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Physical therapy and rehabilitation in canine patients

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Abstract

Physical therapy is often practiced as an alternative therapy, to conventional veterinary treatment. By use of various modalities simple techniques like stretching exercises, cold compression, heat therapy, can be applied on animals in-house, or and having veterinary physiotherapists on-site provides an additional means by relieving pain or discomfort. Physiotherapy can also provide an excellent outcome to the animals following injury or surgery as well as a satisfactory image to the clients.

Keywords: Canine, physiotherapy and rehabilitation

Introduction

The therapeutic use of physical agents such as massage or exercises, to treat disease or injury is called as physical therapy or physiotherapy (McGowan, 2016; Levine *et al.*, 2005) [23, 20]. The main use of therapy is to restore mobility, function and quality of life to patients and which are achieved by stimulating the healing process to improve the injured tissues, strength and balance, stabilizing the cardiorespiratory, neuromuscular systems (Prydie and Hewitt, 2015; Levine *et al.*, 2005) [33, 38]. It is not only a useful adjunct to human medicine in fact it is a feasible option for animals to optimise their performance and prevent injuries. It can be beneficial for animals to correct the post-operative complications occurred as a result of surgery as well as wide range of conditions. (McGowan, 2016; Levine *et al.*, 2005; Prydie and Hewitt, 2015) [33, 23, 9]. This article explains about the benefits of integrating physical therapy and rehabilitation into small animal practice, and describes the various techniques like passive range of motion exercises, hydrotherapy, cryotherapy, thermal therapy, transcutaneous electrical nerve stimulation, therapeutic ultrasound, short wave diathermy, infrared therapy.

Passive Range of Motion

Passive range of motion (PROM) exercises plays an important role for joint health and maintains the flexibility and mobility of the joint (Knapik *et al.*, 2013) [19, 13]. Stretching exercises reduces the stiffness of joints and muscles which further prevents the occurrence of osteoarthritis in the joints (Bockstahler, 2004; Fossum *et al.*, 2007; Millis and Levine, 2014) [3, 12, 9]. It assists in oxidative capacity of the muscles by replenishing synovial fluid and increases local circulation thus, reducing stiffening or fibrosis of joints (Sims *et al.*, 2015) [37]. Beneficial outcomes have been studied using PROM on patient's post-surgery or injury by promoting cartilage nutrition, decreases tissue adhesion between planes, reduces edema and provides pain relief through a gate control mechanism (Sims *et al.*, 2015; Goff and Crook, 2007) [37]. Sims *et al.*, 2015 [37] stated that inappropriate management of this technique, such as over extension and flexion of the muscles and joints results in tissue strain leads to impaired healing of injury, reflex inhibition, tissue damage, delayed use of the limb, and fibrosis of the peri-articular tissues and a stressful experience for the animal. The authors also stated that the animal should be in a relaxed and comfortable position in which the limbs are gripped firmly but gently and the motion performed along the normal plane of limb movement during ambulation with the long bones in proper alignment to each other. Post exercise therapy include icing the affected muscles to reduce inflammation caused during the treatment sessions (Sims *et al.*, 2015) [37]. Goff and Crook, 2007 [13] used PROM exercises on the elbow, carpal and stifle joints of osteoarthritic patients for 21 days twice daily resulted in excellent joint range of motion and flexibility.

Hydrotherapy

Hydrotherapy or Aqua therapy is used as a therapeutic or non-pharmaceutical component in a multimodal pain management in the form of swimming (Davis and Nelson, 2015; Corti, 2014) [7, 5].

It is used for mobilizing joints as well as for strengthening muscles and the cardiovascular system (Veenman, 2006) ^[40]. According to Davidson *et al.*, 2005 ^[6] walking on an underwater treadmill improves proprioception and joint flexion postoperatively. Swimming exercise on osteoarthritic dogs given twice a week for eight weeks interval has resulted in improved lameness, joint mobility and weight-bearing of the affected limbs (Nganvongpanit *et al.*, 2014) ^[30]. Vigneswari *et al.*, 2016 ^[41] used hydrotherapy after 3 months post Femoral Head Osteotomy surgery in six dogs resulted in upto 80% of reduced lameness score and weight bearing was achieved on the affected limbs.

Cryotherapy

Cryotherapy (or cold therapy) is the application of a cold agent to an affected area of the body parts to draw heat energy from body tissues by reduction in the tissue temperature. The effectiveness of this therapy have been shown during the first 72 hours after acute injury or surgery and assisted in the management of inflammation, pain, or decreased range of motion and neurologic disorders (Shumway, 2007; Steiss and Levine, 2005; Bockstahler, 2004) ^[36, 38, 3]. According to Rexing *et al.*, 2010 ^[34] use of icepack for postoperative tissue swelling after extra capsular stifle surgery resulted in less pain when compared to bandaging alone. Drygas *et al.*, 2011 ^[10] used cold compression therapy as a postoperative therapeutic modality and stated that short term pain relieve was achieved with increased limb function after tibial plateau leveling osteotomy surgery.

