

# SONOGRAPHIC DIAGNOSIS AND TREATMENT OF JEJUNOJEJUNAL INTUSSUSCEPTION IN A PERSIAN CAT

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KEYWORDS	ABSTRACT
Jejunojejunal Intussusception, Cat, Sonography, Trident Sign, End-to-End-Anastomosis.	This is a clinical case report of a 15-month old, 4 kg Persian female cat, which was presented at the Pet Centre, UVAS, Lahore. History reported the anorexia and vomiting since 4-days, and no recovery despite medical treatment. Clinical analysis revealed dehydration, depression and abdominal pain. The vomitus was a yellow-brown color. Tentative diagnosis was intestinal intussusception, based on history, lack of progress and abdominal palpation findings. For further confirmation, B-mode sonography was performed, using 7.5 MHz curvilinear transducer. Intestinal intussusception confirmed in the sonographic scans, owing to typical trident sign on longitudinal scan, and alternating dark and light bands with a piece of mesenteric fat interposed between the intussusceptum, on transverse scans, respectively. Finally, ultrasonography is superior to the abdominal palpation and radiography, in diagnosing intestinal intussusception accurately; also, the intestinal intussusception, being an emergency, necessitates planned and prompt surgical repair through end-to-end anastomosis, which has a high success rate to save and prolong the life of affected pets.

## INTRODUCTION

Small animal pets are commonly confronted with the problem of intussusception, which causes obstruction of the bowel (Lewitt & Bauer, 1992). The intussusception relates to the invagination or telescoping of the part of intestine into an adjacent intestinal loop, which can either be cranial or caudal to it (Karapinar & Kom, 2007; Lukanc, Pogorevc, Kastelic & Erjavec, 2015; Radlinsky, 2013). It is of rare occurrence in cats (Thiel, Wigger & Kramer, 2008). Any part of the gastrointestinal tract can be involved, however, jejunojejunal and ileoceocolic junctions are common sites for intussusception. In dogs, Intussusceptions are reported to occur at jejunojejunal, ileocolic, caecocolic and colocolic junctions (Lamb & Mantis, 1998). The etiology behind intussusception stays obscure, however, diseases altering motility of intestines are strongly believed to play a pivotal role (Karapinar & Kom, 2007).

Etiology can be idiopathic, such as in young cats, or primary gastrointestinal disease, such as neoplasia in older cats. In dogs, too, the intussusception can occur subsequent to a primary gastrointestinal neoplasm with the enlarged abdominal lymph nodes, multiple mesenteric cysts, or intestinal foreign bodies (Lamb & Mantis, 1998). Other predisposing causes in the dogs and cats, include the intestinal worms, viral-induced and nonspecific gastroenteritis, presence of a linear foreign body in the gut, intestinal tumors, and recent intra- or extra-abdominal surgeries. Diagnosis of an intussusception can be established over detailed history-taking, performing hands-on physical examination and confirmation using diagnostic imaging (i.e. survey and contrast radiographs and ultrasound), however, many times the radiographs do not specifically signpost the assumed ailment (Thiel et al., 2008).

Ultrasonography, comparatively, is sensitive and specific, and augments diagnosis of the intestinal intussusception more accurately than radiography (Applewhite, Hawthorne & Cornell, 2001; Applewhite, Cornell & Selcer, 2002). Ultrasonography not only enables the

direct visualization of the affected part of the intestine, rather, it is also useful in terms of identification of simultaneously occurring other lesions, if any (Lamb & Mantis, 1998). The clinical examination revealed dehydration, depression and abdominal pain which then indicate the change in different colour leading to yellow or brown. Ancillary tests e.g. hematological and biochemical assays, complete urine analysis, and the fecal egg counts are commonly prescribed in order to identify the fundamental etiology (Bellenger & Beck, 1994).

## MATERIALS AND METHODS

This is a clinical case presentation of a 15-months' old Persian queen, which was presented at the Pet Centre, University of Veterinary and Animal Sciences, Lahore, Pakistan. For research and study purposes, the case was recorded and necessary diagnostic work-up was performed, as narrated below.

### Case Presentation

The cat had presenting complaints of the abdominal pain, persistent vomiting, complete anorexia, depression and dehydration, since 4 days. History revealed that the queen had been feeding normal earlier, and suddenly developed the ailment. Despite aggressive treatment daily, animal did not recover, rather the symptoms kept worsening. On clinical examination, the vitals [respiration rate, heart rate, pulse rate] were slightly elevated and rectal temperature was found normal. The mucous membranes were very pale pink. The dehydration status indicated more than 7% dehydration, hematological and biochemical derangements in (Table 1).

