Original Article

The Use of Omega-3 Concentrate to Relieve Coxofemoral Osteoarthritic Pain in Dogs

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Abstract

The current study aimed to assess the effect of using omega-3 concentrate to relieve coxofemoral osteoarthritic pain in dogs. In total, ten dogs with coxofemoral OA were orthopedically evaluated at the coxofemoral joints in order to grade the pain severity. Pain scores were assessed from lameness at walk and trot (1-6), pain on manipulation (1-3), and range of motion (1-4). All dogs orally received omega-3 concentrate (Omacor®, Banner Pharmacaps Europe BV, the Netherlands) for successively four weeks. During the study, they were evaluated for pain scores on a weekly basis. The results revealed that mean body weight of the patients were 27.2±17.3 kg (range 2.8-50.0 kg). As for lameness at walk and trot, pain scores obviously declined within one week of treatment (3.3±0.9 vs 2.0±0.7, $p<0.001$) and went to 1.7±0.8 at the end of the study. According to joint manipulation, pain scores continuously diminished through the 3rd week (2.5±0.5 vs 1.7±0.7 vs 1.3±0.5, $p<0.001$) and went to 1.2±0.4 at the end of the study. For range of motion, pain scores decreased progressively during 3 weeks (3.0±0.5 vs 2.3±0.5 vs 1.9±0.3, $p<0.001$) and went to 1.6±0.5 at the end of the study. In summary, omega-3 concentrate was one of the nouveau alternatives to alleviate painfulness at the coxofemoral joints as obviously seen from continuously declined pain scores, contributing to the better quality of life for the dogs afflicted with coxofemoral OA.

Keywords: coxofemoral joint, dogs, omega-3, osteoarthritis, pain score

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Introduction

One of the most common joint disorders causing pain and lameness in dogs was osteoarthritis (OA) (Moore et al., 2001). In the United States of America, more than 20% of dogs aged >1 year old suffered from OA. Generally, canine OA was chiefly found in senile, overweight, and large-bred dogs. Nevertheless, OA took place in every age, size, and breed of dogs (Johnston, 1997). Recently, the American Academy of Orthopedaedic Surgeons harmoniously defined OA that it was diseases caused by an imbalance between degradation and synthesis of articular cartilage, extracellular matrix (ECM), and subchondral bone (Budsberg and Bartges, 2006). As a result, OA represented synovitis and degeneration of the articular cartilage, contributing to the complete deterioration of cartilage surface. In general, chondrocytes were responsible for sustaining joint homeostasis and ECM degradation. Articular cartilage was composed of chondrocytes and ECM which was principally made up of water, collagen, and proteoglycans (Man and Mologhianu, 2014). Consequently, OA made chondrocytes considerably release a number of destructive and pro-inflammatory substances, such as proteolytic enzymes, free radicals, and prostaglandins. As a result, catabolic action took place within articular cartilage higher than anabolic phenomena; it contributed to a successive degeneration with such cartilage (Mortellaro, 2003).

Traditionally, a therapy for OA in dogs was majorly focused on controlling clinical signs, especially pain since it dramatically affected activities of the dogs (Roush et al., 2010b). For this reason, anti-inflammatory drugs, both corticosteroid and non-steroid antiinflammatory drugs (NSAIDs), were applied to OA dogs (Aragon et al., 2007). However, the previous study demonstrated perilous effects of long-term administration with both of antiinflammatory agents, such as gastric ulcer, failures of liver and kidney (Henrotin et al., 2005). Nevertheless, a number of studies suggested that omega-3 polyunsaturated fatty acid have advantageous effects in treating rheumatoid arthritis (Calder and Zurier, 2001; Goldberg and Katz, 2007; Roush et al., 2010b). Omega-3 fatty acid produced eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) which were able to inhibit eicosanoids generated from omega-6 fatty acid, which mainly were inflammatory ones (Wall et al., 2010). They could worsen painfulness in the dogs with OA. However, the comprehensive study of applying omega-3 concentrate in coxofemoral-OA dogs has been scant, the present study, consequently, was to investigate the effects of omega-3 concentrate on pain alleviation in dogs afflicted with coxofemoral osteoarthritic pain.

