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A comparative analysis of the effects of Medetomidine and Dexmedetomidine on hemodynamic parameters in cats Technical note

Un análisis comparativo de los efectos de la Medetomidina y la Dexmedetomidina sobre los parámetros hemodinámicos en gatos Nota técnica

Eylem Bektaş Bilgiç

Istanbul University-Cerrahpasa, Faculty of Veterinary Medicine, Department of Surgery. Istanbul, Türkiye
**Correspondence author: eylem.bilgic@iuc.edu.tr*

ABSTRACT

Hemodynamic parameters are clinical indicators used in Human and Veterinary Medicine to assess the general health status of patients and identify potential risks. Alpha-2 adrenoceptor agonists, such as Medetomidine and Dexmedetomidine, are known to produce dose-dependent premedication ranging from mild to profound and have significant cardiovascular effects. This study aimed to evaluate the effects of these commonly used alpha-2 adrenoceptor agonists on hemodynamic parameters, particularly blood pressure. To achieve this, 100 cats aged between 6 months and 7 years old ere randomly divided into two groups. Hemodynamic parameters were analyzed both before and 5 minutes after premedication with either Medetomidine or Dexmedetomidine. Although there were significant changes in hemodynamic parameters before and after premedication within each group, no statistically significant differences were observed between the Medetomidine and Dexmedetomidine groups. In conclusion, the effects of equivalent doses of Medetomidine and Dexmedetomidine on hemodynamic parameters were found to be similar in cats.

Key words: Blood Pressure; Dexmedetomidine; Medetomidine; heart rate; hemodynamic parameters

RESUMEN

Los parámetros hemodinámicos son indicadores clínicos, utilizados en la Medicina Humana y Veterinaria para evaluar el estado general de salud de los pacientes e identificar posibles riesgos. Los agonistas de los adrenoreceptores alfa-2, como la Medetomidina y la Dexmedetomidina, son conocidos por producir una premedicación dependiente de la dosis que varía de leve a profunda y tienen efectos cardiovasculares significativos. Este estudio tuvo como objetivo evaluar los efectos de estos agonistas de los adrenoreceptores alfa-2 comúnmente utilizados en los parámetros hemodinámicos, especialmente la presión arterial. Para conseguirlo, se dividieron aleatoriamente en dos grupos 100 gatos de edades comprendidas entre 6 meses y 7 años. Se analizaron los parámetros hemodinámicos tanto antes como 5 minutos después de la premedicación con Medetomidina o Dexmedetomidina. Aunque hubo cambios significativos en los parámetros hemodinámicos antes y después de la premedicación dentro de cada grupo, no se observaron diferencias estadísticamente significativas entre los grupos estudiados. En conclusión, se encontró que los efectos de dosis equivalentes de Medetomidina y Dexmedetomidina sobre los parámetros hemodinámicos eran similares en los gatos.

Palabras clave: Presión arterial; Dexmedetomidina; Medetomidina; frecuencia cardíaca; parámetros hemodinámicos

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INTRODUCTION

Hemodynamic parameters are clinical indicators in both Human and Veterinary Medicine that provide information about a patient's general health status and potential risks. These parameters reflect blood flow in the vascular system, with heart rate and blood pressure being the primary hemodynamic measures [1].

Heart rate is a non-specific parameter that is typically measured by auscultation at rest, palpation of the heart's apex beat, or palpation over an artery [2]. Heart rate is a crucial determinant of cardiac output. Changes in heart rate are sensitive indicators of a patient's physical condition [3, 4].

Arterial blood pressure (ABP) is a vital monitoring tool used in anesthetized animals and in the emergency room to assess a patient's hemodynamic status [5, 6]. ABP can be measured indirectly or directly [4, 5, 6, 7]. ABP is measured indirectly with a sphygmomanometer [8]. Indirect ABP measurement methods are widely used because they are easy and noninvasive [9]. Direct arterial blood pressure measurement is the most accurate method and is therefore considered the gold standard of blood pressure measurement [6, 10, 11]. The need for experience, equipment and complications limit the indication for use in high-risk patients [11].

