



Comparative Therapeutic Study on Combined Herbal Therapy in Equine Impactive Colic

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Received: 02 April, 2018

Revised: 11 June, 2018

Accepted: 22 June, 2018

ABSTRACT

Total 45 cases admitted to VCC, Hisar, 16 cases diagnosed to be suffering from impactive colic were included in this study. These cases were subjected to complete clinical examination and were randomly divided into two groups for evaluation of haemato-biochemical and therapeutic efficacy. All the affected animals were exhibiting colicky signs along with lack of defaecation and had decreased or absent gastrointestinal borborygmi. Per-rectal examination revealed pelvic flexure as the most common site of impaction. There was increase in temperature, pulse rate, respiration rate, CRT, Hb, PCV, TEC, GGT, LDH, AST, BUN and creatinine. Along with fluid therapy, ceftriaxone (antibiotic), flunixin meglumine (NSAID) with supportive therapy, enteral liquid paraffin, magnesium sulphate and fenbendazole in both groups I and II, group I horses were additionally given aloe vera, ginger, garlic, chebulic myrobalan and asafoetida, while group II animals were given appetite stimulant and digestive tonic powder. The combination of above mentioned herbs/drugs have been tried with excellent recovery in group I animals with 100% efficacy.

Keywords: Equine, Impactive colic, Pelvic flexure, Laxative, Herbs

Equine, one of the most historically vital domesticated animals to human, have a special place among our domestic animals and in our hearts. At present, the equine population in India is 1.14 million, which includes horses and ponies to 0.62 million (55%), mules 0.19 million (17%) and donkeys 0.32 million (28%) as per 2012 census (19th Livestock Census-2012). Equine colic, one of the deadliest diseases a horse suffers, is a difficult task to establish its cause and is a challenge for field veterinary practitioners. An abdominal pain disorder of equines having catastrophic consequences without any forewarning and has been reported to be of multifactorial causes that may lead to huge health and welfare impacts (Radostits *et al.*, 2007). Impaction is an accumulation of dehydrated ingesta in a portion of the digestive tract and is typically located at sites where the intestinal diameter decreases. The specific pathogenesis for impactions is not fully understood, although risk factors such as poor dentition, decreased water intake, feeding of coarse roughage, lack

of exercise, administration of NSAIDs, infestation with gastrointestinal parasites, motility disorders and typical anatomy of equine intestines make it prone to formation of faecoliths and frequent suffering from impactive colic (Radostits *et al.*, 2007; Plummer, 2009). Keeping in view of this, the study was designed to determine the clinical observations and therapeutic efficacy of various drugs/herbs in equines suffering from impactive colic.

MATERIALS AND METHODS

The present investigation was conducted on clinical cases of 16 equines suffering from impactive colic which were brought to Veterinary Clinical Complex (VCC), LUVAS, Hisar. Detailed anamnesis and signalment of affected animals with regard to age, sex, details of earliest colic signs and duration of anorexia or inappetence were obtained from the animal owners. Complete clinical examination of the affected animals was made including recording of

rectal temperature, pulse rate, respiration rate, capillary refill time, gut sounds and per-rectal examination.

Haemato-biochemical Parameters

A total of 10 ml of blood was collected aseptically from the jugular vein of the affected animals, of which 2.5 ml was mixed with disodium salt of EDTA as an anticoagulant for estimation of haemoglobin (Hb), total erythrocyte count (TEC), total leukocyte count (TLC), differential leukocyte count (DLC), packed cell volume (PCV) and platelet count using Haematology Cell Counter (MS4s, Melet Schloesing Laboratories, France). Giemsa-stained blood smears were examined for haemoprotozoan parasites (if any) and the positive cases were excluded from the study. Remaining blood sample was collected without anticoagulant and serum was separated for the analysis of γ -Glutamyl transferase (GGT), Glucose, Urea, Creatinine, Total protein, Albumin, Alkaline Phosphatase (ALP), Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST) and Lactate Dehydrogenase (LDH) using fully automated Random Access Clinical Chemistry Analyzer (EM Destiny 180 Erba Mannheim GmbH – Germany) with kits procured from Transasia Bio-medicals Limited (Mumbai). The clinical and haemato-biochemical parameters of group I and II were compared with standard values available in the literature (Sharma *et al.*, 2009). Observations were made at day 0 (pre-treatment), 1 and 5 post-treatment.

