main clinical sign associated with osteoarthritis is pain, typically described as activity-related or mechanical, but may also occur at rest in advanced disease. Other clinical signs are reduced function, loss of mobility and stiffness of the joints (Hunter et al., 2009).

Pain and pain assessment

Pain caused by OA is considered to be chronic, as pain is regarded as chronic when it lasts or recurs for more than 3 to 6 months (Treede et al., 2015). The prevalence of canine lameness is thought to be about 56% in small animal medicine (Clark & Comerford, 2023).

Originally cartilage damage was believed to be the cause of pain associated with OA, but since cartilage is not innervated, studies have been performed to evaluate the root cause of the pain. These studies have revealed that mechanisms of pain perception include the activation and release of local pro-inflammatory mediators such as cytokines and prostaglandins that cause the destruction of the non-innervated cartilage but also influence the innervated non-cartilaginous structures in the joint including the bone and soft tissue causing pain. However, since clinically there is often a disparity between the degree of the joint degeneration and the extent of pain in subjects with OA. Other studies have shown a more complex mechanism of pain related to activation of central pain-processing pathways (Sofat et al., 2011).

In practice, pain evaluation heavily relies on the veterinarian's assessment of lameness, but it stays a subjective method that depends on the examiner's experience. Studies showed that other scoring methods can be used alone or in association with clinical exams to assess pain levels and pain improvement scores after treatments intended to decrease chronic pain in companion dogs with osteoarthritis. One of the most studied subjective methods is the Canine Brief Pain Inventory (CBPI). It allows us to obtain quantifiable assessments from owners about the severity and impact of chronic pain and treatment for dogs with osteoarthritis treated with an NSAID or a placebo. Studies support the use of the CBPI (Brown et al., 2008).

The availability of other more objective quantitative measures of chronic pain is crucial for the testing and development of treatments designed to reduce such pain. Values generated with the use of force plate gait analysis, when properly collected, offer an objective measure that can be reliably checked over time. These methods, although validated, require expensive and specialized equipment as they also evaluate the animal at one specific moment and outside its typical environment (Brown et al., 2008).

CBPI has the advantage of reliably quantifying the owner's assessment of clinically relevant chronic pain-related behaviors of their dog in its daily activities inside his environment. Force Plate Gait Analysis (FPGA) has the advantage of objectively and reliably measuring the changes in the dog under correctly controlled conditions (Brown et al., 2013).

Mobility and mobility assessment

Mobility is considered the ability of an animal to move without restriction or pain. Studies on dogs showed that decreased mobility negatively impacts longevity and quality of life. Mobility reduction of the joints could be secondary to musculoskeletal diseases but also to breed characteristics (Clark & Comerford, 2023).

Mobility assessment is particularly important for the diagnosis and evaluation of osteoarthritis and for assessing the results of the treatment. Usually veterinary clinical examinations, imaging and mobility scoring systems are used to assess mobility in dogs, but all these methods remain subjective to the veterinarian's and owner's ability to evaluate the condition.

Therefore, additional subjective methods have been investigated in different studies, with good results obtained by combining kinetic and kinematic gait analysis that allow the investigation of mobility during the entire gait event. The results show changes in any particular joint and the data can be compared to subjective clinical examination and mobility scoring system results (Clark & Comerford, 2023). In a study on dysplastic dogs suffering from OA using kinetic and kinematic gait analysis, gait changes were consistently noted in all the physical tasks that the dogs had to perform, in particular those requiring higher levels of effort (Souza et al., 2019).

Hence, monitoring of mobility and pain either via radiography, advanced imaging, clinical examination, CBPI or via other modalities is important to ensure animals are receiving adequate treatment to be pain-free, improve and maintain muscle strength, and preserve joint function (Clark & Comerford, 2023). For now there is still a need for the validation of outcome measures to be used in all the studies that measure outcomes of different treatment methods for canine OA (Belshaw et al., 2016).

