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LABORATORY EFFECTS OF THIOPENTAL ANAESTHESIA IN DONKEYS

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Anaesthesia of large animals in field condition is limited to "Total Intravenous Anaesthesia" (TIVA). Thiopental has been used for induction in various animals but only few research work has been done on its effects on vital organs as a sole anaesthetic drug. TIVA is suitable in donkey patients subjected to surgery in field condition. This paper explains the effects of thiopental TIVA on vital organs of donkey (*Equus asinus*) based on clinical laboratory finding.

Materials and Methods

This study was conducted on five mixed breed healthy donkeys (three male and two female) aged 3-5 years and weighing 138-155 kg. Donkeys were fasted for 24 hours. They were premdicated with 0.1% atropine sulphate (Atropine, Alfasan, Holland; 0.02 $mgkg^{-1}$bwt, IM) followed by IV injection of a combination of 2% acepromazine maleate (Acepromazine, Kela Labratoria, Belgium; 0.03 $mgkg^{-1}$bwt, IV) plus 2% xylazine hydrochloride (Rompun, Bayer Inc. Ont., Canada; 0.5 $mgkg^{-1}$bwt, IV). Left jugular vein catheterization was carried out. Five minutes thereafter, at base line (time 0), anaesthesia was induced with 7$mgkg^{-1}$bwt thiopental Na 5% solution (Thiopenton, Biochemic Gmbh, Vienna, Austria) intravenously. The trachea was intubated as soon as the donkey was recumbent on its right lateral side. Dripping of thiopental solution (1.6 $mgkg^{-1}$bwt %) via cannula was continued to maintain anaesthesia till 100 minutes. Depth of anaesthesia was monitored by response to pain (skin pinching), palpebral and corneal reflexes and heart rate alteration and maintained at a depth suitable for surgery regardless of the solution's infusion rate. Just before anaesthesia (time 0) and during anaesthesia at minutes 5, 30, 60, 120 and during recovery period at minutes 180 and 360 and at 2, 5 and 9 days thereafter, sampling of venous blood and urine were done.

Haematocrit (Microhematocrit), CBC (Standard Manual Method) measurements, Total protein (Refractometric method), Bilirubin (Calorimetric method), BUN (DAM Calorimetric method), Creatinine (Calorimetric method) and enzymatic assessments including AST and CK (Calorimetric method) were performed using venous blood. All data were presented as mean and Standard Deviation (Mean±SD) and were analyzed using the repeated measures ANOVA and the Bonferroni paired t-test comparisons with significance at $P<0.05$.

Results and Discussion

The results of the study are presented in tables 1, 2 and 3. Equines show stress status with metabolic change during anaesthesia even without surgical procedure. May be, this condition arises to maintain appropriate blood pressure, respiratory function and normal acid-base balance (Courtot *et al.*, 1978). Increase of serum glucocorticoids have been known as the main factor altering haemogram during stress of anaesthesia (Ballard *et al.*, 1982; Brunson, 1990). Leukogram changes were increase in neutrophils and decrease in eosinophils and lymphocytes. These changes are known as "classic leukogram of stress". During barbiturate administration, leukocyte decreases in dogs (Usenik and Cronkite, 1965). In the present study leukogram (table 1) showed a pattern similar to "classic leukogram of stress". There was a moderate decrease of leukocytes during anaesthetic period and significant increase during days thereafter. The significant increase was probably due to infection of open facial skin wound, which had been created for exposure of facial artery.

Significant decrease in haematocrit (PCV) following use of thiopental (table 1) may be due to diminishing sensitivity of postganglionic sympathetic receptors and movement of RBCs toward spleen and microvasculature (Courtot *et al., loc. cit.*). Intravenous administration of fluid and usage of acepromazine and xylazine also reduce haematocrit (Clark *et al.*, 1986).

Significant decrease in plasma total protein during anaesthesia (table 1) are probably due to binding of approximately 85% of protein to thiopental and acepromazine.

Some reasons like hypotension and intracopartmental muscle pressure during anesthesia cause muscular ischemia leading to increase of serum AST and CK (Dodman, 1985; Grandy, 1987). Behavior of CK was found to be distinctly different from that of serum AST during muscle injuries in horses. Elevation in AST was present for weeks after the onset of clinical disease, while CK activities remained elevated for only a few days. Results of this study indicate that the behaviors of AST and CK are similar in recumbent donkey (table 2) and this is in contrast with behavior of AST in horses with muscular disease.

Regarding bilirubin metabolism, horse has a surprising different picture in comparison with other domestic animals. Total serum bilirubin levels in horses, ponies and probably donkeys normally range between 0.5 and 2 mg/dl and are related to the time of their last consumption of food. The unique fasting hyperbilirubinemia in horses and ponies has been studied extensively (Naylor *et al.*, 1980; Gronwall and Engelking, 1982). Obviously, the fasting hyperbilirubilirubinemia in horses and probably in other equidae is result of decrease in plasma bilirubin clearance but it is not due to overproduction of the pigments. In the present study, there was a period of 16 to 20 hours fasting and the increasing pattern of bilirubin levels was seen in the animals (table 2).

