Use of Xylazine hydrochloride-Ketamine hydrochloride for immobilization of Indian fox (Vulpes bengalensis) in field situations

Article (PDF Available) *in* Journal of Zoo and Wildlife Medicine
44(3):753 · July 2013 *with* 383 Reads
DOI: 10.1638/2012-0158R.1


Aniruddha Belsare
14.83 · University of Idaho


Abi Tamim Vanak
31.69 · Ashoka Trust for Research in Ecology and the Environment

Abstract

Reports on doses of anesthetic agents for safe and effective immobilization of most wild species occurring in India are very limited. Further, the anesthetic agents available in India for field immobilizations are limited to xylazine hydrochloride and ketamine hydrochloride. A safe and effective dosage of xylazine–ketamine for Indian fox (Vulpes bengalensis) is reported, based on 37 wild Indian fox immobilizations between April 2006 and May 2007. Foxes captured for a radiotelemetry and health monitoring study were immobilized with a mixture of xylazine (2.13 6 0.43 mg/kg) and ketamine (12.68 6 2.18 mg/kg). Induction and recovery was smooth and uneventful in all foxes. The duration of anesthesia was sufficient for the fitting of radiotransmitters, morphometric measurements, and blood sampling. No life-threatening adverse effects of immobilization were documented for at least 1 mo post immobilization. The results suggest that field immobilization of Indian foxes with 2 mg/kg xylazine and 13 mg/kg ketamine is effective and safe.

USE OF XYLAZINE HYDROCHLORIDE–KETAMINE HYDROCHLORIDE FOR IMMOBILIZATION OF INDIAN FOX (VULPES BENGALENSIS) IN FIELD SITUATIONS

Author(s): Aniruddha V. Belsare , B.V.Sc and A.H., and Abi Tamim Vanak , Ph.D.
Source: Journal of Zoo and Wildlife Medicine, 44(3):753-755. 2013.
Published By: American Association of Zoo Veterinarians
DOI: http://dx.doi.org/10.1638/2012-0158R.1
URL: http://www.bioone.org/doi/full/10.1638/2012-0158R.1

Journal of Zoo and Wildlife Medicine 44(3): 753–755, 2013

USE OF XYLAZINE HYDROCHLORIDE–KETAMINE HYDROCHLORIDE FOR IMMOBILIZATION OF INDIAN FOX (*VULPES BENGALENSIS*) IN FIELD SITUATIONS

Aniruddha V. Belsare, B.V.Sc and A.H. and Abi Tamim Vanak, Ph.D.

Abstract: Reports on doses of anesthetic agents for safe and effective immobilization of most wild species occurring in India are very limited. Further, the anesthetic agents available in India for field immobilizations are limited to xylazine hydrochloride and ketamine hydrochloride. A safe and effective dosage of xylazine–ketamine for Indian fox (*Vulpes bengalensis*) is reported, based on 37 wild Indian fox immobilizations between April 2006 and May 2007. Foxes captured for a radiotelemetry and health monitoring study were immobilized with a mixture of xylazine (2.27 ± 0.44 mg/kg) and ketamine (13.39 ± 2.26 mg/kg). Induction and recovery was smooth and uneventful in all foxes. The duration of anesthesia was sufficient for the fitting of radiotransmitters, morphometric measurements, and blood sampling. No life-threatening adverse effects of immobilization were documented for at least 1 mo postimmobilization. The results suggest that field immobilization of Indian foxes with 2 mg/kg xylazine and 13 mg/kg ketamine is effective and safe.

Key words: Field immobilization, Indian fox, ketamine hydrochloride, *Vulpes bengalensis*, xylazine hydrochloride

BRIEF COMMUNICATION

Chemical restraint or immobilization is a critical component of every intervention requiring safe handling of wild animals. Radiotelemetry and other ecological studies, management interventions like preventive medical procedures, and rescue and medical treatment of free-ranging wild animals require field immobilization. Safe field-immobilization procedures need to be established for species that are captured for research or management interventions.

The Indian fox (*Vulpes bengalensis*) is a common carnivore species in many grassland habitats in the Indian subcontinent, yet not much is known about the basic ecology of Indian foxes. Though not yet endangered, the Indian fox is threatened because of rapid habitat loss and poaching throughout its range.[11] Spillover of diseases like canine distemper, canine parvovirus, and rabies from the domestic dog populations to such wild carnivore species is another concern.[3] Further, Indian foxes apparently play a role in transmission of rabies to humans, as foxes have been implicated in 3% of the total human rabies cases in India.[2] Research is necessary to investigate these concerns, and thus there is an increasing need to establish safe chemical immobilization procedures with the use of the currently available drugs in India that will allow researchers and managers to handle Indian foxes with minimal risk of stress or injury.

