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The Effects of Two Different Protocol of General Anesthesia on Clinical Body Health Status in Pigeons (A comparative Study)

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ABSTRACT

Twelve pigeons were used to compare anesthetic efficacy and clinical effects of medetomidine combined with ketamine (MK) to those of diazepam combined with ketamine (DK). The drugs were given intramuscularly and the anesthetic and physiological parameters were recorded along the experiment. The anesthetic parameters represent by onset of analgesia which appear in DK faster than MK group, time of anesthesia (Surgical time) and recovery time were showed longer time in MK group than DK group. The physiological parameters were represented by pulse rate, which showed increase at 10 minutes in MK group. However, at the end of experiment, it showed increase in DK group. SpO₂ parameter showed an increase at the first 20 minute in all groups, but then, it showed decrease at 30 minute in DK group. The cloacal temperature showed gradually decrease during the experiment period. This study showed that medetomidine and ketamine together may be suggested for a number of regular pigeon surgical procedures because it provides a longer operative duration than a combination of diazepam and ketamine. According to the study's results, In order to increase animal production by decreasing anesthetic morbidity and mortality, providing a careful and stress-free anesthetic regimen, it is highly recommended to use medications with low adverse responses and side effects.

Introduction

Pigeons are frequently employed in physiological and behavioral research projects. Anesthesia is necessary for any experimental or surgical technique; however, it makes birds uncomfortable or distressed. Nonetheless, there are fewer data on avian anesthetic that are now available. The use of

pigeons as laboratory animals has gained popular acceptance due to the recent rise in the number of the pigeon, where family kept as pets. Thus, it is critical to develop and reassess pigeon anesthetic techniques for a variety of uses. There are a number of known anesthetics and combinations in mammals, and standard techniques of anesthesia are always being examined. However, pigeons and non-ruminant

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animals do not undergo any assessment of standard methods of anesthesia. (Dobbs et al., 2021)

Pigeon anesthetics include xylazine, midazolam, and chloralose-ketamine; however, because of its analgesic and muscle relaxant properties, medetomidine, a highly selective alpha-2 adrenoreceptor agonist, is also used as a pre-anesthetic in conjunction with ketamine. Furthermore, studies on different animals have demonstrated that medetomidine also has calming and analgesic effects. Due of its long-lasting effects, diazepam is frequently utilized for tiny animals; nevertheless, ketamine is used in conjunction with it to alleviate the retractile reflex and provide enough muscle relaxation. However, the anesthetic effects of these medications have not been well documented in study too far. These anesthetics' side effects and problems are unclear, and the anesthetic techniques frequently used for pigeons vary depending on the specifics of each laboratory's experimental setup. Each anesthetic must be thoroughly inspected for a number of factors, including age, sex, the external environment, and the experimental technique, before the standard method of pigeon anesthesia is prepared (Khaleghiet al.2024).

The aim of our study was to evaluate efficacy and make a comparison between mixture Medetomidine-Ketamine and Diazepam-Ketamine anesthesia.

Materials and Methods

Ethical approval

This study focused on the administration of anesthesia and monitoring in avian, which were part of routine clinical cases within our facility. Although these animals were considered experimental subjects in the context of controlled anesthetic protocols, the procedures were integrated into established

clinical practice and did not constitute a dedicated research project requiring separate ethical committee approval beyond institutional animal welfare oversight. Consent was obtained from owners where applicable. No blood samples were collected, and no mortalities occurred during the study.

Experimental animals

Twelve pigeons (weighting 0.6 ± 0.3 kg) were used in this study. Each pair of these pigeons was placed in a cage in a Lab. room at the College of Veterinary Medicine- University of Basrah. Before the trial began, each bird was thoroughly inspected for any general health concerns. The animals were fed wheat and provided access to potable water (Alrafas et al., 2023; Mohsin et al., 2025).

