Sevoflurane anaesthesia in Iberian lynx (*Lynx pardinus*)

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IBERIAN lynx (*Lynx pardinus*) is the only cat listed in Appendix I of the Convention on International Trade in Endangered Species (CITES), that is, at critical risk of extinction. This critical situation means that suitable anaesthetic management with minimal side effects is essential in this species. Several sedatives and anaesthetics have been used for restraint and anaesthesia in wild cats (Kreeger and others 2002).

Sevoflurane is a newer, volatile anaesthetic, more commonly used for domestic animals and human beings than for wildlife (Gaynor and others 1997, Breck and Gaynor 2003). Sevoflurane provides safe anaesthesia with a rapid and smooth induction and recovery in several species (Clarke 1999). Although isoflurane anaesthesia is used routinely in lynx, no studies could be found on the influence of sevoflurane in Iberian lynx. The objective of this study was to evaluate sevoflurane anaesthesia in Iberian lynx.

Six Iberian lynx, mean (sd) weight 11·9 (1·9) kg and aged 2·6 (1·3) years, which had been captured for medical and reproductive control, were included in this study. Sedation was induced with 89·6±15 µg/kg medetomidine administered intramuscularly. Once sedative effects were noted and no responses to external stimuli were observed, subsequent anaesthesia was induced via a facial mask connected to a semiclosed circle rebreathing system (Matrx VME). Sevoflurane (Sevorane; Abbott Laboratories) was administered at 5 per cent in oxygen (100 per cent), using an out-of-circle calibrated vaporizer (Sevotec 5; Ohmeda-BOC). Time of induction, in minutes from facial mask application to loss of palpebral reflex, was recorded. The vaporizer dial was progressively reduced to the percentage required to maintain a plane of anaesthesia sufficient to avoid clinical responses, that is, lack of movements or changes in heart rate, respiratory rate or blood pressure.

All cardiorespiratory variables recorded during anaesthesia were measured with a multiparametric monitor (Cardiocap 5; Datex-Ohmeda), by placing a pulse oximeter sensor on the tongue and a respiratory gas sampling adapter at the junction of the endotracheal tube and breathing system. Arterial blood pressure was measured non-invasively by an oscillometric method: the blood pressure cuff ('Neonatal cuff' number 3; Johnson & Johnson) was placed over the ulnar artery in the forearm. Lead-II electrocardiography and rectal temperature were also recorded. The vaporizer and the monitoring devices were calibrated before the study.

The following variables were recorded at five minute intervals during anaesthesia: heart rate, mean arterial pressure, systolic arterial pressure, diastolic arterial pressure, rectal temperature, respiratory rate, arterial oxygen saturation, end-tidal concentration of carbon dioxide and end-tidal concentration of sevoflurane required for maintenance of anaesthesia.

When the clinical procedure was complete, 400 µg/kg atipamezole was administered intramuscularly and the animal was disconnected from the anaesthetic machine. Time of anaesthesia, in terms of minutes of sevoflurane administration, and time of recovery in terms of minutes from atipamezole administration and sevoflurane discontinuation to standing up, were also registered. Descriptive statistics were obtained with the Statistica for Windows, version 5.1, computer program (StatSoft).

The cardiorespiratory variables recorded are summarised in Table 1.

Medetomidine induced a deep degree of sedation that permitted handling of the animals. The face mask was easily adapted to the face of the lynx, and no reactive responses were observed. Mean (sd) time of induction was 1·6 (0·5) minutes. During sevoflurane anaesthesia, all cardiorespiratory parameters were within normal limits. The mean (sd) end-tidal concentration of sevoflurane required to maintain anaesthesia was 2·8 (0·2) per cent. The mean (sd) time of anaesthesia was 79 (30) minutes and time of recovery after atipamezole administration was 9·6 (2) minutes. Recovery was smooth, quiet and uneventful.

