

The Reverse Effects of Atipamezole on Medetomidine-tiletamine/zolazepam Combination Anesthesia in the Green Iguana (*Iguana iguana*)

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Abstract : This study was performed to investigate the reverse effects of atipamezole in green iguana anesthetized with intramuscular administration of medetomidine-tiletamine/zolazepam (Zoletil®). Heart rate, respiratory rate and body temperature were measured. Anesthetic depth was evaluated by righting reflex. In all study groups, heart rate and respiratory rate significantly decreased at 5 min after anesthetic administration, and gradually increased after atipamezole administration. The present study suggested that 500 µg/kg atipamezole was effective reversal dosage for 100 µg/kg medetomidine and 10 mg/kg tiletamine/zolazepam combination anesthesia in green iguanas.

Key words : medetomidine, tiletamine/zolazepam, atipamezole, green iguana.

Introduction

Although reptile has become the popular pets, its anesthesia didn't have general protocol (8). Some anesthetics have been used in lizard anesthesia (10). Gas anesthesia is good methods, but inhalation anesthetics have a long induction period (2,12). So, injective anesthesia is preferred to gas anesthesia in wild-life medicine. In addition, intramuscular administration is more common than intravenous or intraosseous administration. Medetomidine is an effective agent among α_2 -adrenergic receptor agonists, and it is completely reversed by atipamezole. It has been usually used with other anesthetic agents such as ketamine or tiletamine/zolazepam. In previous study (9), we found that 100 or 150 µg/kg medetomidine and 10 mg/kg tiletamine/zolazepam (Zoletil®) combination anesthesia was effective anesthetic methods in the green iguana. Atipamezole is a selective alpha-2 adrenergic antagonist. Cattet *et al* (3) reported that atipamezole was completely reversed the effects of the medetomidine-tiletamine/zolazepam (MZ) combination in the wild animal. However, there has not been reported its antagonistic effects on MZ combination anesthesia in green iguanas.

This study was performed to evaluate the reversal effects of atipamezole on MZ combination anesthesia in the green iguana (*Iguana iguana*).

Materials and Methods

Animals

Ten healthy green iguanas (420-490 g) were used in this

experiment. All iguanas were kept in indoor enclosures. Natural sunlight, heat lamp, ultraviolet lamp, various leafy greens and vegetables were provided to reduce environmental stress. Their body temperature was kept to ambient temperature (24°C) for at least 4 hour before the administration of medetomidine-tiletamine/zolazepam combination. They were not given any food for 12 hours before experiment. Only, water was supplied *ad libitum*.

Anesthesia and Experimental procedure

Anesthetic agents used in this study were medetomidine (Domitor®, Orion), tiletamine/zolazepam (Zoletil50®, Virbac) and atipamezole (Antisedan®, Orion). Experimental groups were divided into two groups; MZA100 group (medetomidine 100 µg/kg + tiletamine/zolazepam 10 mg/kg + atipamezole 500 µg/kg) and MZA150 group (medetomidine 150 µg/kg + tiletamine/zolazepam 10 mg/kg + atipamezole 750 µg/kg). Atipamezole was intramuscularly injected 40 minutes after anesthetic administration at the triceps muscle of the opposite limb where anesthetics administered. Atipamezole was administered in a 1:1 volume ratio with medetomidine. All agents were injected into forelimb because renal and portal system of reptiles. Heart rate was obtained by electrocardiogram at 5 min interval after injecting MZ combination. Respiratory rate was measured by expansion and contraction of the ribs. Body temperature was obtained using a rectal thermometer inserted into the cloaca. Induction time was defined as the interval from administration of anesthetics to loss of the righting reflex. Recovery time was the interval from administration of atipamezole to recovery of the righting reflex in MZA group. The righting reflex was assessed at five-minute intervals following administration of MZ combination for 70 min (2).

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Statistical analysis

One-way ANOVA was used to compare difference of induction, recovery period within treatment groups. Repeated ANOVA was used to compare difference of heart rate, respiratory rate, and body temperature within groups with time. Paired t-test was used to return normal range of heart rate, respiratory rate, and body temperature. A statistical significance at $p < 0.05$ was used in the analysis.

