



## CASE REPORT

### Double Intussusception in a Shih-Tzu Puppy: The Triple-Circle Sign

J. M. Kim, S. S. Kang<sup>1</sup>, G. Kim and S. H. Choi\*

Veterinary Medical Center, Chungbuk National University, Cheongju 361-763; <sup>1</sup>Veterinary Teaching Hospital, Chonnam National University, Gwangju 500-757, Republic of Korea

\*Corresponding author: shchoi@chungbuk.ac.kr

#### ARTICLE HISTORY

Received: August 04, 2011  
Revised: August 16, 2011  
Accepted: August 26, 2011

#### Key words:

Double intussusceptions  
Intussusception  
Shih-Tzu  
Ultrasonography

#### ABSTRACT

Intussusception is a common surgical disorder in puppies. Double intussusception (DI) however, is an extremely rare form of this pathology. The authors report a case of a 3-month-old, Shih-Tzu puppy referred to Veterinary Medical Center of Chungbuk National University, Korea with symptoms of abdominal discomfort, intermittent vomiting and bloody diarrhea for 5 days. Ultrasonographic examination of the left mid-abdominal region revealed a mass with a 'triple case' sign completely different from the classic 'target sign'. The surgical intervention confirmed it to be an ileocecal DI in ascending colon. The case emphasizes the rare 'triple case' sign as a descriptive finding on ultrasonography in DI presentations.

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**To Cite This Article:** Kim JM, SS Kang, G Kim and SH Choi, 2012. Double intussusception in a Shih-Tzu puppy: the triple-circle sign. Pak Vet J, 32(2): 292-294.

#### INTRODUCTION

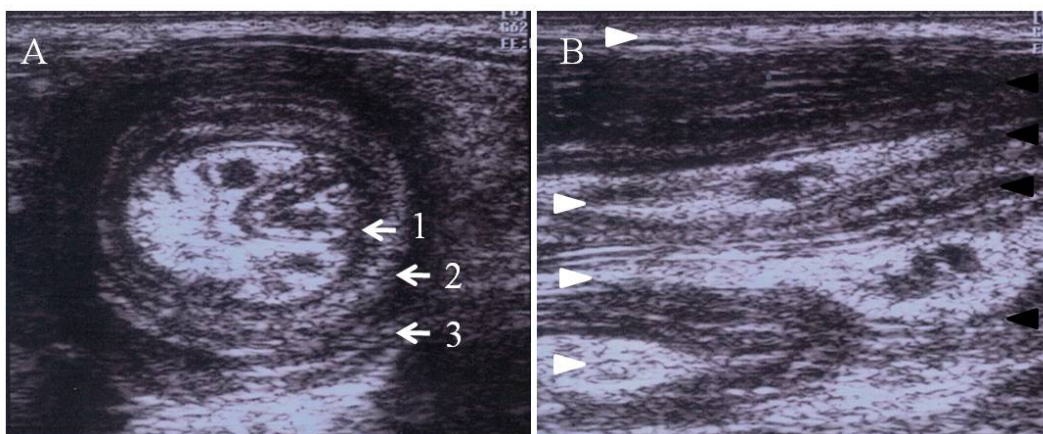
Intestinal intussusception is created by the invagination of a portion of the intestine (intussusceptum) into the lumen of an adjacent intestinal segment (intussusciptens) in the direction of normal peristalsis or occasionally in a retrograde direction (Rallis *et al.*, 2000). It occurs more often as an ileocolic intussusception, although gastroduodenal, duodenojejunal, jejunojejunal, ileoileal and colocolic intussusceptions have been described in young dogs (Lamb and Mantis, 1998; Pietra *et al.*, 2003; Patsikas *et al.*, 2008). Though most intussusceptions in young animals are idiopathic, however a number of conditions including ingestion of bones, linear foreign bodies, prior abdominal surgery, and intestinal parasitism have been suggested as predisposing factors (Kiyon *et al.*, 2002). Acute enteritis or gastroenteritis has been demonstrated as the most likely predisposing factor for intestinal intussusception in young dogs (Rallis *et al.*, 2000). Several reports on intussusception in dogs and puppies have previously been reported (White, 2008; McGill *et al.*, 2009). However, double intussusception (DI) in dogs is a rare entity. This case report describes the ultrasonographic characteristics of DI in a Shih-Tzu puppy with a unique and rare 'triple case' sign.