Materials and Methods

Animals and general examinations: The study was conducted in an out-patient department (OPD) of a veterinary teaching hospital in Bangkok, Thailand. Selection criteria for the present study were the dogs visiting the hospital with client complaint of hindlimb problems, such as difficulty to get up, nonweight bearing hindlimbs, hindlimb weakness, and so on. Those matched with these problems were transferred to perform complete physical and orthopedic examinations by the only one veterinarian through the study. Those with the physical examination with coxofemoral joint problems were sent to conduct radiograph in order to confirm that they had coxofemoral OA on both sides. Moreover, neurological examination was completely performed in order to rule out the dogs visiting with pain from neurological disorders. Moreover, all dogs must be healthy from physical examination and must have had historical vaccination against canine distemper, parainfluenza, parvovirus, infectious hepatitis, infectious laryngotracheitis, rabies, and leptospirosis. Those treated with any medication, hydrotherapy, and acupuncture within one month before initiating the experiment were excluded from the study. Finally, ten dogs naturally suffered with coxofemoral OA were included in the study. Prior to commencing the experiment, consent form was completed by all owners.

Pain assessments at coxofemoral joint: All dogs were assessed for pain at the coxofemoral joint via orthopedic examination by the same veterinarian. Three observations were conducted in order to score the severity of pain: lameness at walk and trot, pain on manipulation, and range of motion at the coxofemoral joints. As for lameness at walk and trot, patients were classified into six groups: 1 = normal walk and trot, 2 = intermittent lameness, 3 = persistent lameness, 4 = non-weight bearing walk, 5 = ambulatory walk only with assistance, and 6 = non-ambulatory walk. According to pain on manipulation at coxofemoral joint, all dogs were categorized into 3 classes: 1 = no pain, 2 = mild pain (make an effort to withdraw limb against strong manipulation), and 3 = severe pain (abruptly withdraw limb when start touching the joint). Owing to range of motion, all dogs were grouped into 4 indices: 1 = no pain through full range of motion, 2 = pain only at full range of motion, 3 = pain at less than full range of motion, and 4 = pain at any joint manipulation (Black et al., 2008).

Provision of omega-3 concentrate: All dogs in the study were assigned to intake omega-3 concentrate from the first date of examination. It was prepared in a gel capsule (1,000 mg) of omega-3 concentrate (Omacor®, Banner Pharmacaps Europe BV, the Netherlands) comprising 460 mg EPA, 380 mg DHA, and 4 mg alpha-tocopherol. Omega-3 concentrate was orally administered to the dogs on the basis of one capsule per 10 kg_{BW} per os (Mueller et al., 2004). In addition, all patients must have visited the hospital to perform orthopedic examination in order to evaluate pain scores at the coxofemoral joints on a weekly basis by the same veterinarian after starting the intake of omega-3 concentrate for successive four weeks.

Statistical analysis: All data were manipulated and analyzed statistically by the Statistical Analysis Systems Software (SAS version 9.0, Cary, NC, USA). Descriptive statistics of all dogs were presented as mean±SD. Orthopedic examinations contributed to pain scores as 1-6 for lameness at walk and trot, as 1-3

for pain on manipulation, and as 1-4 for range of motion. The scores of each parameter were analyzed for difference among weeks (0-4) using signed rank test. Values with $p<0.05$ was considered statistically significant.

Results

Ten patients having coxofemoral OA, in the present study, were five male and five female dogs which were 1 German Shepherd, 1 Pomeranian, 1 Yorkshire terrier, 4 Labrador Retrievers, 1 Pekingese, 1 Rottweiler, and 1 mixed breed with mean body weight of 27.2±17.3 kg (range 2.8-50.0 kg), and mean age of 7.9±2.7 years old (range 2.2-12.8 years old). On a weekly basis, mean body weight of the patients did not significantly change: 27.6±18.1, 27.5±18.1, 25.4±17.7, 27.6±18.0, and 27.8±18.3 kg ($P>0.05$) from the first to the last week of the study, respectively.

