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Comparative Radiographic and Ultrasonographic Evaluation and Surgical Management of Gastrointestinal Disorders in Canines

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ABSTRACT

Present study was conducted on 6 diseased dogs of either sex to evaluate the gastrointestinal disorders based on the radiographic and ultrasonographic examinations along with the alteration in urine analysis, haematological and biochemical parameters. Clinical parameters (dehydration status, mucous membrane, respiratory rate, heart rate, rectal temperature), haematological parameters (white blood cells, red blood cells, haemoglobin, haematocrit value, platelet count, lymphocytes, neutrophils), biochemical parameters (blood urea nitrogen, total protein, alanine transaminase, serum creatinine, blood glucose), urological parameters (leukocyte esterase, ketone bodies, nitrites, urobilinogen, bilirubin, protein, glucose, specific gravity, blood, pH) were analyzed. In radiography lateral and ventro-dorsal view of the gastrointestinal system were taken. Ultrasonographic scanning of the gastrointestinal organs was performed using 3.5-7.5 MHz convex transducer with suitable gain. A prospective study of gastrointestinal disorders of canines was carried out and 6 cases were diagnosed i.e. Gastro-duodenal disorders (2 cases), Mesenteric lymph node disorder (1 case) and Intestinal disorders (3 cases). Gastro-duodenal disorders subdivided into Gastro-duodenal foreign body (1 case), Duodenal stenosis (1 case). Intestinal disorders subdivided into Intestinal foreign body (1 case) and Intussusceptions (2 cases). Urine analysis, haemato-biochemical testing, radiography, and sonography were combined to provide a precise and prompt diagnosis of gastrointestinal system disorders. The clinical output was enhanced by the precise and prompt diagnosis.

HIGHLIGHTS

- Prompt and precise diagnosis and surgical management of gastrointestinal disorders in canines.
- Evaluation of haemato-biochemical and urinary parameters for early diagnosis of the gastrointestinal disorders.

Keywords: Canines, Surgery, gastrointestinal disorders, radiographic and ultrasonographic evaluation

In cases of gastrointestinal foreign bodies, ultrasonography is greatly helpful to arrive at a definitive diagnosis and also provides additional information about the structure and integrity of the bowel wall, surrounding mesentery, presence of free peritoneal fluid, size of intestinal lymph nodes, motility, etc., which helps in determining the prognosis. Ultrasonography is a safe and rapid procedure that does not require any special preparation or tranquilization of the patient under examination.

Strangulations of the small intestine may also occur due to intussusception, volvulus, hernia, etc. Obstruction significantly leads to an alteration in mesenteric blood flow by increasing and decreasing the blood flow oral and aboral to the obstruction, respectively. Dogs suffering from the affections usually have non-specific signs like vomiting, difficulty in defecation, dehydration, fever, anorexia, abdominal pain, and abdominal distension, making diagnosis more challenging (Tyrell and Beck, 2006).

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Radiography has been considered the primary imaging modality for the diagnosis of abdominal affections in dogs. The most common conditions diagnosed by radiography are radio-opaque gastric and intestinal foreign bodies, gastric dilatation and volvulus, intestinal dilation, etc (Tyrell and Beck, 2006).

MATERIALS AND METHODS

Clinical parameters, physical parameters, radiographic images, ultrasonographic scanning, haematogical analysis, biochemical analysis, urological analyses were carried out of clinical cases of genital disorders in canines. In radiography, lateral or ventro-dorsal views were taken for the diagnosis of uroliths formation. In ultrasongraphic scanning gastric region, large and small intestines, duodenum, jejunum were scanned properly for any foreign body, bunching or enteroplication of intestines.

In pre-operative preparation, intravenous fluids were administered and maintained throughout the surgery and until recovery from anesthesia. Pre-operative broad-spectrum antibiotics were given intravenously. The operative site was prepared and animals were restrained properly. Mid-ventral laparotomy was performed followed by gastrotomy and enterotomy in most of the cases to retrieve foreign body and intussusceptions. The laparotomy wound was closed routinely. Post operative treatment was prescribed to the patient with antibiotics and anti-inflammatory drugs for one week. Three cases were recovered uneventfully and three cases were collapsed after few days post surgery due to some medical issues and owner negligence.

RESULTS AND DISCUSSION

Gastro-intestinal disorders were recorded in 6 dogs. These gastrointestinal disorders were further categorized according to the part involved into the gastro-duodenal disorders, mesenteric lymph node disorders and intestinal disorders (Table 1). The Mean±SE values of the various haematological, biochemical and urological parameters of the animals suffering from various gastro-intestinal disorders are presented in table 2, 3 and 4.

1. Gastro-duodenal disorders

Gastro-duodenal disorders diagnosed in 2 cases and they included gastro-duodenal foreign body (N=1) and duodenal stenosis (N=1). Gastro-duodenal disorders were diagnosed in male Labrador (6 Years) and female Pitbull (7 Years) dogs. The male Labrador dog was presented with the history of vomiting, anorexia, dull and depressed behavior, while Pitbull dog had the history of ingestion of the foreign body obstruction and should be subjected to radiographic and ultrasonographic assessment to arrive at a definitive diagnosis, similar findings reported by (Chaudhary *et al.,* 2009).

On clinical examination of these cases revealed anorexia, dullness, depression, vomiting tendency, no defecation and dehydration, similar clinical signs were also reported by (Capak *et al*., 2001 and Hayes, 2009). Rectal temperature, heart rate and respiratory rate were found to be 100±0.75 (˚F), 124±0.5 (beats per minute) and 77±**0.5** (breaths per minute), respectively. Dehydration was 2-5%, similar findings reported by (Capak *et al*., 2001).

