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**Short Communication**

# Effects of injectable dexmedetomidine-ketamine-midazolam and isoflurane inhalation anaesthetic protocol for gelding in a Spiti donkey

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## Abstract

**The effect of injectable dexmedetomidine-ketamine-midazolam with isoflurane inhalation was assessed on various vital signs for gelding procedure in a donkey. The animal was premedicated with dexmedetomidine and midazolam. Anaesthesia was induced with ketamine and maintained under isoflurane. Excellent quality of induction with satisfactory muscle relaxation was observed. Changes in blood pressure returned to normal, 90 minutes post weaning. The total time taken with a single attempt to stand was 28 minutes, and the recovery quality was excellent. Moderate degree of sedation, rapid and smooth induction, ideal anaesthetic depth and excellent recovery quality were observed with this protocol.**

**Key words**: Dexmedetomidine, Donkey, Isoflurane, Ketamine, Midazolam

## Highlights

- Dexmedetomidine-ketamine-midazolam combination with isoflurane maintenance was found to be good for castration in healthy donkeys.
- Bradycardia, hypotension and hypoxemia were observed for short term as post anaesthetic effects.

In equine, general anaesthesia with $\alpha_2$ adrenoceptor agonists – benzodiazepine-dissociative agent is widely used. This combination is reported to reduce the requirement of inhalant agent by 25-30 per cent (Auer *et al*., 2019). Due to significant anatomical and physiological differences between donkeys and horses viz., intravenous drug administration, drug dosing and orotracheal intubation, administration of anaesthesia needs to be specifically considered in donkeys (Bidwell, 2010). The effects of above mentioned protocol on various vital signs were studied and discussed here.

The estimated haematology and biochemistry parameters were within the clinical range. Pre-operatively, food and water were withheld for 12 hours and 4 hours respectively. Ceftriaxone @ 20 mg/kg and flunixine meglumine @ 1.1 mg/kg, I/V were given. The donkey (ASA 1 status) was premedicated with dexmedetomidine @ 5 µg/kg, I/V and anaesthesia was induced with ketamine @ 2.2 mg/kg, I/V and midazolam @ 0.1 mg/kg, I/V. The onset of induction was found to be 15 seconds. The donkey was intubated, and anaesthesia was maintained with isoflurane inhalant agent (Fig. 1). Gelding was performed by half-closed method using Serra emasculator. Vital signs such as cardiovascular and pulmonary variables were recorded every five minutes viz., 0, 5, 10, 15, and 20 minutes using a multigas vital sign monitor (TRUSCOPE Ultra-Q5 SCHILLER Private Limited) (Fig. 2) and were compared with pre-operative and at 10 and 90 minutes post-operative values.

A slight decrease in the heart rate and pulse rate was noticed during the intra-operative period (37 and 35/min) and at 10 minutes post-operative period (36 and 33/min) when compared to the pre-

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# Dexmedetomidine-ketamine-midazolam-isoflurane anaesthesia for gelding in a donkey

**Fig. 1. Animal under isoflurane maintenance**


**Fig. 2. SCHILLER Truscope Ultra-Q5 vital sign monitor**

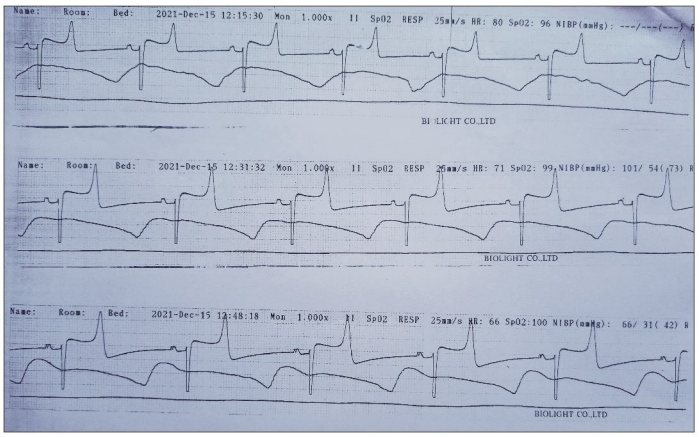

**Fig. 3. Pre-operative, intra-operative and post-operative electrocardiograph with no significant changes**

operative period (43 and 39/min). The arterial blood pressures were significantly reduced intra-operatively; SAP-99, DAP-52 and MAP-68 mmHg and marked hypotension were noticed during the post-operative period; SAP-80, DAP-28 and MAP-42 mmHg, compared to pre-operative values; SAP-143, DAP- 91 and MAP-110 mmHg. These changes could be due to the activity of dexmedetomidine (Hoy and Keating, 2011). All the above parameters improved gradually to the pre-operative values after 90 minutes of surgery. Pre, intra and post-operative ECG configuration (Fig. 3) had no significant changes.

During the peri-operative period, the pulmonary variables were found to be maintained without any marked variations, and the MAC ranged from 1.0 to 0.9. Intra-operatively and at 10 minutes post-operatively, blood was collected from the facial artery and was analysed using an automated blood gas analyser (Siemens 0L085-RAPIDLAB 348). The partial pressure of oxygen ($PaO_2$) and partial pressure of carbon dioxide ($PaCO_2$) were markedly altered during the post-operative period (68.8 and 54.7 mmHg) compared to the intra-operative period (393.1 and 30.3 mmHg), indicative of post-operative hypoxemia.

The sedation was scored as 3 (moderate sedation) using the 4-point scale (Lizarraga *et al*., 2015), and the quality of induction was 1 = excellent (Casoni *et al*., 2015). The quality of anaesthetic depth was in an ideal plane throughout the surgery.

The duration of lateral recumbency: 8 minutes, sternal to standing time: 15 minutes, number of attempts to sternal: 2, number of attempts to stand: 1, total time to stand: 23 minutes and the time to make first movement: 10 minutes. The recovery was scored as 1 = excellent (quiet, 1 or 2 coordinated efforts to sternal and standing positions with no or minimal ataxia once standing) based on Casoni *et al*. (2015) description. The total time taken to standing position was shorter (33 mins) compared to the report with xylazine premedication (33 mins) (Matthews *et al*. 1992). Overall, dexmedetomidine-ketamine-midazolam combination with isoflurane maintenance was found to be ideal for short surgical procedures (< 30 mins) with good induction, muscle relaxation, anaesthetic depth and recovery characteristics.

**Conflict of interest:** Authors have no conflict of interest in this study.

**Author's contribution:** KR: Design/ conduct of the study; KR, DG, GRM: Collection, analysis and interpretation of data; KR, SR, PRH: Writing (review and editing); SR, PRH: Supervision; SR, PRH, KR, DG, GRM: Approval/ decision to submit the manuscript for publication.

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