PhD THESIS

Research on the therapeutic effects of acupuncture and electroacupuncture in clinical cases

(SUMMARY OF THE PhD THESIS)

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INTRODUCTION

Traditional Chinese Veterinary Medicine (TCVM) although a newer concept for Western Medicine is a medical technique practiced in China for treating animals for at least 3.000 years. This system has been in continuous development since prehistoric times when humans tried to understand the mechanism of action of different pathologies to date. Each generation contributed with valuable information that was passed on to their descendants. Although medicine has evolved an many of the therapeutic techniques have developed, TCVM has been adapted to the changes given by other cultures and also to modern technology.

Ancient Chinese techniques are combined with medical practice by using acupuncture needles that are sterile, one single use, filiform, hypodermic needles with or without syringes, electricity or even laser therapy to stimulate acupoints.

Today, the practice of TCVM in the Western World differs from the original Chinese one. On the one hand, most acupoints and Meridians used by Western veterinarians are transposed from humans. This has led to several questions regarding the location and the energetic significance since the humans are bipedal and the animals use their all four limbs to touch the ground. On the other hand, acupuncture has been used in China for animals that were important for agriculture, namely calves, pigs or horses. In the Western world, the emphasis is on treating pets, the most common species being dogs, cats or birds.

In order to learn TCVM, you need an overview of perspective. In general, Western medicine believes in control, while TCVM believes in balance. Western Medicine relies on mechanism, while TCVM relies on various energies given by the body. Western practitioners focus on disease-specific analysis of the organ or segment involved in the pathology and treat the symptomatology, while TCVM is based on treating the body as a whole and trying to restore overall balance.

Both medical systems rely on medical history and physical examination to be able to make a diagnosis. Each uses its own pathways, but in general, both systems have the same goal: healing the animal.

THE STRUCTURE AND CONTENT OF THE THESIS

The PhD thesis entitled "*Evaluation of analgesic and therapeutic effects of acupuncture and electroacupuncture in animals*" contains a total of X pages and is structured in two parts: The current state of knowledge and Personal contributions.

I. Literature review

The first part is divided into six chapters and extends over a number of 38 pages. The first chapter, *Current Principles in Traditional Chinese Veterinary Medicine,* contains introductory notions on the basic concepts of acupuncture as well as how to apply theories from Chinese medicine to classical or Western medicine. This chapter also discusses how patients are selected to achieve the maximum effect of this type of complementary medicine. The next chapter, *Electroacupuncture analgesia,* describes the main mechanisms known so far in animals and humans. Also, in this chapter is presented the mechanism and the receptors involved at the level of the spinal cord, but also in the Central Nervous System. The third chapter, *The influence of electroacupuncture in dogs with spinal cord injury,* highlights a study conducted by us on dogs with spinal cord diseases treated with electroacupuncture. This study is actually a review that was published in an international journal (ISI, IF). To understand how electroacupuncture works, the chapter *How to apply electroacupuncture,* reviews this concept and type of complementary therapy which is superior to manual acupuncture. The following chapter is entitled *Herbal and Food Therapy* and represents another type of therapy that is part of Traditional Chinese Medicine, and can in turn act as a single therapy or in combination with other therapies to get the most effective response. The last chapter, *Safety in acupuncture,* presents side effects that can be associated with acupuncture. Studies to date show that this reactions, in animals, are minimal.

II. Personal contribution

The second part of the thesis is divided into four distinct chapters that present the analgesic and therapeutic effects of acupuncture and electroacupuncture. This part extends over 80 pages, being presented the studies that took place in the period 2019-2021. The introduction illustrates the working hypothesis and the objectives of the research, while chapters 1-4 are presented the results of the research, each containing objectives, materials and methods, results and discussions, respectively the

conclusions. Chapter 5 contains the general conclusions and recommendations, and Chapter 6 presents the originality and innovative contributions of the thesis.

Chapter 1.

Currently, electroacupuncture is perceived as a distinctive procedure of traditional Chinese medicine that produces analgesic effects by regulating the nervous system and releasing peptide neurotransmitters, being far superior to manual acupuncture. Castration or orchidectomy is the ablation of the testicles. Incisions in the cat are made directly over the scrotum using the chielotomy procedure. In the studied literature we did not find references to the use of electroacupuncture with analgesic effect in cat orchidectomy. In this context, we aimed to evaluate the analgesic effect of acupuncture in this medical procedure, based mainly on observations in the literature on analgesics provided by acupuncture.

For this purpose, 10 cats of European breed, aged between 7 months and 1.5 years, weighing between 2 and 4 kg, were used. The choice of species as well as sex for this type of research was based on the fact that in veterinary practice it is a common surgery. The cats underwent a 12-hour preoperative diet and were divided into two groups, 3 control cats (NLA) and 7 electroacupuncture cats (EA). For cats in the EA group, a dose of Medetomidine (0.01mg / kg i.m) was used compared to the NLA group where Medetomidine (0.03mg / kg i.m) and Ketamine (2mg / kg i.m) were used. The dose of Medetomidine was 3 times lower in the EA group compared to the NLA group and 5 times lower than the minimum dose recommended by the manufacturer.

