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Case Report

Resumption of Athletic Performance Following Emergency Surgical Correction of Strangulating Large Colon Volvulus in a Thoroughbred Mare

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Abstract

This report describes a case of large colon volvulus in a 6-year-old Thoroughbred mare used for tent pegging sport by the Police department. The mare was presented in severe and acute pain from the last 5-6 hours (while returning after national games) with injected mucous membrane and capillary refill time >3secs. The mare was immediately anaesthetized and subjected to surgery. Sub-serosal hemorrhages and edema was evident on the mesentery of left ventral and dorsal colons. The condition was diagnosed as volvulus (>360º) of the left ventral colon. The volvulus was corrected and pelvic flexure was emptied and flushed. The mare recovered from anesthesia but experienced moderate pain for the next 5-6 hours. Uneventful recovery was reported on the next day with no pain, passed feces and took some green fodder. The mare recovered and resumed athletic performance in the subsequent7-8 months. The report recommends early referral for surgery in large colon volvulus for favourable prognosis and also highlights the pre- and post-surgery serial monitoring of clinical, haematological and biochemical parameters.

Keywords: Athelete, Edema, Large Colon, Mesentery, Sport, Volvulus

Introduction

Large colon volvolus (LCV) in equine is a strangulating surgical condition and account to almost one fifth of the total colic cases (Proudman *et al.,* 2002) leading to colon distension and ischemia (Peterson *et al.,* 2019). It is a severely painful condition of equine requiring quick diagnosis and surgery. Thoroughbred brood mares of 8-10 years of age and 30-90 days peri-parturient are considered at high risk along with the influence of heritability (Peterson *et al.,* 2019) compared to mares that have never foaled or males (Suthers *et al.,* 2012). The present report highlights the occurrence of volvulus in a sports Thoroughbred mare and its excellent outcome due to early referral for surgery along with the serial monitoring of clinical and hemato-biochemical parameters.

A six-year-old Thoroughbred athlete mare weighing 350 Kg was presented with severe and acute colic in the morning hours of early winter. The mare was from the police department and was returning base camp after playing at national games 2 two days before. During journey the mare showed moderate colic (12 hours back) which, increased in severity within 5-6 hours and was non-responsive to analgesics. The mare had a history of one time rolling in the vehicle 30 minutes before reaching the hospital. The mare came down from the vehicle but could not stand still and was violent due to severe pain. On clinical examination, there was mild tachycardia (50 bpm) and moderate tachypnoea (25/min) with normal rectal temperature. The capillary refill time was more than 3 seconds and had injected mucous membranes. The abdominocentesis revealed serosanguinous fluid. The mare had not passed feces since the onset of colic. The severity of pain did not allow any other assessment of borborygmi, nasogastric reflux, per-rectal examination or ultrasonography. When brought to soft bedding, the mare immediately become recumbent and started rolling. The blood samples were drawn for haematological (complete blood count) and biochemical (lactate, creatine kinase, total protein, alkaline phosphatase, Sodium, Potassium, Chloride, Calcium and Glucose) examination. Without further delay, the mare was administered inj. Xylazine hcl @ 1.1mg/kg, intravenously (IV); however, the violent behaviour continued. Induction of general anaesthesia was done with inj. Ketamine @ 3mg/kg, IV (Harðardóttir *et al*., 2020) in the indoor facility itself within 15 minutes of case presentation. The animal was brought to surgical theatre, endotracheal intubation was done (no. 20) and the mare was put on partial re-breathing inhalant anesthesia of isoflurane mixed with 100% oxygen. Two-way central venous catheter was placed in the jugular vein and fluid therapy with normal saline was started @ 40 ml/kg/hour, for the initial 30 minutes and was later maintained at 10ml/kg/hr. Inj. Flunixin megludine @1ml/50kg was administered IV. Antibiotics Inj. Piperacillin Tazobactum @50mg/Kg b.wt was administered IV prior to surgery.

