

Surgical management of an ileocecolic intussusception in a Korean native calf: a case report

D.B. LEE, S.M. SHIN, K.C. LEE, H.B. LEE, M.S. KIM, N.S. KIM

BK 21 Plus Program and College of Veterinary Medicine, Chonbuk National University, Jeonju, Republic of Korea

ABSTRACT: A two-month-old male 40 kg Korean native calf was referred to the Chonbuk Animal Medical Centre, College of Veterinary Medicine, Chonbuk National University because of prolonged diarrhoea, depression, and anorexia lasting three weeks. On physical examination, abdominal distension presented in the right flank and a percussion sound was audible. A round-shaped lesion was observed in the area of the large intestine on computed tomography and ultrasonography, and a diagnosis of intestinal intussusception was made. A surgical operation was decided upon immediately to correct the intussusception. An infarct lesion was found during surgery, and the lesion was observed on the intussuscepted intestines including the cecum, ileum, and colon. The area of intussusception was excised, and an anastomosis was performed. Despite intensive and supportive care, the patient died one day after the surgery due to poor general condition. An ileocecolic intussusception is an uncommon case compared within other intestinal intussusceptions. Most affected calves have a history of severe diarrhoea and the prognosis is guarded due to poor general condition. Good survival can be expected if patients are diagnosed quickly.

Keywords: ileocecolic intussusception; caecal intussusception; calf; Korean native calf

Intussusception is the telescoping or invagination of a portion of the intestine (intussusceptum) into the lumen of an adjacent intestinal segment (intussusciens) and is a cause of intestinal obstruction (Pearson 1971; Smart et al. 1977; Strand et al. 1993; Constable et al. 1997). Intussusception typically develops secondary to altered intestinal motility, and the process occurs more commonly in the direction of peristalsis (Horne 1991). Although intussusception can occur in any portion of the alimentary tract, the most common location is the intestine. The blood supply to the affected portion of the intestine is interrupted when intussusception occurs, and the intestinal wall becomes oedematous, ischaemic, and turgid (Smart et al. 1977; Horne 1991; Levitt and Bauer 1992). Intussusception varies in duration and in the severity of clinical signs, which are associated with partial or complete gastrointestinal tract obstruction (Levitt and Bauer 1992; Patsikas et al. 2008).

Intussusception is frequently observed in adult cattle (Pearson 1971); however, it appears to be most common in calves up to two-months-old (Constable

et al. 1997; Pravettoni et al. 2009). A previous study in cattle classified intussusceptions into four major groups according to the region of occurrence: small intestine, ileocolic, cecocolic and colocolic intussusceptions. A total of 336 cattle were identified, comprising 281 (84%) cases of small intestinal, 7 (2%) ileocolic, 12 (4%) cecocolic, and 36 (11%) colocolic intussusceptions (Constable et al. 1997). Because of the minimal fat-filled mesentery in the caecal area of calves compared with that in adult cattle, mobility of the intestine is increased and intussusception is more common. Intestinal intussusceptions within the caecal area can be classified into four different types: cecocecal, cecocolic, ileocecal, and ileocecolic (Steiner 2004). The comparative rarity of ileocecolic intussusceptions in both calves and adult cattle is attributed to the mesenteric fat deposits and the shortness of the ileocecal ligament which stabilises the intestine (Strand et al. 1993).

This is the first case report of surgical management of ileocecolic intussusception in a Korean native calf.

Case description

A two-month-old male 40 kg Korean native calf was referred to the Chonbuk Animal Medical Center, College of Veterinary Medicine, Chonbuk National University because of prolonged diarrhoea lasting three weeks. The diarrhoea had started as whitish and greenish in colour three weeks previously and subsequently the amount decreased. The calf was depressed and emaciated at the time of referral.

On physical examination, although anorexia was prolonged for more than two weeks, abdominal distension presented in the right flank and percussion sound was audible. The calf was reluctant to move, and tenesmus behaviour was observed. A small amount of dark greenish faeces with mucous was present around the anal area. Lateral plain radiographs showed distended intestinal loops (Figure 1A), while no notable findings were made upon observation in the dorsal view. Multiple hyper- and hypoechoic concentric lines that surrounded a hypoechoic center were observed, resembling a “bull’s eye” pattern on ultrasonography (Figure 1B). A computed tomography (CT) scan was performed for a more accurate diagnosis. A round-shaped mass-like sign was observed just behind the abdominal region, which revealed a gas-filled intestine on plain radiographs (Figure 2).

Although the general condition of the patient was depressed and emaciated, surgery was decided upon immediately to correct the underlying cause. Aggressive intravenous fluid therapy was performed before surgery to correct the dehydra-

tion and electrolyte imbalance. Anaesthesia was induced with a combination of 0.02 mg/kg xylazine (Rompun, Bayer HealthCare LLC, Seoul, Korea) and 2 mg/kg ketamine (Yuhan Ketamine 50 Inj., Yuhan Co., Ltd, Seoul, Korea) and maintained with isoflurane (Ifran, Hana Pharm. Co., Ltd, Seoul, Korea) and oxygen.