Alpha-2 adrenoceptor agonists produce mild to profound premedication depending on the dose. They have analgesic and muscle relaxant properties and are known for their significant cardiovascular effects, including second-degree heart block, bradycardia, and vasoconstriction. Dexmedetomidine is the dextro isomer of Medetomidine and is approximately twice as potent. Both Medetomidine and Dexmedetomidine cause more prolonged vasoconstriction and hypertension compared to Xylazine. This prolonged hypertension leads to a deeper reflex bradycardia than seen with other alpha-2 adrenoceptor agonists [10, 12, 13, 14, 15, 16].

This study comparatively evaluated the effects of medetomidine and dexmedetomidine on hemodynamic parameters, particularly blood pressure.

MATERIAL AND METHODS

This study involved a total of 100 male and female cats (*Felis catus*) between 6 months and 7 years old aged, brought to the Otorhinolaryngology Clinic of Istanbul University-Cerrahpasa Faculty of Veterinary Science, Department of Surgery, between 2018 and 2022. These cats were indicated for Ventral Bulla Ostectomy (VBO) based on the examinations performed.

Laboratory investigations and radiographic examinations (Ecoray Veterinary Digital X-ray System and Ecoray Ecoview System, Hasvet, Turkey) were conducted as part of routine anesthesia preparation. Hemogram (VH5R Veterinary Hematology Analyzer, Hasvet, Turkey) and preanesthetic biochemistry panels (FUJI DRI-CHEM NX700V Fully Automatic Veterinary Biochemistry Analyzer, Hasvet, Turkey) were reviewed for all patients. Right and left laterolateral and dorsoventral thoracic radiographs were obtained to evaluate the airway, pulmonary parenchyma, mediastinum, and pleural cavity before anesthesia. Patients with laboratory and radiological examination results considered normal were included in the study. Before taking the patient to the operating room, the owner was asked the following questions: When did the patient last eat? When did the patient last drink water? Has the patient undergone surgery before? Were there any complications related to anesthesia? Is the patient currently on any medication? Has the patient recently had any illnesses? Has the patient experienced vomiting, diarrhea, or loss of appetite in the past week? Is the patient in estrus? The responses were recorded. Animals with no food restriction, those with general health issues, and those in estrus had their surgeries canceled and were excluded from the study.

Patients with ASA degree I and II anesthesia risk, based on physical, laboratory, and radiological examinations, were included in the study. The 100 patients were randomly divided into two groups of 50 each. Each patient underwent a preanesthetic examination before anesthesia and medication administration. Palpation of the mandibular, lateral retropharyngeal, prescapular, and popliteal lymph nodes, as well as the thoracic and abdominal regions, was performed for each patient. Mucous membrane color, capillary refill time (CRT), and body temperature were assessed and recorded. Heart rate and respiratory rate were measured with a stethoscope (Littmann 5870 Classic III Stetoskop, 3M, Turkey). Systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and pulse rate were measured with an automatic digital sphygmomanometer (Pettrust, noninvasive blood pressure monitor, BioCARE, United Kingdom).

After the preanesthetic examination, preemptive subcutaneous administration of butorphanol (0.4 mg·kg^{-1}) (Butorphanol®, Richter Pharma AG, Austria) was performed using the same protocol in both groups. Ten minutes (min) after butorphanol administration, intravenous access was established via the cephalic vein or saphenous vein using a 22- or 24-gauge angiocath (Intraket, Bıcakcilar, Turkey). For premedication, the first group received Medetomidine HCl (40 µg·kg^{-1}) (Tomidin®, ALIVIRA) IV, while the second group received Dexmedetomidine HCl (20 µg·kg^{-1}) (Hipnodex®, Haver Farma, Turkey) IV. Following premedication, patients were immobilized and connected to a bedside monitor (Multiparameter Veterinary Monitor, GT9003E, MVM, Turkey).