The mare was positioned in dorsal recumbency on an equine table and the midline was prepared for aseptic surgery. A linear incision of approximately 25-30 cm was made on the midline starting cranial to umbilicus and caudally. The cutaneous blood vessels in the ventral abdomen were engorged due to severe abdominal distension and pain. The mildly distended small intestines popped out on incising the peritoneum. Peritoneal fluid was markedly increased and was aseptically collected for cytological and biochemical examination. The large colon was exteriorized. Sub-serosal hemorrhages and edema was clearly evident on the mesentery of left ventral and dorsal colon (Fig. 1). The condition was diagnosed to be volvolus (>360º) of left ventral colon (rotated anticlockwise). The volvulus was corrected and the pelvic flexure enterotomy was done to empty the contents. A tissue sample from pelvic flexure was collected for histo-pathological examination. The colon was thoroughly flushed with water using hose pipe. The enterotomy site was closed in two layers; simple continuous sero-muscular layer followed by cushing pattern using 2-0 poly-p-dioxanone. Proper rinsing with normal saline was done before placement of colons back into the abdomen in their normal anatomical position. A silicone foley's catheter (F 16) was placed lateral to the incision line in the abdominal cavity to facilitate the drainage of peritoneal fluid. The abdominal cavity was thoroughly irrigated with normal saline solution and the midline was closed using poly-p-dioxanone (No. 1) absorbable monofilament suture material in continuous pattern followed by subcutaneous tissue and skin. The animal recovered smoothly from anaesthesia and was continued with fluid therapy for the next 12 hrs. Supportive bandage (broad cotton tape) was applied following anaesthetic recovery. For upto 5-6 hours post-surgery, the animal was in moderate pain which was evident by the continuous movement of limbs. Mild lukewarm water intake was allowed for the next 24 hours. The mare showed marked improvement on the next day with no clinical sign of pain, passed feces and took some soft green fodder. One litre of liquid paraffin and 500gm of magnesium sulphate was also given in luke warm drinking water on day one of surgery.

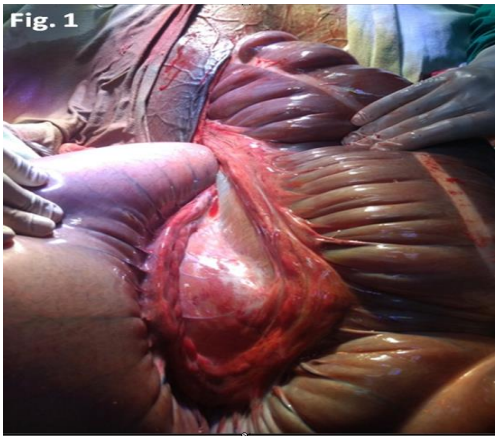

Figure 1: Photograph showing sub-serosal hemorrhages and edema on the mesentery of left ventral and dorsal colon

Supportive bandage was continued for a period of 12-14 days. The bandage was daily removed for 10-15 minutes for ventilation and wound dressing. The Foley's catheter was allowed to hang in between the bandages. Postoperative treatment included; Intravenous fluid therapy with nearly 40 litres of normal saline in a day for 3 continuous days, antibiotic inj. Amikacin @10mg/kg b.wt once daily IM for 3 days, inj. Piperacillin Tazobactum @50mg/kg b.wt, IV twice daily for 5 days and analgesic inj. flunixin meglumine @1.1 mg/kg IV once daily for 3 days. Tab isoxsuprine was given orally for 7 days to prevent endotoxemia induced laminitis. Serial monitoring of blood, serum and peritoneal fluid was done for the next 3 days (Table 1).

Table 1: Table showing the pre-and post-surgery comparative parameters of blood, serum and peritoneal fluid