Therapeutics

For therapeutic studies equines suffering from impactive colic were randomly divided into two groups. Group I animals were given aloe vera (*Aloe barbadensis*) 250ml, ginger (*Zingiber officinale*) powder 40-50 gm, garlic tablets¹ (*Allium sativum*) 20-25 nos., chebulic myrobalan (*Terminalia chebula*) powder 100-150gm and asafoetida (*Ferula asafoetida*) powder 10gm depending on the condition and body weight of horse and group II animals were given appetite stimulant and digestive health tonic² powder (200 gm). Additionally in both the groups, parenterally fluid therapy (RL, NSS and DNS @ 20ml/

¹Lasuna® (Garlic 250mg/tab, M/s The Himalaya Drug Company)

²Catone® (Appetite stimulant & digestive health tonic, M/s Cattle Remedies)

kg b.wt., BD IV), ceftriaxone (10mg/kg b.wt., OD IM/IV), flunixin meglumine (1.1mg/kg b.wt., BD IM/slow IV), ascorbic acid (20ml OD IM/IV), vitamin B-complex (10ml OD IM), antihistamines (10 ml OD IM) along with enteral liquid paraffin (2 litre) with equal volume of lukewarm water, magnesium sulphate (1g/kg b.wt.) and fenbendazole (10mg/kg b.wt.) via nasogastric tube were given. Treatment was followed by 20 minutes light exercise preferably trot.

RESULTS AND DISCUSSION

A total of 45 cases of equines suffering from various types of colic were reported to VCC, LUVAS. According to the type of colic, the incidence of impactive colic, spasmodic colic and renal colic observed were 37.21% (16/45), 53.49% (23/45) and 9.30% (4/45), respectively on basis of history, clinical signs and per-rectal examination. Among these, a total of sixteen (16) cases diagnosed to be suffering from impactive colic were considered for this study and randomly divided into two groups (group I and II) for evaluation of haemato-biochemical and therapeutic efficacy of some new drugs/herbs. Gender wise, the majority of these animals were found to be females in the age group of 6 to 12 years. All the animals were stall-fed and had decreased exercise consequently leading to reduced water consumption leading to the development of impaction and this finding was found to be in direct confirmation with Plummer (2009). On auscultation of abdominal cavity at different sites most of the horses had decreased or absent borborygmi and these findings are in agreement with Plummer (2009) and Turkar *et al.* (2014).

The impaction generally occurs at the sites where bowel luminal diameter decreases and is due to dehydration of ingesta, which leads to a progressive reduction in colonic motility. In our study, on per-rectal examination it was established that the main site of impaction was pelvic flexure where diameter of bowel is abruptly decreased (McGovern and Bladon, 2011). Rectal examination was reported as 'gold standard' test for diagnosing the site of impaction in affected horses by Jennings *et al.* (2014). Affected animals manifested a combination of clinical signs of colic like anxiety, pawing or stamping, flank watching, kicking at the abdomen, rolling, lying down and getting up, grunting, excessive sweating, sham drinking, frequent attempts to urinate, lack of defecation and typical

posture such as 'saw-horse' stance as reported by Alsaad and Nori (2009) and Sharma *et al.* (2009).

Clinical parameters such as temperature, pulse rate, respiration rate and capillary refill time of affected animals were recorded thrice i.e. before the start of the treatment (d0), after one day (d1) and after 5 days (d5) of treatment (Table 1). There was increase in temperature, pulse rate, respiration rate and capillary refill time (CRT) before treatment in both the groups, due to dehydration and pain (Singh *et al.*, 2017). Temperature was restored to normal while pulse rate and respiration rate were still slightly elevated, but within normal range after 5 days of treatment. Drop in CRT value after 24 hours of treatment was markedly high in group I (1.91 ± 0.12 sec) in comparison to group II (2.25 ± 0.20 sec), suggesting a better response of group I regimen.

