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International Journal of Clinical Anesthesiology

Short Note

Use of Dexmedetomidine in Veterinary Practice

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Submitted: 30 June 2017

Accepted: 26 July 2017

Published: 27 July 2017

ISSN: 2333-6641

INTRODUCTION

A variety of alpha2 adrenoceptor agonists - xylazine, detomidine, romifidine, medetomidine (MED) and dexmedetomidine (DEX) - have been developed in veterinary medicine for sedative purpose. The tranquilizing and muscle relaxant effects of these substances differ primarily because of their *alpha-2: alpha-1* affinity on central nervous noradrenergic receptors (maximum for dexmedetomidine, minimum for xylazine) in a dose-dependent way in small and large animal. The analgesic and anxiolytic effects of alpha2 agonists is due to different mechanisms of action in the different animal species, and is not proportional to the tranquilizing effect. In general, the sedative and analgesic effects of alpha2 agonists are dose-dependent at low dosage; at high dosage, there is an upper limit on the degree of analgesia, while the sedation increase only in duration [1,2]. The adverse effects are also dose-dependent, especially the reduction in blood pressure and heart output [3]. In most animal species, dexmedetomidine (the active enantiomer of medetomidine) have replaced the other alpha2 agonists because the higher receptor selectivity making its effect more predictable. Moreover, its anesthetic and collateral effects may be completely antagonized with a specific antidote (atipamezole) [4,5]. The sedative DEX activity is two times potent than MED and with less side effects [6]. In the cat only, the muscular relaxation induced by MED seems deeper [7]. The dosages of DEX are one half the dosage for racemic MED, but the concentration of DEX [0.5 mg/ml] is half that of MED [1 mg/ml]; therefore, the dosage volumes are the same for both commercial products (*Dexdomitor* and *Domitor*).

DOG AND CAT

DEX and MED commercial products are labeled for use in dog and cat only. In ASA class I or II dogs and cats, the restraint dosage of MED causes side effects a little more serious than the equipotent dosage of DEX [8]. Then, from a clinical point of view, it is difficult to assess whether a dog or cat have been received sedation with MED or equivalent dose of DEX. In ASA III or IV, where the patient has severe systemic disturbances or systemic disease is life-threatening, the use of DEX is not recommended because its important adverse effects, especially on cardio circulatory and respiratory system [9-11]. For this reason and to minimize the overall adverse effects, administer low doses of DEX in conjunction with other agents (dissociatives, opioids, tramadol) as part of an anesthetic balanced regimen, it's a good choice normally used by vets in dog and cat as well as in other species [12,13]. DEX can also enhance the analgesic effects of other agents given epidurally in the dog. It acts in synergy with opioids and local anesthetics, improving the quality and duration of analgesia [14,15]. DEX is absorbed by epidural space, increasing the effects of other sedatives used to permit epidural injection.

USE OF DEXMEDETOMIDINE IN OTHER ANIMALS

DEX is labeled for using only in dog and cat, but due to its potency, the small volume necessary to produce sedation, the synergic effect with other anesthetic substances and the possibility to reverse completely sedative and collateral effects with a specific antidote, DEX is utilized widely by vets in other domestic and not domestic animal.

Horse

DEX is used in standing chemical restraint as a part of a balanced anesthesia or in Total Intravenous Anesthesia (TIVA) [16,17]. Standing chemical restraint becomes necessary when general recumbent anesthesia is hazardous for the horse (i.e. pregnancy or severe respiratory problem), or when the operator have to perform diagnostic or surgery procedures keeping the anatomic planes in a physiological position (i.e. abdominal endoscopy or laryngeal surgery, as shown in Figure 1 and Figure 2). The balanced anesthesia in standing chemical restraint is obtained with a combination of DEX and opioid. DEX is to prefer to the other alpha2 agonists because the high potency, especially on the opioid brain receptors. This results in a synergistic effect, leading to improved quality and duration of analgesia. TIVA is an effective method of providing *field anesthesia* and anesthesia for short procedures in the practice setting. TIVA is obtained with DEX in conjunction with many substances like dissociatives, opioids, propofol, guaifenesin or tramadol by intravenous route. Depending on the need, these anesthetics can be injected one at a time, mixed in the same syringe or in constant rate infusion. In this species DEX can also be used intraarticularly because alpha-2 agonists are also distributed on the terminal ends of primary afferent nociceptive fibers [18]. The combination of DEX and a local anesthetic (i.e. bupivacaine or mepivacaine) is then used to provide long term analgesia when given in the joint after arthroscopy or arthrotomy [19,20].

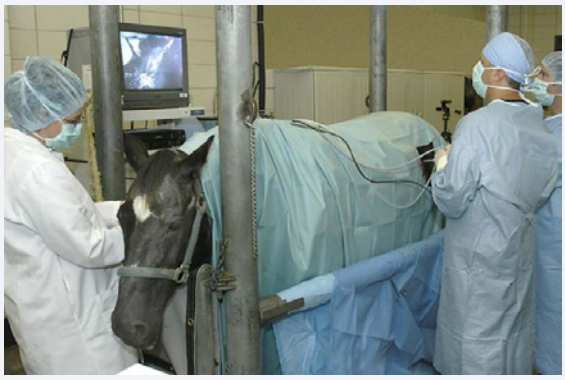

Figure 1 Standing chemical restraintin a horse submitted to laparoscopy.

Figure 2 Standing chemical restraintin a horse submitted to laryngoplasty.

Ruminant

Medetomidine, dexmedetomidine and detomidine induces severe collateral effects in adult cattle [21]. Therefore, the oldest alpha-2 agonists xylazine is preferred to produces sedation in these animals. In small ruminants (sheep, goat, alpaca, llama and calf) DEX is used in standing chemical restraint with tramadol or opioids as a part of balanced anesthesia [22-24]. In combination with intramuscular ketamine, DEX works very well in these animals to obtain short recumbent anesthesia. Prolonged recumbent anesthesia with TIVA or inhalants can be complicated and life threatening because of their unusual anatomy and physiology.

Swine

In domestic animals, swine is the most resistant to sedative drugs. DEX can be intramuscular administered in combination with a particular tranquilizer (azaperone) and dissociatives to produce deep sedation and smooth induction of inhalant anesthesia [25,26].

Non-Domestic Animal

The presence of alpha2 adrenoreceptor in the central nervous system is a constant in animal species. Therefore, administration of an alpha2 adrenoceptor agonists always gives a sedative effect in the majority of animal species. In small animal species (i.e. birds, rabbits, tortoises, snakes) DEX is right and proper because it is very powerful and need a small volume to give sedative effect [27-31]. The small volume it's also important because it's necessary to inject small quantity of liquid in the little muscles of these particular animals. MED and DEX can be mixed in the same syringe without chemical interaction with all the other drugs necessary to perform balanced anesthesia [32].

Small volume and efficacy is in fact a primary need when veterinarianshave to charge a small syringe to capture a wild or unapproachable animal with teleanesthesia. For example, mixing *Dexdomitor* 2,5 ml and *Ketavet 100* 2,5 ml can immobilize in few seconds a 100-kg deer using remote injection with a dart gun [33].

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Cite this article

Paolo S (2017) Use of Dexmedetomidine in Veterinary Practice. Int J Clin Anesthesiol 5(4): 1078.