

RETROGRADE JEJUNAL INTUSSUSCEPTION IN ONE YEAR OLD CAT AFTER TREATMENT WITH METOCLOPRAMIDE AND MENBUTONE

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Summary: Intussusception refers to invagination or prolapse of one portion of the intestine into the part of the tract that either precedes or follows it. Young cats may be more likely to have idiopathic intussusception, and older cats with intussusception may be more likely to have primary gastrointestinal tract disease, i.e. neoplasia. An intussusception will result in either a partial or complete intestinal obstruction and this will lead to a variety of clinical signs depending on the chronicity, size and location of the intussusceptions.

In the literature no suggestion has been made to show association between intussusception and prokinetic or choleric drug. A one year old male Maine Coon cat was presented with a history of anorexia, depression and inability to defecate for few days. On two consecutive days the cat was treated with metoclopramide, ranitidine, hyoscine butylbromide and menbutone. On the same day of therapy vomiting started and continued for three days before the moribund cat was presented to the clinic. In transverse ultrasonographic view, a target-like mass with multiple concentric hypo- and hyperechoic rings consistent with intussusception was seen in the left mesogastrium.

This paper describes that possible cause of intussusception may be iatrogenic by application of prokinetic metoclopramide and choleric menbutone given to an obstipated cat.

Key words: cat; jejunal intussusception; surgery; prokinetic; choleric

Introduction

Intussusception refers to invagination or prolapse of one portion of the intestine into the part of the tract that either precedes or follows it and may occur anywhere in the gastrointestinal tract (1).

Intussusceptions have been reported as sequelae to a number of conditions, including intestinal parasitism, viral-induced enteritis, alimentary foreign bodies (1, 2, 3, 4, 5) intestinal masses (1, 2, 4) recent abdominal or extra-abdominal surgery (1,

2, 4, 5, 6) and nonspecific gastroenteritis (1, 4, 5).

There is a bimodal age distribution of cats presented with intussusception. In older cats, most likely intussusceptions were associated with neoplasia or IBD in some cases. Underlying causes for younger cats are ill defined and may be idiopathic in many cases, but associations with parasitism and, in one case, a linear foreign body have been made (4, 7).

An intussusception will result in either a partial or complete intestinal obstruction and this will lead to a variety of clinical signs depending on the chronicity, size and location of the intussusception (5).

Diagnosis is established using a combination of history, physical examination and diagnostic

imaging, including survey and contrast radiography and ultrasonography. Ancillary testing such as haematology, biochemistry, urinalysis, and faecal examination is frequently performed to try and identify an underlying cause (7).

Case description

A one year old, 4.9 kg, castrated, indoor, male Maine Coon was presented with a history of anorexia, vomiting, depression and unable to defecate for one week. Micturition was normal. He was regularly vaccinated but dehelminthiasis was not carried out. The cat was treated on the other clinic four and three days previously with metoclopramide 1.0 mg/kg (Reglan, Alkaloid, Skopje, Macedonia), ranitidine 4.0 mg/kg (Ranital, Sandoz, Ljubljana, Slovenia), hyoscine butylbromide (Buscopan, Boehringer Ingelheim, Ingelheim, Germany) and menbutone (Genabil, Boehringer Ingelheim, Ingelheim, Germany). After therapy vomiting started and lethargy worsened therefore the cat was presented to our faculty clinic.

On clinical examination the cat was depressed and unresponsive, unable to stand, hypothermic ($T=37.0^{\circ}\text{C}$), tachycardic (200bpm) with weak pulse, eye bulbs were sunken with scleral injection, capillary refill time was prolonged (> 4 sec) and skin turgor decreased. The cat was assessed 10% dehydrated. On auscultation heart murmur was detected. Lymph nodes were normal. Abdominal palpation was painful. The cat was hospitalised for stabilisation and further diagnostics.