The values of haemoglobin, total erythrocyte count and packed cell volume (Table 2) were observed markedly elevated in all the animals suffering from impactive colic of both the groups before treatment (d0) which may be due to haemoconcentration as a consequence of pain/stress leading to splenic contraction and compartmental fluid shifts leading to dehydration and hypovolemia (Orsini, 2011; Yadav *et al.*, 2014 and Singh *et al.*, 2017). All the affected animals were having lowered platelet count (Table 2) and the basic reason reported by Alsaad and Nori (2009) is the release of endogenous mediators such as platelet activating factor in inflammatory disorders inducing changes in the coagulation system causing disseminated intravascular clotting, which was restored to normal levels after 5 days of treatment. Leukocytosis was observed in most of the affected animals due to bacterial infection and inflammation of the impacted gut segment (Enbavelan

Table 1: Pre-treatment and post-treatment alterations in temperature, pulse rate, respiration rate and capillary refill time in Group I and II animals

Animal No.	Parameters												
	Temperature (°F)			Pulse rate (per minute)			Respiration rate (per minute)			CRT (in sec)			
	d0	d1	d5	d0	d1	d5	d0	d1	d5	d0	d1	d5	
Group I	1	102.0	101.8	101.4	56	51	48	36	32	30	3.2	2.2	1.8
	2	100.2	100.0	100.0	64	38	36	40	35	36	2.6	1.8	1.3
	3	102.2	100.0	100.2	56	49	42	42	53	35	3.0	1.9	1.5
	4	100.0	100.4	100.2	54	46	43	30	32	29	3.1	1.8	1.5
	5	100.8	100.2	100.4	38	39	36	40	38	31	2.1	1.4	1.8
	6	101.2	100.4	100.0	45	42	41	35	36	29	2.8	1.5	1.6
	7	100.5	100.4	99.8	65	52	40	30	30	29	3.4	2.3	1.9
	8	101.3	101.0	100.5	74	56	44	28	30	25	4.0	2.4	1.8
	Mean ± SE	101.03 ± 0.28	100.53 ± 0.21	100.31 ± 0.17	56.50 ± 4.04	46.63 ± 2.29	41.25 ± 1.42	35.13 ± 1.88	35.75 ± 2.66	30.5 ± 1.25	3.03 ± 0.19	1.91 ± 0.12	1.65 ± 0.07
Group II	9	102.4	101.4	100.6	72	62	43	36	28	25	3.6	2.2	1.6
	10	101.0	101.1	100.8	46	45	46	45	38	36	1.8	1.6	1.8
	11	100.8	100.4	99.8	60	55	48	40	34	25	2.2	1.6	1.5
	12	99.8	100.2	D	66	60	D	42	40	D	2.2	2.1	D
	13	102.0	100.4	100	55	48	39	38	32	26	3.0	2.2	1.7
	14	101.2	101.1	D	66	72	D	59	64	D	2.2	2.1	D
	15	102.0	102.3	D	69	66	D	40	39	D	2.8	2.6	D
	16	101.4	101.2	D	63	60	D	40	41	D	3.8	3.4	D
	Mean ± SE	101.33 ± 0.29	101.01 ± 0.24	100.3 ± 0.23	62.12 ± 2.9	58.50 ± 3.16	44.00 ± 1.95	42.5 ± 2.53	39.5 ± 3.8	28 ± 2.6	2.7 ± 0.25	2.25 ± 0.20	1.65 ± 0.06
Control Values (Literature)	Mean ± SE (Range)	100.5 ± 0.5 (100-101)			35 ± 5 (30-40)			10 ± 2 (8-12)			< 2 second		

D= animal died during treatment.