Due to the pain evaluation at walk and trot, the dogs had less pain at once after one week of treatment (3.3±0.9 vs 2.0±0.7, $p<0.001$). Moreover, the decline of pain score was further found significantly between the 2nd and the 4th weeks of study (2.0±0.7 vs 1.8±0.8, $p<0.001$). Finally, pain score decreased to 1.7±0.8 at the end of the study as seen in Figure 1. As for pain at joint manipulation, it was obviously found that pain score alleviated successively from the 1st to the 3rd visits (2.5±0.5 vs 1.7±0.7 vs 1.3±0.5, $p<0.001$) as demonstrated in Figure 2. At the end of the study, pain score while manipulating the coxofemoral joints was 1.2±0.4. As per pain score at examining range of motion, it continually decreased from the 1st to the 3rd weeks of study (3.0±0.5 vs 2.3±0.5 vs 1.9±0.3, $p<0.001$); in addition, it was the lowest at the end of the study (1.6±0.5) as seen in Figure 3.

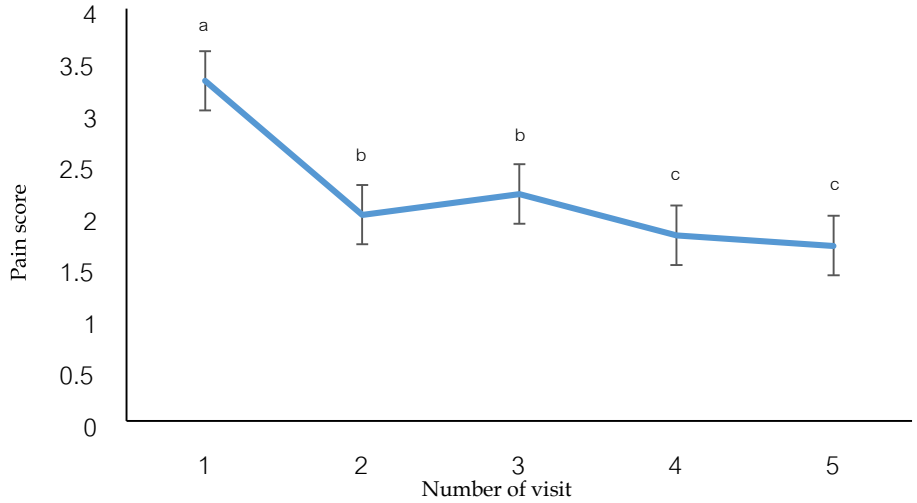

Figure 1 Pain scores (mean±SD) investigated at walk and trot of 10 dogs with naturally coxofemoral osteoarthritis. [a,b,c] different letters indicate statistical significance ($p<0.05$).

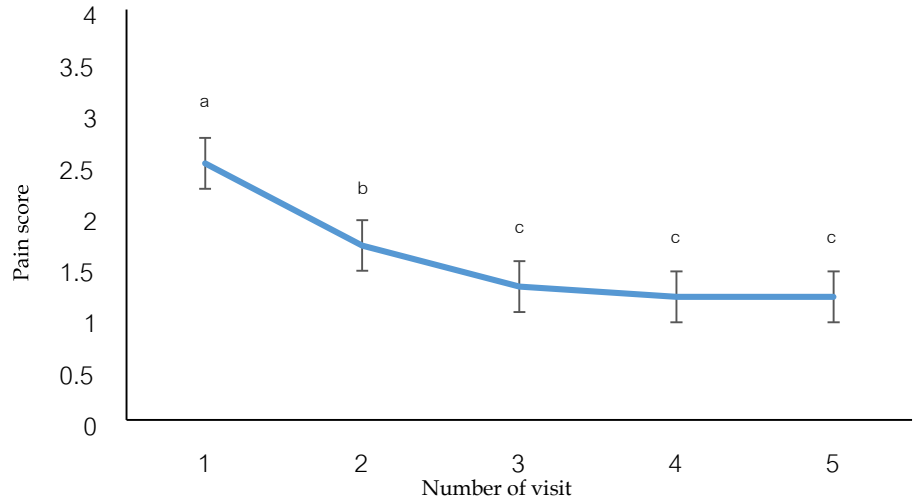

Figure 2 Pain scores (mean±SD) investigated at joint manipulation of 10 dogs with naturally coxofemoral osteoarthritis. [a,b,c] different letters indicate statistical significance ($p<0.05$).