Abnormalities on the complete blood count included leucocytosis with mature neutrophilia and lymphopenia, erythrocytosis, elevated hematocrit and haemoglobin. Blood chemistry abnormalities included decreased activity of ALP (alkaline phosphatase), hyperproteinemia, hyperalbuminemia, hypochloremia, hyponatremia, elevated urea and creatinine (Table 1).

Survey radiography of the cat in right lateral recumbency was performed (Figure 1). In thorax a microcardia was seen. In abdomen there was some air in the stomach and caudal to the liver a mass of soft tissue opacity. Some parts of small intestine were dilated. In transverse and descending colon formed faeces were present. In transverse ultrasonographic view (Figure 2), a target-like mass with multiple concentric hypo- and hyperechoic rings was seen in the left

mesogastrium. The small intestine was fluid filled and dilated consistent with obstruction (Figure 3).

For the stabilisation of the cat we used saline (500 ml 0.9% NaCl, B Braun, Melsungen, Germany) in which we added 10 mmol potassium chloride (KCl) (University Medical Centre Ljubljana, Slovenia). It was administered with perfusion pump at rate of 20 ml/h for 7 hours, and then increased to 30 ml/h. A solution of vitamin B complex, electrolytes, amino acids and dextrose for injection (Duphalyte, Fort Dodge Veterinaria S.A., Girona, Spain) at dose of 50 ml was administered slowly intravenously. For analgesia tramadol 1 mg/kg (Tramal 50 mg/ml, Grünenthal GmbH, Germany) subcutaneously was given. Antibiotic therapy was started with cefazoline 20 mg/kg/8h (Cefamezin 1g, Krka, Novo mesto, Slovenia) intravenously.

The next day the cat underwent exploratory surgery, he was premedicated with methadone 0.18 mg/kg (Heptanon, Pliva, Zagreb, Croatia) subcutaneously two hours before intravenous induction with propofol 3.6 mg/kg (Norofol 10 mg/ml, Norbrook, Newry, Ireland). Five minutes before induction with propofol the cat was preoxygenated with oxygen 2 l/min. After induction the cat has vomited a lot of fluid and some of that was aspirated. The cat was intubated with cuffed endotracheal tube with internal diameter 4.5 mm. Fluid from trachea, bronchi and oral cavity was aspirated and the cat was then connected to the anaesthetic machine via circle breathing system. Anaesthesia was maintained with isoflurane (Forane, Abbott, Berkshire, UK) in 100 % oxygen for 145 minutes. End tidal isoflurane was 1.4 – 1.3%. Lactated Ringer's solution (RL) (Hartmannova raztopina Braun, B Braun, Melsungen, Germany) was given at rate 10 ml/kg/h.

On surgery a ventral midline laparotomy had been performed. We found that the large portion of the jejunum has telescoped into the oral part of intestine (Figure 4). As traction failed to reduce the jejunojejunal intussusception, resection of the affected bowel was deemed necessary, with anastomosis of the healthy tissue. Approximating end-to-end intestinal anastomosis was created with simple interrupted suture pattern with monofilament synthetic absorbable suture material Glycomer 631 (Biosyn 4/0, Syneture, Grimsby, UK) (Figure 5). The large bowel was filled with formed hard dry faeces which were milked out through the anus. Abdominal wall was closed in

three layers with absorbable monofilament suture.

Intravenous fluids RL with KCl supplementation were administered at 30 ml/h on the day of surgery and 20 ml/h next two days, during hospitalisation. Duphalyte solution for injection (50 ml) was administered on the day of surgery and discontinued after. Cefazolin was discontinued and broad-spectrum antibiotic therapy was started with amoxicillin and clavulanic acid 20 mg/kg/12h (Synulox, Pfizer, Roma, Italy) subcutaneously and metronidazole 10 mg/kg/12h (Efloran,

Krka, Novo mesto, Slovenia) intravenously. Both antibiotics were discharged for another 12 days postoperatively. Pain was treated with methadone 0.2 mg/kg/12h and fentanyl patch (Durogesic 12 µg/h, Janssen pharmaceuticals, Beerse, Belgium). Two days postoperatively meloxicam 0.1 mg/kg/24h (Loxicom 1.5 mg/ml, Norbrook, Newry UK) was started intravenously and continued orally three consecutive days. He was also treated with sucralfate 0.25 g/8h (Venter 1g, Krka, Novo mesto, Slovenia) orally.