Table 2: Haematological estimation of Group I and II animals before and after treatment compared with control values

Parameters	Days	Control values (Literature)	Group I	Group II
		Mean	Mean \pm SE	Mean \pm SE
Haemoglobin (g/dl)	d0		12.91 \pm 0.56	12.88 \pm 0.72
	d1	10.8 g%	11.85 \pm 0.47	11.16 \pm 0.68
	d5		11.61 \pm 0.49	11.18 \pm 0.90
Total erythrocyte count ($10^6/\mu\text{l}$)	d0		9.71 \pm 0.51	8.75 \pm 0.41
	d1	$6.9 \times 10^6/\mu\text{l}$	8.93 \pm 0.37	7.93 \pm 0.37
	d5		8.59 \pm 0.48	7.73 \pm 0.64
Packed Cell Volume (%)	d0		43.74 \pm 2.10	39 \pm 1.55
	d1	36.0 %	39.57 \pm 1.34	34.47 \pm 1.44
	d5		37.91 \pm 1.24	34.02 \pm 2.3
Platelet count ($10^3/\mu\text{l}$)	d0		123.13 \pm 4.56	146.13 \pm 12.03
	d1	$176 \times 10^3/\mu\text{l}$	200.38 \pm 14.49	185.00 \pm 16.71
	d5		247.75 \pm 19.62	262.25 \pm 9.19
Total leukocyte count ($10^3/\mu\text{l}$)	d0		9.94 \pm 1.68	8.13 \pm 1.52
	d1	$5.11 \times 10^3/\mu\text{l}$	9.05 \pm 0.98	7.38 \pm 1.08
	d5		8.58 \pm 0.41	7.32 \pm 0.22
Neutrophils (%)	d0		63.00 \pm 5.09	60.50 \pm 3.60
	d1	62 %	62.50 \pm 3.90	53.00 \pm 4.10
	d5		60.75 \pm 2.58	52.50 \pm 3.37
Lymphocytes (%)	d0		30.87 \pm 4.90	33.25 \pm 3.98
	d1	26 %	31.37 \pm 3.77	42.00 \pm 3.69
	d5		32.25 \pm 2.39	39.75 \pm 3.40
Monocytes (%)	d0		4.88 \pm 0.47	4.75 \pm 0.67
	d1	8 %	4.25 \pm 0.41	3.62 \pm 0.49
	d5		4.25 \pm 0.36	4.25 \pm 0.47
Eosinophils (%)	d0		1.00 \pm 0.26	1.50 \pm 0.60
	d1	4 %	1.38 \pm 0.32	1.25 \pm 0.36
	d5		2.00 \pm 0.46	2.75 \pm 0.25

et al., 2015b and Singh *et al.*, 2017) causing relative neutrophilia. Mean values were remarkably decreased in both the groups after treatment but were still higher after 5 days of treatment, probably due to gut inflammation and dehydration because of compartmental fluid shifts.

The serum biochemical parameters (Table 3) exhibited remarkable increase in LDH, GGT, ALT, AST, ALP, total proteins, glucose, BUN and creatinine (Singh *et al.*, 2017) before the start of treatment in both the groups. AST, LDH and ALP were poorly specific for hepatic damage while GGT was found to be the most sensitive indicator of hepatic damage in horses (Sprayberry and Robinson, 2015). In present study also, elevation in liver function

enzymes, specifically GGT indicated liver dysfunction in clinical cases of impactive colic horses. Mean values of liver function enzymes significantly decreased after treatment in both the groups and restored to the normal range, but values were still higher than control mean values indicating convalescence period of few more days for restoration to control values.

The increase in total protein is attributed to haemoconcentration and dehydration causing loss of plasma water and is associated with high PCV (Radostits *et al.*, 2007; Langdon *et al.*, 2009 and Orsini, 2011). Total proteins along with PCV are an important indicator of tissue perfusion and it also determines the success of

Table 3: Biochemical estimations of Group I and II animals before and after treatment as compared to control value