Thermal Therapy

Thermal therapy or heat therapy is the therapeutic effect by warming the specific body area as well as adjunctive pain management of musculoskeletal disorders. According to Millard *et al.*, 2013; Millis and Levine, 2014 ^[25, 26], superficial heat application reaches within 1.5 cm of the body surface and achieves negligible change in deep tissue temperature and should be initiated after 72 hours of injury and continued for a period of 5 to 7 days as it induces vasodilatation and leukocyte migration, improves circulation, soft tissue extensibility and metabolism, relaxes muscles and relieves pain. Application of heat around the soft tissue reduces the risk of tissue damage and improves in the range of movement achieved by stretching (Nakano *et al.*, 2012) ^[28]. Davidson *et al.*, 2005 ^[6] used superficial heat therapy in the management of chronic degenerative osteoarthritis, however the authors stated that the therapy maybe discontinued if acute flare-ups of osteoarthritis occurs.

Transcutaneous Electrical Nerve Stimulation (TENS)

Transcutaneous electrical nerve stimulation (TENS) is a modality that uses electric current to activate nerves in order to assist with short-term or long-term pain relief (Johnson *et al.*, 2017) ^[17]. Denegar *et al.*, 1992 ^[8] used low-level electric current which decrease pain and inflammation by disrupting the normal pain and perception pathways and the frequency and pulse rate used for acute and chronic inflammation were 80–150 Hz and 0-10 Hz, respectively. TENS also contributes in acceleration of wound healing (Brown *et al.*, 1989) ^[4] by aiding in epithelialization (Alvarez *et al.*, 1983) and contraction (Stromberg, 1988) ^[1, 39].

Therapeutic ultrasound

Sound waves with higher frequency are used as a therapeutic

modality to improve the damaged muscles, tendons or ligaments which increases the range of motion by stretching the fibrous tissue around the joint, thereby, reduces the inflammation and swelling. It penetrates deep into the injured tissue by increasing the local blood flow thus decreases the pain and spasms which facilitate wound healing. Mueller *et al.*, 2009 reported that use of therapeutic ultrasound with the intensity of 1.0 W/cm² for 10 minutes in the treatment of partial gastrocnemius muscle avulsion resulted in complete recovery after one month. Gurunathan *et al.*, 2023 ^[15] stated that use of therapeutic phonophoresis @ 1 watt/cm² around the surgical site at weekly intervals postoperatively promoted early wound healing. According to Prins *et al.*, 2022 ^[32] therapeutic ultrasound is a form of acoustic energy commonly used in physical therapy with varying intensity of ultrasonic waves and the authors used therapeutic ultrasound massage @ 1 watt/cm² around the atrophied temporalis and masseter muscles which aided in 90% of its function after two weeks of treatment. Saini *et al.*, 2002 ^[35] inferred that use of ultrasound therapy in severed Achilles tendon at 0.5 W/cm² for 10 minutes showed rapid healing when compared to untreated animals. Goranov and Stara, 2010 ^[14] stated that the modality enhanced the range of motion around the affected joint by increasing the muscle mass in dogs with osteoarthritis, however, the therapy did not show any changes in the circumference of the affected joint due to chronic fibrous tissues.

Short Wave Diathermy (SWD)

Short Wave Diathermy (SWD) uses high-frequency electromagnetic energy to generate heat in pulsed or continuous energy waves and induces vasodilatation, elevates pain threshold, reduces muscle spasm, accelerates cellular metabolism, and increases soft tissue extensibility however areas with oedematous tissues and haematomas are not applicable (Wang *et al.*, 2017) ^[42]. According to Ansari *et al.*, 2012 ^[2] use of SWD along with conventional drug therapy in dogs with hind quarter weakness resulted in early neurological recovery compared to therapeutic ultrasound. Nath *et al.*, 2007 ^[29] stated that use of SWD in dogs with various neuromuscular disorders enhanced faster ambulation.

Infrared therapy

Infrared (IR) therapy is a non-invasive, passive modality of neuromuscular rehabilitation mainly used as an adjuvant along with the treatment of Inter-vertebral Disc Disease (IVDD). It develops endogenous heat which aids in recovery of skeletal muscles, tendons and ligaments injuries by reducing inflammation (Luigi, 2019) ^[22]. It uses visible light with wavelength of 770 to 1500 nanometres (Park *et al.*, 2002) ^[31]. Infrared therapy is mainly used in dogs with cervical intervertebral disc herniation (IVDH) for 10-15 min twice a day to the paralysed area increases blood flow (Jeong *et al.*, 2019) ^[16]. Low and Reed, 2000 ^[21] reported that IR light falling under this wavelength is found to be beneficial in tissue-heating as it penetrates deeper due to its larger distribution of energy. Infrared therapy potentiates cellular metabolism and tissue repair leading to cell growth (Dycus, 2014) ^[11]. Additionally, it stimulates growth of stem cells (Karu, 2010) ^[18] along with anti-inflammatory effects that decrease prostaglandin E2 (PGE2) and cyclooxygenase-2 (COX-2) (Medrado *et al.*, 2003) ^[24].

Conclusion

Physical therapy and rehabilitation are a critical part of

successful healing from various neurological and musculoskeletal disorders in canine patients. As the interest in veterinary physiotherapy and rehabilitation within the small animal practice advances, it boons challenges for the veterinary surgeons. Therefore, promoting physiotherapy in canine practice will result in better outcomes to the patient as well as the owner.

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