Table 1: Laboratory findings from the day of operation to the first postoperative day

	Unit	Reference range	Preoperative day	Day of operation	Postoperative day
WBC	x 10 ⁹ /l	5.5 – 19.5	26.84	22.56	40.48
RBC	x 10 ¹³ /l	5 - 10	10.89	9.74	7.07
HGB	g/l	80 - 150	171	151	111
HCT	l/l	0.3 – 0.45	0.49	0.44	0.33
MCV	fl	39 – 55	45.1	45.6	46.3
MCH	pg	12.5 – 17.5	15.7	15.5	15.7
MCHC	g/l	300 – 360	348	339	339
RDW	%		15.2	14.9	14.6
HDW	g/l		29.1	29.3	27.6
PLT	x 10 ⁹ g/l	300 - 700	360	144	263
MPV	fl		9.2	8.2	8.4
PDW	%		36.4	36.3	44.5
PCT	l/l		0.003	0.001	0.002
Differential cell count					
NEUT	x 10 ⁹ /l	2.2 – 12.8	23.84	20.19	35.42
LYMP	x 10 ⁹ /l	1.5 – 7	1.02	0.98	2.41
MONO	x 10 ⁹ /l	0.1 – 0.85	0.55	0.49	0.16
EOS	x 10 ⁹ /l	0.1 – 1.5	1.57	0.87	2.45
BASO	x 10 ⁹ /l		0.06	0.03	0.04
LUC	x 10 ⁹ /l		0	0	0
Urea	mmol/l	5.3 – 12.1	76.24	26.5	11.9
Creatinine	mmol/l	70.7 – 159	328.4	127.7	112.0
Na	mmol/l	147 – 156	128.8	154.1	147.8
K	mmol/l	4.0 – 4.5	4.13	3.42	4.12
Cl	mmol/l	117 – 123	69.0	110.6	114.3
ALP	U/l	25 – 93	7.4		
ALT	U/l	6 – 83	80.8		
Total protein	g/l	54.0 – 78.0	90.2		
Albumins	g/l	21.0 – 33.0	46.17		

Legend: WBC – white blood cells, RBC – red blood cells, HGB – haemoglobin, HCT – haematocrit, MCV – mean corpuscular volume, MCH – mean corpuscular haemoglobin, MCHC – mean corpuscular haemoglobin concentration, RDW – red cell distribution width, HDW – hemoglobin distribution width, PLT – platelets, MPV – mean platelet volume, PDW – platelet distribution width, PCT – plateletcrit, NEUT – neutrophils, LYMP – lymphocytes, MONO – monocytes, EOS – eosinophils, BASO – basophils, LUC – large unstained cells, Na – sodium, K – potassium, Cl – chloride, ALP – alkaline phosphatase, ALT – alanine aminotransferase

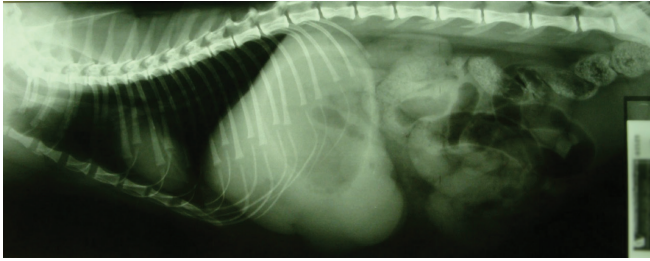


Figure 1: A right lateral thoracic and abdominal radiograph. In ventral abdomen, caudal to the liver, a mass of soft tissue opacity is seen. Some loops of small intestine are dilated. Large intestine is filled with formed faeces