Ketamine hydrochloride, a dissociative anesthetic in the cyclohexamine group, is one of the most used immobilizing drugs for wild carnivores. It is usually used in combination with an α-2 adrenergic agonist like xylazine hydrochloride. Xylazine potentiates the effect of ketamine, resulting in reduction in the dosage of ketamine required for immobilization.[5] Xylazine also makes the induction and recovery smooth by reducing the undesirable side effects of ketamine like convulsions and cataleptic effects.[7] Xylazine–ketamine combination has been used for immobilization of bat-eared fox (*Otocyon megalotis*), Cape fox (*Vulpes chama*), red fox (*Vulpes vulpes*), and swift fox (*Vulpes velox*).[6] Medetomidine hydrochloride, a more potent and highly specific α-2 adrenergic agonist, induces a longer sedation and analgesia than xylazine.[4,8] Medetomidine–ketamine mixture has provided safe and effective immobilization of numerous species; and many clinicians have switched to medetomidine–ketamine combination recently.[7] Unfortunately, medetomidine is not available in India at present, and xylazine–ketamine combination is currently the sole practical option for immobilization of wild carnivores in India.[1] This is the first report of the use of xylazine–ketamine for field immobilization of free-ranging Indian fox.

From the Department of Fisheries and Wildlife Sciences, 302 ABNR, University of Missouri, Columbia, Missouri 65211 (Belsare and Vanak). Present address (Vanak): Ashoka Trust for Research in Ecology and the Environment (ATREE), Royal Enclave, Srirampura, Jakkur P.O. Bangalore 560064, India. Correspondence should be directed to Dr. Belsare (avbxv8@mail.missouri.edu).

Thirty-seven Indian foxes (20 male, 17 female) were immobilized between April 2006 and May 2007 for a radiotelemetry study with a disease- and health-monitoring component. This study was approved by the University of Missouri (USA) Animal Care and Use Committee (ref. no. 4265) and with permission from the State Forest Department (No. 22[8]/Research/2563/2005-06).

The trapping sites were located in and around the Great Indian Bustard Sanctuary at Nannaj, Maharashtra (17°49′40″N and 75°51′35″E) in central India. Indian foxes were trapped with the use of padded leg-hold traps (1 Softcatch, Woodstream Corp., Lititz, Pennsylvania 17543, USA). Leg-hold traps were deployed at sites that were prebaited and monitored for 4–5 d prior to deployment. A radiotransmitter was attached to each trap so that it emitted a signal when the trap was triggered. Because the radiotransmitter was continuously monitored postdeployment, the response time was between 2 and 5 min, thus minimizing the possibility of trap-related injuries.

The trapped animals were physically restrained with the use of a net, and were hand injected with xylazine and ketamine in the hind leg muscles (biceps femoralis). A dose of 2 mg/kg xylazine (Ilium Xylazil, 100 mg/ml; Troy Laboratories Private Ltd., Smithfield NSW 2164, Australia) and 10 mg/kg ketamine (Ketamil, 100 mg/ml; Troy Laboratories) was administered based on the estimated body weight. Dispovan 1 ml tuberculin syringe with a 26-G half-in. needle was used to inject the drugs. A single injection of xylazine and ketamine was sufficient to immobilize the foxes on all occasions; supplemental doses of ketamine were not required. The time required for complete immobilization (from injection of the immobilizing drugs until recumbency) or the induction time (IT), and the time from complete immobilization until the first sign of arousal or the first reaction time (FRT), were noted in all cases. Upon loss of responsiveness to stimuli, the animals were examined thoroughly, weighed, and placed in right lateral recumbency. Ophthalmic ointment was applied to both the eyes to avoid corneal damage, and eyes were covered with a clean and damp cloth to reduce visual stimuli. Vital signs, including rectal temperature, respiratory rate, heart rate, and capillary refill time (CRT) were monitored immediately after induction, and thereafter at 10-min intervals. Rectal temperature was measured with the use of a digital thermometer, chest excursions were counted for a minute to obtain the respiratory rate, a stethoscope was used to obtain the heart rate, and CRT was measured by blanching of gums with digital pressure. Heart rates under anesthesia ranged from 48 to 168 beats/min, with a mean of 111 beats/min ($n = 37$). Respiratory rates ranged from 16 to 104 breaths/min, with a mean of 36 breaths/min ($n = 37$). Rectal temperatures ranged from 38.7 to 42.8°C, with a mean of 40.9°C ($n = 37$). CRT was less than 2 sec throughout the anesthetic period for all foxes. Vital-sign monitoring was performed by the same individual to minimize biases. Monitoring was suspended as soon as the first sign of arousal was noticed and the animals were allowed to recover undisturbed. The animals were released at the site of capture after complete recovery. Ambient temperatures were recorded during each capture event; they ranged from 15 to 33°C.