Table 1 Hematologic & Biochemical Changes in Cat (Jejunojunal Intussusception)

	Parameter	Normal Range	Patient Values
Hematology	WBC Count ( $10^9$ /L)	5.5- 19.5	↑ 22.8
	Lymphocytes (%)	20-55	17
	Monocytes (%)	1-4	↑ 5
	Granulocytes (%)	41-79	↑ 85
	Hemoglobin (g/ dL)	9.5-15	↓ 8
	RBC Count ( $10^{12}$ / L)	6-10	↓ 5.5
	PCV/ HCT (%)	29-45	↑ 50
	MCV (fL)	41-54	41
	MCHC (g/ dL)	31-36	31
	Platelets ( $10^9$ /L)	150-600	↑ 200
	MPV (fL)	4-7	↑ 5
	Serum Biochemistry	Bilirubin (Total) mg/ dL	0.0-0.4
Bilirubin (Direct) mg/dL		0.0-0.4	0.3
Bilirubin (Indirect) mg/dL		0.0-0.4	0.3
ALT U/L		5.0-76	↑ 83
AST (U/L)		5-55	↑ 110
ALP (U/L)		10-62	↑ 72
Total Protein (g/dL)		5.9-8.5	8.4
Globulin (g/dL)		3.4-5.2	↑ 5.4
A/G Ratio		0.6-1.5	↓ 0.5
Creatinine (mg/dL)		0.4-2.3	0.8
Urea (mg/ dL)		30-68	35
Blood Glucose (mg/dL)		70-150	↓ 65
Calcium (mg/dL)		7.5-10.8	↓ 6.5
Phosphate (mg/dL)		3.0-7.0	3.2

Abdominal palpation was done as part of thorough clinical examination, and a sausage-like mass was palpated, raising suspect of an intestinal intussusception. Furthermore, ultrasound examination was performed to confirm the diagnosis.

## RESULTS OF STUDY

### Hematologic Assessment

Complete blood counts showed a considerable increase in white cell counts, with granulocytes and monocytes fairly high. Packed Cell Volume (PCV) was high, too. Platelet counts and mean platelet volume were fairly high. Contrarily, hemoglobin and red blood cell counts were decreased (Table 1).

### Biochemical Assays

Serum biochemistry showed moderate increase in liver enzyme concentrations (ALT, ALP, AST), whilst Calcium and Glucose levels were fairly decreased (Table 1).

### Sonographic Diagnosis

Sonography was performed for diagnostic work-up. A 7.5 MHz curvilinear transducer was used, to scan the abdomen. Typical presentation of an intussusception in the form of a “Trident Sign” on longitudinal scan; and “bull’s eye appearance”, with alternating white and black circles on transverse scan, were noted. The entrapped mesentery was visualized as a hyperechoic C-shaped structure adjacent to anechoic intussusceptum. The diagnosis was drawn for an intussusception (Figures 1 and 2).

Figure 1 Longitudinal Section of Intussusception: “Hay Fork / Trident” appearance, with alternating white and black lines in oblong fashion. M:

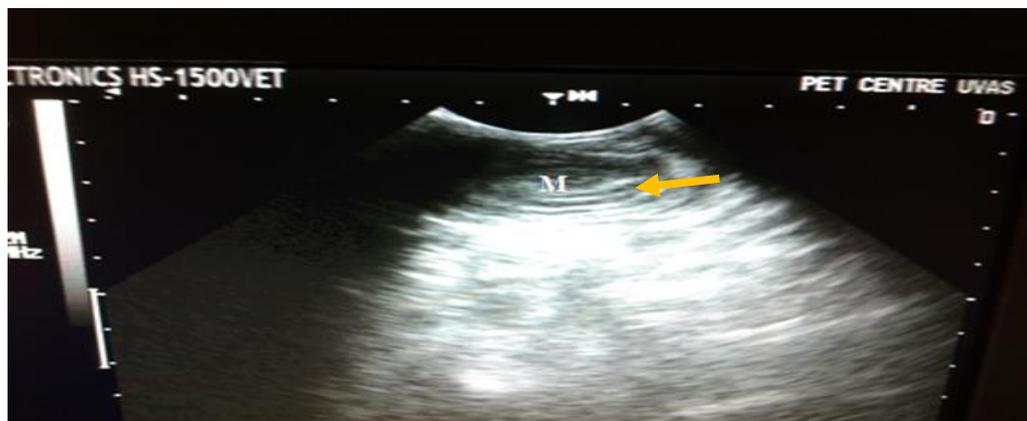


Figure 2 Transverse section of intussusception: alternating dark and light concentric rings; mesenteric fat (M) hyperechoic: characteristic “Bull’s Eye” appearance.



The cat was stabilized initially through an infusion, and simultaneously, prepared for a surgery. Laparotomy confirmed the presence of a jejunojejunal intussusception. End-to-end anastomosis surgery was performed successfully (Figures 3-6).