Both BUN and creatinine were relatively insensitive in detecting renal dysfunction. Any processes that diminish renal blood flow will directly cause a decrease in GFR and then will decrease clearance of urea and creatinine. In addition, hypovolemia and reduced renal perfusion enhance resorption of Na and H_20 in proximal tubules, which in

Thiopental anaesthesia in donkey

Table 1 - WBC, Neutrophil, Lymphocyte, Eosinophil, Monocyte and PCV and Serum Total Protein of Anaesthetized Donkeys (Mean±SD)

Time	WBC n/µl	Neutrophil n/µl	Lymphocyte n/µl	Eosinophil n/µl	Monocyte n/µl	PCV %	Total protein gr/dl
Base time	8470±998.43	3600±234	4253±971	290±189	221±74	35.4±2.07	240±54.77
5th min.	7490±125.50	3450±802	3852±609	219±89	72±85*	29±2.64*	360±114.0
30th min.	7754±1895.30	3318±1800	4200±966	199±78	80±57*	26.6±3.71*	300±70.71*
60th min.	7670±1828.50	3375±1050	3890±814	281±190	168±71	28±2.34*	280±83.66*
120th min.	7760±2200.40	4268±1140	3200±1250	240±60	130±80	28.2±2.94*	300±141.42*
180th min.	9180±3425.90	5020±2024	3748±1825	272±131	128±52	30.2±3.42*	320±83.66*
360th min.	1098±2191.30	6522±1085*	4075±1238	244±210	145±85	34.0±1.41	320±83.66
2nd day	12260±2530.40*	6525±635*	5200±1422	392±189	133±80	34.2±1.78	360±181.65
5th day	12390±176720*	6365±971	5300±2050	567±270*	148±81	34.41±67	320±130.38
9th day	12020±1567.20	6135±1086	5409±1932	278±152	220±204	34.4±1.94	320±109.54
Significancy	S	NS	NS	S	S	S	S

*Significantly difference between a specific time and base time at P<0.05

Table 2 - AST, CK, Bilirubin, BUN and Creatinine Serum levels of Anaesthetized Donkeys (Mean±SD)

Time	AST IU/L	CK IU/L	Bilirubin mg/dl	BUN mg/dl	Creatinine mg/dl
Base time	156.2±33.21	13.2±1.30	0.408±0.008	18.4±2.40	0.70±0.10
5th min.	181.4±30.63	13.6±1.14	0.418±0.004	18.4±2.40	0.74±0.05
30th min.	191.2±31.35	14.4±0.54	0.420±0.007	18.8±2.20	0.74±0.05
60th min.	198.4±31.70	17.0±1.22*	0.426±0.008	20.0±2.00	0.74±0.05
120th min.	198.6±31.95	20.0±2.00*	0.434±0.011*	22.8±1.90*	0.74±0.05
180th min.	199.8±32.55	25.0±1.00*	0.444±0.008*	25.4±2.70*	0.74±0.05
360th min.	255±38.37*	26.0±1.30	0.452±0.008*	22.4±3.04	0.76±0.08
2nd day	214.2±48.73	22.0±1.00*	0.526±0.018*	19.6±2.30	0.80±0.14
5th day	193.4±43.84	14.4±1.67	0.452±0.013	18.8±2.77	0.74±0.11
9th day	157.4±34.47	13.6±0.89	0.412±0.008	18.4±2.40	0.74±0.11
Significancy	S	S	S	S	NS

*Significantly difference between a specific time and base time at P<0.05

Table 3 - Urine PH of Anaesthetized Donkeys (Mean±SD)

	Time									
	Base time	5th min.	30th min.	60th min.	120th min.	180th min.	360th min.	2nd day	5th day	9th day
Urine PH	6.6±0.54	7.2±0.44	7.4±0.54*	7.6±0.54*	7.6±0.54*	7.6±0.54*	7.6±0.54*	7.6±0.54*	7.6±0.54*	7.0±0.70

*Significantly different between a specific time and base time at P<0.05

turn promote passive proximal tabular resorption of urea (but not creatinine) because the lower flow rate provides more time for resorption (Stockham, 2002). So, increase of BUN on 120th and 180th minute (table 2) were probably due to diminished renal blood flow subsequent to hypotensive effect of thiopental anaesthesia and significant increase in the urine pH during and after anaesthesia (table 3) may be indication of gradual renal elimination of alkaline thiopental solution.

