

13.4 Osteoarthritis

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Osteoarthritis (OA) is characterized by progressive loss of articular cartilage and by reactive changes at the margins of the joints and bones (Schumacher 1988). Clinical manifestations include aching discomfort that worsens with activity and is relieved by rest, a restriction of activity level, a limitation in the ability to perform, poorer proprioception, pain and discomfort, joint stiffness, effusion and enlargement and loss of strength and flexibility (Schumacher 1988; Millis & Levine 1997; Buckwalter 2003; Shrier 2004; Snibbe & Gambardella 2005).

The causes of OA are age, genetics and conformation, as well as obesity, repetitive stress and joint trauma (such as subchondral bone damage, intra-articular derangement or surgical interventions) (Schumacher 1988; Johnson & Johnson 1993; Olmstead 1995; Lahm, Uhl, Erggelet et al. 2004; Millis 2004). Physiotherapy can prove useful in both the treatment of OA as well as in attempting to prevent or delay the onset and progression of OA.

13.4.1 Assessment of osteoarthritis

Early detection and subsequent treatment of OA will yield the most favourable outcomes. Physiotherapists have long used manual testing techniques and clinical reasoning to diagnose early-onset joint OA (Magee 1986; Cibulka & Threlkeld 2004). If there is a joint capsule lesion or a total joint reaction present (OA lesions), a characteristic pattern of restriction in the passive ROM will occur (Magee 1986; Cibulka & Threlkeld 2004). This is called a capsular pattern, and in humans, the common capsular patterns for all joints are documented (Magee 1986; Gross-Saunders, Walker, & Levine 2005). The same is not true for animals, however speculation can be made from clinical practice as to common patterns of restriction i.e. hip extension is commonly restricted in OA at the canine hip joint (Gross-Saunders, Walker, & Levine 2005). Pain and a loss of end-range extension is a frequent finding in early OA of many canine joints (Olmstead 1995). Additionally physiotherapists utilise 'joint end feel' to assist in determining the pathology at the joint (Magee 1986). This practice can also be transferred to the canine patient by a practitioner skilled in manual therapy (see Chapter 9).

13.4.2 Treatment of osteoarthritis (OA)

The goal for the treatment of OA is to improve the joint and overall function and quality of life of the animal; relieve pain and associated muscle spasm, maintain and regain joint range of motion, improve joint health, strengthen supporting muscles, address proprioceptive deficits and advise on lifestyle modifications.

Relief of pain may be accomplished by use of modalities (ultrasound, LASER, PEMF, and NMES, see Chapter 10) (Nelson & Currier 1987; Michlovitz 1990; Millis & Levine 1997; Gur, Cosut, Sarac et al. 2003; Sutbeyaz, Sezer, & Koseoglu 2005). Massage has been shown to reduce pain, increase pain tolerance, and stimulate a release of endorphins so long as regular massage sessions are administered (Tappan 1988; Corbin 2005; Plews-Organ, Owens, Goodman et al. 2005). For this reason, owners could be instructed in how to properly perform massage techniques as a regular home-based intervention. Thermal agents such as heat or cold are both reported to have pain relieving effects and application of each should be taught to owners and/or utilized as part of a therapy session (Michlovitz 1990; Millis & Levine 1997; Steiss & Levine 2005). Additionally, isokinetic muscle strengthening exercises are also capable of

significantly reducing pain (Huang, Lin, Lee et al. 2005). Many other forms of manual therapy techniques can also be utilised to reduce pain as described in Chapter 9.

The goals of improving joint ROM, joint health, muscular strength, functioning, and proprioception can be accomplished by case specific strengthening and exercise (Millis & Levine 1997; Brosseau et al. 2003; Buckwalter 2003; Roddy 2005; Roos & Dahlberg 2005; Stitik et al. 2005). Strengthening the supporting muscles aids in shock absorption, with the increase in strength minimising fatigue-related injuries, in general conditions (Millis & Levine 1997; Buckwalter 2003). Both aerobic walking and quadriceps strengthening exercises have been shown to reduce pain, increase joint ROM and improve function in human knee OA patients thus reducing disability (Roddy, Zhang, & Doherty 2005; Roos & Dahlberg 2005; Snibbe & Gambardella 2005). Moderate exercise has also been shown to improve knee cartilage glycosaminoglycan content in humans at risk of developing osteoarthritis (Roos & Dahlberg 2005). Articular cartilage can be stressed and damaged with repetitive impact loads, blows to the joint or torsional loads (Buckwalter 2003). Thus, aquatic exercises have been praised for OA patients because of the buoyancy effect of the water that allows exercise without significant joint impact (Cochrane, Davey, Matthes Edwards 2005; Stitik, Kaplan, Kamen et al. 2005). Cross training has been proposed as a method to reduce the repetition of the same patterns of joint loading and motion (Buckwalter 2004). This information can be translated to the care of dogs with OA. Regular exercise (walks or trotting) on a softer surface (grassy areas) should be encouraged. The use of an underwater treadmill or swim therapy can be very beneficial and utilised as a cross training tool (Millis & Levine 1997; Hamilton 2002; Huang, Lin, Lee et al. 2005). Walking on hilly terrain could also alter joint loading and build different muscle groups (Edge-Hughes 2002). Competitive athletics should be discouraged, however, as canine sports such as agility, fly ball, and racing, etc. could impart excessive joint loading or torsional forces.

