Thermographic Evaluation for the Efficacy of Acupuncture on Induced Chronic Arthritis in the Dog

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ABSTRACT. This study was performed to evaluate the efficacy of acupuncture on induced chronic arthritis of the dog by thermography. Complete Freund’s adjuvant was injected into the left knee joint of 8 dogs to induce arthritis. Acupuncture was applied to BL-40, GB-33, GB-34, and LIV-8 once a week for 4 consecutive weeks, from 3 weeks after induction of chronic arthritis, in treatment group. At 3 weeks of acupuncture treatment, skin temperature difference (\(\Delta T\)) of treatment group returned to normal range (< 0.3°C), while \(\Delta T\) remained high in non-treatment group. Infrared thermography (IRT) is useful to evaluate the treatment of acupuncture for induced canine chronic arthritis. Therefore, it is considered that clinical application of IRT in arthritis treatment would be also valuable.

KEY WORDS: acupuncture, canine, thermography.

Assessment of knee arthritis has largely been dominated by the subjective lameness score, synovial fluid analysis, and ground reaction force (GRF) in combination with the imaging study. In humans, computerized infrared thermography (IRT) was used to evaluate the efficacy of treatment of knee arthritis [5]. In horses, IRT has been applied for the diagnosis of lameness, back pain/intervertebral disk problem, muscle tears/strain, tendonitis, fractures, neuritis and peritonitis [9]. In dogs, infrared thermography has been experimentally introduced to detect the cardiac ischemia, coronary artery attenuation and intestinal infarction [1, 2, 4]. IRT was used for the determination of a dosage regimen of nimesulide, a cyclooxygenase 2 selective non steroidal anti-inflammatory drug in the dog [8].

This study was performed to evaluate the efficacy of acupuncture on induced chronic arthritis of the dog by thermography. Healthy eight mixed-breed dogs (4–5 kg and 2–5 years) were used regardless of sex. This study was conducted under the guidelines of the College of Veterinary Medicine, Seoul National University. To take thermograph, both stifle joint regions were clipped. Dogs were randomly assigned to two study groups (n=4/group); the non-treatment group and treatment group. Zero point three (0.3) ml Complete Freund’s adjuvant (F5881, Sigma Chemicals Co.) which is an oily suspension of killed Mycobacterium tuberculosis was administered into the left stifle joint. Acupuncture was applied to treatment group from 3 weeks of induction of arthritis. For the treatment group, stainless steel needles (32 gauge, 30 mm long, Haeng Lim Seo Won, Seoul, Korea) were inserted at each acupoint (BL-40, GB-33, GB-34, and LIV-8 as local points). The needles were periodically rotated clockwise or counterclockwise to stimulate for 20 min. Acupuncture was applied once a week for consecutive 4 weeks. Fifteen consecutive thermograms were obtained from each target. The study was carried out using Digital Infrared Imaging System (IRIS-5000, Medicore Co., Ltd., Seoul, Korea). The mean of these fifteen measurements was determined and used to calculate the differences between skin temperature of the left and right stifle [8].

Paired sample \(t\) test was used to compare the skin temperature of non-treatment group and that of treatment group. Before induction of arthritis, symmetrical and contouring pattern was observed in both groups. In non-treatment group, this consistency was lost with time red to purple segments of left stifle region had increased. In treatment group, the skin temperature of left stifle joint was higher than that of right at 2 and 3 weeks after acupuncture treatment, but returned to normal at 4 weeks. In both group, skin temperature difference (\(\Delta T\)) increased over 0.3°C with significance until 3 weeks. At 4 weeks after acupuncture treatment, \(\Delta T\) of treatment group returned to normal range (< 0.3°C), while \(\Delta T\) remained high in non-treatment group (P<0.05, Fig. 1).

In arthritic patients, IRT has been shown to be a reproducible, sensitive, quantifiable method for measuring disease activity, and not subject to circadian variation or interobserver error [3]. In this regard, Thomas \textit{et al.} have reported that an excellent correlation exists between IRT and magnetic resonance imaging (MRI, 94%), between IRT and computerized tomography (CT, 87%) and between IRT and myelography (94%) in patients with low back pain [7]. Furthermore, these investigators suggest that IRT is a more sensitive method than MRI, CT and myelography for detecting abnormalities caused by pain. There are numerous reports in the human medical literature on the benefits of acupuncture in musculoskeletal disorders. In the veterinary literature, there have been reports on the effects of acupunc-
ture on degenerative joint disease, hip dysplasia, immune-mediated arthritis, and intervertebral disk disease [6]. In the present study, there was constant symmetrical pattern like contour map before induction of arthritis. The lateral contours of the stifle joint were readily detected and the color was changed from red to yellow according to the skin temperature. Moreover, the medial portion had more red color. This consistency was observed in different dogs and different measurements in the same dog. After induction of arthritis, the color of left stifle joint changed red to purple, and losing more homogeneous symmetrical pattern like contour map while right knee joint showed no significant changes.

Before induction of arthritis, symmetrical and contouring patterns were observed. ΔT was not significant between the left and right knee joint of the dog. After induction of arthritis, ΔT between the left and the right stifle joint increased with time in non-treatment group (p<0.05). However, ΔT of acupuncture treatment group returned to normal range at 4 weeks (<0.3°C).

It is considered that infrared thermography would be useful to evaluate the treatment of acupuncture for canine induced chronic arthritis.

REFERENCES