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Acepromazine and Midazolam with butorphanol as preanaesthetics to propofol anaesthesia in Pigs

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Abstract
The clinical study was conducted on twelve clinically healthy female pigs brought for oophorectomy were divided into two groups (Group ABP and MBP). The animals of ABP group was premedicated with acepromazine @ 0.1mg/kg, IM and butorphanol @ 0.2mg/kg, IM and the animals of MBP group was premedicated with midazolam @ 0.5mg/kg, IM and butorphanol @ 0.2mg/kg, IM. Anaesthesia was induced with propofol and maintained by repeat bolus injections of propofol. The clinical, physiological and haemodynamic parameters were recorded. Recovery time was significantly higher in ABP group. Analgesia and muscle relaxations were adequate in both the groups. The changes in the physiological and haemodynamic parameters remained within the normal physiological limits. Both the anaesthetic combinations were found to be safe and effective for pigs except for a longer recovery time in ABP group.

Keywords: acepromazine, midazolam, propofol, pig

Introduction
Surgery in pig often requires general anaesthesia except in very minor procedure or younger pigs that can be easily restrained. Where economically possible, for all other than minor surgery it is better to have the pig transported to a place with complete surgical facilities. However it is challenging in case of adult pigs with high body weight particularly in farms located in steep and hilly terrain necessitating operation at farm site. Injectable anaesthetic agents are preferred over inhalation anaesthetics due to its simplicity and cost effectiveness whenever surgery is done at farm site. Castration in young pigs are usually done under local anaesthesia however, for adult animals, general anaesthesia becomes necessary as it is difficult to restrain adult pigs and there is considerable stress which have significant effect on physiological function (Madrigal *et al*., 2006) [1]. Therefore, the present study was planned to study the suitability of acepromazine and midazolam with butorphanol as preanaesthetics to propofol anaesthesia in pigs.

Materials and Methods
The clinical study was conducted on twelve female pigs of age group 4 to 6 months referred for spaying to the Department of Veterinary Surgery & Radiology, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University, Selesih, Aizawl, Mizoram. The selected pigs were randomly divided into two Groups: ABK and MBK each consisting of six pigs. Feed was withheld for 12 hours but not water prior to anaesthesia. The pigs were initially restrained manually and butterfly cannula was placed on the ear vein taking aseptic precaution.

The animals were randomly divided in to two groups viz. Group ABP and Group MBP consisting six animals in each group. The pigs in Group ABP were premedicated with acepromazine @0.5mg/kg IM followed by butorphanol @0.2mg/kg IM and Group MBP pigs were premedicated with midazolam @0.5mg/kg IM followed by butorphanol@0.2mg/kg IM. Anaesthesia was induced with propofol after 15 minutes of premedication and maintain with propofol till the completion of surgery.

Induction time, Duration of anaesthesia, Depth of anaesthesia and Recovery time Muscle Relaxation, Analgesia were recorded. The heart rate, respiratory rate, rectal temperature, systolic and diastolic pressure, SpO2 level were recorded at 0 minute (before administration of anaesthetics) and 15, 30 and 60 minutes after administration of anaesthetic agents. The data were analyzed by using statistical software, SPSS v16.

Results and Discussion

The induction dose and total dose of propofol in ABP group was 3.62 ±0.11 and 5.45 ±0.31 mg/kg body weight and in MBP group it was 3.40 ±0.07 and 5.30 ±0.35mg/kg body weight. There was no difference in the induction dose and total dose of propofol between the groups. Both the preanaesthetic combinations reduced the induction dose and total dose of propofol as compared to dose of propofol without premedication. The reduction of the dose of induction gent could be due to muscle relaxing properties of the preanaesthetic agents in addition to central nervous system depressing effects (Dzikiti *et al*, 2009) [2]. The induction time of propofol in ABP and MBP groups were recorded as 41.00 ±4.41 and 40.50 ±3.69 second respectively. The induction time was short and there was no difference in the induction time between the groups.

Table 1: Effects of anaesthetic treatments on heart rate, respiratory rate, rectal temperature, systolic pressure, diastolic pressure and peripheral oxygen saturation at different time intervals in pigs.

Parameter	Groups	0 min Mean±SE	5 min Mean±SE	15 min Mean±SE	30 min Mean±SE	60 min Mean±SE	Significance
HR (beats/min)	ABP	119.67^{a}±4.20	109.45^{b}±4.32	106.67^{b}±4.50	111.00^{b}±4.91	114.33^{ab}±4.49	*
	MBP	120.17^{a}±5.26	110.84^{b}±5.26	108.45^{b}±5.26	114.00^{ab}±4.51	109.67^{b}± 3.75	*
significance		NS	NS	NS	NS	NS	
RR (breaths/min)	ABP	20.36^{abc}±0.69	23.56^{ab}±0.69	24.95^{a}±0.17	18.89^{c}±0.68	19.87^{bc}±0.19	*
	MBP	20.98^{b}±0.12	22.77^{ab}±0.54	24.97^{ab}±0.45	20.00^{bc}± 0.62	21.38^{b}±0.65	*
significance		NS	NS	NS	NS	NS	
RT	ABP	38.44±0.02	38.42±0.12	38.39±0.22	38.42±0. 23	38.35±0.02	NS
	MBP	38.52^{a}±0.17	38.43^{a}±0.15	38.42^{ab}±0.19	38.40^{b}±0.15	37.95^{c}±0.32	*
significance		NS	NS	NS	NS	NS	
SP (mm Hg)	ABP	135.98±2.34	140.00±2.34	135.98±2.34	135.27^{B}±2.28	138.38±1.98	NS
	MBP	135.86^{b}±2.56	140.45^{a}±2.34	142.65^{a}±2.34	140.22^{Aab}±2.44	140.85^{a}±2.34	*
Significance		NS	NS	NS	*	NS	
DP (mm Hg)	ABP	70.61^{a}±1.87	67.58^{a}±2.34	59.56^{b}±2.34	58.58^{Bb}±1.71	69.67^{Aa}±1.90	*
	MBP	66.80^{b}±1.8	73.14^{a}±2.34	62.00^{c}±2.34	67.54^{Ab}±1.44	63.01^{Bb}±1.82	*
Significance		NS	NS	NS	*	*	
SpO2 (%)	ABP	96.28±0.58	94.89±0.48	93.54±0.56	93.32±0.57	95.35±0.49	NS
	MBP	97.12±0.54	95.68±0.25	94.95±0.45	94.17±0.43	94.06±0.70	NS
Significance		NS	NS	NS	NS	NS	