At the fifth minute following premedication, mucous membrane color, CRT and body temperature, SBP, DBP, MAP and pulse rate were measured again and recorded (Pettrust, noninvasive blood pressure monitor, BioCARE, United Kingdom).

The data obtained in this study were analyzed with the licensed SPSS 27 package program. Frequency analysis, frequency (n) and percentage (%) values of the groups were calculated. Descriptive statistics such as arithmetic median (Med) and interquartile range (IQR) were also included in hypothesis testing. Shapiro Wilks test was used to search whether the variables were from a normal distribution due to the number of units. While interpreting the results, 0.05 was used as the significance level and it was stated that the variables did not come from a normal distribution if $P<0.05$. Mann Whitney U test, one of the 2 independent group comparison tests, was used for scale scores that were not suitable for normal distribution. Wilcoxon sign test was used to examine the difference between dependent continuous variables. In the interpretation of the results, 0.05 was used as the significance level and it was stated that there was a significant difference if $P<0.05$ and there was no significant difference if $P>0.05$.

RESULTS AND DISCUSSION

This study included 100 cats, with the youngest patient being 6 months old and the oldest being 7 years old, resulting in an average

age of 2.32 years. In terms of gender, the study included nearly equal numbers of male (51) and female (49) cats. It was recorded that 65% of the 100 patients included in the study were intact, and 35% were sterile. The average body weight of the patients was calculated to be 3.32 kg, with a minimum value of 1.3 kg and a maximum value of 5.75 kg. When the entire population was assessed, it was recorded that 94 patients were mixed breeds, while the remaining 6 patients consisted of 4 British Shorthairs, 1 Chinchilla, and 1 Himalayan cat.

This study was conducted between 2018 and 2022 and was carried out during the COVID-19 pandemic, a period marked by many global changes. When analyzing hemodynamic responses by year, it was observed that cases evaluated during 2020–2021 showed similar results to those evaluated in other years; however, the number of cases in these two years was lower (a total of 25).

Heart rate was 162.94 bpm in the preanesthetic period and 95.23 bpm after premedication. z: -8.254 and *P*:0.001, there was a statistically significant difference between heart rate in the preanesthetic period and after premedication (*P*<0.05).

Pulse rate was 131.48 bpm in the preanesthetic period and 83.13 bpm after premedication. z: -7.742 and *P*:0.001, but there was a statistically significant difference between pulse rate values in the preanesthetic period and after premedication (*P*<0.05).

SBP was 170.29 mm Hg in the preanesthetic period and 163.94 mm Hg after premedication. z -2.109 and *P*: 0.035, but there was a statistically significant difference between SBP values in the preanesthetic period and after premedication (*P*<0.05).

DBP was 98.74 mm Hg in the preanesthetic period and 117.56 mm Hg after premedication. z -3.287 and *P*: 0.001, but there was a statistically significant difference between DBP values in the preanesthetic period and after premedication (*P*<0.05).

MAP was 116.49 mm Hg in the preanesthetic period, 132.45 mm Hg after premedication, z: -3.435 and *P*: 0.001. There was a statistically significant difference between MAP values in the preanesthetic period and after premedication (*P*<0.05).

CRT was <1.00 seconds in the preanesthetic period and <1.03 seconds after premedication, z: -1.732 and *P*: 0.083. There was no statistically significant difference between CRT in the preanesthetic period and after premedication (*P*<0.05) (TABLE I).

When the medetomidine group was evaluated, the preanesthetic heart rate was 164.28 bpm and 90.74 bpm after premedication. z -5.824 and *P*: 0.001, there was a statistically significant difference between the heart rate values during the preanesthetic period and after premedication in the medetomidine group (*P*<0.05).

Pulse rate was 140.51 bpm in the preanesthetic period, 85.68 bpm after premedication, z: -5.710 and *P*: 0.001. In the medetomidine group, there was a statistically significant difference between pulse rate values in the preanesthetic period and after premedication (*P*<0.05).