3. Conventional Pharmacological Treatment

A study by Anderson and co. found that 85% of dogs suffering from OA were managed with either surgical or medical treatment. 77.9% received analgesic medication, non-steroidal anti-inflammatories (NSAIDs) being used the most. 4.8% of cases are treated surgically. Thus, at present medical treatment is the mainstream treatment of canine OA (Anderson et al., 2018). Recent pharmacological developments allow the clinician not only to control clinical signs of the disease, but also to slow the progression of cartilage degeneration (Vaughan-Scott & Taylor, 1997). Current approaches for the treatment of OA, include weight management, rehabilitation, pharmacologic therapies (NSAIDs, anti-Nerve Growth Factor monoclonal antibodies), disease-modifying osteoarthritis drugs, regenerative treatments, and nutraceuticals. Body weight management is one of the most important parts in the treatment of OA. Obesity accelerates the progression of OA both mechanically, by increasing joint loading, and biologically, via proinflammatory adipokines. Controlled, low-impact exercise (e.g., moderate walking and swimming) helps maintain joint mobility and periarticular muscle mass, which reduces articular load (Bougherara et al., 2025).

Non-steroidal anti-inflammatories (NSAIDs)

NSAIDs remain until now the cornerstone for managing OA pain and inflammation by inhibiting prostaglandin synthesis. Studies showed strong evidence of the potent effect of NSAIDs in modifying the signs of osteoarthritis (Sanderson et al., 2009). Since canine OA is a chronic progressive disease that requires long-term therapy, selective blockers of COX-2 are more specific in treating inflammation, and do not affect the potentially cytoprotective effects of prostaglandins produced by non-inflammatory cells, making them safer for long-term use (Vaughan-Scott & Taylor, 1997).

An NSAID like enflicoxib, a cyclooxygenase-2 (Cox-2) inhibitor and pyrazol metabolite drug indicated for the treatment of pain and inflammation in canine osteoarthritis (OA) showed no unexpected overaccumulation in dogs treated long-term, this supports the use of enflicoxib for as long as therapeutically required (Cendrós et al., 2025). In dogs suffering from other comorbidities Grapiprant, an EP4 prostaglandin receptor antagonist, provides a safer alternative by sparing other proteinoid pathways (Bougherara et al., 2025). It is important to realize that NSAIDs have analgesic and anti-inflammatory properties and do not modify cytokine-mediated pathways that result in cartilage degeneration (Vaughan-Scott & Taylor, 1997).

Anti-Nerve Growth Factor monoclonal antibodies (anti-NGF)

Monoclonal canine-specific antibodies against nerve growth factor (NGF) like Bedinvetmab (LibrelaTM), are a substantial shift in OA management. NGF is a key mediator in pain signaling, thus by neutralizing it, bedinvetmab has been shown in randomized controlled trials to improve quality of life by alleviating pain. It is particularly beneficial in dogs with comorbidities (e.g., renal diseases and gastrointestinal diseases) and contraindications to NSAIDs (Bougherara et al., 2025).

Nutraceuticals

Nutraceuticals are dietary supplements used to support joint health and improve mobility in dogs with osteoarthritis. Omega-3 fatty acids (Eicosapentaenoic Acid and Docosahexaenoic Acid) derivatives are less pro-inflammatory than other lipid derivatives. One study showed an excellent response in 27 %, a good response in 32 %, and a poor response in 41 % of 22 dogs suffering from OA treated for two weeks with Omega-3 fatty acids (Vaughan-Scott & Taylor, 1997).

The introduction of the polysulphated glycosaminoglycans (PSGAG) and related agents which are considered very safe, has provided the possibility of treating the underlying pathogenesis of OA. They could stimulate chondrocytes to produce proteoglycans, and synovial fibroblasts to produce hyaluronic acid (Vaughan-Scott & Taylor, 1997). But there was a moderate level of comfort for the efficacy of glycosaminoglycan polysulphate, for the modification of the structures involved in the disease (Sanderson et al., 2009).

Various experimental models confirmed the anti-inflammatory properties of green-lipped mussel (Perna canaliculus) extract which also contains glycosaminoglycans. Studies showed moderate success in managing canine OA using green-lipped mussel extract (Vaughan-Scott & Taylor, 1997).

Studies performed to evaluate the effects of different nutraceuticals for the treatment of OA showed inconclusive results when using therapeutic diets enriched with glucosamine and Chondroitin, potential benefits with green-lipped mussel extract and undenatured type II collagen and strong evidence of anti-inflammatory effect for omega-3-fatty-acids-rich diets (Bougherara et al., 2025).

