



## CLINICAL CASE REPORT



# Paraclinical Investigations of Electroacupuncture Analgesia in a Rabbit Ovariohysterectomy

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glycemia;  
ovariohysterectomy

### Abstract

The aim of this study is to investigate paraclinical changes in glycemia, serum cortisol, and adrenocorticotrophic hormone (ACTH) due to electroacupuncture analgesia (EAA) in a rabbit undergoing an ovariohysterectomy. Seven clinically healthy New Zealand white rabbits were used in this study. Local and systemic analgesia was represented by EAA. Blood samples were collected at preoperative, operative, and postoperative times. At the operative time, increased cortisolemia does not promote a proportional increase in glycemia even though it is correlated with an increased level of ACTH. EAA follows the stress mechanism, which is coordinated by neuroendocrine activity. EAA in a rabbit ovariohysterectomy underscores the crucial involvement of the hypothalamus–pituitary–adrenal axis with a direct influence on paraclinical changes, including changes in glycemia, cortisol, and ACTH, which are specific for stress changes.

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## 1. Introduction

In acupuncture, modern theory explains neurohormonal modulation with the central nervous systems (CNSs) involvement in pain sensation whereas the hormonal system is activated or suppressed by the presence of substances involved in pain. The hypothalamic–pituitary–adrenal axis plays a critical role in neuroendocrine modulation [1]. Local and general effects of acupuncture are the consequence of stimulation or inhibition of endogen substances released by the glands and tissues, which gives the body the ability to correct the imbalance and to speed up homeostasis. The purpose of this study is to evaluate paraclinical trends of glycemia, cortisol, and adrenocorticotropic hormone (ACTH) recorded for electroacupuncture analgesia (EAA) in a rabbit ovariectomy.

## 2. Materials and methods

The study was performed according to the guidelines on the use of living animals in scientific investigations. All experiments were approved by the Ethical Committee of the Faculty of Veterinary Medicine, Cluj-Napoca, Romania (No. 10473/24.07.2012). The experiments were conducted using seven female New Zealand white rabbits aged between 10 months and 1.8 years Micro-farm rabbits, Mr. Petru Pestean, Cluj-Napoca, Romania and weighing between 1.3 kg and 2.8 kg.

A specially-designed device, Acupar was proposed to restrain the rabbits undergoing EAA. The electroacupuncture devices used were models WQ-IOD 1 (Beijing Haidian district Donghuan electronic instrument factory, Beijing, China) and KWD-808 1, Jinagsu, China. The acupuncture needles used were Ding Dragon 0:20 × 25 mm and Scarborough 0:30 × 75 mm needles, Tun Cun Wujiang J., China. The clinical functions, including HR (heart activity), R (respiratory activity) and  $t^{\circ}\text{C}$  (internal temperature) were recorded using a Drager Medical System, Inc. Telford, USA.

The important acupoints for this study were GV-16 (Tian Men), GB-20 (Feng Chi), BL-25 (Da Chang Shu), and ST-25 (Tian Shu) [2]. The location of the dorsal acupoints for the systemic analgesia were represented by acupoint N1 (N = neck area and 1 = acupoint No. 1) and acupoint B1 (B = back area and 1 = acupoint No. 1) [3].

The EA device, model KWD-808 1, was used to stimulate the dorsal muscles (2.2–2.7 V,  $f_1 = 80$  Hz,  $f_2 = 80$  Hz), and the model WQ-IOD 1 device was connected to the abdomen (low –8 V, E–E/3,  $f_1 = 20$  Hz,  $f_2 = 80$  Hz), where  $f_1 =$  fixed frequencies and  $f_2 =$  variable frequencies. The parameters of the electroacupuncture analgesia, including the stimulation time, were recorded for each rabbit: “induction” (preoperative) = 20 minutes and “maintenance” (operative) = 22–35 minutes [3]. For the analgesic assessment of EAA, the following analgesic scale was proposed: excellent, good, and poor.

Blood samples were collected in three different sections: the first blood sample was collected prior to the beginning of EAA, which is defined as the preoperative time; the second blood sample was collected immediately after the second ovary had been removed, which is



**Figure 1** Blood sample collection from a rabbit under EAA at the operative (O) time. EAA = electroacupuncture analgesia.

defined as the operative time (Fig. 1); and the third blood sample was collected 1 hour after the operation, which is defined as the postoperative time. The first two blood samples were collected from the jugular vein, and the final sample was collected through an intracardiac puncture. During the procedure, 2.5–3 mL of blood was collected.

The laboratory tests were completed by using an electrochemiluminescence immunoassay technique (ECLIA) for cortisol (nmol/L) and an enzyme-linked immunosorbent assay chemiluminescence detection technique (ELISA) for ACTH (pg/mL). Glycemia (mmol/L) was determined during the blood collection by using a glucometer (One Touch Verio Pro, Life Scan Europe, Switzerland) with test strips.

## 3. Results

During the electrostimulation, abdominal muscles were under continuous fasciculation. The contractions of the neck muscles were more evident with a temporary character. Tachypnea was evident (80–135/minute) at the preoperative time, but a slight decrease was noted at the postoperative time. Heart activity was characterized by a decrease (85–125 beats/minute) in the induction time at the preoperative time, but the heart activity was improved at the operative and the postoperative times. During induction, the body temperature increased by 0.3–0.8°C, followed by a sharp loss of temperature during the operation due to the laparotomy. Postoperatively, the body temperature was gradually restored in 20–30 minutes. Local electroanalgesia at the incision site was classified as excellent (7/7, 100%). The clinical findings of electroacupuncture analgesia were analyzed and classified according to grade as follows: excellent: 2/7 ( $p = 0.28$ , 28%) and good: 5/7 ( $p = 0.71$ , 72%).

For each biologic parameter, including glycemia, cortisol, and ACTH, the arithmetic mean of the group was calculated (Table 1). Glycemia was increased by 0.69 at the operative time and by 1.20 at the postoperative time. Cortisolemia was increased by 2.63 at the operative time and by 1.64 at the postoperative time. ACTH was increased by 1.90 at the operative time and by 0.027 at the postoperative time.

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