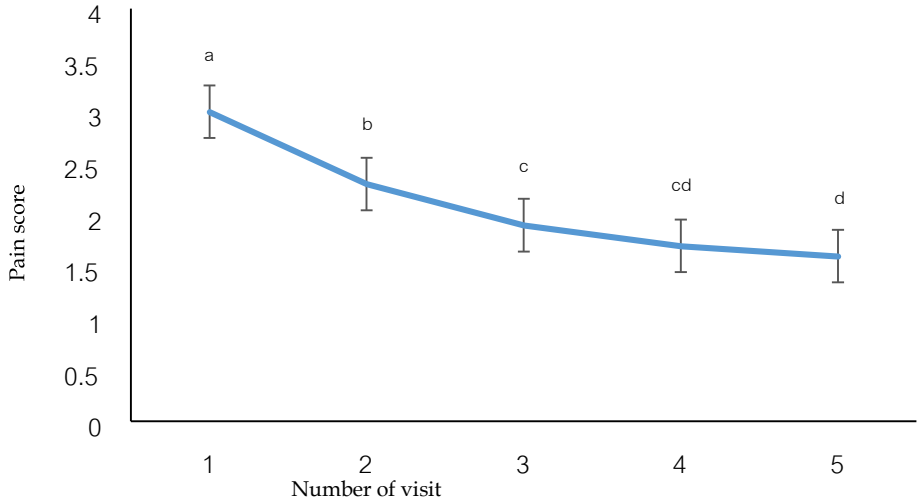

Figure 3 Pain scores (mean±SD) investigated at examining range of motion of 10 dogs with naturally coxofemoral osteoarthritis. [a,b,c] different letters indicate statistical significance ($p<0.05$).

Discussion

The current study found that OA at the coxofemoral joint took place in large and small breeds with varied ages and body weights. This corresponded with the former study demonstrating that canine OA could occur in dogs with various breeds, ages, and sizes (Johnston, 1997). Besides, mean body weight of the dogs did not change significantly from the first to the last week of study, implying that the improving result of the study was not related to the body weight or weigh reduction.

Considering pain alleviation, it was found that omega-3 concentrate, in the present study, was an effective agent in reducing pain at the coxofemoral joint of dogs naturally afflicted with coxofemoral OA. It was lucidly seen from the successive decline of pain scores at walk and trot, at coxofemoral joint manipulation, and at examining range of motion through the study. Through the study, pain scores from all parameters declined approximately two times from the first visit. Moreover, pain scores at the end of the study were between 1.0 and 2.0 in every parameter measured, implying that the administration of omega-3 concentrate was able to help dogs with coxofemoral OA earn an almost normal life in terms of joint painfulness. Likewise, the preceding study undertook the concoction of omega-3 fish oil in the feed of the dogs with OA for 90 days found the significant improvement of weight-bearing posture (Roush et al., 2010a). Moreover, those with OA having feed added with omega-3 fatty acid possessed significantly better ability to raise up from resting position, walk, and play, than fed with control feed (without omega-3 supplementation) (Roush et al., 2010b).

The ameliorative results, in the current study, might be resulted from the potential of eicosanoids produced from omega-3 concentrate, especially DHA and EPA. It was widely accepted that DHA and EPA were able to prevent an advancement of inflammation at different stages of immune response. Moreover, they could assuage the existing inflammatory process. Generally, eicosanoids produced from omega-6, especially arachidonic acid, possessed proinflammatory and immunoactive functions, whereas those derived from omega-3 had antiinflammatory effect majorly by inhibiting the establishment of omega-6-derived eicosanoids. (Wall et al., 2010). In addition, the previous *in vitro* research conducted in bovine revealed that the appearance of omega-3 polyunsaturated fatty acid, specially EPA, in bovine chondrocytes lessened the expressions of cartilage-degrading enzymes, cyclo-oxygenase-2, and several types of inflannation-induced cytokines (Zainal et al., 2009). As a result, the patients treated with omega-3 concentrate, in this study, had better hindlimb condition from coxofemoral OA as apparently seen from the diminished pain scores measured.