SBP was 153.38 mmHg in the preanesthetic period, 165.44 mmHg after premedication, z: -1.376 and *P*: 0.169. In the medetomidine group, there was no statistically significant difference between SBP values in the preanesthetic period and after premedication (*P*>0.05).

DBP was 97.58 mm Hg in the preanesthetic period, 116.44 mm Hg after premedication, z: -2.148 and *P*: 0.032. In the medetomidine group, there was a statistically significant difference between DBP values in the preanesthetic period and after premedication (*P*<0.05).

TABLE I
Comparison of hemodynamic parameters during preanesthetic period and after premedication

Variable	N	Med	SS	Med Rank	z	*P*
Preanesthetic Heart Rate	100	162.94	42.67	53.54	-8.254	0.001*
Heart Rate After Premedication	100	95.23	27.87	15.56		
Preanesthetic Pulse	100	131.48	39.20	54.90	-7.742	0.001*
Pulse After Premedication	100	83.13	21.73	21.04		
Preanesthetic SBP	100	170.29	186.15	44.00	-2.109	0.035*
SBP After Premedication	100	163.94	36.62	55.05		
Preanesthetic DBP	100	98.74	36.57	50.61	-3.287	0.001*
DBP After Premedication	100	117.56	40.92	50.45		
Preanesthetic MAP	100	116.49	32.17	46.24	-3.435	0.001*
MAP After Premedication	100	132.45	34.64	52.60		
Preanesthetic CRT	100	1.00	0.00	0.00	-1.732	0.083
CRT After Premedication	100	1.03	0.17	2.00		

**P*<0.05; z=Wilcoxon sign test

MAP was 115.52 mm Hg in the preanesthetic period, 132.02 mm Hg after premedication, z: -2.245 and *P*: 0.025. In the medetomidine group, there was a statistically significant difference between MAP values in the preanesthetic period and after premedication (*P*<0.05).

CRT preanesthetic <1.00 seconds, <1.02 seconds after premedication, z: -1.001 and *P*: 0.317. In the medetomidine group, there was no statistically significant difference between CRT values during the preanesthetic period and after premedication (TABLE II).

In the dexmedetomidine group, heart rate was 161.60 bpm in the preanesthetic period, 99.72 bpm after premedication, z: -5.894 and *P*: 0.001. There was a statistically significant difference between heart rate values in the preanesthetic period and after premedication (*P*<0.05).

TABLE II
Comparison of hemodynamic parameters during preanesthetic period and after premedication in medetomidine group

Variable	N	Med	SS	Med Rank	z	*P*
Preanesthetic Heart Rate	50	164.28	47.77	27.57	-5.824	0.001*
Heart Rate After Premedication	50	90.74	25.81	6.90		
Preanesthetic Pulse	50	140.51	41.43	27.31	-5.710	0.001*
Pulse After Premedication	50	85.68	22.08	9.20		
Preanesthetic SBP	50	153.38	36.62	21.52	-1.376	0.169
SBP After Premedication	50	165.44	38.99	28.89		
Preanesthetic DBP	50	97.58	34.59	21.84	-2.148	0.032*
DBP After Premedication	50	116.44	38.99	27.74		
Preanesthetic MAP	50	115.52	31.83	19.29	–2.245	0.025*
MAP After Premedication	50	132.02	37.94	30.00		
Preanesthetic CRT	50	1.00	0.00	0.00	–1.001	0.317
CRT After Premedication	50	1.02	0.14	1.00		

*P<0.05; z=Wilcoxon sign test

Pulse rate was 122.46 bpm in the preanesthetic period, 80.58 bpm after premedication, z: -5.189 and *P*: 0.001. There was a statistically significant difference between pulse rate values in the preanesthetic period and after premedication (*P*<0.05).

SBP was 187.20 mm Hg in the preanesthetic period, 164.44 mm Hg after premedication, z: -1.680 and *P*: 0.093. There was no statistically significant difference between SBP values in the preanesthetic period and after premedication.

DBP was 99.90 mm Hg in the preanesthetic period, 118.82 mm Hg after premedication, z: -2.433 and *P*: 0.015. There was a statistically significant difference between DBP in the preanesthetic period and after premedication (*P*<0.05).