Table 1: Details of the cases suffering from the gastrointestinal disorders (*n* = 6)

No. of groups	Groups	Type of disorders	Number of animals
2.1	Gastro-duodenal disorders	Gastro-duodenal foreign body	1
		Duodenal stenosis	1
		Sub-Total	2
2.2	Mesenteric lymph node disorders	Mesenteric lymph node tumour	1
		Sub-Total	1
2.3	Intestinal disorders	Intestinal foreign body	1
		Intussusceptions	2
		Sub-Total	3
Total			**6**

Table 2: Mean±SE of values of haematological parameters of dogs suffering from various gastrointestinal disorders (*n* = 6)

Sl. No.	Parameters	Gastro-duodenal disorders (n=2)	Mesenteric lymph node disorders (n=1)	Intestinal disorders (n=3)
1	W.B.C (x 10^3/uL)	17±0.3	12.1	17.8±0.34
2	R.B.C (x 10^6/uL),	6.2±0.25	6.68	5.7±0.39
3	H.G.B (g/dL),	10.4±0.25	13.1	10.7±0.42
4	H.C.T (%)	34.1±0.6	38.4	33.9±1.2
5	P.L.T (x 10^3/uL)	215.5±3.5	316	222.5±17.5
6	LY (x 10^3/uL)	5.1±0.45	4.1	8.2±0.13
7	NE (x 10^3/uL)	13±0.3	8.0	8.8±0.21

*W.B.C = White blood cells, R.B.C = Red blood cells, H.G.B = Haemoglobin, H.C.T = Haematocrit value, P.L.T = Platelet count, LY = Lymphocytes, NE = Neutrophils.

Table 3: Mean±S.E of values of biochemical parameters of dogs suffering from gastro-intestinal disorders (*n* = 6)

Sl. No.	Parameters	Gastro-duodenal disorders (n=2)	Mesenteric lymph node disorders (n=1)	Intestinal disorders (n=3)
1	BUN (mg/dL)	15.5±1.5	26	18.6±**0.4**
2	T. P (g/dL)	5.1±**0.3**	7.1	6.37±**0.26**
3	ALT (units/L)	18±**2**.0	21	32.2±**2.0**
4	Sr.C. (mg/dL)	1.6±**0.1**	1.2	1.02±**0.08**
5	B.Glu.(mg/dL)	107±**9**.0	80	103.7±**4.2**

*BUN = Blood urea nitrogen, T. P = Total protein, ALT = Alanine transaminase, Sr.C. = Serum creatinine, B.Glu. = Blood glucose.

Table 4: Details of various urological parameters of dogs suffering from various gastrointestinal disorders (*n* = 6)

Sl. No.	Parameters	Gastro-duodenal disorders (n=2)	Mesenteric lymph node disorders (n=1)	Intestinal disorders (n=3)
1	Leukocyte esterase (Cell/µL)	0	0	0
2	Ketone bodies (mmol/L)	0	0	0
3	Nitrites	NIL	NIL	NIL
4	Urobilinogen (µmol/L)	NIL	NIL	NIL
5	Bilirubin (µmol/L)	NIL	NIL	NIL
6	Protein (g/L)	NIL	NIL	NIL
7.	Glucose (mmol/L)	0	0	0
8	Specific gravity	1.015-1.025	1.020	1.015-1.020
9	Blood	NIL	NIL	NIL
10	pH	6-6.5	6.5	6-6.5

**pH = Potential of hydrogen.*

The colour of mucus membrane was slightly pale. The rectal temperature was within the reference range while heart rate found to be slightly elevated. In haemato-biochemical analysis, the normal leukocyte counts in dogs with gastric affections. However, marked neutrophilia in dogs affected with gastritis and dogs had anemia, also reported by (Stanton and Bright, 1989).

There were no significant differences in the values (Mean±SE) of BUN, ALT, total Protein, serum creatinine and blood glucose between healthy control and diseased dogs. No typical biochemical changes in dogs with early disease other than a mildly elevated serum creatinine in gastric foreign body affected dogs, similar findings reported by (Mazaki-Tovi *et al*., 2002).

In urological analysis, the animals suffering from gastro-duodenal disorders, the concentration of urobilinogen in the urine was higher than normal physiological range. Higher concentration of the protein and bilirubin were recorded in the animals suffering from gastro-duodenal disorders, due to the renal damage and liver damage of the dog because of infection, similar findings was reported by (Thrall DE, 2009).

Gastro-duodenal foreign body was diagnosed radiographically and ultrasonographically. The foreign body was radio-opaque and was located in the gastro-duodenal region. Radiography has been an essential technique for identification of gastrointestinal obstruction, same reported by (Sharma A *et al.,* 2011).

Orthogonal, lateral and ventro-dorsal views were taken, radiography revealed the radio-opaque foreign bodies in gastric region of one dog and duodenal stenosis in another dog. Radio lucent bodies usually were not visible on X-ray, same as reported by (Aras *et al.,* 2010).

In ultrasonographic scanning, presence of hyper echoic structure with distal acoustic shadowing was seen same also documented by (Kaur *et al.,* 2013). Lateral survey radiograph of pyloric stenosis demonstrated a distended stomach with thickened gastric wall. The contrast series study using barium sulphate provided further confirmation in the diagnosis. Different researchers have reported different normal timings for contrast media emptying from stomach (Thornton, 1962; Ljunggren, 1964; Simpson, 2010).

1.1 Gastro-duodenal foreign body

One case of female pitbull dog (7 year) was reported with the history of foreign body ingestion. Clinical examination revealed anorexia, dullness, depression, vomiting tendency and dehydration.

Diagnosis

Radiography and ultrasongraphy with haemato-biochemical and urological examination were used to establish the precise diagnosis of the disease. Gastro-duodenal foreign body was diagnosed radiographically and ultrasonographically. The foreign body was radio-opaque and was located in the gastro-duodenal region. Laprotomy was planned to remove the foreign body (Fig. 1 a).

Treatment

In pre-operative preparation, the dog was cannulated using a 20-22 gauge cannula. Intravenous fluids were started and maintained throughout the surgery until the recovery from anesthesia. Pre-operative broad-spectrum antibiotics were given intravenously. Surgical site was shaved and prepared aseptically.