Signs of sedation with medetomidine included ataxia, muscular relaxation, sternal or lateral recumbency, and closure of the eyelids. These signs have been described previously in cats and in European lynx (Vaha-Vahe 1989, Kreeger and others 2002). The dose of medetomidine administered was based on the range of doses previously reported (Vaha-Vahe 1989, Ansah and others 1998, Kreeger and others 2002). The face mask for anaesthesia induction was easily adapted to the animals under medetomidine sedation, as has been reported for mask induction with isoflurane and sevoflurane in premedicated cats (Hikasa and others 1996, Lerche and others 2002).

Anaesthesia was easily maintained with sevoflurane. The mean end tidal concentration of sevoflurane was 2·8 per cent, slightly higher than the minimum alveolar concentration of 2·58 per cent reported in cats (Steffey 1994). Sevoflurane is a volatile anaesthetic that provides safe anaesthesia with a rapid and smooth induction and recovery in domestic cats (Clarke 1999). It has a variable effect on heart rate, causes sys-

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TABLE 1: Mean (sd) cardiovascular variables of six Iberian lynx (*Lynx pardinus*) anaesthetised with sevoflurane

Variables	Time (minutes) 5	10	15	20	25	30	35	40	45	50	55	60
Heart rate (bpm)	110 (13)	112 (12)	110 (12)	107 (10)	105 (11)	103 (8)	103 (7)	102 (7)	101 (6)	101 (7)	102 (9)	102 (8)
Respiratory rate (breaths/minute)	24 (6)	24 (4)	21 (3)	19 (2)	19 (3)	18 (5)	16 (6)	16 (6)	16 (8)	18 (4)	16 (6)	17 (5)
Mean arterial pressure (mmHg)	104 (6)	104 (14)	106 (13)	109 (8)	103 (7)	111 (9)	100 (11)	92 (10)	84 (9)	91 (16)	98 (17)	97 (17)
Systolic arterial pressure (mmHg)	131 (11)	129 (11)	131 (7)	127 (8)	127 (7)	130 (8)	124 (9)	121 (7)	118 (5)	115 (12)	123 (15)	122 (17)
Diastolic arterial pressure (mmHg)	86 (17)	80 (15)	88 (10)	87 (12)	89 (15)	92 (12)	80 (11)	73 (12)	66 (17)	68 (18)	77 (17)	77 (18)
Rectal temperature (°C)	37·4 (0·5)	37·4 (0·5)	37·3 (0·5)	37·1 (0·6)	36·9 (0·5)	36·7 (0·5)	36·6 (0·4)	36·5 (0·2)	36·5 (0·4)	36·4 (0·5)	36·4 (0·5)	36·3 (0·3)
O_2 saturation (%)	99 (1)	99 (1)	99 (1)	99 (1)	99 (1)	99 (1)	99 (1)	99 (1)	99 (1)	99 (1)	99 (1)	99 (1)
End tidal CO_2 (mmHg)	37 (6)	38 (6)	38 (5)	39 (4)	38 (2)	39 (3)	39 (6)	39 (5)	42 (2)	41 (3)	42 (4)	43 (4)
End tidal sevoflurane (%)	5·2 (0·1)	3·8 (0·6)	3·2 (0·2)	2·9 (0·2)	2·8 (0·2)	2·8 (0·2)	2·8 (0·2)	2·8 (0·2)	2·8 (0·1)	2·8 (0·1)	2·8 (0·1)	2·8 (0·1)

temic vasodilation and produces dose-dependent decreases in mean arterial pressure, total peripheral resistance and cardiac output (Hikasa and others 1996, Lerche and others 2002, Pypendop and Ilkiw 2004). Sevoflurane causes dose-related respiratory depression characterised by a fall in ventilation frequency (Clarke 1999). In the present study, all of the measured cardiorespiratory parameters were within normal limits.

Atipamezole has demonstrated its effectiveness for reversal of medetomidine sedation in several species (Verstegen and others 1991, Kreeger and others 2002). Recovery from anaesthesia after atipamezole administration and cessation of sevoflurane administration was smooth, quiet and uneventful in all cases.

In conclusion, medetomidine induces a useful degree of sedation for mask induction of anaesthesia with sevoflurane. Sevoflurane produces a rapid induction of anaesthesia and provides good controllable maintenance anaesthesia.

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