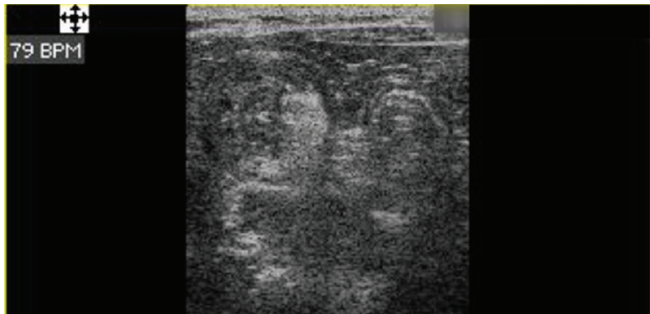


Figure 2: Transverse sonogram of jejunal intussusception. Note the multilayered appearance of the intestinal wall (called also *concentric rings*). Only a small amount of fat is invaginated. There is some gas in the lumen

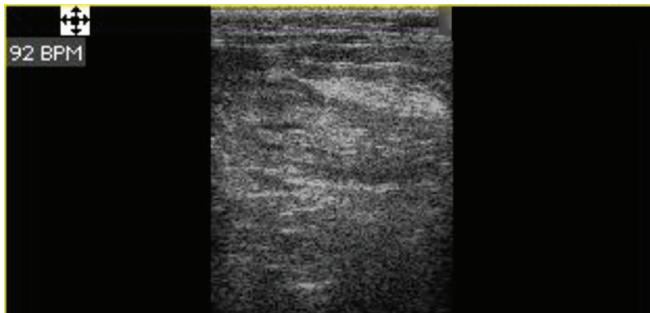


Figure 3: Longitudinal sonogram of jejunal intussusception

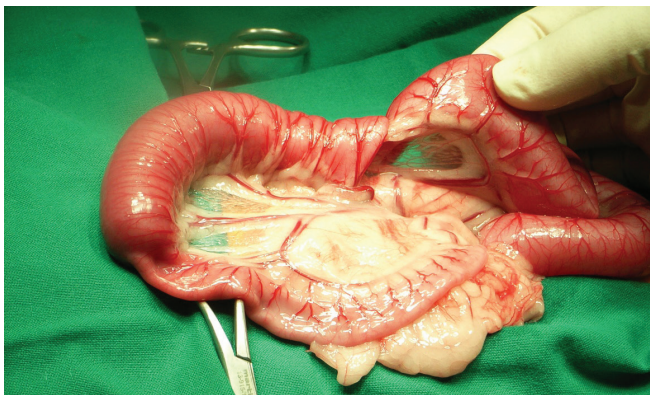


Figure 4: Intra-operative appearance of a retrograde jejunojejunal intussusception of a cat at laparotomy

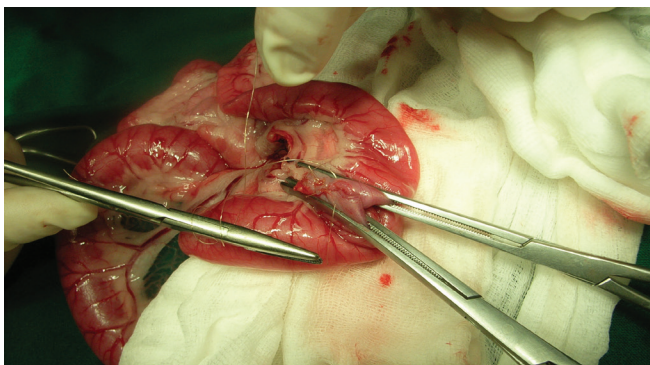


Figure 5: Apposing the wound edges with simple interrupted appositional sutures after resection of affected jejunum

Discussion

Because cats and dogs differ in their anatomy, physiology and behaviour, there may be differences in the clinical presentation of intestinal intussusceptions (7). It usually occurs in the direction of normal peristalsis, these are referred to as direct or normograde intussusceptions (8, 9, 10). In our case intussusception occurred against the direction of normal peristalsis, referred to as indirect or retrograde intussusception.