In anaesthetic protocol**,** the dog was given atropine sulphate at 0.02 to 0.04 mg/kg of body weight by I/M route. Xylazine (1-1.5 mg/kg of body weight, I/M) was administred to the patient after 20 minutes; Induction was achieved using combination of diazepam (0.5 mg/kg IM and ketamine (5–10 mg/kg IM). Then endo-tracheal intubation was done, and maintained on isoflurane (1–3%) mixed with oxygen using Boyle's apparatus. In surgical procedure the animal was positioned in dorsal recumbence, and the site was prepared using savlon and povidone. Proper draping was done, and alcohol was poured over the site.

A ventral midline abdominal incision was made on Linea Alba to perform the laparotomy. The abdominal cavity was fully explored for gastro-duodenal foreign body. Gastrotomy was performed for retrieval of gastro-duodenal foreign bodies. Stomach was isolated and exteriorized with proper packing of the remaining abdominal cavity was done. The incision was given on region between greater and lesser curvature of stomach. The incision was

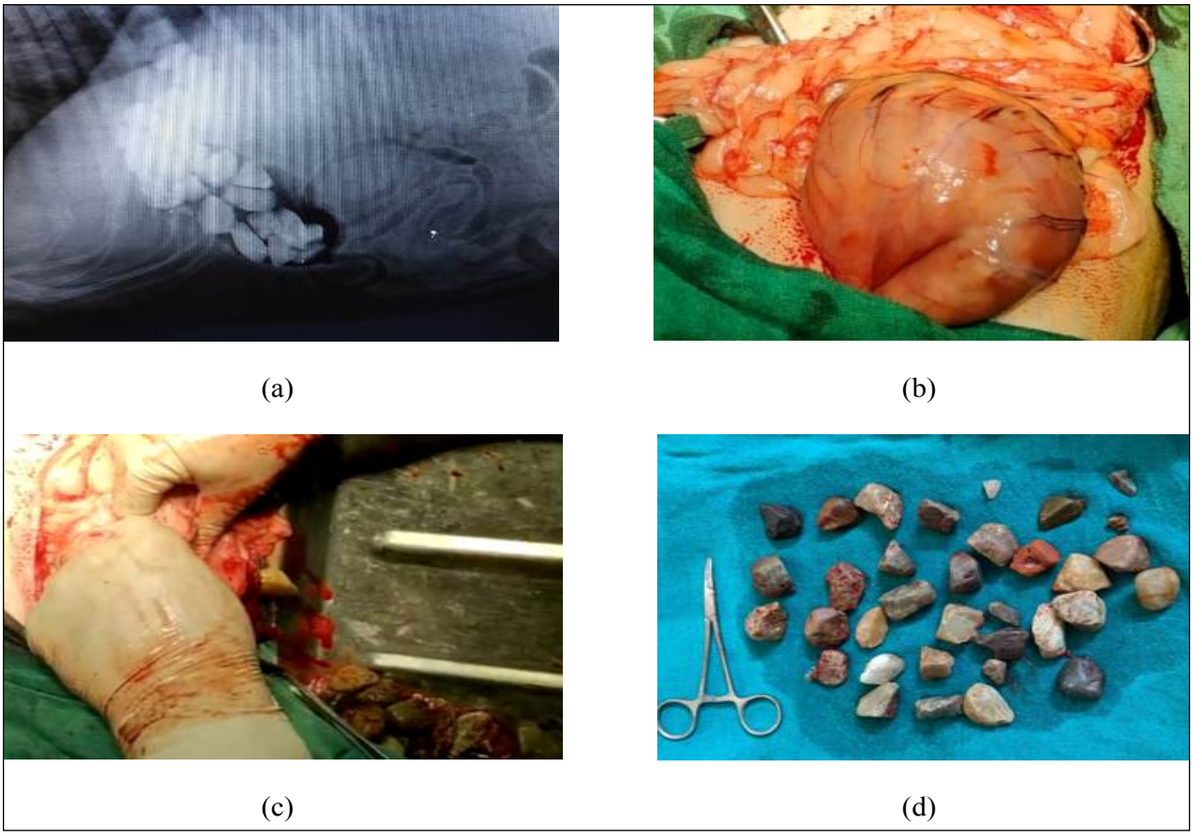


Fig. 1: Diagnosis and removal of Gastro-duodenal foreign body in dogs. **(a)** Stone grits in gastric region of lateral abdominal radiograph, **(b)** Exteriorized the stomach, **(c)** Remove grits from stomach with small incision, **(d)** Stone grits

extended using metzenbaum scissors. Gastric foreign materials (stone crits) were slowly retrieved out from the gastric incision into the tray, sequentially milking of duodenum towards gastric side and take out the stone crits from the same gastric incision.

The rest of the stomach and duodenum was checked again for any residues of foreign bodies. The incision was closed in a double-layer inversion pattern using 3-0 PDS. The stomach was properly cleaned and rinsed before reposing in the abdomen. After this, the rest of the cavity was explored for any other foreign bodies in the intestines. Muscles were closed using PDS 2-0 in a simple, interrupted fashion. The same material was used for subcuticular sutures. Cross-mattress sutures were applied using nylon on the skin.

The dog was kept on parenteral fluids for three days postoperatively. Oral feeding was started after three days with a liquid diet for three days, followed by semi-solid feed, and gradually normal feed was resumed. NSS (normal saline 0.9%) and RL (ringer lactate) were administered intravenously bid for three days. Parenteral broad-spectrum antibiotics and analgesics were administered twice daily for five days and once for three days, respectively. Antibiotics include Inj. Monocef (ceftriaxone, 15–20 mg/kg body weight IM) for five days, Tab. Pan-40 (pantoprazole, 0.7–1 mg/kg body weight, orally) for five days, Tab. Carodyl (carprofen, 4 mg/kg body weight, orally) once a day for 3 days were administered. Aseptic dressing was done on the alternative days. Dressing was done using topical application of povidone iodine ointment on the suture site, and protective abdominal bandaging was done to prevent animals from biting the suture site. Dog recover uneventfully and after 15 days of the surgery sutures were removed (Fig. 1 b, c and d).