Figure 3 & 4 Exteriorization of the intussuscepted intestinal loop & Clamping the ends needing resection

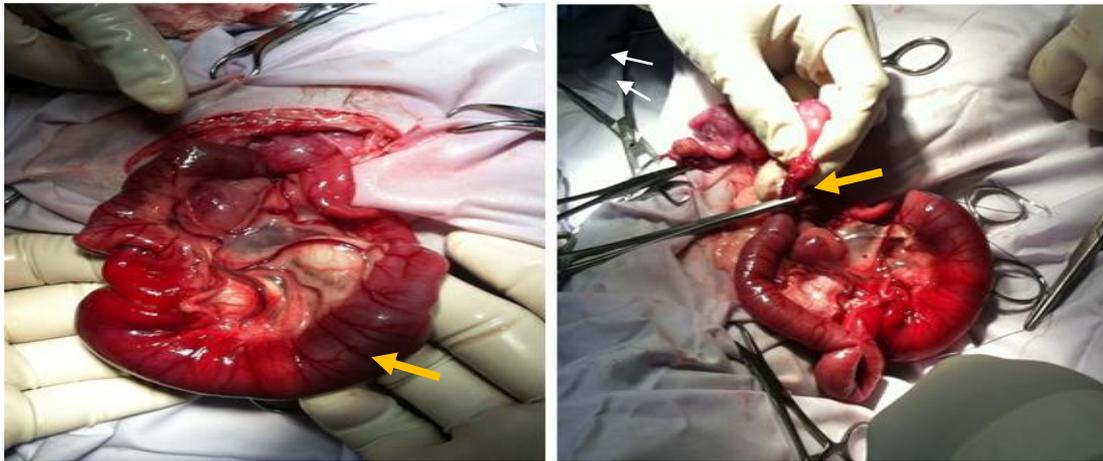


Figure 5 & 6 End-to-end anastomosis using Gambee sutures & Completed End-to-end anastomosis including approximation of mesenteric border.



The cat had also been bred two-weeks ago, and was also found pregnant; at owner request, and owing to high risk of the abortion due to anesthesia, spaying was also performed thereafter; the laparotomy incision was closed as per the routine in three layers, i.e. the peritoneum and transversus abdominis muscle, internal and external abdominal oblique muscles, and the subcut tissue, respectively. The cat was maintained post-operatively on lactated ringer's infusion for three days. After that, liquid food till 7 days, post-operatively, and gradually thereafter, semi-solid food was introduced. The cat recovered uneventfully from the anesthesia and surgery and reported to be very well till date.

## DISCUSSION

Intussusception in the cats' accounts for the infrequent cases presented during routine pet practice. This was a case presentation of a jejunojejunal intussusception, confirmed on exploratory laparotomy; hence, our findings were in complete agreement with those as reported by the other scientists (Thiel et al., 2008; Lamb & Mantis, 1998). Generally, the intussusception can occur in either ways, direct or normograde, which occurs in forward

direction of normal peristalsis, or indirect or retrograde type, which occurs in the reverse direction, against peristaltic wave, as occurred in present case (Applewhite et al., 2002). Hence, our findings were in close agreement with those of Applewhite et al. (2002), and, Lukanc et al. (2015). The prognosis and the outcome of the case depends on whether the intussusception causes a complete or a partial obstruction; accordingly, the clinical signs are manifested in the patient.

The bigger size, prolonged duration and location of intussusception can further aggravate the signs (Lukanc et al., 2015). Upper gastrointestinal intussusceptions cause more severe and dramatic systemic changes (Applewhite et al., 2002). In case treated at our hospital, the cat was not suffering from any gastrointestinal or viral disease, and was otherwise healthy; hence in accordance with the findings of the other scientists (Lukanc et al., 2015), and cause was anticipated to be either idiopathic or intestinal parasitism. Furthermore, the intussusception was 3 days' old (operated on the 4<sup>th</sup> day); on exploratory laparotomy, the intussusceptum was approximately a 5cm piece and the location was jejunojejunal. Hence, the case was treated on time before the commencement of shock stage. In this regard, too, our findings were in close agreement as presented by Applewhite et al. (2002), and, Lukanc et al. (2015).

On clinical examination, during abdominal palpation in young pets (dogs, cats), presence of firm, tube-shaped/sausage-shaped structure should raise suspicion of intussusception, whilst ruling out feces and the intestinal foreign bodies (Thiel et al., 2008). This was in agreement with our clinical findings, whereby, the tubular sausage-shaped structure was palpated on abdominal palpation, in the cranial abdominal quadrant. The diagnosis of the intussusception is best made over ultrasound, while exceptions still occur. Sonographic features of intussusception include a multi-layered, target-like mass/ lesion. The short and long segments of small intestine are attributed to resemble a "bull's eye" (Lamb & Mantis, 1998). Sonographic findings in transverse scans consist of hyperechoic or anechoic central ring, walled by multiple parallel rings which are hyperechoic and hypoechoic (Patsinka, 2003; Radlinsky, 2013).