S. No	Parameters	Pre-surgery	Day 1	Day 2	Day 3
1	HR (bpm)	50	62	45	42
2	RR (/min)	25	28	20	18
3	CRT/sec	>3	3	>2	2
4	MM	Injected	Congested	Normal	Normal
5	Temp (ºF)	101	100	101.2	99.6
6	Hb (g%)	16.5	13.8	15	11.6
7	TLC (cumm)	15200	10900	3400	3400
8	DLC, N %	96	88	52	48
9	DLC, L %	4	12	48	52
10	PCV (%)	50.2	42.2	46	36.8
11	Plt ($x10^3$)	289	288	255	242
12	S. Lactate (mmol/l)	6.4	2.4	2.3	1
14	S. TP (g/l)	6	5	6	5.5
15	S. CK (U/L)	364	690	699	591
16	S. AKP (U/L)	234	274	285	289
17	S. Na (mEq/l)	142	138	-	128
18	S. K (mEq/l)	3.2	3.4	-	4
19	S. Cl (mEq/l)	108	109	110	-
20	S. Ca (mg/dl)	11.6	11.6	11.4	11.4
21	S. Glu (mg/dl)	160	140	132	100
22	P. lactate (mmol/L)	5.5	7.6	4.4	-
23	P. TP (g/L)	1.8	1.6	1.5	-
24	P. CK (U/L)	<20	<20	<20	-
25	P. Lactate: S. lactate	0.85	-	-	-

(HR: heart rate, bpm: beats per minute, RR: respiration rate, CRT: capillary refill time, MM: mucous membranes, Temp: temperature in ⁰ Fahrenheit, Hb: hemoglobin, TLC: total lecocyte count, N: neutrophils, L: lymphocytes, PCV: packed cell volume, S: serum, CK: Creatine Kinase, AKP: Alkaline phosphatase, Na: sodium, K: potassium, Cl: chloride, Ca: calcium, P.: peritoneal, TP: total protein, Glu: Glucose)

Abdominal ultrasonography was done on day 3 to assess the status of intestines and presence of peritoneal fluid. The right ventral colon wall thickness was 4.5 mm. Good motility was seen in small intestines and right ventral

colon. On the left side; the spleen was normal in echo texture and no free fluid seen in the abdomen. The left ventral colon wall thickness was 5.7 mm with reduced motility. Mild fluid column (1.2 cm) was detected near the bulb of Foley's catheter and so the catheter was removed. A pre-operative large colon wall thickness of ≥9mm on ventral abdominal ultrasonography has been reported as a reliable predictor of torsion of colon in horses (Pease *et al.*,2004). Pre-surgery ultrasonography helps in assessing an increased peritoneal fluid with hypo-motility of intestines and mural thickening of large colon (Preez *et al.*, 2018) in lesions of torsion or LCV, but it was not possible in this mare due to severe pain and the mare was subjected to emergency laparotomy.

The mare was discharged on the 4th post-operative day and sutures were removed at the second visit on 15th postoperative day. The mare was advised for mild exercise of trot at two months and full exercise at three months of surgery. The athletic performance of the mare resumed and the mare won national medal in tent pegging competition in the next 7-8 months of surgery. (Fig. 2).

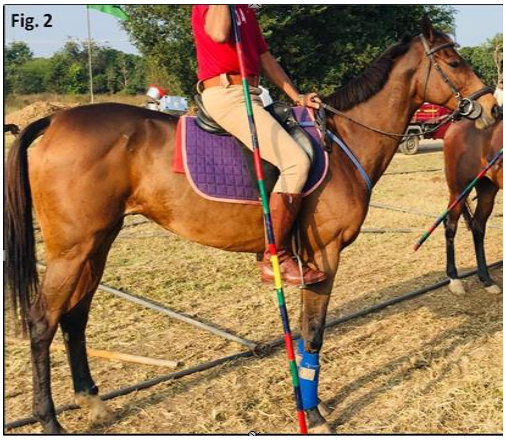

Figure 2: Photograph showing the healthy equine during exercise after 7 months of surgery

The LCV is an emergency surgical condition in horses. Poor response to analgesic medication and rapid deterioration in condition are usually suggestive of strangulating lesions. Various pre-disposing factors reported for the left LCV include; previously foaled mares, horses with a history of multiple colic episodes in the previous year, taller horses and horses that have received medication (other than anti-helminthic) in the previous 7 days (Suthers *et al.*, 2012). Certain management alterations of feeding and dental care have also been advised to prevent LCV (Suthers *et al.*, 2013). Spring and autumn season are reported to be the peak season for LCV (Archer *et al.*, 2006). Horses with LCV are usually reported with mild to moderate signs for the first few hours (may be due to gas distention) which can progress to acute and painful (due to strangulating obstruction) (Southwood, 2004).