4. Osteopathic Manual Therapy

Osteopathic manual therapy (OMT) is a manual therapeutic approach based on the relationship between structure and function in the body. It aims to improve mobility, reduce pain and restore functional balance through mobilization and manipulation techniques applied to joints and soft tissues. Osteopathic principles were originally developed by Andrew Taylor Still, founder of osteopathy, and although they have evolved over time, they keep the same fundamental concepts.

OMT principles

An osteopathic principle can be described as a biological, behavioral or clinical concept that is considered important in diagnosis and treatment because it reflects the osteopathic view of health, function and disease.

In the fall of 1978, the Michigan State University launched the project on Osteopathic Principles Education. A brief letter was sent to members of the advisory group, and selected Fellows of the American Academy of Osteopathy. Respondents were asked to answer the question “What characterizes an osteopathic principle?” A total of 42 responses were received, and 34 were analyzed (Sprafka et al., 1981). Answers included explanations on the typical characteristics of osteopathic principles as well as examples of these principles:

1. The body is a unit. (body, mind, and overall function are interconnected).
2. The body is capable of self-regulation. (The body is naturally capable of maintaining and restoring health when conditions allow it).
3. Structure and function are reciprocally interdependent. (Abnormal structure can affect function, and abnormal function can affect structure).
4. The body can maintain health and avoid disease when it is maximally able to adapt to its environment. This capability is best supported when structural relationships are normal, environmental conditions are favorable, and nutrition is adequate.
5. When normal adaptability is disrupted, or when environmental changes exceed the body's ability for self-maintenance, disease may occur.

The survey showed that there is more agreement about what characterizes an osteopathic principle than was anticipated and that the current views on osteopathic principles are not fundamentally different from those stated in the writings of Andrew Taylor Still (Sprafka et al., 1981).

OMT techniques

Rational and effective therapies using OMT techniques should be based on OMT principles, taking into consideration the body unity, the self-healing ability, and the relationship between structure and function. Mobilization and manipulation techniques are the main OMT techniques used in treating musculoskeletal disorders. Joint mobilization and manipulation have been shown in several studies to have positive effects via biomechanical and neurophysiological mechanisms in humans (Haussler et al., 2021).

Manual joint mobilization techniques require good knowledge and adequate training to ensure meticulous application and a positive outcome. By applying these techniques elasticity of the periarticular soft tissue and musculature is improved. Several studies confirmed that Manual passive joint mobilization techniques reduce pain, restore function, and improve mobility and quality of life in people suffering from OA (Mille et al., 2022). Mobilization techniques use controlled forces to move musculoskeletal tissues and may be categorized into articular or soft tissue-based approaches. Soft tissue mobilization techniques restore normal motion to the skin, underlying fascia, muscles, tendons, ligaments, and neural tissues indirectly reducing pain, and improving function. Joint mobilization techniques involve repetitive passive movements of the joints. These techniques restore normal and balanced joint articulation (Haussler et al., 2021).

The benefits of passive joint mobilization techniques were first proven by R.B. Salter and colleagues in the 1970s by improving Range of Motion (ROM) in experimental rabbit models after cartilage injury. This was a turning point in the treatment of post-traumatic arthritis and post-articular surgery in people. Since then, passive joint techniques have been widely recommended to ensure faster cartilage healing and restore range of motion (Mille et al., 2022).

Manipulation requires practical experience to ensure safety and reliable results. Manipulation is performed by applying a non-repetitive, high-velocity, low-amplitude thrust (HVLA) at appendicular or spinal articulations (Haussler et al., 2021).

Both spinal mobilization and manipulation were shown to effectively improve spinal flexibility and range of motion; HVLA treatment showed rapid results within sessions, while the effects of passive articular mobilization showed delayed results, as range of motion continuously improved during the periods between sessions. These findings suggest two different mechanisms of action for mobilization and manipulation, which is consistent with the human literature (Haussler et al., 2021).

5. Analysis of Current Evidence

OA is a progressive degenerative disease associated with cartilage deformation osteophyte formation and different degrees of inflammation within the joints. Up to this date there is no cure for OA, but different therapies, both pharmaceutical and non-pharmaceutical, have been proposed and have shown efficacy in managing canine OA (Pye et al., 2024). Management of OA focuses on reducing pain and improving range of movement, muscle mass and quality of life (Dycus et al., 2022). Most recent studies have confirmed that a multimodal rehabilitation approach is the best option for managing OA in dogs to ensure the best outcome. But this also makes it harder to evaluate a single treatment option separately (Haussler et al., 2021).