MAP was 117.46 mm Hg in the preanesthetic period, 132.88 mm Hg after premedication, z: -2.679 and *P*: 0.007. There was a statistically significant difference between mean arterial pressure values in the preanesthetic period and after premedication (*P*<0.05).

CRT was <1.00 s in the preanesthetic period, <1.04 after premedication, z: -1.414 and *P*: 0.157. There was no statistically significant difference between CRT in the preanesthetic period and after premedication (TABLE III).

TABLE III
Comparison of hemodynamic parameters in dexmedetomidine group during preanesthetic period and after premedication

Variable	N	Med	SS	Med Rank	z	*P*
Preanesthetic Heart Rate	50	161.60	37.33	26.55	-5.894	0.001*
Heart Rate After Premedication	50	99.72	29.35	9.00		
Preanesthetic Pulse	50	122.46	34.97	27.98	-5.189	0.001*
Pulse After Premedication	50	80.58	21.29	12.50		
Preanesthetic SBP	50	187.20	260.93	23.18	-1.680	0.093
SBP After Premedication	50	164.44	34.42	27.05		
Preanesthetic DBP	50	99.90	38.77	32.13	-2.433	0.015*
DBP After Premedication	50	118.82	40.00	23.41		
Preanesthetic MAP	50	117.46	32.79	30.00	-2.679	0.007*
MAP After Premedication	50	132.88	31.38	24.08		
Preanesthetic CRT	50	1.00	0.00	0.00	-1.414	0.157
CRT After Premedication	50	1.04	0.19	1.50		

*P<0.05; z=Wilcoxon sign test

When comparing the data from both groups, the heart rate in the medetomidine group was 160.00 bpm (IQR 47.77), while in the dexmedetomidine group it was 162.00 bpm (IQR 37.33), with z-score of -0.111 and *P*-value of 0.912. There was no statistically significant difference between the two groups in terms of heart rate during the preanesthetic period. Following premedication, the heart rate was 88.50 bpm (IQR 25.81) in the Medetomidine group and 96.50 bpm (IQR 29.35) in the Dexmedetomidine group, with z-score of -1.765 and *P*-value of 0.078. Again, there was no statistically significant difference between the two groups in terms of heart rate after premedication.

In the preanesthetic period, the pulse rate was 138.00 bpm (IQR 41.43) in the medetomidine group and 124.50 bpm (IQR 34.97) in the Dexmedetomidine group, with a z-score of -2.027 and *P*-value of 0.043. A statistically significant difference in pulse rate between the two groups was observed during the preanesthetic period (*P*<0.05), with the Medetomidine group showing a higher pulse rate. After premedication, the pulse rate was 86.50 bpm (IQR 22.08) in the Medetomidine group and 76.50 bpm (IQR 21.29) in the Dexmedetomidine group, with a z-score of -1.534 and *P*-value of 0.125. There was no statistically significant difference in pulse rate between the two groups after premedication.

In the Medetomidine group, SBP was 148.00 mm Hg (IQR 36.62), and in the Dexmedetomidine group, it was 152.00 mm Hg (IQR 260.93), with a z-score of -0.014 and *P*-value of 0.989 during the preanesthetic period. There was no statistically significant difference in SBP between the two groups before premedication. After premedication, SBP in the Medetomidine group was 161.00 mm Hg (IQR 39.00) and in the Dexmedetomidine group it was 158.00 mm Hg (IQR 34.42), with a z-score of -0.138 and *P*-value of 0.891. There was no statistically significant difference in SBP between the two groups after premedication.

In the Medetomidine group, DBP was 102.50 mm Hg (IQR 34.59), and in the Dexmedetomidine group, it was 102.00 mm Hg (IQR 38.77), with a z-score of -0.159 and *P*-value of 0.874 during the preanesthetic period. There was no statistically significant difference in DBP between the two groups before premedication. After premedication, DBP in the Medetomidine group was 116.00 mm Hg (IQR 42.19), and in the Dexmedetomidine group, it was 118.50 mm Hg (IQR 40.00), with a z-score of -0.048 and *P*-value of 0.962. There was no statistically significant difference in DBP between the two groups after premedication.