The most common location of intussusception is ileocolic and jejunojejunal (4, 6, 7, 8, 9, 11, 12). Burkitt et al., 2009, found that 40% intussusceptions in cats were jejunojejunal (4). Levien and Baines, 2011, reported, that two of 18 cats presented with jejunojejunal intussusception were Maine Coon breed aged 17 and two months with no underlying cause detected (11), which was consistent with our case, Maine Coon, 13 months old of jejunojejunal intussusception detected. Unpublished data from our clinic show that two of three cats presented with jejunojejunal intussusception in last year were Maine Coons, suggesting that Main Coons may be overrepresented; however the number of cats was too small to make any conclusions.

The cat in our study had signs of shock consistent with findings in previous study (4). The most consistent clinical signs seen in cats in one study were a palpable abdominal mass and anorexia (7, 12) however other study reported that palpable abdominal mass was evident only in three of nine cats presented (6). In our case abdomen was painful on palpation without resistance. Most common clinical signs in cats were also vomiting, depression, weight loss and dehydration (4, 6, 7) which were all present in our cat. Bellenger and Beck, 1994, suggested that cats with intussusception are less likely to eat and drink and, therefore, there is less ingesta to result in diarrhea (7).

Abdominal radiographs revealed intestinal dilatation in all cats and gastric dilatation in two of 10 cats with intussusceptions (4), and consistent with those findings our cat had intestinal and gastric dilatation. Our final diagnosis based on ultrasonographic examination was jejunojejunal intussusception.

Surgical treatment in our cat involved unsuccessful simple manual reduction, resection

and anastomosis of the involved portion of the intestine. Manual reduction of the intussusception was attempted by gentle “milking” of the intussusceptum from within the intussusciens. This technique should employ more pressure on the intussusciens in an effort to reduce the intussusceptum by pushing it out rather than using traction on the intussusceptum (8, 9). However gentle milking failed to reduce the jejunojejunal intussusception, because there was significant venous infarction, edema, and congestion as well as adhesions from fibrin and effusions from the affected bowel. Adhesions between the intussusceptum and intussusciens that we observed are reported to be common in cats, but there is no relationship evident between the duration of clinical signs and the presence or absence of adhesion (6). We performed resection and anastomosis of the intussusception, which is reported to lessen the incidence of recurrence when compared with manual reduction (6, 13, 14).

A simple interrupted appositional suture that we used incorporates all tissue layers and gently apposes the wound edges. Interrupted pattern is generally easier to perform, but the simple continuous pattern minimizes mucosal eversion and therefore provides better serosal apposition and primary intestinal healing. Regardless of the suture technique used, proper incorporation of the tough submucosa and reduction of mucosal eversion are vital in performing consistently successful intestinal anastomosis (15). Recurrence of intussusception is not related to intestinal plication performed at the initial surgery (6). In our cat the plication was not performed and intussusception has not recurred. The decrease in incidence of intussusception was hypothesized to be the result of increased smooth muscle tone along the whole gastrointestinal tract together with a decrease in propulsive peristalsis secondary to opioid administration (16, 17).

Although the results of histological examination are not commonly reported in the literature, they may identify an underlying cause and allow diagnosis of associated or concurrent diseases (11). In our case a portion of the affected intestine had been submitted for histology examination. Intussusception was considered idiopathic because the results revealed only inflammatory changes considered secondary to the intussusception. Major limitation of the present case report is the lack of faecal parasite

examination which may have ruled out parasitism as cause of intussusception.