Summary

This study was conducted on five donkeys *(Equus asinus)* of two sexes aged between 2.5 to 3.5 years. Atropine-acepromazine-xylazine premedicated donkeys were anaesthetized with 7mg/kg 5% thiopental solution and maintained with 0.0016%/Kg thiopental solution. Infusion of the solution was interrupted at 100th minute of anaesthesia. Haematology (WBC, leukogram, PCV) blood biochemicals (Totat protein, bilirubin, BUN, creatinine) and enzyme (AST, CK) profile and urine pH revealed significant variations during anaesthesia and during recovery period.

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CROSS PIN FIXATION FOR PROXIMAL FRACTURE OF THE TIBIA IN A FOAL

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Physeal fractures of tibia in foals generally occur as Salter-Harris type II but occasionally a Salter-Harris type I or type III injury may also be diagnosed (Young *et al.*, 1989). In this article, a case of proximal physis fracture (Salter-Harris type II) and its treatment by two Steinmann pin in cross fashion with successful outcome in a foal has been reported.

Case history and Treatment

A two month old, female, thoroughbred foal was referred to the clinics of school of veterinary medicine, with a history of trauma in the left hind limb. On clinical examination mild cellulites was observed at the level of proximal tibia and fracture of the proximal tibia was suspected. Lateral and anterioposterior radiographs of the affected limb revealed Salter-Harris type II fracture at the proximal physis of the tibia. Internal fixation with two Stinneman pins in cross fashion and support the limb with Thomas splint was chosen for the repair of the fracture (Fig.). Prior to the surgical intervention the foal was administered flunixine meglumine (Razak company, Iran) 1.5 mg/kg IV, cefazolin (Daropakhsh company, Iran)20 mg/kg IV and tetanus toxoid (Razi institute Iran) 3000 IU. General anesthesia was induced using diazepam 0.2 mg/kg. Xylazin hydrochloride I mg/kg and ketamin hydrochlorides 2.2mg/kg intravenously . Further, after endotracheal intubatiuon anesthesia was maintained by halothane. The foal was placed in dorsal recumbency and the area prepared for aseptic surgery. After reduction of the fracture site, two small incision were made at the lateral and medial site of the proximal physis of the tibia and two Stinnman pin (one an either side) was inserted for stabilizing the fracture site. Incision was sutured by Nylon material no. 0 in a simple interrupted fashion. Post surgical radiography revealed acceptable reduction and fixation on the fracture. The wound was dressed routinely and a Thomas splint was applied to support the left hind limp. Post surgical antibiotic and analgesic therapy included cefazolin 20 mg/kg IV for 3 days and flunixine meglumine 1.5 mg/kg IV once daily for 4 days, respectively. The bandage was changed daily

On day 83, postoperatively, the pins were removed under general anesthesia taking all the aseptic precautions. The skin wound was sutured aseptically and the limb was again immobilized with Thomas splint. After one week the splint was removed. Foal showed lameness in walking but after 10 days the foal became sound.

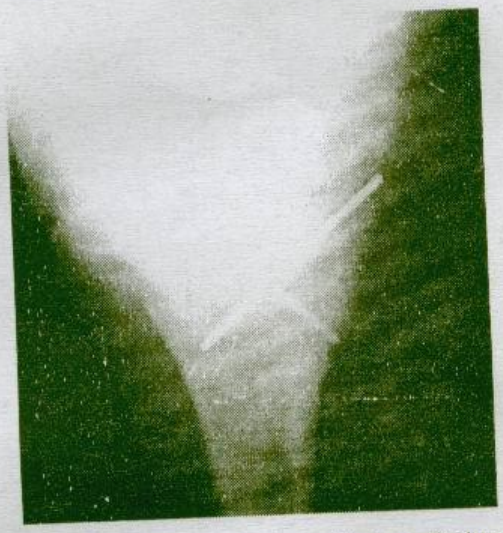

Fig. - Tibial fracture - Foal : Internal fixation with two Steinmann pins in cross fashion

Discussion

The use of external fixation with Thomas splint is difficult to construct and to retain by newborn foals because of their temperament and spoilage of splint during urination (Watkins *et al.*, 1985; Turner 1982). In the present case, the fracture were treated by two Steinmann pins and the limb was supported by Thomas splint. Bone plate fixation needs invasive surgery and the risk of infection is high (Sardari and Sharifi, 2002). Use of cross pin fixation is very simple but it should be done very carefully to prevent damage to the articular surface (Turner, *loc. cit.*). In most instances, after fracture fixation using pins or bone plates in horses, dressing by a plaster cast is advised, but tibial casting by plaster cast is not very easy, for the proximal fractures. Additional support with Thomas splint helped in preventing local infection as daily antiseptic dressing could easily be performed at the surgical site (Sardari and Sharifi, *loc. cit.*). Further fixation of the proximal physis with method presented here did not need long incision and the risk iof infection was very low.

Summary

A case of Salter-Harris type II fracture at the proximal physis of the tibia in a 2 month-old female thoroughbred foal treated using two Stinneman pins in cross fashion and Thomas splint support with successful outcome is presented and discussed.

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