In conclusion, omega-3 concentrate (Omacor®) was a novel effective agent to reduce pain from coxofemoral -OA in dogs as obviously seen from the successively declined pain score when diagnosing pain at walk and trot, at joint manipulation, and at examining range of motion of the coxofemoral joints. The coxofemoral-OA patients continuously having omega-3 concentrate on a daily basis for four weeks had declined pain scores of every parameter measured almost into normal condition (between pain score of 1.0 and 2.0). These contributed to the better life quality of the dogs suffered with coxofemoral OA.

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บทคัดย่อ

การใช้โอเมก้า-3 เข้มข้นเพื่อลดความเจ็บปวดในสุนัขที่มีภาวะข้อสะโพกเสื่อม

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การศึกษานี้มีวัตถุประสงค์เพื่อประเมินผลในการใช้โอเมก้า-3 เข้มข้นในการจัดการความเจ็บปวดใน สุนัขที่มีภาวะข้อสะโพกเสื่อม สุนัขที่ใช้ศึกษาได้รับการตรวจยืนยันว่ามีภาวะข้อสะโพกเสื่อมจ านวน 10 ตวั ถูกน ามาตรวจทางออร์โธปิดิกส์เพื่อประเมินความเจ็บปวด โดยดูจากความเจ็บปวดขณะเดินและวิ่งเหยาะ (1-6) ขณะขยับข้อต่อ (1-3) และขณะตรวจพิสัยการเคลื่อนไหวของข้อต่อ (1-4) สุนัขทุกตัวเริ่มได้รับโอเมก้า-3 เข้มข้น (Omacor®, Banner Pharmacaps Europe BV, the Netherlands) อย่างต่อเนื่องทุกวันตั้งแต่เริ่มเข้ารับ การศึกษาเป็นเวลา 4 สัปดาห์ ผลการศึกษาพบว่า สุนัขมีน้ าหนักเฉลี่ย 27.2±17.3 กิโลกรัม (พิสัย 2.8-50.0 กิโลกรัม) คะแนนความเจ็บปวดขณะเดินและวิ่งเหยาะลดลงอย่างเห็นได้ชัดภายในสัปดาห์แรกของการศึกษา (3.3±0.9 vs 2.0±0.7, $p<0.001$) และลดลงสู่ 1.7±0.8 เมื่อสิ้นสุดการศึกษา คะแนนความเจ็บปวดขณะขยับ ข้อต่อลดลงอย่างต่อเนื่องใน 3 สัปดาห์แรก (2.5±0.5 vs 1.7±0.7 vs 1.3±0.5, $p<0.001$) และลดลงสู่ 1.2±0.4 เมื่อสิ้นสุดการศึกษา คะแนนความเจ็บปวดขณะตรวจพิสัยการเคลื่อนไหวของข้อต่อลดลงอย่างต่อเนื่องในช่วง 3 สัปดาห์แรก (3.0±0.5 vs 2.3±0.5 vs 1.9±0.3, $p<0.001$) และลดลงสู่ 1.6±0.5 เมื่อสิ้นสุดการศึกษา โดย สรุป โอเมก้า-3 เข้มข้นถือเป็นหนึ่งในทางเลือกใหม่ในการลดความเจ็บปวดบริเวณข้อสะโพกในสุนัข โดยสังเกต ได้ชัดเจนจากค่าคะแนนความเจ็บปวดที่ลดลงอย่างต่อเนื่องจากเมื่อเริ่มต้นการศึกษา ส่งผลให้สุนัขที่ป่วยด้วย ภาวะข้อสะโพกเสื่อมมีคุณภาพชีวิตที่ดีขึ้น

คำสำคัญ: ข้อสะโพก สุนัข โอเมก้า-3 ข้อเสื่อม คะแนนความเจ็บปวด

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