Results

In all groups, heart rate was significantly decreased compared with that of 0 minute and was not recovered to the baseline value in spite of atipamezole administration, ($p < 0.05$, Fig 1). Heart rates of MZA100 group were faster than those of MZA 150 group after atipamezole injection. Although respiratory rate gradually increased after atipamezole administration in both groups, it was not returned to the baseline value during experiment period (Fig 2). There was no statistically significant difference between the groups. In both groups, body temperature did not significantly changed even after the administration of atipamezole, and it did not differ to ambient temperature (Fig 3). Recovery period is time from atipamezole administration to the recovery of righting reflex. In MZA100 group (20.70 ± 4.03 min), it was significantly shorter than MZA150 group (31.30 ± 5.68 min) ($p < 0.05$). After atipamezole administration, time to regain normal neurological reflexes was markedly shorter in MZA100 group than MZA150 group.

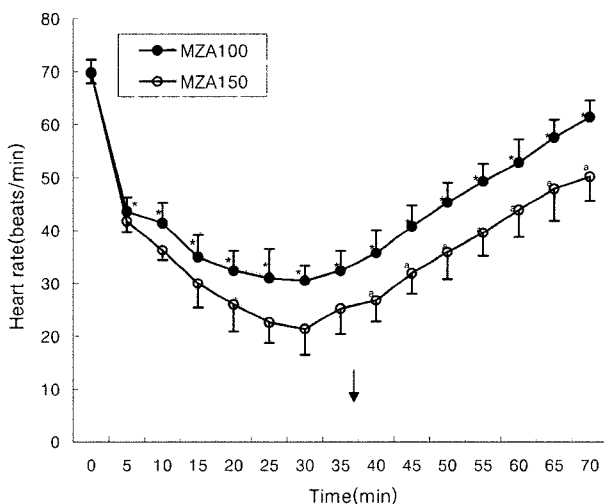


Fig 1. Changes of heart rate before and after atipamezole administration in iguanas anesthetized with medetomidine-tiletamine/zolazepam combination. ↓: atipamezole administration. MZA100: 100 mg/kg medetomidine + 10 mg/kg tiletamine/zolazepam + 500 µg/kg atipamezole. MZA150: 150 µg/kg medetomidine + 10 mg/kg tiletamine/zolazepam + 750 µg/kg atipamezole.

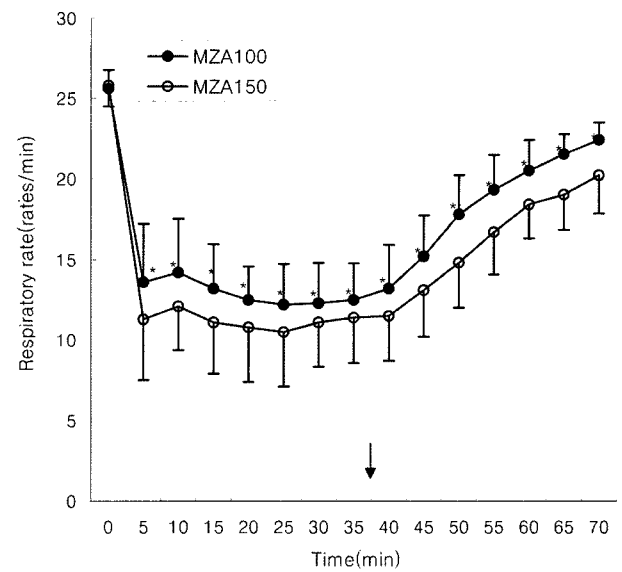


Fig 2. Changes of respiratory rate before and after atipamezole administration in iguanas anesthetized with medetomidine-tiletamine/zolazepam combination.

*: significantly different from the value in 0 minute.

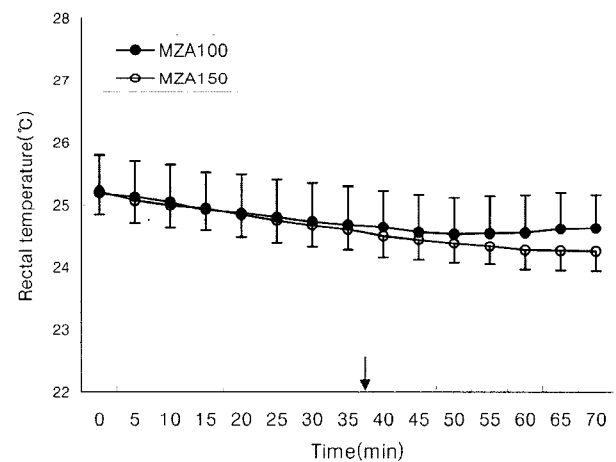


Fig 3. Changes of body temperature before and after atipamezole administration in iguanas anesthetized with medetomidine-tiletamine/zolazepam combination.