Manual physiotherapy techniques such as joint mobilizations, stretching and joint traction / distraction have been found to be effective in improving function, walking tolerance and quality of life in humans and ROM in dogs (Crook 2004; Hoeksma, Dekker, Runday et al. 2004). Manual therapy as an adjunct to exercise therapy has been shown to have a greater effect than exercise therapy alone on OA of the human hip (Hoeksma, Dekker, Runday et al. 2004; Deyle, Allison, Matekel et al. 2005). A physiotherapist trained in manual therapy is the most qualified practitioner to apply mobilisation treatments, as a keen appreciation of arthrokinematics, end feel and an ability to grade the mobilisation is required (see Chapter 9). Owners can be instructed in muscle stretching and joint traction if deemed safe to perform these manoeuvres.

Joint health, cartilage regeneration and slowing of the progression of OA lesions can be targeted with use of modalities and nutritional supplementation. PEMF has been shown to increase chondrocyte matrix synthesis and proliferation in vitro and in vivo and has been shown to preserve the morphology of articular cartilage and retard the development of OA lesions in the knee of aged osteoarthritic guinea pigs (Fioravanti, Nerucci, & Collodel 2002; Fini, Giavaresi, Torricelli et al. 2005; Sutbeyaz, Sezer, & Koseoglu 2005). LASER therapy (Chapter 10) is able to enhance the biosynthesis of arthritic cartilage, and results in the improvement of arthritic histopathological changes (Cho, Lim, Kim et al. 2004; Lin, Huang, Chai et al. 2005). Additionally, human studies have found a correlation with glucosamine use and a reduction in joint space narrowing and erosive effects of OA over a period of three years (Verbruggen, Goemaere, Veys 2002; Bruyere, Honore, Ethgen et al. 2003). Canine studies have found that the use of a glucosamine / chondroitin sulphate mixture can enhance synthesis and turn over of the matrix of proteoglycans and collagen and hence can have a protective effect against synovitis and associated bone remodelling (Canapp, McLaughlin, Hoskinson et al. 1999; Johnson, Hulse, Hart et al. 2001). Cetylated fatty acids have been shown in both human and

animal studies to modulate the immune response and inflammatory process of osteoarthritis and in-turn improve ROM and overall function (Richardson et al. 1997; Curtis et al. 2002; Hunter & Marshall 2002; Kraemer et al. 2005). Advice regarding nutritional supplementation should be considered just as important as physical management of the disease.

Overall improvement in functioning and quality of life is the ultimate treatment goal for OA. Excessive body weight can impact the stresses on articular cartilage. In a human study each pound of body weight lost resulted in a 4-fold reduction in the load exerted on the knee per step during daily activities (Messier et al. 2005). A canine study found that dogs with hip OA that were fed 60% of their current calorie intake lost 11 – 18% of their body weight and experienced a significant decrease in hind limb lameness (Impellizzeri et al. 2000). Weight management should be deemed an integral part of rehabilitation of the osteoarthritic dog.

13.4.3 Prevention of osteoarthritis

Preventing OA should be an important goal for all aging animals or animals that have suffered a joint trauma (including surgical interventions). One canine study found that lifelong exercise did not cause cartilage erosion, osteophytes or meniscal injuries (Newton et al. 1997). In fact, a separate study found that: dogs exercised 4 km/day x 5 days/week x 40 weeks had increased cartilage thickness, proteoglycan content and indentation stiffness; dogs exercised 20 km/day x 5 days/week x 15 weeks had a decrease in cartilage thickness and proteoglycan content, but no degeneration; and dogs that were exercised 40 km/day x 1 year had a decrease in proteoglycan concentration and indentation stiffness and stimulated remodelling of subchondral bone but no degeneration (Buckwalter 2003). The authors commented that increasing exercise causes changes in cartilage composition and mechanical properties but does not accelerate joint degeneration. So, given that muscle strengthening aids in shock absorption capabilities for joints (Buckwalter 2003), exercising to strengthen muscles may help to prevent the development of OA (Berend, Lombardi, & Mallory 2004). Lifelong weight management is also an excellent prevention aid. The results of a 14 year-long study suggest that a 25% restriction in food intake can increase median life span and delay the onset of signs of chronic disease in dogs (Kealy, Lawler, Ballam et al. 2002).

In summary to prevent or delay the onset of OA, dogs should be kept lean, exercised regularly on surfaces that reduce joint impact and torsions and advised on nutritional supplementation as the animal ages or should joint injuries/surgical procedures arise.

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Full chapter references available upon request.