Physiological constants were monitored intraoperatively, and the Glasgow scale for acute pain in cats was analyzed postoperatively. The only variable stage, noticed during the surgery, was correlated with the incision and externalization of the first testicle. The overall clinical evaluation of the EA group was analyzed and classified into grades: Excellent, Good and Poor. In the case of cats in the EA group, the evaluation was Excellent at 6/7 cats.

Postoperatively, cats in the EA group recovered briefly (± 5 minutes: mean 5.33 minutes) for tubing, compared with those in the NLA group who needed a longer time for tubing (± 21 minutes, average 16.0 minutes).

In addition, the path of the Liver Meridian through the projection area of the sciatic nerve could give reactions on the hind limbs in all cats with EA.

Chapter 2.

The evaluation of the electroacupuncture effect on some paraclinical parameters in cats subjected to orchidectomy, is a topic of continuous debate in

veterinary medicine. To reveal the analgesic effect induced by electroacupuncture in cat orchidectomy, we studied the pain markers: glucose and cortisol, in blood, urine and saliva. Regarding to this we used the batch we mentioned in the previous Chapter. Cats were clinically evaluated for pain. Vital functions, heart rate, respiratory rate, temperature, end tidal carbon dioxide and peripheral saturation were monitored every 5 minutes with the Drager -Infinity Delta. Blood, saliva and urine samples were collected at four different times, using the same technique:

1. The pre-anesthetic time followed the collection of blood, saliva and urine samples immediately after the premedication with 10 μg/kg Medetomidine i.m, both groups, for the EA and for the NLA (40 μg/kg Medetomidină şi 1.5mg/kg Ketamină i.m).
2. The operative time followed the collection of blood, saliva and urine samples immediately after the application of the forceps on the second testicle.
3. Early postoperative time followed the collection of blood, saliva and urine samples 3 hours after surgery.
4. The late postoperative time followed the collection of blood samples, saliva and urine 24 hours after surgery.

The values obtained from the biochemical investigations were analyzed individually as well as in groups for each experimental group (NLA and EA). In this study, we compared the values of blood cortisol in the EA group with that in the NLA group and we compared the preoperative values of each individual in the group.

Increased blood cortisol was present in both groups with a peak during surgery, followed by a decrease to 3 hours postoperatively only in the EA group. As an anticipated response to awakening, the highest cortisol production occurs in the early hours of the morning, so urinary cortisol levels are higher. We took samples every morning, between 8:30-9:00, and higher values may be the result of overnight accumulation of urinary cortisol. The maximum value reached in the urine was 3 hours postoperatively (media 180.98 ng/ml, reference 10-240 ng/ml). Maximum urinary and salivary cortisol levels were close, with increases occurring postoperatively at 3 hours for both groups. This is surprising, as our expectations were higher for urinary cortisol. While a longer increase in salivary cortisol may be the result of the strong effect of the stress factor, the urinary response shows a long peak. The influence of anesthetics on the body is manifested by the increase and maintenance of high blood sugar even 3 hours after surgery. In both groups, increases were much increased intraoperatively, even though cortisol was significantly higher in the EA group compared to the NLA group. The fact that blood glucose and cortisol values in all 3 parameters taken into account (blood, saliva, urine) did not increase in direct proportion, demonstrates the positive effect of electroacupuncture on blood glucose growth without demonstrating an aggressive threshold for homeostasis.

Chapter 3.

Urinary incontinence can be difficult to treat and often leads to euthanasia or discontinuation of treatment, which makes the prognosis generally unfavorable. Studies described so far show that the most common causes in cats with urinary incontinence are spinal cord injuries. This pathology can lead to dysfunction of the lower motor neurons, characterized by reduced urinary retention. In the literature, we have identified studies in which electroacupuncture has been shown to be useful in the treatment of urinary incontinence in humans. Regarding cats, we did not identify studies conducted in this regard.

For the study *The influence of electroacupuncture in cats diagnosed with urinary incontinence*, the research was performed on 5 cats, European breed, 3 males, 2 females, aged 5 months-1.5 years (Figure 1). The choice of species for this type of study was based on the fact that, at least until now, not enough scientific data are known related to this subject, which gives the originality of the study itself. This study also shows the limitations of acupuncture and electroacupuncture, namely that their mechanism of action is largely based on the nervous system. Once the nerve connections are broken, the effects are diminished.

The acupoints used, as well as the electroacupuncture stimulation technique were established in this study according to the principles of Traditional Chinese Medicine. All cats benefited a standard protocol regarding the treatment of urinary incontinence, but, depending on the cat, as well as the other diagnoses given to it, the protocol was adapted to the situation.

All cats were diagnosed with urinary incontinence from a Western point of view, and from a Traditional Chinese point of view with Kidney Qi Deficiency. The Kidney Meridian has an important role in the storage of the Essence of Life (Essence), it controls both water and energy (Qi) in the whole body; it is responsible for the anterior orifices (urethra, vagina), but also for the posterior orifice (anus). When the Kidney Qi Meridian has a deficiency, the body can no longer retain urine or feces, which leads to urinary or fecal incontinence.