Duodenal stenosis

Diagnosis

Radiography and ultrasongraphy with haemato-biochemical and urological examination was used to establish the accurate diagnosis of the disease. In ultrasongraphy scanning and radiographic images of the dog abdomen no such stenosis was seen but suspected for gastro-duodenal stenosis on the basis of ultrasonography. So we go for barium contrast radiography, in which we give barium suspension orally to the dog and take simultaneous radiograph at 30 minutes interval each.

Treatment

Duodenal stenosis was diagnosed in male Labrador dog (6 Years) using barium series at 30 min interval. In barium contrast radiography readymade Microbar suspension (1 litre) of ESKAY SPECIALITY CHEMICALS was used, each 100 ml suspension contains barium sulphate 95 gm and palatable base qs 100 ml. For stomach and duodenum barium radiography, 120 ml of microbar suspension diluted with 80 ml of water was given orally to the patient and take lateral radiograph in every 30 minutes to evaluate the patency of the suspension through the stomach and duodenal tract. With the comparison of time and movement or amount of content of the suspension passes through the part of the GIT, we diagnosed the presence of any obstruction and stenosis. In this case very less amount of barium suspension was passes through the duodenal region of the GIT in a longer time interval than in the normal GIT cases. The surgical intervention to treat the duodenal stenosis was suggested to owner but unfortunately the owner reluctant for this and later on the animal was collapsed (Fig. 2).

2. Mesenteric lymph node disorder

Mesenteric lymph node tumour

Male Labrador dog, aged 8 year, presented with the history of anorexia, dull and depressed behavior, frequent urination, scanty faeces and hard mass was palpable on the left side of the abdomen. Abdominal mass exert

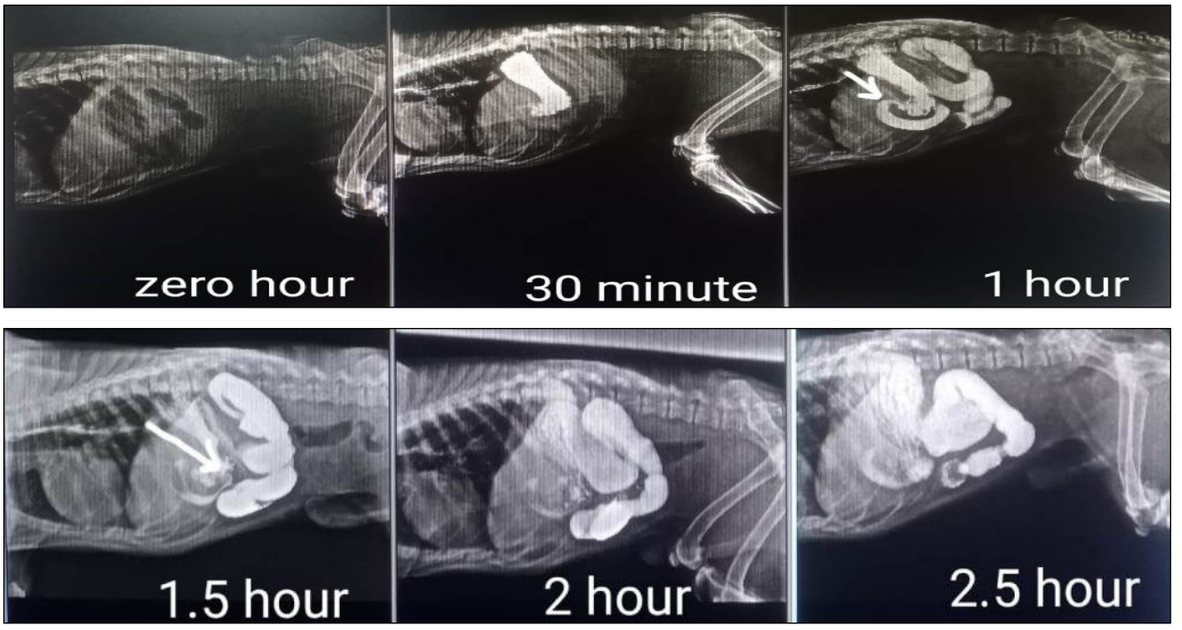


Fig. 2: Shows the contrast radiography (Barium contrast radiography) to diagnose the blockage or stenosis of the GIT tract, arrow shows the stenosis of duodenum and intestine also block by some foreign object

unnecessary pressure on the abdominal organ by which animal cannot able to take feed and watering and also the capacity of the urinary bladder decreases because of the size of the mass. Similar observation was reported by earlier worker (Helbling R *et al.,* 2003; Nakachi S *et al.,* 2003; Salavati Schmitz S, 2016; Ribas Latre A *et al.,* 2019).

Rectal temperature, heart rate and respiratory rate were found to be 99.5 (°F), 85 (beats per minute) and 42 (breaths per minute), respectively. Dehydration ranged from 6-8%. The colour of mucus membrane was slightly pale. Heart rate found to be slightly elevated, tachycardia was seen may be due to excessive pressure applied on the diaphragm by the tumorous mass present in the abdomen, similar findings were also reported by (Kaneko JJ *et al.,* 2008).

In haemato-biochemical examination haematocrit value was lower and serum creatinine was higher than the normal physiological range. In urological analysis protein and urobilinogen was present in the urine sample.

Diagnosis

Ultrasonographic and radiographic evaluation was carried out to confirm the diagnosis. In radiographic evaluation, an oval shape mass was seen in the abdominal cavity while ultrasonography revealed a spider web like appearance in the abdominal cavity which occupied almost all of the space of the abdominal cavity. Ultrasonographic examination showed that the lymph nodes was clearly identified and appeared as homogeneous, hypo-echoic and smoothly marginated structures within thin hyper-echoic capsule. Mesenteric lymph node appeared as well defined structure with clear lobulation and hypo-echoic homogenous pattern this agreed with (Burk and Ackerman, 1996) (Fig. 3).