During the preanesthetic period, the MAP was 117.50 mmHg (IQR 31.83) in the Medetomidine group and 112.50 mm Hg (IQR 32.79) in the Dexmedetomidine group, with a z-score of -0.091 and *P*-value of 0.929. There was no statistically significant difference in preanesthetic MAP between the two groups. After premedication, the MAP was 130.00 mm Hg (IQR 37.95) in the Medetomidine group and 131.50 mm Hg (IQR 31.38) in the Dexmedetomidine group, with a z-score of -0.442 and *P*-value of 0.657. Similarly, there was no statistically significant difference in MAP values between the two groups after premedication.

During the preanesthetic period, CRT was <1.00 s (IQR 0.00) in both the Medetomidine and Dexmedetomidine groups, with z-scores of 0 and *P*-values of 1. There was no statistically significant difference in CRT between the two groups. After premedication, CRT remained <1.00 s, with an IQR of 0.14 in the Medetomidine group and an IQR of 0.20 in the Dexmedetomidine group, resulting in z-scores of -0.583 and a *P*-value of 0.561. Similarly, there was no statistically significant difference in CRT between the two groups after premedication.

During the preanesthetic period, normal mucous membrane color was observed in 98% of the Medetomidine group and 96% of the Dexmedetomidine group. Pale mucous membrane color was noted in 2% of participants in both groups. Hyperemic mucous membrane color was absent in the Medetomidine group but observed in 2% of the Dexmedetomidine group (*P*=0.603). There was no statistically significant difference between the two groups in terms of preanesthetic mucous membrane color.

After premedication, normal mucous membrane color was observed in 96% of the Medetomidine group and 94% of the Dexmedetomidine

group. Pale mucous membrane color was noted in 4% of the Medetomidine group and 2% of the Dexmedetomidine group. Hyperemic mucous membrane color was absent in the Medetomidine group but observed in 4% of the Dexmedetomidine group (*P*=0.211). There was no statistically significant difference between the two groups in terms of mucous membrane color after premedication (TABLE IV).

In this study, the mean preanesthetic heart rate was calculated as 162.94 bpm and it was noted to be within normal limits according to the literature [4, 17]. It is considered normal for cats under stress to have a heart rate of up to 240 bpm [18]. In addition, values above 240 bpm are defined as sinus tachycardia [19]. In this study, the maximum value of preanesthetic heart frequency was 280 bpm and was considered as stress-induced sinus tachycardia [18, 19]. The pulse rate monitored with a noninvasive blood pressure monitor was 131.48 bpm. Normal pulse rate is in the range of 100–160 bpm [20] and pulse rate results were in parallel with the literature [20] and within normal limits. The maximum pulse rate among the cases was 234 bpm, which was above normal limits, and the pulse rate up to 240 bpm was within acceptable limits [18]. The reference ranges of SBP are 80–120 mm Hg [21], 80–140 mm Hg [4, 22], 90–160 [23] 120–170 mm Hg [24], 115–162 mm Hg [25] but they differ in the sources. In the study, SBP was 187.20 mm Hg in the preanesthetic period, was found to be above all reference values reported in the literature [4, 21, 22, 23, 24, 25, 26]. DBP was 98.74 mm Hg in the preanesthetic period. Although the normal DBP reference range is 45–55 mm Hg [23], 55–75 mm Hg [21, 22], 70–120 [24], 74–91 mm Hg [25], this results were above the reference range according to some literatures [21, 22, 23, 24, 25]and within normal limits according to *Clark* [24] MAP was 116.49 mm Hg in the preanesthetic period, which was above the reference range, although the normal values of 60–80 mm Hg [23], 60–100 mm Hg [21, 22], 96–106 mm Hg [25] differ between the literatures.