Parameters	Days	Control values (Literature)	Group I	Group II
		Mean(range)	Mean \pm SE	Mean \pm SE
Lactate dehydrogenase (U/l)	d0	287 U/l	685.25 ^{aY} \pm 53.48	848.25 ^{aX} \pm 51.70
	d1		558.38 ^b \pm 41.35	692.50 ^b \pm 56.40
	d5	(162-412)	372.13 ^c \pm 25.43	408.25 ^c \pm 23.52
Alanine aminotransferase (U/l)	d0	13 U/l	26.72 ^{aY} \pm 7.14	37.19 ^{aX} \pm 7.37
	d1		16.78 ^b \pm 3.40	29.61 ^a \pm 4.20
	d5	(3-23)	14.83 ^b \pm 1.38	15.80 ^b \pm 2.14
Aspartate aminotransferase (U/l)	d0	296 U/l	452.03 ^a \pm 27.65	586.04 ^a \pm 81.30
	d1		393.06 ^b \pm 28.93	459.73 ^b \pm 49.91
	d5	(226-366)	285.04 ^c \pm 15.44	281.50 ^c \pm 14.18
γ -Glutamyl transferase (U/l)	d0	8.85 U/l	18.03 ^a \pm 0.90	20.41 ^a \pm 2.10
	d1		14.26 ^b \pm 0.94	17.81 ^b \pm 2.10
	d5	(4.3-13.4)	10.10 ^c \pm 0.48	11.82 ^c \pm 0.70
Alkaline phosphatase (U/l)	d0	269 U/l	304.25 \pm 71.96	312.89 \pm 39.85
	d1		246.75 \pm 44.90	255.63 \pm 28.72
	d5	(143-395)	225.38 \pm 30.76	220.75 \pm 31.05
Glucose (mg/dl)	d0	95 mg/dl	116.79 ^a \pm 3.82	120.70 ^a \pm 3.41
	d1		98.78 ^b \pm 6.32	110.65 ^b \pm 5.98
	d5	(75-115)	90.20 ^{cY} \pm 2.62	99.83 ^{cX} \pm 3.09
Total protein (g/dl)	d0	6.55 g/dl	7.56 ^a \pm 0.25	7.62 \pm 0.24
	d1		6.84 ^b \pm 0.22	7.08 \pm 0.24
	d5	(5.2-7.9)	6.50 ^{cY} \pm 0.13	7.07 ^X \pm 0.22
Albumin (g/dl)	d0	3.15 g/dl	3.50 ^a \pm 0.10	3.63 ^a \pm 0.11
	d1		3.17 ^b \pm 0.11	3.29 ^b \pm 0.11
	d5	(2.6-3.7)	3.14 ^b \pm 0.08	3.41 ^b \pm 0.08
Blood urea nitrogen (mg/dl)	d0	17 mg/dl	24.04 ^a \pm 2.29	25.09 ^a \pm 1.35
	d1		19.95 ^b \pm 1.56	23.63 ^b \pm 1.27
	d5	(10-24)	16.96 ^c \pm 1.20	19.42 ^c \pm 1.07
Creatinine (mg/dl)	d0	1.55 mg/dl	2.50 ^a \pm 0.48	2.63 ^a \pm 0.34
	d1		2.00 ^b \pm 0.32	2.38 ^b \pm 0.30
	d5	(1.2-1.9)	1.54 ^c \pm 0.15	1.68 ^b \pm 0.18

Note: Means bearing different superscripts (a,b,c) differ significantly ($p < 0.05$) in column for each parameter. Means bearing different superscripts (X,Y) differ significantly ($p < 0.05$) in row for each parameter.

fluid therapy given to diseased animals (Robinson and Sprayberry, 2009). Blood glucose concentration becomes dysregulated due to the action of endotoxins (absorbed across compromised intestinal mucosa), release of cortisol and adrenaline in response to the stress/pain which leads to hyperglycaemia (Latson *et al.*, 2005 and Toth *et al.*, 2009) which is associated with poor prognosis. The increase in BUN and creatinine was presumably due to dehydration leading to hypovolemia, decreased renal blood flow and glomerular filtration rate impairing the excretion of urea and creatinine, thus leading to pre-renal azotemia which

has also been reported by Orsini (2011) and Lester *et al.* (2015). However, post-treatment mean values of LDH, GGT, ALT, total proteins, glucose, BUN and creatinine in group I horses were more proximate to normal levels as compared to values of group II on d5, indicating better response with group I regimen.