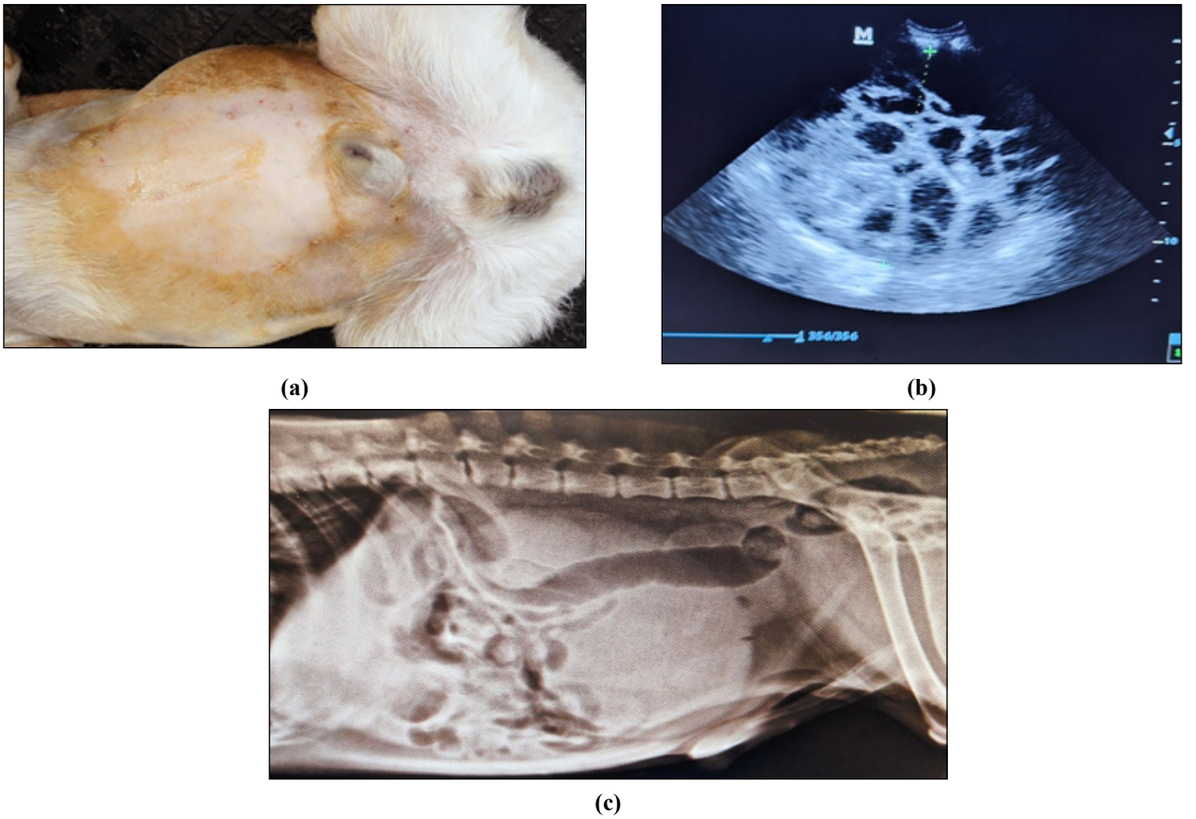


Fig. 3: Radiographic evaluation, an oval shape mass in the abdominal cavity in dogs. **(a)** On abdominal palpation hard mass was present in the caudal part of stomach, **(b)** In ultrasonography spider web like formation was present in the lower abdomen, ventro-cranial to the urinary bladder and ventral to the spleen, **(c)** Radiographic image shows oval shape mass present in the abdominal cavity

Treatment

The preoperative, anaesthetic protocols and laprotomy procedure were performed as discussed previously, after the entry in the abdominal cavity; large tumorous mass was palpated just beneath the surgical field. Exteriorization of the tumour mass was done, the blood vessels were located and ligated; and the tumour mass was excised. Dog recover uneventfully from the surgery. Broad spectrum antibiotics, analgesics were prescribed as discussed previously. Unfortunately dog died on 7th day post-operatively due to owner negligence (Fig. 4).

3. Intestinal disorders

Intestinal disorders were diagnosed in 3 cases out of which intestinal foreign body in one case and Intussusceptions were diagnosed in 2 cases.

Three dogs were presented out of which intestinal foreign body in one case and intussusceptions were diagnosed in 2 cases. These cases were presented with the history of vomiting, anorexia, scanty faeces, dull and depressed behavior. History and clinical signs suggested that all cases presented with persistent vomiting or retching should be ruled out for foreign body obstruction and should be subjected to radiographic and ultrasonographic assessment to arrive at a definitive diagnosis. In haematological analysis, W.B.C was higher than the normal physiological range in the intestinal disorders cases. Both the cases of intestinal foreign body were treated with enterotomy.

3.1 Intestinal foreign body

Intestinal foreign body was diagnosed in 2.5 months old non-descript male pup. History revealed ingestion of a linear intestinal foreign body seen by the owner. Clinical parameters were recorded and Mean±S.E values of the rectal temperature was 100±0.5 ($^{\circ}$F), heart rate was