Study protocol

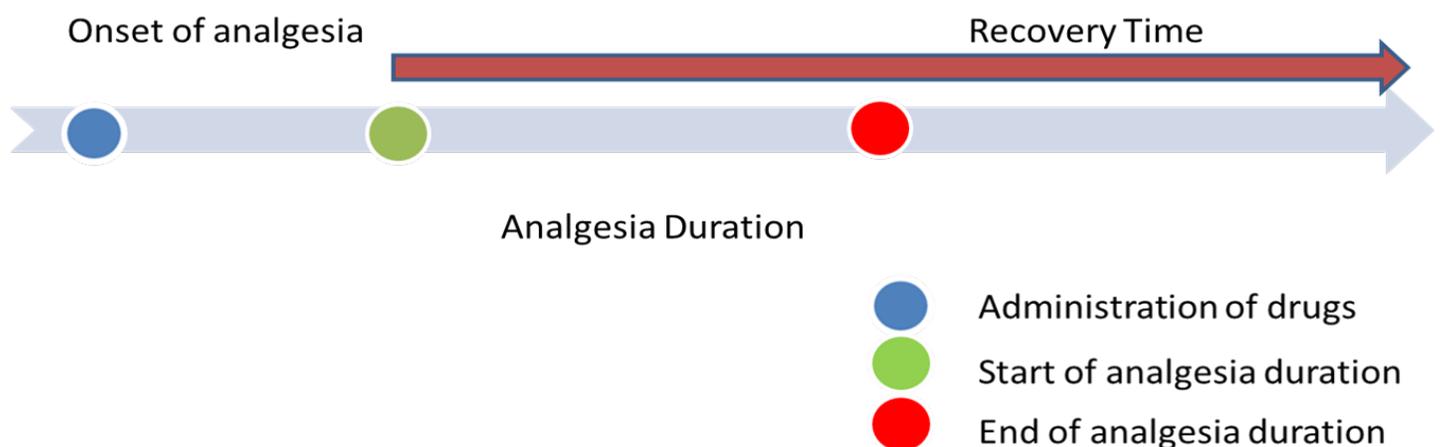
The 12 pigeons were used to compare anesthetic efficacy and clinical effects of medetomidine combined with ketamine to those of diazepam with ketamine.

Medetomidine at dose 0.5 mg/kg (Tomidin ° Provet; 1mg/ml) with ketamine at dose 0.5 mg/kg (Ketamine Fresenius °, Fresenius Kabi, Austria; 50 mg/ml) was administered to the MK group (n = 6),

Diazepam at dose 0.5 mg (Roche products Ltd in Welywn Garden City, U.K.) combined with ketamine (0.5 mg) was administered to the DK group (n = 6).

Analgesia Parameters

After administration of the anesthetic drugs by chest muscle injection, the anesthetic period was measure in all different time points which is start with onset of analgesia followed by analgesia duration and ended with recovery time (Abduljaleel., 2024)(figure-1).



(Figure-1): Analgesia time

The onset of anesthesia measured the time from injection to the absent of reflex, but analgesia duration measured the time from loss of reflex to again the appearance of the reflex, the recovery time which time has been measure until the end of experiment.

Physiological parameters

Heart rate, SPO2 (saturated oxygen pressure), and cloacal temperature were measured by using a Medical Monitor (Infinium Medical USA) (figure2) at different times which taken at (0, 10, 20, 30, 40, 50, 60) minute after administration of drugs (Albozachri et al., 2012).



(Figure-2): Medical Monitor

Results and Discussion

The present study was aim to investigate the effectiveness

of anesthetic technique administration of medetomidine and ketamine in pigeons and compared it with the use of diazepam followed by ketamine.

Anesthetic Efficacy and Duration

Numerous studies have tried to provide different pharmacological strategies for pet pigeon sedation and complete anesthesia. Pigeons most frequently get the benzodiazepines diazepam and midazolam, as well as the alpha-2 agonist drugs medetomidine and xylazine. There have also been effective uses of xylazine and ketamine together. In commercial pigeon homes, medetomidine and other alpha-2 agonists are commonly given to calm the birds from the time they are one week old until the final day before they are sold. The term “calm” is therefore very important (Jassim et al., 2023; Ludders and Guzman., 2024; Jasim et al., 2025).