**History and clinical findings:** A 3-month-old Shih-Tzu puppy was referred to Veterinary Medical Center of

Chungbuk National University, Korea with symptoms of abdominal discomfort, intermittent vomiting and bloody diarrhea for 5 days. During physical examination, the dog was mild depression, vital signs were within normal limits and capillary refill time was 1.5 sec. Abdominal palpation revealed a tender mass that was relatively mobile and had multiple direction mobility in the left mid-abdominal region. The clinicopathological analysis included complete blood count and serum electrolytes by ion-specific potentiometry. Results showed a mild leukocytosis, hyponatremia and hyperkalemia on blood chemistry analyses (Table 1). The ampicillin (40 mg/kg, tid) and metronidazole (10 mg/kg, bid) were intravenously injected to decrease leukocytosis. And normal saline (3-10 ml/kg/hr, iv) was given perioperatively.

Plain abdominal radiographs showed areas of reduced serosa detail and of increased soft tissue opacity in the left mid-abdomen. In addition, a gas distended loop of small intestine situated within the left mid-abdomen was also observed. Ultrasonography revealed a mass (15-90 mm) which appeared as a series of concentric circles in the transverse section and multiple anechoic fluid and hyperechoic because of mesenteric fat tissue parallel lines in the longitudinal section (Fig. 1).

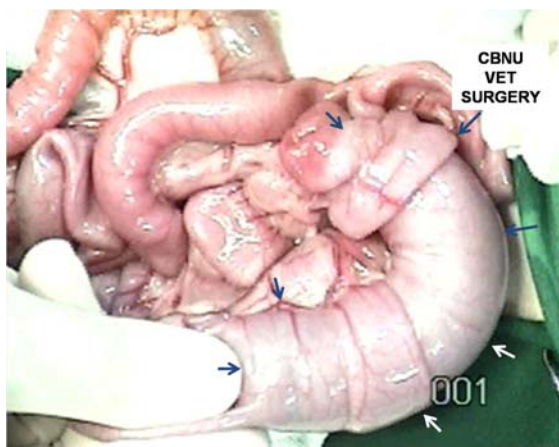
**Surgical procedure:** Anesthesia was induced with 10 mg/kg of propofol intravenously and maintained with isoflurane. Exploratory laparotomy confirmed an ileocecal intussusception in ascending colon (Fig. 2). An ileoileal



**Fig. 1:** Ultrasonographic images in a puppy with double intussusception. A: Triple-circle appearance in the transverse section. 1 = the proximal prolapsed segment; 2 = the distal prolapsed segment; and 3 = the distal intestinal segment. B: multiple hyperechoic (white arrow heads) and hypoechoic (black arrow heads) parallel lines in the longitudinal section.

**Table 1:** Complete blood cells and electrolytes in a puppy with double intussusceptions

Item	Result	Reference range
White blood cell	20.9	6.0-17.0 x 10 <sup>3</sup> /μl
Neutrophil	17.2	3.0-11.8 x 10 <sup>3</sup> /μl
Monocyte	1.6	
Lymphocyte	1.7	0.2-2.0 x 10 <sup>3</sup> /μl
Eosinophil	3.4	1.0-4.8 x 10 <sup>3</sup> /μl
Basophil	0.3	
RBC	7.2	0.1-1.3 x 10 <sup>3</sup> /μl
PCV	47.9	0-0.5 x 10 <sup>3</sup> /μl
Hemoglobin	13.9	
Platelet	470	5.5-8.5 x 10 <sup>6</sup> /μl
		37-55%
		12-18 g/dl
		200-500 x 10 <sup>3</sup> /μl
Serum Na <sup>+</sup>	137	141 - 152 mmol/L
Serum K <sup>+</sup>	5.5	4.37 - 5.35 mmol/L