The same alternating hyperechoic and hypoechoic rings in longitudinal sections, appear as alternating hyperechoic and hypoechoic parallel lines, with a layered pattern, one on top of the other, resembling a three-forked/ trident structure. The same were recorded in our sonographic scans, i.e. target-like structure resembling "bull's eye" on transverse scans (Figure 2) and forked/ trident shape on longitudinal scans (Figure 1). On transverse scans, the multiple (i.e. 2 or 3) parallel, hypoechoic rings represent the vaguely visible intestinal wall, which is abnormally thickened due to inflammation, along with wall compression and edema formation (Patsinka, 2003). Edema results in black/ hypoechoic color of the intestinal wall. There is generally proximal fluid accumulation and diminished intestinal motility (Radlinsky, 2013). In our cat, at surgery, turgidity, ischemia and edema formation in affected part of the small intestine was also noted; hence, our findings are in agreement with Radlinsky (2013).

Clinical presentation of the intussusception may differ, and signs may be aggravated due to larger size, prolonged duration and location of the intussusception (Fernandez, Seth, Murgia & Puig, 2017), and whether the obstruction is complete or incomplete (Bellenger & Beck, 1994). If not treated on time, clinical signs can progress to depict the state of shock (Lukanc et al., 2015). The cat under examination at our hospital, was suffering from the anorexia and vomiting since 4-days, and no recovery despite medical treatment. It was clinically dehydrated (7%), depressed and having abdominal pain. The temperature was normal however, the cat showed slight tachycardia (140 bpm), mild depression and the capillary refill time of the approximately 3 seconds. The cat's vomitus was yellow-brown in color. In this connection, abnormalities on complete blood count included leucocytosis

with mature neutrophilia and lymphopenia, raised/elevated the hematocrit, the lowered haemoglobin.

Blood chemistry abnormalities included slightly increased activity of AST (Aspartate Transferase) and ALP (alkaline phosphatase), slight hyperglobulinemia (Table 1). Similar findings have been reported by Atray, Raghunath, Singh & Saini (2012). Burkitt et al. (2009), reported that in cats, 40% of the intussusceptions were jejunojejunal in origin. Levien and Baines (2011) and Boland et al., (2017), have reported that older cats with gastrointestinal neoplasia are more prone to develop intussusception; however, some cats may also present with jejunojejunal intussusception with no underlying cause detected, which was consistent with our case. Clinical signs in cats affected with intussusception can vary, with anorexia (83 %) comprising of most persistent clinical finding. Other reported signs include weight loss (83%) and the distinct mass (92 %) on the abdominal palpation. Contrarily, in dogs, clinical signs of vomiting (58 %) and diarrhea (50 %) occur frequently, while cats often stay anorectic, thus leading to a lesser possibility of diarrhea (Bellenger & Beck, 1994).

Our findings of an anorectic, non-diarrheic, dehydrated cat, were thus in close agreement with all these reported signs. Abdominal radiographs revealed intestinal dilatation, which was also consistent with those findings, since our cat had intestinal dilatation. Our final diagnosis based on ultrasonographic examination was intestinal intussusception, which was confirmed at surgery. Newer, complimentary surgical techniques are now aimed to prohibit re-occurrence of the intestinal intussusception in the pets. Nevertheless, the core, emergency surgical procedure of the resection and the end-to-end anastomosis of the intussusception, which was performed successfully in this cat (Figures 3-6), serves as a life-saving remedy, with minimal incidences of recurrence (Lukanc et al., 2015), and good prognosis, if ample and well-timed treatment (medical & surgical) is launched (Bellenger & Beck, 1994); our findings were, hence, in complete agreement with these, since the cat recovered uneventfully on follow-up.

## CONCLUSIONS

With regards to the present case, B-mode ultrasonography was used as diagnostic modality to diagnose an intestinal intussusception in a cat, this was further confirmed on exploratory laparotomy. The history obtained, the clinical signs and diagnostic work-up, were all similar as documented by other scientists (above). The case was successfully treated surgically by resection of the ischemic, turbid part, and end-to-end anastomosis of the healthy part of the intestine. The animal was maintained on intravenous fluids for 5 days, a soft-liquid diet for the next successive 7 days, and gradually re-introduced to solid food, thereafter. The surgical treatment proved successful on follow-up and the cat is reported healthy till date. Conclusively, ultrasonography is the ideal modality enabling accurate diagnosis of intestinal intussusception in pets. Ultrasonography facilitates direct visualization of intestinal intussusception and prompt surgical repair, in order to save and prolong the lives of pets.

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