The muscle relaxation was sufficient for surgical intervention in both the groups. There was relaxation of muscles of limbs, abdomen and jaw in both the groups. There was relaxation of anal sphincter and abolition of swallowing reflexes along with protrusion of tongue. Quality of muscle relaxation was excellent till 30 minutes and good to moderate at 60 minutes in both the groups. Sufficient analgesia was observed in both the groups. There was loss of pin prick and pedal reflex, surgical interventions were performed without any pain sensation in the animals indicating sufficient somatic as well as visceral analgesia in both the groups. Most of the animals showed excellent quality of analgesic score up to 30 minutes in both the groups. The analgesia observed in the present study might be due to addition of butorphanol as preanaesthetic before administration of propofol in both the groups. Similar observations of abolition of pain reflexes after butorphanol-propofol anaesthesia were reported by Carrol *et al*. (1998) [3] in goats.

In this study, non-significantly shorter duration of anaesthesia was observed in MBP group than in ABP group. The shorter duration in MBP group might be due to midazolam, owing to its highly protein bound nature, rapid crossing of the blood-brain barrier, less cumulative effect and considerably shorter half life as suggested by Hall *et al*. 2001. Anaesthetic depth in both the groups was satisfactory throughout the period of anaesthesia. None of the animals reacted to the surgical stimulation, pedal, palpebral, corneal and auditory reflexes in both the groups. The recovery time in ABP and MBP groups were recorded as 32.40±1.09 and 23.17±1.42 minutes respectively. The difference in recovery time in ABP group was significantly higher (P<0.05) than in MBP group. Similar observation was recorded by Bufalari *et al*. (1997) [5] in dogs.The longer recovery time in ABP could be attributed to slow onset of action and longer duration of sedation of acepromazine (Gaikwad *et al*., 2006) [6].

The heart rate (Table 1) decreased significantly up to 15 minutes in both the groups and returned towards the pre-treatment values at 60 minutes in both the groups. These findings corroborated to the findings of Dzikiti *et al*. (2009) [2] in goats. Significant decrease in heart rate in the ABP group might be due to additive or supra-additive effects of acepromazine-butorphanol. A significant decrease in heart rate with midazolam was also reported by Smith *et al*. (1991) [7] in swine. The respiratory (Table 1) rate showed non-significant increase at 15 minutes followed by significant decrease at 30 minutes in ABP group. In MBP group, a non-significant increase in respiratory rate was observed at 15 minutes followed by non-significant decrease at 30 minutes. Apnoea was observed for a period of 10 to 15 seconds immediately after the induction of propofol in both the groups. Similar observation of increased respiratory rate immediately after propofol induction in dogs was reported by Quandt *et al.* (1998) [8]. In animals of ABP group, little or no change in rectal temperature (Table 1) was recorded throughout the period of observation. In MBP group, a non-significant decrease in rectal temperature was observed till 30 minutes which continued to decrease significantly at 60 minutes. In ABP group, Systolic pressure (Table 1) showed non-significant increase at 5 minutes and remained near to the pre-treatment level from 15 to 30 minutes and again increased non-significantly till the end of the observation period. In animals of MBP group, significant increase (P<0.05) in systolic pressure was recorded at 15 minutes and thereafter returned at 60 minutes towards the pre-induction level. A significant decrease (P<0.05) in diastolic pressure (Table 1) was observed till 30 minutes, thereafter returned towards the base line value in ABP group. In MBP group, the diastolic

pressure showed significant increase at 5 minutes and thereafter decreased non-significantly throughout the period of observation. Hypotension caused by acepromazine alone and the condition aggravated when acepromazine combined with butorphanol were also reported by Smith *et al.* (1991) [7]. The initial rise in blood pressure in MBP groups might be attributed to propofol (Pfeiffer *et al,* 2012) [9]. The peripheral oxygen saturation showed non-significant decrease till 30 minutes and thereafter increased throughout the period of observation in ABP group. In MBP group, non-significant decrease till 60 minutes followed by non-significant increase throughout the period of observation.A decrease in peripheral oxygen saturation after propofolanaesthesiapremedicated with midazolam and acepromazine was reported by Dzikiti *et al.* (2009) [2] in goats.

Conclusion

Both the combinations were found to be safe and effective for use as balance anaesthesia in pig. The recovery was smoother and shorter with midazolam-butorphanol-propofol combination.

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