**Fig. 2:** Photograph of double intussusception (arrows) with triple circles at the ileocecal junction in a puppy.

intussusception of some duration had intussuscepted through the ileocolic orifice. The latter intussusception was readily reduced by pushing the ileoileal intussusceptions from the colon. The bowel involved in the ileoileal intussusceptions was resected along with some bowel proximal and distal to it. End-to-end anastomosis was performed. The resected bowel

represented 200 mm of the ileum, 50 mm of the colon, and included the cecum and ileocolic junction.

**Postoperative care and progress:** The patient was recovered uneventful. The same antibiotic drugs which were given preoperatively were administered for 7 days. There were no signs about recurrence of intussusception and short bowel syndrome.

## DISCUSSION

Intestinal intussusception in young dogs is usually suspected on the basis of abdominal palpation which feels like a defined, firm, tubular structure that should be differentiated from feces and foreign bodies. Abdominal radiography, including survey radiographs and contrast studies, may be diagnostic; however, the radiological findings are often nonspecific (Patsikas *et al.*, 2003). Ultrasonography is an accurate diagnostic method that has totally replaced conventional radiology in the diagnosis of intestinal intussusception in children (Goyal *et al.*, 2010); however, few reports of ultrasonographic findings of intestinal intussusception have been published in the veterinary literature (Lamb and Mantis, 1998; Lee *et al.*, 2005). The ultrasonographic patterns of intestinal intussusception result from the juxtaposition of the walls of the inner and outer intussusception and the wall of intussusciens (Lee *et al.*, 2005). Although definitive diagnosis of intussusception with plain films may be difficult, radiographic signs of obstruction are usually present and are more pronounced with complete obstruction. A tissue-dense tubular mass lends strong support to a diagnosis of intussusception. However, ultrasonography may provide a sensitive, specific, and accurate method of diagnosing intestinal intussusception in young dogs (Patsikas *et al.*, 2003). Abdominal ultrasound can be used to identify the intussusception. A cylindrical intestinal mass with a characteristic "ring sign" is highly specific for intussusception. In our case, a third ring (colic segment) was noticed after the intraoperative and sonographic findings were evaluated retrospectively. The outer third ring was the distal segment (colic

segment); the middle second ring and the inner first ring were ileoileal intussusception.

In the current case, DI caused standard intussusception symptoms and was indistinguishable from classical intussusception preoperatively. At the celiotomy, however, it could be detected easily and it did not cause any extra difficulty in manual reduction. There was no sign to hypothesize an explanation for the origin of this entity. There also was no clue to suggest which of the intussusceptions occurred first. However, a plausible justification is that the obstruction of the distal intussusception may have caused colonic distention, thus, enabling the invagination of the ileum into the distended ascending colon.

As many of the disease conditions that may mimic intussusception are also predisposing factors for development of intussusception, thorough examination and close patient monitoring is of utmost importance. The differential diagnoses include all other causes of intestinal obstruction; foreign bodies, intestinal volvulus or torsion, intestinal laceration, adhesions, strictures, abscesses, granulomas, hematomas, tumors, or congenital malformations (Hayden and Sprouse, 2011). Another cause might be physiologic ileus that occurred secondary to inflammation such as parvovirus or peritonitis (Evermann *et al.*, 2005). The complexity of the intussuscepting mass noted at surgery is also of surgical interest due to its rarity. To our knowledge, there is no such report in the published literature though we do not have a definite answer to the formation of the complex intussusception mass. In classic cases, the displacement of one segment of bowel is defined, whereas, very rarely, two separate segments can be prolapsed into the same distal segment, giving rise to DI. To our knowledge, DI case in

dogs is a very rare. In conclusion, it is the first report of double intussusception with 'triple circle sign' in Shih-Tzu puppy.

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