After anesthesia injection, the onset of anesthesia was significantly faster in the diazepam-k group (1.49 ± 0.1 min.) than in the medetomidine-k group (3.7 ± 0.21 min), as determined by loss of the startle reflex. The time to attainment of surgical anesthesia in the diazepam-k group (47.33 ± 1.47 min) was significantly shorter than in the medetomidine-k group (84.33 ± 1.64 min). The recovery time in the diazepam-k group (86.33 ± 2.01 min.) was significantly shorter than in the medetomidine-k group (181.33 ± 1.83 min) (Figure-3). Parameters such as quality of induction, and muscle tone during anesthesia were not significantly different between the groups. The quality of recovery was smoother in the medetomidine-k group compared to the diazepam-k group. No mortalities were reported in either group. Both medetomidine and diazepam combined with ketamine worked as effective anesthetic combinations for pigeons.

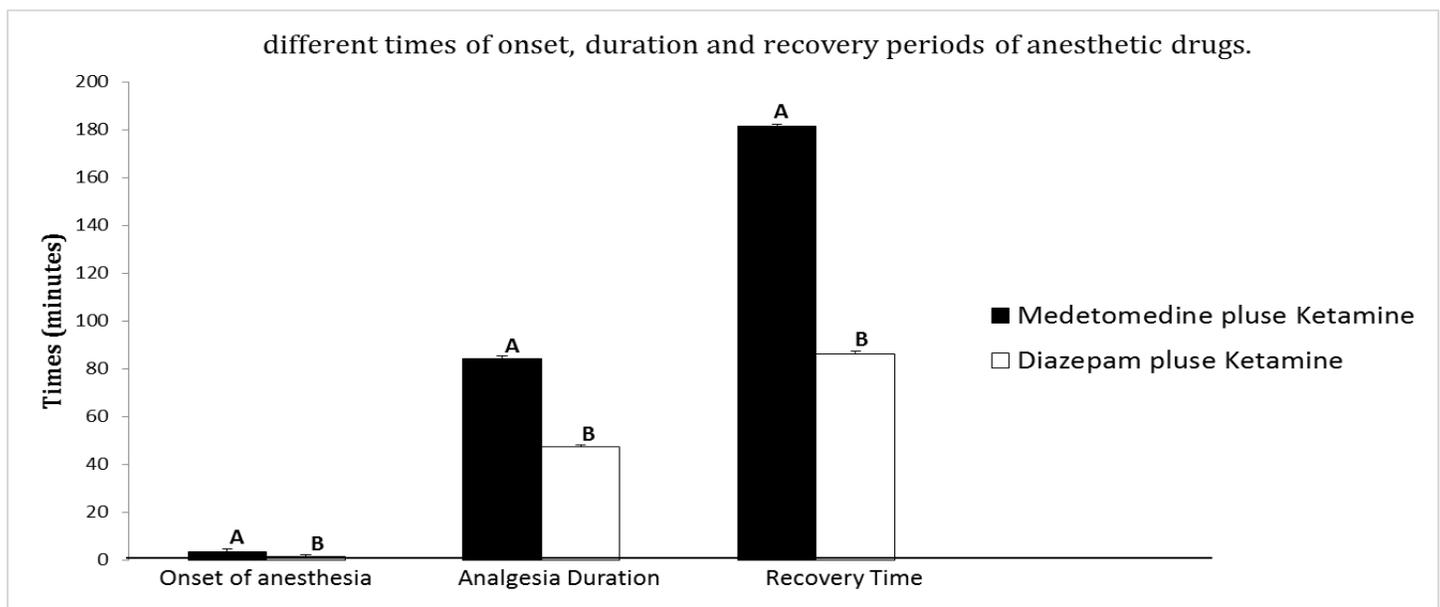


Figure (3): Anesthetic Duration

Cardiovascular and Respiratory Effects

Pigeon anesthesia has been the subject of relatively few. In addition to a mixing of midazolam and ketamine for pigeons undergoing surgery or intestinal endoscopy, isoflurane has also been used to place the birds under anesthesia. Under the category of field anesthesia, pigeon anesthesia has been carried out using either metomidine or tramadol. Findings indicate that a righting reflex or an end-tidal isoflurane of >2.5 MAC are indicators of a sufficient depth of anesthesia. The effects of discovering anesthesia in pigeons and the clinical variations of the most widely used opioids are still poorly understood. (Uzuret al., 2003; Botman et al., 2016)

The results of the vital signs for medetomidine-k group were better than diazepam-K group. Additionally, cyanosis, heart arrhythmias, severe bradycardia, and excessive movements during anesthesia recovery were among the problems that could be seen with diazepam-ketamine.