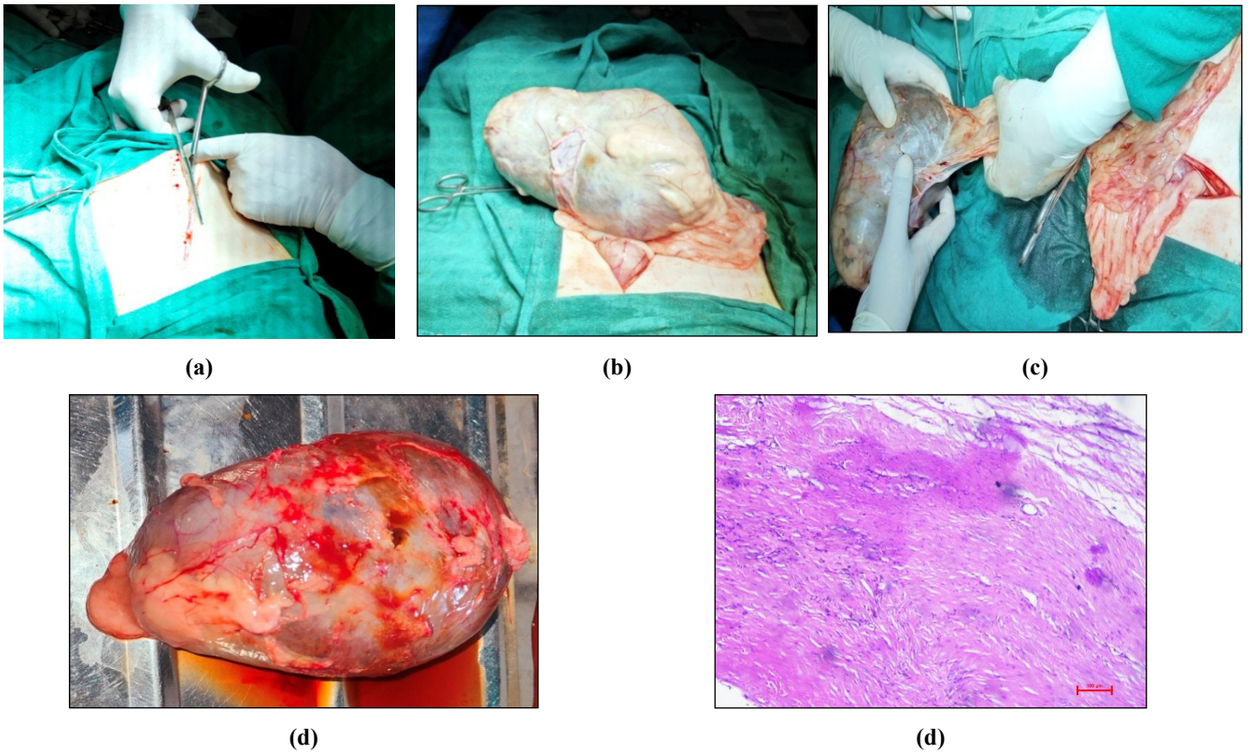


Fig. 4: Tunour in the abdominal cavity of the Dog. **(a)** Midline incision on linea alba, **(b)** Exteriorized the tumour, **(c)** Ligate blood supply, **(d)** Exteriorized abdominal tumorous mass, **(e)** Microscopic image of tumour (100×)

85.5±1.5 (beats per min), respiratory rate was 26±1.25 (breaths per min) respectively, Dehydration was up to 5%. The color of mucus membrane was slightly pale because of intestinal haemorrhage which causes blood loss. Heart rate was found to be slightly elevated; tachycardia was seen may be due to anorexia and dehydration. Blood in faeces was present in one case, there was history of parvovirus infection or gastroenteritis in one cases and prolapsed mass was also seen, similar findings were reported by (Rallis *et al.,* 2000). In some cases tachycardia, tachypnea, dehydration and elevated respiratory rate was found in all the cases might be due to impaired blood flow due to obstruction caused by foreign body, same documented by (Allman *et al.,* 2013).

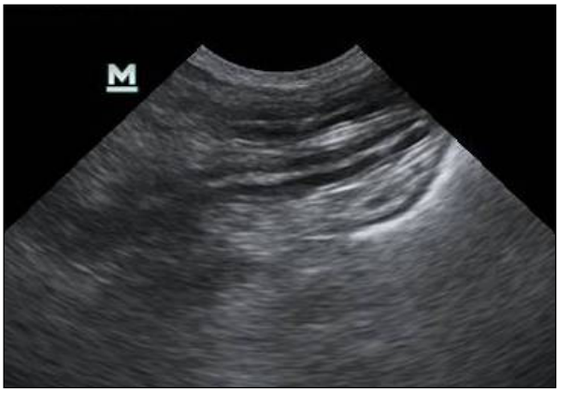
Diagnosis

In haematological examination, leukocytosis was evident in intestinal disorders; the cause of elevated WBC might be due to concurrent infection. Leucocytosis and neutrophilia in intestinal disorders might be because of invasion of damaged epithelium of intestine by bacteria leading to onset of secondary bacterial infections in the dogs same as reported by (Kataria *et al.,* 2020).

In radiography examination, the presence of radio-opaque foreign body was confirmed. Ultrasonographic evaluation also revealed a hyper-echoic linear foreign body. Gas filled intestinal loops were noted in the case. Bunching of intestines was recorded in the case (Fig. 5 a,b). The surgical intervention was planned. In radiographic screening the ratio between maximum diameter of most distended intestinal loop and height of the body of fifth lumbar vertebra was calculated for the diagnosis of dilation of the intestines because of any obstruction in the intestine, same as reported by (Papazoglou *et al.,* 2003) suggested ratio of >1.6 was suggestive of distention value above 2 was suggestive of highly probable obstruction. They also suggested gravel sign proximal to the obstruction that was due to accumulation of indigestible materials.

Treatment

Mid-line laparotomy was performed under the considering the preoperative and anaesthetic protocols as discussed previously. The abdominal cavity was fully explored for foreign body. The foreign body containing segment of intestine was exteriorized. After exteriorizing and proper packing, the intestinal foreign body which was a linear multiple threads extending from stomach to the half of the length of the intestine. Foreign body was milked away from the affected part, and non-crushing intestinal clamps were used for occluding the lumen. An incision was made distal to the foreign body on the anti-mesenteric border. The foreign body was removed carefully. The incision was closed in two layers using PDS 3-0 in a Schmeiden pattern, followed by cushing suture patterns, but the intestine was severely damaged from the foreign body and linearly get opened at multiple places throughout the intestine at mesenteric border so the prognosis was very poor. Dog was euthanized due to poor prognosis. The intestines were placed in the abdominal cavity. The rest of the abdominal incision was closed as described earlier (Fig. 5 c, d, e, f).