Respiratory rate, SBP, DBP and MAP are parameters directly affected by stress [4, 27]. In this study, hemodynamic parameters were above the reference ranges in the preanesthetic period, suggesting that the patients were exposed to stress. The fact that the hospital is located far from the city center, the patients were brought by motor vehicles, the patients mostly waited in line when they arrived and interacted with other cats and dogs visually or audibly during this waiting period was seen as the main factor of this stress. In addition to this, it was stated by many patient owners that even getting the cats, which constituted the material of the study, into the carrying bag was a source of stress in itself. In addition, especially considering that preanesthetic measurements were performed while the patient was awake, it was thought that the reactions of many cats to these measurements also contributed to stress, and this idea was in line with the results of Qimby *et al.* [27] and Haskins *et al.* [4].

Heart rate refers to the number of heart beats per minute, whereas pulse denotes the number of distinct beats felt in an artery due to increased blood pressure. Essentially, pulse is a reflection of heart rate [28]. The study results indicated that the mean heart rate

TABLE IV
Comparison of Hemodynamic Parameters Between Groups

Variable		Group				Mann Whitney U Test	
		Medetomidine		Dexmedetomidine			
		Med.	IQR	Med.	IQR	z	*P*
Preanesthetic Heart Rate		160.00	47.77	162.00	37.33	-0.111	0.912
Heart Rate After Premedication		88.50	25.81	96.50	29.35	-1.765	0.078
Preanesthetic Pulse		138.00	41.43	124.50	34.97	-2.027	0.043*
Pulse After Premedication		86.50	22.08	76.50	21.29	-1.534	0.125
Preanesthetic SBP		148.00	36.62	152.00	260.93	-0.014	0.989
SBP After Premedication		161.00	39.00	158.00	34.42	-0.138	0.891
Preanesthetic DBP		102.50	34.59	102.00	38.77	-0.159	0.874
DBP After Premedication		116.00	42.19	118.50	40.00	-0.048	0.962
Preanesthetic MAP		117.50	31.83	112.50	32.79	-0.091	0.929
MAP After Premedication		130.00	37.95	131.50	31.38	-0.442	0.657
Preanesthetic CRT		1.00	0.00	1.00	0.00	0	1
CRT After Premedication		1.00	0.14	1.00	0.20	-0.583	0.561
		n	**%**	**n**	**%**		***P***
Preanesthetic	Normal	49	98.00	48	96.00		
Mucous Membrane	Pale	1	2.00	1	2.00		0.603
Color	Hyperemic	0	0.00	1	2.00		
After Premedication	Normal	48	96.00	47	94.00		
Mucous Membrane	Pale	2	4.00	1	2.00		0.211
Color	Hyperemic	0	0.00	2	4.00		

**P*<0.05; chi-square test

(162 bpm) and pulse rate (131 bpm) were distinct from each other, yet both remained within normal ranges. Interestingly, contrary to results in the literature [28], the pulse rate did not precisely mirror the heart rate. This discrepancy could be attributed to the timing disparity between heart rate and pulse measurements, or it may relate to stress or movement induced while restraining the animal during the heart rate assessment.

Alpha–2 adrenoreceptor agonists have been reported to significantly impact cardiovascular function, often causing bradycardia [29, 30]. A heart rate below 100 bpm [31] or 90 bpm [4] is referred to as bradycardia. In this study, heart frequency was measured as 95.23 bpm and pulse rate as 83.13 bpm after premedication and it was found that the pulse rate was in parallel with the literature [29, 30] and decreased significantly. Considering the heart rate values, bradycardia, one of the cardiovascular dysfunctions mentioned by Nicolas *et al*. [29] and Sinclair [30], which is within the reference range according to the literatures [4, 31], did not occur. However, significant bradycardia was observed upon evaluating the pulse after premedication. In cats experiencing a progressive decrease in blood pressure, the metatarsal pulse may vanish, and obtaining a femoral pulse becomes difficult in severe hypotension [32]. The discrepancy between pulse and heart rate values in the study was attributed to the potential disappearance of the metatarsal pulse, as noted in the results of Reineke *et al*. [32], or irregular beats due to arrhythmias induced by alpha–2 agonists that may not be palpable in peripheral vessels. It was concluded that assessing the pulse by palpating the femoral artery during premedication of small animals like cats may be more reliable than using a digital sphygmomanometer.

