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Short communication

General intravenous anesthesia for brachial plexus surgery in the rabbit

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Abstract

The rabbit is a good experimental model for brachial plexus surgery. The risks of death during anesthesia were significantly greater in rabbits than cats or dogs. This article presents the protocol of injectable anesthesia for a short surgical procedure, safe for the rabbit patient and convenient for the surgeon.

Key words: brachial plexus, rabbit, injectable anesthetics

Introduction

The rabbit is the most commonly used species for experimental model (Hedenqvist et al. 2013). The anatomic structure of the rabbit's brachial plexus provides good conditions for experimental study of nerve injury. Anesthesia in this species is associated with high mortality and is a challenge for the anesthesiologist (Brodbelt 2009). Proper use of anesthetics and analgesics in research animals is an ethical and scientific imperative. Good anesthesia on the one hand should ensure the patient's comfort; on the other hand, the surgeon should perform the operation efficiently. Anesthesia should cover the 30 minutes surgery time and provide adequate muscle relaxation.

Materials and Methods

The experiments were approved by the II Local Ethics Committee for animals at the University of Life Sciences in Wroclaw, permission 54/2012. 30 New Zealand White rabbits (22 females, 8 males) were anesthetized, 22 weeks old, average weight 3.6 kg. Premedication was performed with medethomidine (Cepetor) at a dose of 150 μg/kg of body weight and butorphanol (Torbugesic) at a dose of 0.2 mg/ kg of body weight and ketamine (Bioketan) at a dose of 35 mg/kg body weight. All medicaments were mixed in one syringe and administered intramuscularly in the thigh muscles. Upon reaching a state of sedation a cannula was placed in the marginal ear vein. A size

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Table 1. Vital parameters monitored during surgical procedure.

Average weight [kg]	Average body temperature [°C]	Average Heart rate/min	Average $SpO_{2[\%]}$	Average time of surgery [min]
3.59	38.06	167.8667	92.2	25.66667

24G vein cannula was used. General anesthesia was performed using propofol and was administered continuously at ain dose of 0.1/mg/kg/min. The total dose of propofol depended on weight and time of anesthesia. During anesthesia the vital parameters (Table 1) was monitored. Heart rate was evaluated via auscultation and electrocardiogram monitoring. Body temperature was measured per rectum. A pulse oximeter was placed on the tongue. The pedal withdrawal reflex was used to assess the depth of anesthesia. During operation the analgesic effect was supported using fentanyl at a dose of 2-3 µg/kg. After the procedure buprenorphine (Vetergesic) at a dose of 20 µg/kg every eight hours was administered. The animals received meloxicam (Metacam) at a dose 0.2 mg/kg body weight for two days after surgery. The animals were operated in the lateral position. The mean time of the surgery was 26 min.

Results and Discussion

There were no complications during surgery and in the postoperative period. Based on parameters such as heart rate, breathing, body temperature, blood oxygen saturation level and the pedal withdrawal reflex the depth of anesthesia and analgesia was monitored. In two cases blood oxygen saturation dropped to 85%, and these patients received oxygen supplementation. Loss of pedal withdrawal reflex indicated the desired level of anesthesia (Longley 2008). Anesthesia and pain can have adverse effects on a rabbit's gastrointestinal motility. Therefore, it is important to monitor feeding and fecal output (Wenger 2012). Appetite and fecal output returned to normal about one hour after regaining consciousness. The animals were not starved before anesthesia. In this way, acid base equilibrium was maintained and hypoglycemia was avoided (Bonath et al. 1982). The animals were sedated before general anesthesia. The sedation procedure protects patients against panic behavior related to the release of catecholamine. The α2-adrenergic agonist (medetomidine) was given to calm the patient and for muscle relaxation (Raekallio et al. 2012). Medetomidine has side effects such as hypoglycemia and cardiovascular and pulmonary depression (Greene 1999). At the same time ketamine was administered. As a result of the synergistic effect of ketamine and medetomidine an analgesic effect was obtained (Siller-Matula et Jilma 2008). The medetomidine antagonized the cataleptic effect of ketamine. In order to obtain an adequate level of analgesia butorphanol kappa receptor opioid agonist was administered (Schroeder et Smith 2011). Inhalation anesthesia was not used due to the risk of complication during intubation. Rabbits are difficult to intubate because of the anatomical structure of the oral cavity. The oral cavity is long and narrow, which limits direct visualization of the larynx. Intubation is associated with a high risk of damage to the larynx. In addition, there is an increased risk of respiratory infection with Pasteurella pneumotropica (Hedenqvist et al. 2013). Inhalation anesthesia in rodents is associated with their uneven breathing. Apnea may occur and then compensative tachypnea. This situation may lead too a high concentration of anesthetic gases and death. Injectable anesthetic protocol is the preferred method for the rabbit (Wenger 2012). Based on our observations this protocol is sufficient for 30 min of surgical procedure without disturbing the homeostasis and maintaining the patient's welfare.

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