(a)

(b)

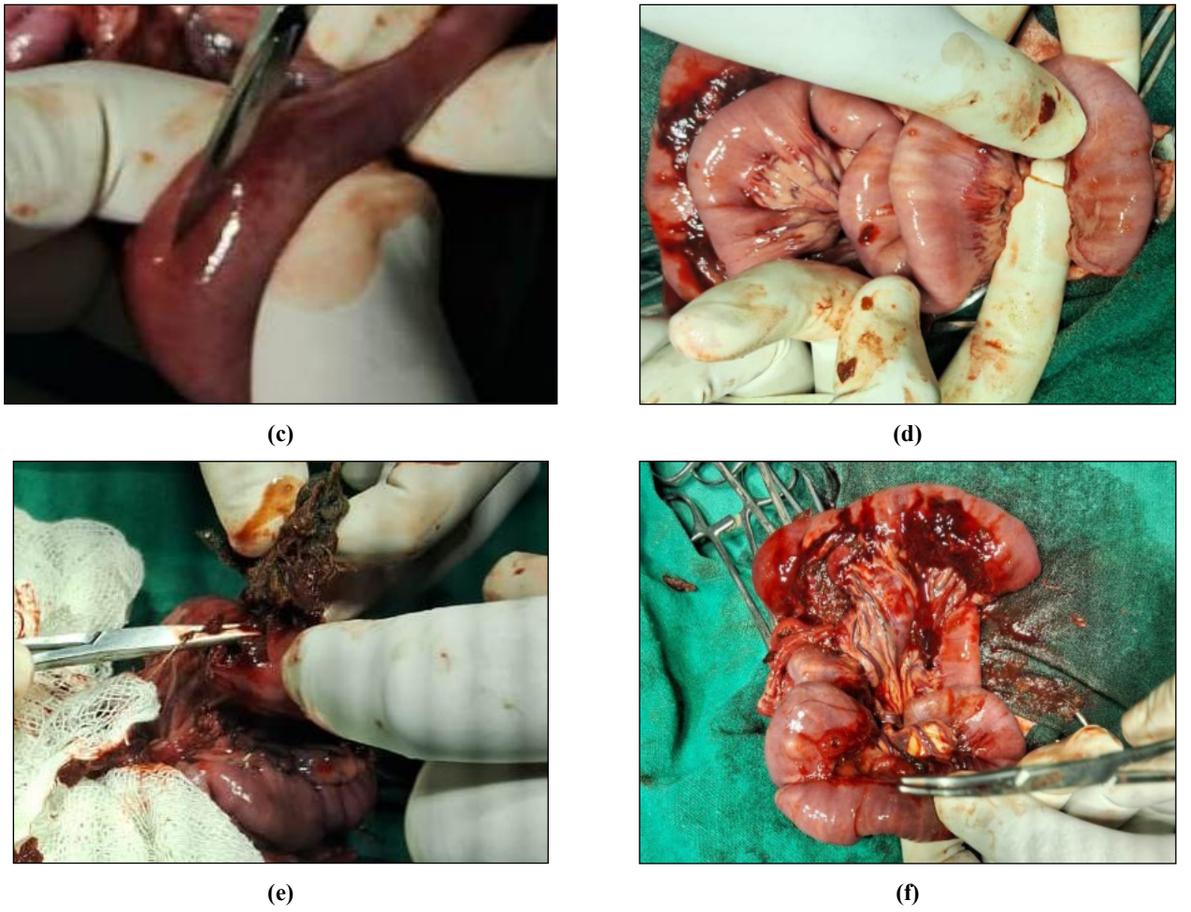


Fig. 5: Intestinal foreign body in dogs. **(a)** USG shows foreign object in the intestine, **(b)** Lateral radiograph shows thread like foreign object running through stomach or intestine, **(c)** Make incision on anti-mesenteric border of the intestine, **(d)** Linear foreign object (thread) was passing through the intestine on mesenteric border, **(e)** All fecolith and foreign objects was removed, **(f)** Suturing the mesenteric border of intestine but blood supply or motility was very poor in the major part of intestine shows poor prognosis

Intussusceptions

This group comprised of 2 cases of intussusceptions in female non-descript (4 year) and German shepherd dog (6 year). Animals were presented with history of anorexia, vomiting, and blood in faeces and difficulty in defecation.

Mean±S.E values of rectal temperature, heart rate, respiratory rate and dehydration were 101.6±0.2 (˚F), 108.4±7.3 (beats per minute), 72.8±3.1 (breaths per minute), respectively. The colour of mucous membrane was pale in one case and congested in another case. Rectal temperature was found within the normal physiological range, although fever was recorded in one case. Heart rate was found within normal physiological range. Tachycardia was seen in one case. Respiratory rate was found to be slightly elevated. Both of the dogs were dehydrated up to 6-8%.

Diagnosis

Haematocrit values were found to be decreased in intestinal disorders. The decreased haematocrit value could be due to intestinal haemorrhage and bleeding associated with gastroenteritis, same as reported by (Bhat *et al.,* 2015). The anemia was also found in some cases of intestinal disorders might be due to blood loss occurring through the