Pre and Post Surgery Analysis of History, Hematological and Biochemistry Parameters (Table 1)

The mare was on a regular balanced diet (4 times feeding) of gram, oats, wheat bran, barley and green fodder (barseem). The barseem feeding was replaced with maize one month before the onset of LCV. There was no previous history of diarrhoea or colic. The equine was on regular de-worming at every 3 months intervals.

The pre-surgical hemoglobin, packed cell volume and platelets were elevated suggesting dehydration. Leukocytosis with severe neutrophilia and toxic changes was recorded. The pre-surgery serum and peritoneal lactate was elevated 3 and 5 times, respectively, and the peritoneal to serum lactate ratio was of 0.85. The serum CK and AKP were mildly elevated, while the peritoneal total protein and CK were within the normal reference range. The serum glucose was markedly higher than the normal values. Serial monitoring of hemato-biochemical and clinical parameters showed improvement from day one of surgery (Southwood, 2004). Though, the HR and RR were slightly higher on day one. The serum lactate dropped to 2.4 mmol/L and 1.0 mmol/L on day 1 and 3, respectively; whereas, the peritoneal fluid lactate increased on day 1 and then started decreasing. The serum CK and AKP kept on increasing from day 1 till day 3 and did not come to normal range during the hospital stay.

Equines operated for LCV should show an improvement in the gastrointestinal sounds during the first 24hours, if not and with signs of pain and increasing abdominal distention is reported as a poor prognostic indicator for survival (Southwood, 2004). Although, all the pre-surgery clinical and hemato-biochemical parameters recorded in the

present mare were indicative of poor prognosis for LCV (Southwood, 2004; Suthers *et al.,* 2012), but the mare started showing signs of improvement from day one of surgery. An elevated PCV and decreased total protein on initial follow up days had been reported in LCV (Southwood, 2004). Endotoxemia leading to post-operative laminitis is a common complication of LCV and sterile polyionic isotonic fluids are advised to manage the cardiovascular effects of endotoxemia (Southwood, 2004).

Cited literature reports, the overall anaesthetic recovery of LCV to be 68-86% (Mair and Smith 2005; Kelleher *et al.,* 2013), while the survival to discharge as 36-74% (Suthers *et al.,* 2013) and a reoccurrence of 15.3% (Hackett *et al.,* 2015). However, the mare in the study was found healthy with no episode of recurrence till the follow up of 19 months. The peritoneal fluid cytology of the mare was non-diagnostic due to blood contamination. Histology of pelvic flexure biopsy revealed superficial necrosis and severe congestion in the sub-mucosa along with infiltration of mononuclear cells (Fig. 3). Previous study on the pelvic flexure biopsies has not been found to be accurate for the prediction of short-term survival after LCV in horses (Levi *et al.*,2012).

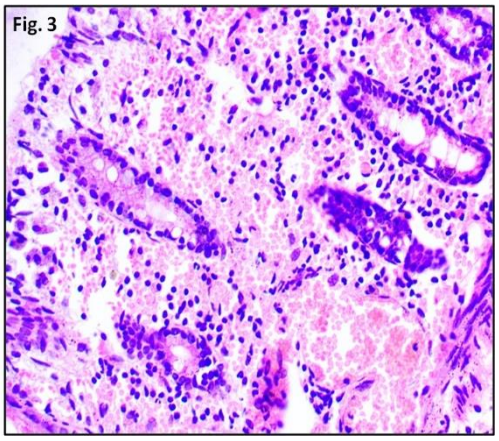

Figure 3: Microphotograph of pelvic flexure biopsy with superficial necrosis and severe congestion in sub-mucosa along with mononuclear cells

Conclusion

In summary, the report highlights pre and post-surgery serial monitoring of clinical, hematological and biochemical parameters of serum and peritoneal fluid in a mare with successful surgical management of left colon volvulus and resumption of full athletic activity on long term follow up. The report recommends early referral for surgery in equine with severe and acute colic non-responsive to analgesics and suspected for strangulating lesions for favourable prognosis.

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Conflict of Interests

There is no conflict of interest.

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