Alpha–2 adrenoceptor agonists immediately affect the cardiovascular system by inducing peripheral vasoconstriction through alpha–2 adrenoreceptors in the peripheral vasculature, resulting in increased blood pressure [16]. In this study, DBP and MAP values increased after premedication in parallel with the literature [16]. In another study, it was observed that systolic, diastolic, and mean arterial pressure values increased following administration of alpha–2 agonists [33]. After premedication, the blood pressure results were consistent with those reported by Johard *et al*. [33], showing an increase in DBP and MAP values. However, a decrease in SBP was observed, which has not been reported in the literature before. This slight decrease in SBP, independent of DBP and MAP values, was attributed to the reduction in heart rate and cardiac output resulting from the central nervous system suppression induced by alpha–2 agonists.

The normal MAP value is in the range of 60–100 mm Hg [8, 34]. The blood pressure in vital organs is automatically regulated within the range of 60–150 mm Hg, ensuring a constant flow to the organs as long as the mean arterial pressure (MAP) is maintained within this range [34]. After premedication, the MAP value remained within the range reported in the literature [8, 34]. It was concluded that the doses of Medetomidine and Dexmedetomidine used in this study did not significantly impact perfusion levels in vital organs, and adequate perfusion was maintained.

The heart frequency results of the study showed no significant difference between the Medetomidine and Dexmedetomidine groups and were in line with the literatures [12, 13, 14, 15, 16] and although Dexmedetomidine is twice as potent as Medetomidine, it is argued that the effects of equivalent doses of Medetomidine and Dexmedetomidine on the cardiovascular system are similar. However, since the *P*–value was close to the 0.05 limit (*P*=0.078), it was interpreted that there might be a difference between the two groups. Although this difference was not statistically significant, the heart rate results in the preanesthetic period and after premedication were lower in the Medetomidine group.

Studies have reported that Medetomidine acts more rapidly, exhibits less vasoconstriction at the injection site, and is absorbed more quickly than Dexmedetomidine following intramuscular administration in dogs [35] an alpha2–adrenoceptor agonist, is a racemic mixture of two optical stereoisomers: dexmedetomidine (the active enantiomer. The heart rate results supported those of Bennet *et al*. [35] an alpha2–adrenoceptor agonist, is a racemic mixture of two optical stereoisomers: dexmedetomidine (the active enantiomer, showing a more rapid decrease in heart rate in the Medetomidine group compared to the Dexmedetomidine group. However, there was no significant difference observed between the two groups in pulse rate results, contrary to the findings of Bennet *et al*. [35] an alpha2–adrenoceptor agonist, is a racemic mixture of two optical stereoisomers: dexmedetomidine the active enantiomer. Peripheral vasoconstriction was found to be similar in both groups. Similarly, no statistically significant difference was observed in SBP, DBP, and MAP values, which are crucial indicators of hemodynamic stability, consistent with previous literature [12, 13, 14, 15, 16]. These findings suggest that the use of Medetomidine or Dexmedetomidine at equivalent doses does not confer superiority over each other based solely on hemodynamic parameters.

CONCLUSIONS

In this study, the effects of Medetomidine and Dexmedetomidine on hemodynamic parameters in cats were compared. In conclusion, equivalent doses of Medetomidine and Dexmedetomidine have similar effects on hemodynamic parameters in cats and can be safely used interchangeably for premedication. However, if these drugs are intended for purposes other than premedication, nociception and other vital parameters should also be evaluated.

Ethical statement

This study was approved by the Cerrahpasa Faculty of Veterinary Science Animal Experiments Local Ethics Board (2019/109).

Conflict of interest

The authors declares that they have no conflict of interest. Statement of Animal Rights all applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

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