Metoclopramide stimulates motility of the upper gastrointestinal tract; gastric emptying and intestinal transit time can be significantly reduced but has no effect on colon motility. It also increases duodenal and jejunal peristalsis (18), therefore it should not be used when gastrointestinal obstruction is suspected (19), as metoclopramide may cause constipation itself (18). Side effects are uncommon in metoclopramide therapy but occur more often in cats than in dogs (19).

Menbutone is indicated for constipation and intestinal atony in dogs and large animals (20) and should according to manufacturer's instructions never be given to cats. The product contains cresol and cats have limited ability to glucuronidate it (21). Menbutone increases the excretion of the bile, the gastric and the pancreatic juice into the gut by two- to five-fold the normal secretion, stimulates the function of the gastrointestinal tract and increases peristalsis (22).

With regard to the fact that metoclopramide was given to our cat in overdose (1 mg/kg) compared to 0.2 – 0.4 mg/kg, which is recommended dose for cats by Plumb, 2011, and vomiting occurred after overdosed therapy with it we assume that metoclopramide was the cause of vomiting. However, vomiting in a cat may have also appeared due to formation of jejunojejunal intussusception as a result of application of both drugs metoclopramide and menbutone, which increased jejunal peristalsis, since the cat was already unable to defecate for seven days. On the other hand initially intussusception, if already present, might have caused only partial intestinal obstruction, which had progressed to complete obstruction after the prokinetic and choleric therapy and to worsening of clinical signs, which had already been present for four days. It was in our cat impossible to discern whether the cat was initially presented with intussusception, because the duration of illness in cats varies from 12 hours to three weeks (7). Application of metoclopramide in gastrointestinal obstruction may delay diagnosis (19), in general in jejunojejunal intussusception the duration of signs is longer than in ileocolic intussusception (7). However due to acute worsening of clinical signs after the therapy we assume that prokinetic and choleric therapy caused intussusception. Intussusception should be included in the differential diagnosis of all cats

presented with typical signs of intussusception, i.e. anorexia, lethargy and vomiting. We conclude that metoclopramide should be given with caution or not given at all in cats presented with obstipation as it may cause the intussusception or, if already present, partial intestinal obstruction may progress to complete obstruction (23). The prognosis for cats with intussusception appears to be good given appropriate medical and surgical treatment (7).

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RETROGRADNA INVAGINACIJA JEJUNUMA PRI ENO LETO STARI MAČKI PO ZDRAVLJENJU Z METOKLOPRAMIDOM IN MENBUTONOM

Povzetek: Invaginacija je uvihanje ali prolaps enega dela črevesja v drugi del pred ali za njim. Pri mladih mačkah je navadno idiopatska, medtem ko je pri starejših pogostejši vzrok primarno gastro-intestinalno obolenje, t.j. neoplazija. Posledica invaginacije je delna ali popolna obstrukcija, ki se kaže z različnimi kliničnimi znaki, odvisno od trajanja, obsega in lokacije invaginacije. V literaturi nismo zasledili neposredne povezave med invaginacijo in prokinetiki ali holeretiki.

Leto star maček, pasme main coon je bil pripeljan na kliniko z anamnezo, da nima apetita, da je apatičen in že nekaj dni ne more odvajati blata. Dva zaporedna dneva je bil zdravljen z metoklopramidom, ranitidinom, hioscinijevimi butilbromidom in menbutonom. Dan po zdravljenju je začel bruhati. Po treh dneh bruhanja je bil moribunden pripeljan na kliniko. Z ultrazvočnim pregledom trebuha smo v levem mezogastriju našli maso z multiplimi koncentričnimi hipo- in hiperehogenimi krogi, ki je značilna za invaginacijo črevesja.

Predstavljamo primer invaginacije črevesja pri obstipirani mački po aplikaciji prokinetika metoklopramida in holeretika menbutona.

Ključne besede: mačka; invaginacija jejunuma; kirurgija; prokinetik; holeretik