Given that birds may struggle to cope with low oxygen saturation and hypercapnia as a result of excessive stomach movements, the findings should stimulate more research on anesthetic monitoring, particularly in extended procedures.

The pulse rate appear significant increase in MK at 10 minute than DK, however, it significantly increased in DK at 60 minute than MK (Figure-4) due to Increases in heart rate, mean aortic pressure, pulmonary arterial pressure, central venous pressure, and cardiac output are all signs that the ketamine is stimulating the cardiovascular system (Igado et al., 2023). Ketamine is a dissociative substance that stimulates the central nervous system, which raises heart rate (Ragab et al., 2022).

Sp O₂ showed increase at first 20 minute at two groups.

The animal's fear and excitement during an intramuscular medication injection may be the cause, and the excitement phases may be the reason why the rise becomes more noticeable 10 minutes after the injection.

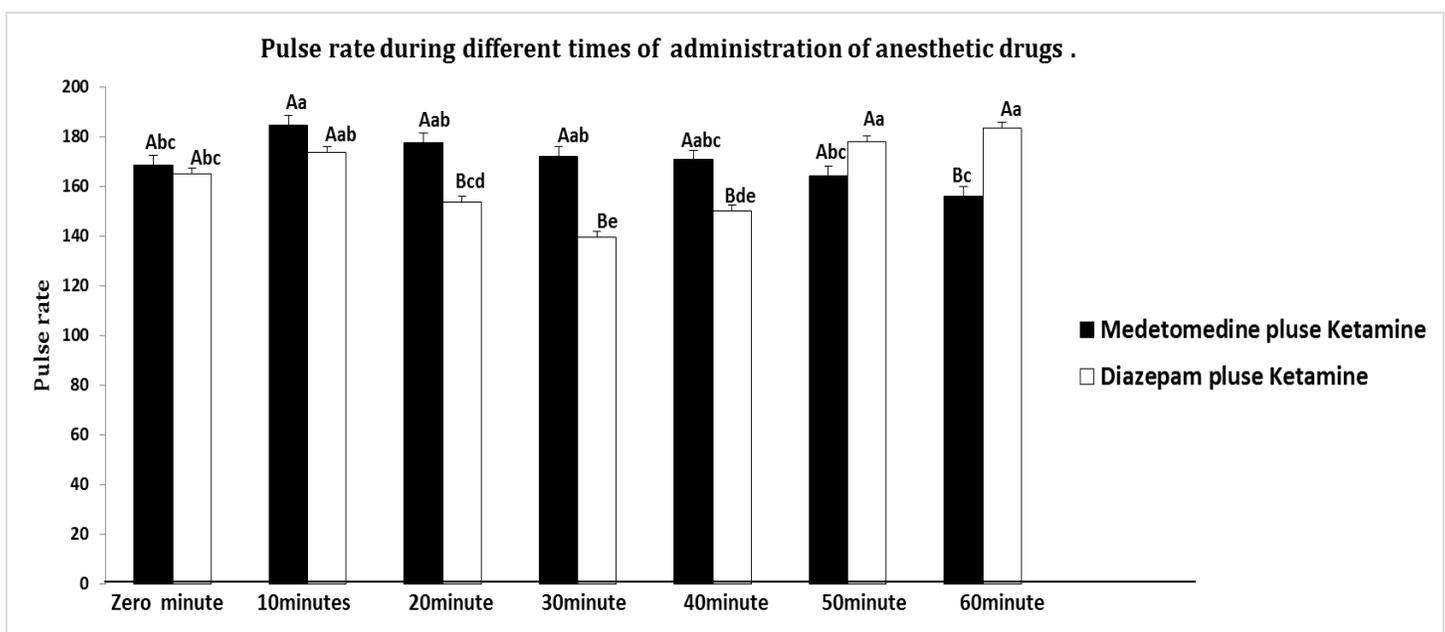
Sp O₂ appeared significantly decreased in Dk group at 30 minute than MK group (Figure-5) due to the decreasing in respiratory rate (Ragab et al., 2022).