After the acupuncture sessions, urine samples were collected, randomly, to track the consequences that may occur in rapid urine tests. The basic parameters we followed were urinary pH, the presence of leukocytes, nitrites, red blood cells and proteins. We decided to follow these parameters in order to be able to diagnose early urinary tract infections that are frequently associated with urinary incontinence. No urinary tract infections were reported on the following treatments.

In conclusion, the electroacupuncture and phytotherapy used led to the improvement of clinical signs in cats with urinary incontinence by reducing the amount of urine leakage, changing the smell and color of urine, but also by fighting

infection in cats with fractured spinal cord. In contrast, cases with the total spinal cord treatment protocol used were not considered significant.

Chapter 4.

Acupuncture has a beneficial effect on the treatment of many painful diseases and conditions, so it proves to be useful as a complementary therapy or sometimes even to replace the generally accepted pharmacological treatments. In recent years, an increasing number of patients, especially those with chronic pathologies, resort to this type of complementary treatment. As a result, further studies are being conducted to better establish and understand the mechanism of acupuncture. In this context, the chapter *entitled Evaluation of the therapeutic effect of complementary procedures in animals with different pathologies* aimed to address acupuncture and electroacupuncture in various pathologies in animals, where established therapies have not yielded results. At the same time, in our country, the literature is poor in terms of the application of complementary medicine to animals.

The biological material was represented by 16 cases, of which 12 dogs, 2 cats and 2 horses. The case study intended for the treatments was a personal choice as well as on the recommendation of other doctors for specialized treatment. The treatments were performed within the Discipline of Surgery and ATI, Department of Physiotherapy and Veterinary Medical Recovery, at the Faculty of Medicine in Cluj-Napoca, during 2021.

For each patient, the following steps were applied:

1. Taking an anamnesis as informed as possible about the patient, informing the owner as well as obtaining his consent;
2. Physical examination of the patient, both from the point of view of classical medicine and from the point of view of TCVM;
3. Establishing the diagnosis and treatment plan;
4. Performing traditional Chinese treatment.

The effects of acupuncture were different depending on the patient, but also on the pathology he suffers from. After treatment, the animal should be allowed to rest as long as possible so that its body can get the maximum benefit from the treatment. Animals may have various reactions, positive or negative, 24-48 hours after treatment, and after this time may not show any immediate change, or on the contrary become hyperactive. These phenomena can be due to sudden changes in energy flows that take place in their body. None of these results are a cause for alarm. To help us with further

treatments, we asked the owners to note any changes in the animal's attitude, gait, alertness, appetite, but also defecation and urination. All these aspects direct the acupuncturist in the right direction for future treatments. Depending on the patient, there are reactions that occur during treatment, some animals may have positive

reactions along with positive effects, as there are patients with positive reactions, but with less obvious effects, or not at all.

Regarding our study, electroacupuncture proved to be more effective compared to acupuncture, through the shorter treatment time, but also through the long-lasting effects. At the same time, the use of phytotherapy procedures potentiated the effects of acupuncture and electroacupuncture and did not induce significant side effects.

The favorable effects of EA and Ac in the treatment of animal diseases we believe are due to analgesia and stimulation of energy circulating throughout the body.

GENERAL CONCLUSIONS OF THESIS

The general conclusions that emerge from the studies can be systematized as follows:

1. Our original electroacupuncture analgesia protocol has been shown to be excellent in cat orchidectomy.
2. Regarding cat orchidectomy, the EA group had a faster recovery with minimal effects due to the use of a five times lower dose of Medetomidine than the lowest recommended dose by the manufacturer.
3. Three hours postoperative analgesia was good according to the Glasgow scale in the case of the EA group compared to the NLA group.
4. The results after evaluation of cortisol and blood glucose in our study showed that electroacupuncture has a higher analgesic effect and a longer duration than neuroleptanalgesia.
5. The path of the Liver Meridian through the projection area of the sciatic nerve could give reactions on hind limbs in all cats in the EA group.
6. The electroacupuncture protocol proposed by us may be a basic plan choice of acupuncture for cats diagnosed with urinary incontinence.
7. Electroacupuncture and phytotherapy have led to improved clinical signs in cats with urinary incontinence.
8. In cases where the spinal cord was sectioned completely, the results were not considered significant; this might be a limit of acupuncture.
9. Electroacupuncture and acupuncture are complementary therapy procedures accessible in the treatment of animal diseases.
10. The use of phytotherapy procedures have potentiated the effects of acupuncture and electroacupuncture.
11. The use of these complementary treatments did not induce significant adverse reactions.

RECOMMENDATIONS

1. The results obtained during the performed studies recommend the use of a maximum of 10-15 acupuncture points for a surgical intervention, and their distribution must be at local, paraincisional, but also distal level;
2. Intraoperatively it is important to determine accurately the frequency and intensity that we set at the electroacupuncture device in order to obtain a maximum analgesic effect. Otherwise, side effects may occur;
3. The results obtained during the studies allow the recommendation of the use of electroacupuncture as a method of analgesia in cats but also of therapy of some diseases in animals.