A review of sixty-eight papers published in peer-reviewed journals assessing the efficacy of different treatment modalities for OA in dogs showed high efficacy of NSAID treatment and moderate efficacy of nutraceuticals (Sandersoln et al., 2009). Studies suggested that the combination of both NSAIDs and nutraceuticals particularly omega-3 fatty acids from marine origin is more effective in managing OA (Vijarnsorn et al., 2019).

Since physiotherapy has been confirmed to improve mobility and reduce pain in people with OA, it has been internationally recommended as an adjunctive treatment for management of OA. In the last twenty years dog owners have highly adopted the idea of manual therapy as an adjunctive treatment intended to relieve pain and improve quality of life in osteoarthritic dogs (Mille et al., 2022). Studies showed that early intensive physiotherapy after TPLO in dogs greatly shortened the time needed to regain a normal range of motion in the stifle joint (Monk et al., 2006). Therapeutic exercises applied to increase range of motion (ROM), are the cornerstone of rehabilitation programs after musculoskeletal injuries (Drum et al., 2015).

It has been documented that mobilization and correct loading of joints in OA patients is best for articular cartilage repair by inhibiting inflammatory signaling cascades and pro-inflammatory gene expression. Thus, manual therapy is effective by using controlled mobilization of the joints to enhance range of motion, preserve muscle mass and reduce pain and stiffness in OA patients (Mille et al., 2022). Animal osteopaths use mobilization and manipulation techniques to treat musculoskeletal and neurologic dysfunctions.

Manual therapy has become widely used in equine and small animal patients for alleviating pain associated with joint diseases (Haussler et al., 2021).

Manual therapy was shown to provide immediate short-term improvement in Range of motion and comfort in canine patients suffering from different musculoskeletal diseases (Lane & Hill, 2016). Similar to findings in humans suffering from acute and chronic forms of neck and back pain, manipulation techniques in horses have been shown to be more effective in treating chronic back pain and stiffness than acute back pain (Haussler et al., 2021). A single OMT manipulative treatment using HVLA thrusts is more effective (27%) in reducing pain after 7 days compared to massage therapy (12%) or oral administration of phenylbutazone for 7 days (8%) in horses suffering from back pain and stiffness (Haussler et al., 2021).

In the last few years, a modern and comprehensive approach associating pharmacological treatments with non-pharmacological therapies including weight control and manual therapy has been emerging for the management of canine OA. A more individualized treatment approach is recommended depending on the stage of the disease, associated diseases, clinical signs and environment. Ultimately, combining different therapeutic strategies under skilled veterinary supervision, provides the best opportunity to effectively reduce chronic pain and stiffness and improve quality of life in dogs with OA (Bougherara et al., 2025).

In the scope of developing manual therapy treatment guidelines for canine patients with OA, more research based on randomized controlled trials is still needed (Pye et al., 2024). Although different studies reported a positive outcome when using mobilization and manipulation techniques for treating chronic articular pain and stiffness, more studies should be done to specifically evaluate the effects of OMT as a treatment for OA in dogs. These studies should incorporate larger numbers of animals, adequate control groups and include long-term results (Haussler et al., 2021).

6.Conclusion

Current studies suggest that OMT using mobilization and manipulation techniques may help improve quality of life by reducing pain, increasing range of motion and reducing stiffness in dogs suffering from OA. However, available data is still limited, and most studies have focused on the use of pharmacological treatments for the management of OA.

Since OA causes chronic pain and stiffness, and since evidence has shown that mobilization and manipulation techniques are more effective in treating chronic pain and stiffness by reducing pain and improving mobility through increasing range of motion, OMT appears suitable as an adjunctive treatment in canine OA.

Studies showed that combining pharmacological treatments with physical therapy provides a better outcome than pharmacological treatment alone. In addition, OMT manipulative treatment showed better results in horses suffering from chronic back pain and stiffness compared with massage therapy. Therefore, combining OMT with pharmacological treatment could represent the best option for the management of OA.

More randomized controlled trials analyzing different OMT techniques, using a large number of dogs and including long-term results, should be performed to develop manual therapy treatment guidelines as a sole or adjunctive treatment for canine patients with OA.

7.Bibliography

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