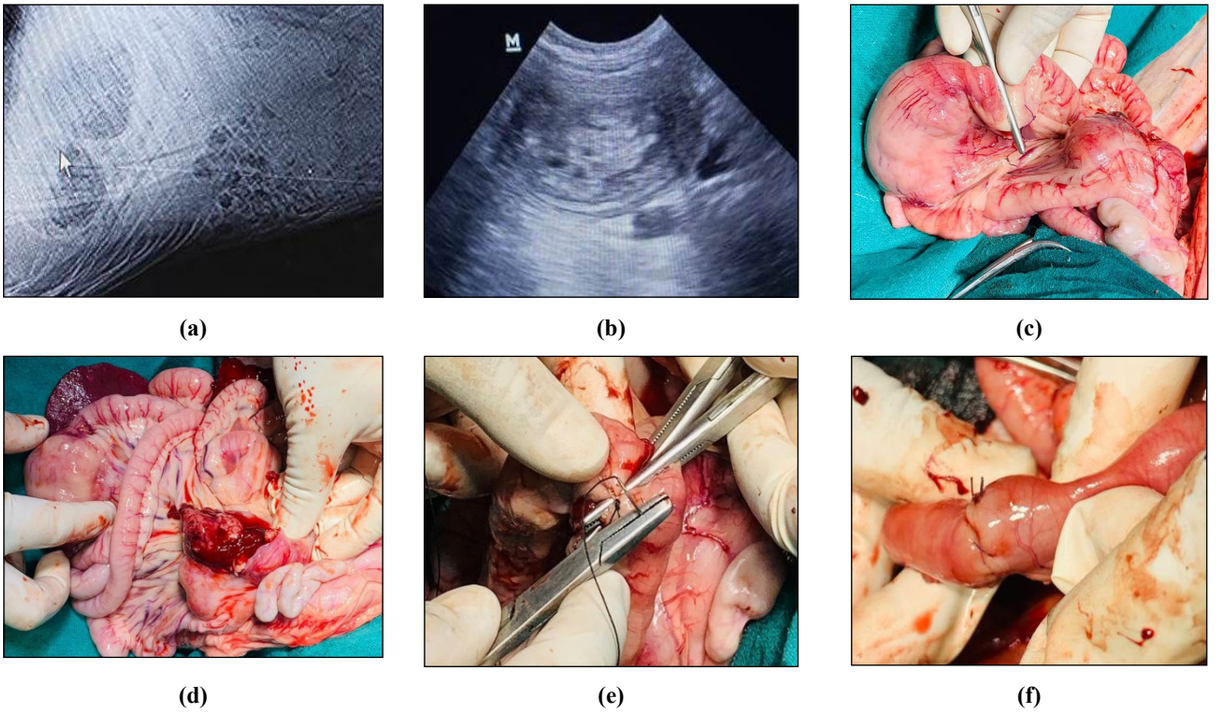


Fig. 6: Intussusception in dogs. **(a)** Radiograph shows multiple pleating of intestine, **(b)** USG shows bull's eye appearance, **(c)** holding the intestine with doyen's intestinal to prevent spillage of intestinal content, **(d)** removed dead part, **(e)** Anastomosis, **(f)** Anastomosed part of intestine

gastric and the intestinal haemorrhages, same as reported by (Agnihotri *et al*., 2017).

In radiography examination, the presence of multiple pleating of intestines was seen. Ultrasonography was used for definitive diagnosis of intussusceptions (Fig. 6 a, b). Hyper echoic mesenteric fat was seen in the middle of the target lesion. In longitudinal plane, multiple hyper echoic and hypo echoic parallel lines could be seen. Lower blood supply to the concerned part, reduced motility of both intusussceptum as well as intussuscepiens, oedema of wall of intussusceptum predicts the non viability of the intususception. Both cases treated surgically with enteroectomy.

In transverse plane, the ultrasonography revealed typical bull's eye pattern or target like lesion in intestine in all the cases leading to diagnosis as intussusceptions, similar findings were reported by (Patsikas *et al.,* 2003; Kaur *et al.,* 2013). Ultrasonography was useful for demonstration of foreign bodies which were identified by presence of hyper echoic structure with distal acoustic shadowing, similar findings was reported by (Kaur *et al.,* (2013). Ultrasonography of intestine showed, an alternative hypo and hyper echoic concentric rings in transverse scan. In sagittal plane multiple parallel, alternative hypo and hyperechoic lines were observed and these findings were typical of an intussusception. Similar observation was reported by earlier worker (Kantrowitz *et al.*, 1988; Lamb, 1990a; Shobha *et al.*, 2008).

On plain abdominal radiographs, one case showed the dilated, gas and fluid filled intestinal loops proximal to the intussusception. Similar findings reported by (Kevin Kealy J and Hester MA, 2000; Shobha *et al.*, 2008). Intussusceptions was observed as a dense soft tissue mass in the central abdomen, with thin lines of gas surrounding the intussusception and gas between intussusception's and intussusceptum in plain radiography, same reported by (Williams and Reichle, 1993). In intussusception there was a multilayered lesion, which appears as linear streaks of hyperechoic and hypoechoic tissue in long section and as

a series of concentric rings when viewed in cross-section and these findings agreed with the description given by (Patsikas *et al.,* 2008; Kim *et al.,* 2011).

Treatment

Pre-operative assessment and anaesthetic protocols followed as discussed previously. Ventral midline laparotomy was performed. The abdominal cavity was explored to locate the intussusception. The intussusception segment of intestine was exteriorized. The intestinal contents were milked away, and the region to be resected was decided. Doyen's intestinal clamps were applied to prevent the contents from leaking. Mesenteries of the affected part and vasa-recta vessels were ligated. The affected part was transected with a scalpel blade. End-to-end anastomosis was done using the Schmeiden pattern, followed by simple continues inversion pattern using 3-0 PDS. Leakage was checked, and blood supply to the healthy part was ensured. Washing with saline was done to remove any dirt, debris, or blood clots. An abdominal incision was closed routinely. In postoperative management, broad spectrum antibiotics and analgesic was administered. One the case was recovered uneventfully. One case of intususscception was died on 3rd day post-operatively (Fig. 6 c, d, e, f).

CONCLUSION

Out of total six cases four cases were died within one week. Gastro-duodenal case dog died due to owner negligence and the case of linear foreign body was euthanized due to severe intestinal damage by foreign body on mesenteric border.

Urine analysis, haemato-biochemical testing, radiography, and ultrasonography combined to provide a precise and prompt diagnosis of gastrointestinal disorders. The clinical output was enhanced by the precise and prompt diagnosis.

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