Group I horses were treated with aloe vera, ginger, garlic, chebulic myrobalan and asafoetida. The clinical uses of these herbs in the veterinary and medical field have been in reports by numerous Indian and Foreign authors, while

the combined use of these herbs with aloe vera has been probably reported very rare in India for impactive colic in equines.

Aloe vera possesses numerous activities including laxative, antioxidant, anti-inflammatory, immunomodulatory and hepatoprotective properties (Baruah *et al.*, 2016 and Sánchez-Machado *et al.*, 2017) and its active anthraquinones (aloe-emodin-9-anthrone and aloe-emodin) are metabolised by the colonic flora and excreted in the large intestine to work as a stimulant and irritant for the gastrointestinal tract, hence act as a potent laxative (Joseph and Raj, 2010). Reports are on record that anthraquinones of aloe also stimulates mucous secretion, thereby increases intestinal water content (Baruah *et al.*, 2016) and are of greatest value in those animals that suffer from impaction of the large intestine (Wynn and Fougère, 2007). Ginger is known to increase the motility of the gastrointestinal tract and has a positive influence on gastrointestinal tract possessing gastroprotective, carminative, sialagogue, anti-inflammatory, antibacterial, antiviral, analgesic and antipyretic properties (Srinivasan, 2017).

Garlic (*Allium sativum*) has a broad antimicrobial spectrum, antioxidant and anti-parasitic properties. It is administered in veterinary practices for gastrointestinal spasms and also improves digestive, respiratory, cardiovascular function in animals (Wynn and Fougère, 2007). Most frequent uses of asafoetida are in gastrointestinal disorders as an anti-flatulence, antispasmodic, antihelminthic, antioxidant, hypotensive and hepatoprotective (Iranshahy *et al.*, 2011). Asafoetida was used for indigestion, flatulence, colic, abdominal distension, constipation and arthritis in veterinary practices (Wynn and Fougère, 2007). Chebulic myrobalan's flavonoid and tannin makes it popular for use as an astringent, laxative and digestive (Jokar *et al.*, 2016).

The results of present study for the use of these herbs have been strengthened by the above mentioned workers and results of the current study too were superior in group I compared to group II, as the percent efficacy of treatment has been recorded on basis of remission of clinical symptoms and restoration of haemato-biochemical parameters in general and the passing of faeces in particular. The time taken for complete recovery in animals of group I (n=8) varied from 32 to 50 hours (average 37.88 hours), while it varied from 36 to 48 hours (average 43 hours) in four

animals of group II that survived by day 5 of treatment (Table 4).

Table 4: Therapeutic efficacy of drug combinations in Group I & II animals (n=8)

Drug combination	Animal S. No.	Defecation post-treatment (in hours)	
Group I	1	50	
	2	32	
	Fluid therapy + liquid paraffin + magnesium sulfate + Aloe vera	3	38
	+ Ginger + Garlic + Chebulic myrobalan + Asafoetida +	4	35
	fenbendazole + antibiotic +	5	32
	flunixin and supportive therapy	6	38
		7	40
		8	38
% efficacy		100 percent	
Group II	9	46	
	10	42	
	11	36	
	Fluid therapy + Liquid paraffin + magnesium sulfate + catone	12 [#]	D
	+ fenbendazole + antibiotic +	13	48
	flunixin and supportive therapy	14 [#]	D
		15 [#]	D
		16 [#]	D
% efficacy		50 percent	

D= Animals died during treatment.

White and Dabareiner (1997) and Chand *et al.* (2011) reported that the mean time required for resolution of impactive colic (with parenteral fluid therapy) was 48 hours and 72 hours, respectively which is slightly more than the recovery time of our group I and group II animals. However, nutritional and molecular biological analysis of herbal drugs requires further research and may be pursued further in interest of equines and equine owner welfare.

CONCLUSION

Thus, it was concluded that animals of group I treated with aloe vera, garlic, chebulic myrobalan and asafetida gave 100 per cent results while it remained 50% in group II, indicating better response with the group I regimen. The combination of above mentioned herbs/drugs have been tried with excellent efficacy for the first time in cases of equine impactive colic in India.

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