Discussion

Chemical restraint or general anesthesia is required to diagnose green iguanas. Generally, injective anesthetic agents were used to sedate or anesthetize. Medetomidine has become increasingly popular for sedation and maintenance of anesthesia in wildlife medicine such as crocodile, lizard, tortoises and turtles (4,7,10,11). It has been usually combined with tiletamine/zolazepam for the anesthesia of wildlife animals (13). Atipamezole is effective antidote of alpha 2 adrenergic agonist. Medetomidine was antagonized by atipamezole in

tortoises and crocodiles (4-7). In this study, heart rate significantly decreased at 5 min after administration of MZ combination and dependently according to the dose of medetomidine in all groups. Heart rate was significantly decreased to be compared with that of 0 minute was not recovered to the baseline value in spite of atipamezole administration ($p < 0.05$, Fig 1). MZA100 group had the trend of the faster increase of heart rate than MZA150 group after atipamezole injection. The body temperature can vary markedly according to ambient temperature because reptiles are poikilothermal animals. In this study, body temperature gradually decreased regardless of the administration of drugs. Iguanas lack a diaphragm and move tidal volume by expansion and contraction of the ribs in iguanid (1,12). Respiratory rate was measured by observing the rib movements in this study. The respiratory rate significantly decreased at 5 min after MZ combination administration in all study groups. Although it gradually increased after atipamezole administration, respiratory rate was not recovered to that of alert status at 70 min during experiment period. There was no statistically significant difference between the groups. Recovery period were defined by righting reflex. All iguanas were maintained in sternal recumbency during induction of anesthesia (2). Time to recovery of righting reflex was significantly shorter when iguanas were given atipamezole. Righting reflex was recovered rapidly after atipamezole administration in MZA100 group. However, the reflexes were not recovered rapidly in MZA150 group compared to MZA100 group.

Conclusion

The reversal effects of atipamezole on medetomidine-tiletamine/zolazepam (MZ) combination anesthesia in the green iguana (*Iguana iguana*) were evaluated. In all study groups, heart rate and respiratory rate were decreased dependently according to the dose of medetomidine 5 min after anesthetic administration. Although they gradually increased after atipamezole administration, they was not recovered to the level of alert status during experiment period. MZA100 group had the trend of the faster increase of heart rate than MZA150 group after atipamezole injection. After atipamezole administration, righting reflex was markedly shorter in MZA100 group than MZA150 group. In combination anesthesia with 100 $\mu\text{g}/\text{kg}$ of medetomidine and 10 mg/kg of tiletamine/zolazepam was effectively reversed with the single administration of 500 $\mu\text{g}/\text{kg}$ of atipamezole, however reversal effect of atipamezole was not sufficient to 150 $\mu\text{g}/\text{kg}$ of medetomidine and 10 mg/kg of tiletamine/zolazepam combination anesthesia. Thus, this study

suggests 500 $\mu\text{g}/\text{kg}$ atipamezole is effective reversal dosage for 100 $\mu\text{g}/\text{kg}$ medetomidine and 10 mg/kg tiletamine/zolazepam combination anesthesia in green iguanas.

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그린 이구아나에서 medetomidine - tiletamine/zolazepam의 병용 마취시 atipamezole의 길항작용

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요 약 : 그린 이구아나에서 medetomidine과 tiletamine/zolazepam의 병용마취시 atipamezole에 의한 길항효과를 알아보기 위하여 본 실험을 실시하였다. 심박동수, 호흡수 그리고 체온을 측정하였으며 righting reflex에 의하여 마취의 심도 및 회복을 평가하였다. 두군 모두에서 심박동수와 호흡수는 마취주사 5분 후에 유의성 있는 감소를 보였으며 ($p < 0.05$) atipamezole 주사 후에는 지속적으로 증가하는 양상을 보였다. 본 연구결과 atipamezole 500 $\mu\text{g}/\text{kg}$ 은 medetomidine 100 $\mu\text{g}/\text{kg}$ 과 tiletamine/zolazepam 10 mg/kg 의 병용마취를 실시한 그린 이구아나에서 효과적인 길항 용량이라고 생각된다.

주요어 : medetomidine, tiletamine/zolazepam, atipamezole, 그린 이구아나