Induction of anesthesia was rapid and smooth in all cases. Mean induction time was 4 min (range = 1–12 min, $n = 37$). During induction, salivation followed by ataxia and recumbency was seen in all cases; two foxes exhibited some tremors during induction. Seizures were not seen in any of the foxes during or after induction. Recovery was smooth and uneventful in all cases; only one fox regurgitated stomach contents during recovery. The rectal temperatures were usually elevated after induction; the mean rectal temperature was 40.9°C (range = 38.8°C–42.6°C, $n = 37$). Immobilized animals were sprayed with cold water and rectal temperature was monitored until recovery. It is interesting to note that in a study using xylazine–ketamine combination in free-living red foxes, hyperthermia was not recorded.[10]

All the foxes were weighed after immobilization, and the actual dose of xylazine and ketamine administered was calculated. Mean body weight of foxes in this study was 2.37 kg (range = 1.38–3.10 kg, $n = 37$). In all cases, the actual body weights fell within the estimated body-weight range. The mean dose of xylazine administered was 2.27 mg/kg (range = 0.73–3.62 mg/kg, $n = 37$), and the mean dose of ketamine administered was 13.39 mg/kg (range = 9.68–18.12 mg/kg, $n = 37$).

This regime of xylazine and ketamine resulted in smooth and rapid induction, smooth recovery and a first reaction time sufficient for fitting of radiocollar, morphometric measurements, and blood sampling. The extended recovery times experienced in swift foxes with the use of xylazine-ketamine were not observed in Indian foxes.[9] Immobilized foxes started showing signs of arousal within a few minutes of finishing the

procedures. A 45-min wait is generally recommended before administering reversal agents; otherwise there is a risk of rough recovery, with convulsions, tremors, and hyperthermia.[7] In this study, the mean first reaction time was 14 min (range = 8–39 min, $n = 37$), and the recovery process thereafter was smooth in every case. Therefore, the use of an antagonist like yohimbine hydrochloride was not deemed necessary. All the foxes that were immobilized were radiocollared and monitored for a minimum period of 1 mo postimmobilization. No immobilization-related mortality or abnormal physiologic observations were recorded during or after the immobilization events. Four pregnant females immobilized and radiotagged in November and December 2006 subsequently had successful litters postcapture.

These results suggest that field immobilization of Indian foxes with 2 mg/kg xylazine and 13 mg/kg ketamine is effective and safe. This dosage will allow researchers and managers to handle Indian foxes safely while undertaking field procedures like physical examination, blood collection, and radiocollar attachment.

Acknowledgments: This research was supported by the Maharashtra Forest Department; the authors thank Mr. B. Majumdar (Chief Wildlife Warden, Maharashtra) and all the field officers for their interest and support.

LITERATURE CITED

1. Belsare, A. V., and V. R. Athreya. 2010. Use of xylazine hydrochloride–ketamine hydrochloride for immobilization of wild leopards (*Panthera pardus fusca*) in emergency situations. J. Zoo Wildl. Med. 41: 331–333.

2. Bhatia, R., R. L. Icchpujani, S. N. Madhusudana, and T. Hemachudha. 2004. Rabies in south and southeast Asia. Program Abstracts of the WHO Expert Consultation on Rabies, Geneva.

3. Funk, S. M., C. V. Fiorello, S. Cleaveland, and M. E. Gompper. 2001. The role of disease in carnivore ecology and conservation. *In:* Gittleman, J. L., S. M. Funk, D. W. MacDonald, and R. K. Wayne (eds.). Carnivore Conservation. Cambridge University Press, Cambridge, United Kingdom. Pp. 443–466.

4. Jalanka, H. H., and B. O. Roeken. 1990. the use of medetomidine, medetomidine ketamine combinations, and atipamezole in nondomestic mammals—a review. J. Zoo Wildl. Med. 21: 259–282.

5. Knight, A. P. 1980. Xylazine. J. Am. Vet. Med. Assoc. 176: 454–455.

6. Kreeger, T. J., J. M. Arnemo, and J. P. Raath. 2002. Handbook of Wildlife Chemical Immobilization: International Edition. Fort Collins, Colorado: Wildlife Pharmaceuticals.

7. Larsen, R. S., and T. J. Kreeger. 2007. Canids. *In:* West, G., D. Heard, and N. Caulkett (eds.). Zoo Animal & Wildlife Immobilization and Anesthesia, 1st ed. Blackwell, Ames, Iowa. Pp. 395–407.

8. Sinclair, M. D. 2003. A review of the physiological effects of α2-agonists related to the clinical use of medetomidine in small animal practice. Can. Vet. J. 44: 885–897.

9. Telesco, R. L., and M. A. Sovada. 2002. Immobilization of swift foxes with ketamine hydrochloride–xylazine hydrochloride. J. Wildl. Dis. 38: 764–768.

10. Travaini, A., P. Ferreras, M. Delibes, and J. J. Aldama. 1992. Xylazine hydrochloride–ketamine hydrochloride immobilization of free-living red foxes (*Vulpes vulpes*) in Spain. J. Wildl. Dis. 28: 507–509.

11. Vanak, A. T., M. Irfan-Ullah, and T. Peterson. 2008. Gap analysis of Indian fox conservation using ecological niche modelling. J. Bombay Nat. Hist. Soc.. 105: 49–54.

Received for publication 19 July 2012