Because medetomidine causes the muscles of the larynx and nares to relax and the head to drop, it also causes a decrease in respiratory rate and oxygen consumption (Samimi, 2020). Though α_2 -adrenergic agonists can bronchodilate, their efficacy in raising Sp O₂ rate decreased when CNS activity decreased or because animals under anesthetic regimen needed a lesser oxygen supply (Igado et al., 2023).

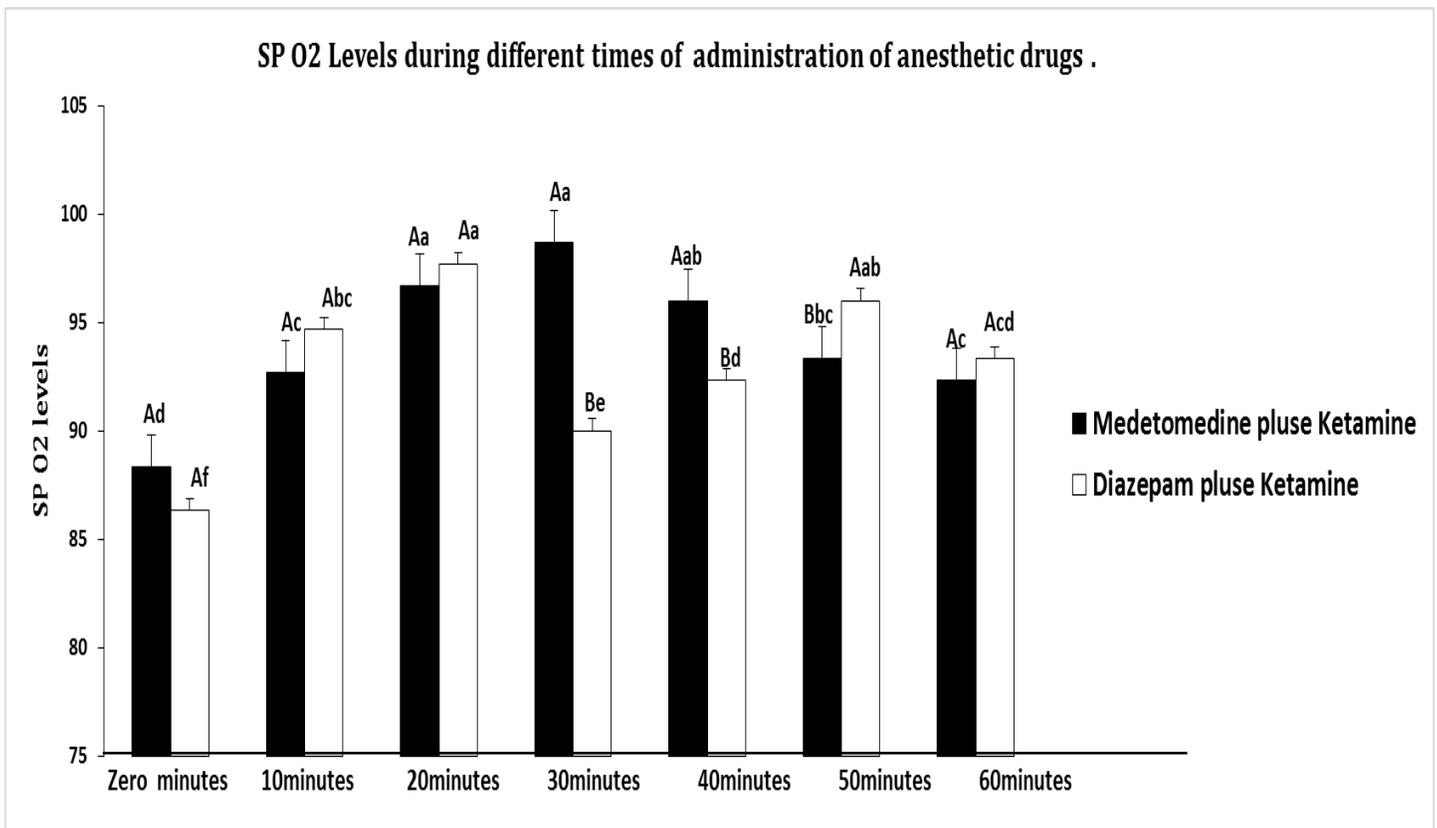
Cloacal Temperature

During the observation time after these drugs were injected, the body temperature slightly decreased in all groups. Demonstrate a significant decrease between groups at the $P < 0.05$ level (Figure 6). The observed effects during the post-anesthesia period may be attributed to vasodilation, a decline in skeletal muscle tone, a decrease in metabolic rate, and a depression of thermoregulatory centers (Ludders and Guzman-2024).

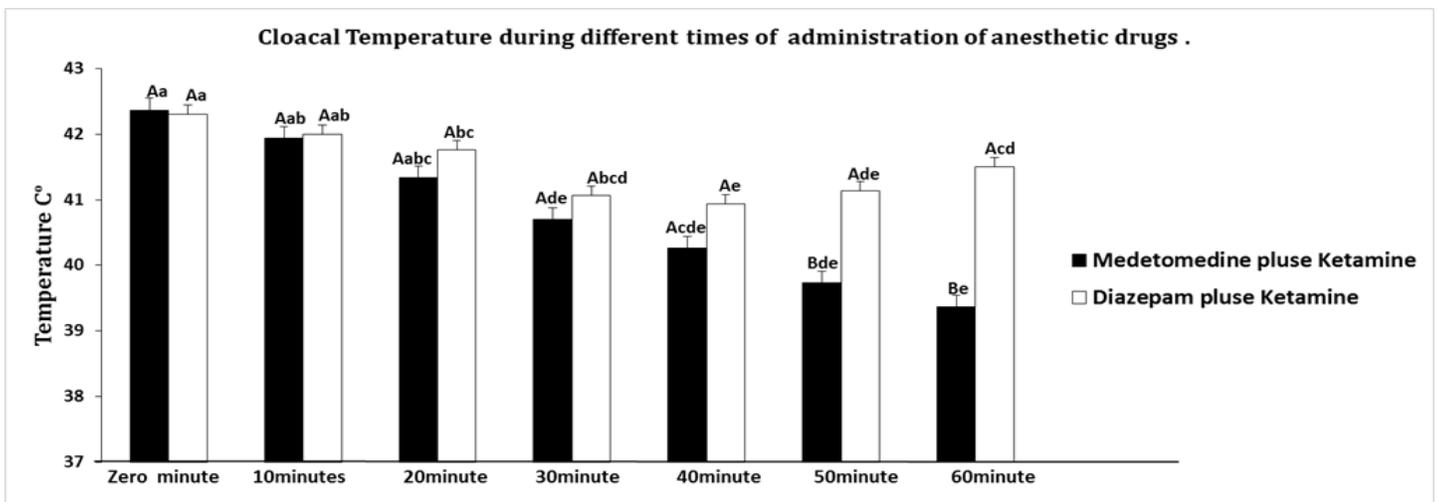
Ketamine and other dissociative anesthetics which cause hypothermia by releasing monoamines responsible for centrally mediated hypothermia by inhibiting endogenous release of norepinephrine (Atalan et al., 2019 and Ragab et al., 2022). In DK group at 50 minute showed increase temperature due to start recovery of pigeons.



(Figure-4) Pulse rate



(Figure-5): Sp O₂



(Figure - 6): Cloacal Temperature

Conclusion

The medetomidine and ketamine together may be suggested for a number of regular pigeon surgical procedures because it provides a longer operative duration than a combination of diazepam and ketamine. This research could help reduce the negative effects and enhance pigeon anesthetic success and welfare. According to the study's results, In order to increase animal production by decreasing anesthetic morbidity and

mortality, providing a careful and stress-free anesthetic regimen, it is highly recommended to use medications with low adverse responses and side effects.

Acknowledgement

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Novelty Statement

The novelty of our work entitled (A comparative Study of Two Different Protocol of General Anesthesia in Pigeons) despite of many cases that require surgical intervention in Pigeons; the problems of general anesthesia are numerous and remain a challenge in veterinary medicine. A few researchers highlight on general anesthesia in Pigeons.

Author Contributions

All authorsequally contributed to this work.All authorsread and approved of the final manuscript.

Conflict of Interest

The authors declare no conflict of interest.

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