The right paramedial abdominal area where the round-shaped mass was revealed on the CT scan was incised longitudinally for an easier approach and exploration. The small intestine was clear but an infarct lesion was found, which took the form of an approximately 40 cm long mass in the area of the caecum. The infarcted lesion was revealed on an intussuscepted intestine that included the cecum, ileum, and colon, which was impossible to reduce by manual traction. A portion of the intussusception was resected and an end-to-end anastomosis was performed between the ileum and colon using 3-0 polyglyconate suture material (Maxon, Covidien LLC, Mansfield, MA, USA). The subcutaneous tissues and skin were closed using 3-0 polyglyconate and 1-0 nylon (Blue nylon, Ailee Co., Ltd, Seoul, Korea), respectively. Postoperative care consisted of cefazolin (25 mg *i.v.*; CKD Cefazolin Inj., ChongKunDang Pharm. Co., Ltd, Seoul, Korea), flunixin meglumine (2.5 mg/kg *i.m.*; Fluximine Inj., Bomac Laboratories, Auckland, New Zealand), butaphosphan and cyanocobalamin (5 ml *s.c.*; Catosal Inj., Bayer HealthCare, Seoul, Korea), and an intravenous injection of lactated Ringer’s solution in 5% dextrose (Daihan Hartmann’s Dex Inj., DaiHan Pharm. Co., Ltd, Seoul, Korea). Partial parenteral nutrition (PPN) was administered to correct

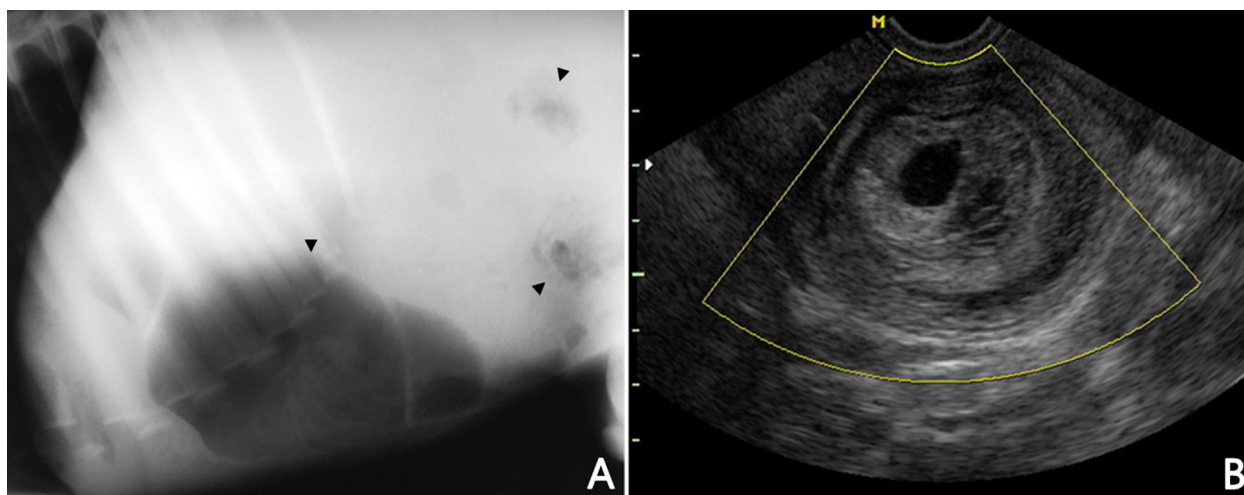


Figure 1. (A) Lateral plain radiograph (arrowhead: distended loops of the intestine). (B) Ultrasonographic image of the intussusception. Target-like or bull’s eye sign



Figure 2. Computed tomography. Note the round-shaped mass-like image (arrowhead) located behind the dilated intestine (white dotted line)

the hypoalbuminaemia and improve general condition. The patient's depressed and anorexic status continued the day after surgery. Before further investigation could be completed, the patient died on the day after surgery because of poor general condition induced by prolonged diarrhoea over the preceding weeks.

DISCUSSION AND CONCLUSIONS

The pathophysiology of intestinal intussusception remains unclear. In general, any focal disturbance of intestinal motility can incite invagination of a portion of the bowel into an adjacent segment causing an intussusception. A previous study suggested that it may begin as a result of local intestinal incongruity in homogeneity or a mechanical linkage of intestinal segments (Rallis et al. 2000). Submucosal abscesses, fibroserous granulation, intestinal tumours, enteritis (viral, bacterial, and parasitic), and sudden diet changes resulting in vigorous and uncoordinated intestinal motility or hyper-motility and gas distension are predisposing factors (Archer et al. 1988; Okamoto et al. 2007; Pravettoni et al. 2009). Calves have a higher prevalence of intussusception than adult cattle because of the thin, fragile nature of the mesentery, which is more susceptible to tearing under tension, and which allows increased movement of adjacent intestinal segments (Pearson 1971). The high preva-

lence of intussusception in calves results from the common problem of enteritis in this age group, before two months of age. The immune system of calves becomes fully functional only two months after birth. Therefore, calves have a high risk for viral and bacterial enteritis before this age. Prolonged diarrhoea causes abnormal peristalsis and thinning of the intestinal wall. These risk factors, along with the lower amounts of fat-filled mesentery, contribute to ileocecolic intussusception, as shown in this case.

Intussusception can be a diagnostic challenge in cattle. In small animals, diagnosis is based on history and physical examination, particularly palpation of an abdominal mass (Levitt and Bauer 1992; Patsikas et al. 2008). In cattle, the diagnosis of intussusception is commonly based on transabdominal ultrasonographic findings because of the depth of the abdominal cavity (Horne 1991; Braun et al. 1995; Pravettoni et al. 2009). Additionally, because the site of intestinal intussusception is often at a greater distance from the abdominal wall than the penetration capacity of the transducer, similar data can be obtained from transrectal ultrasonography (Karapinar and Kom 2007). However, prominent ultrasonographic appearance, called a "target-like sign" or "bull's-eye sign", is not confirmatory of intestinal intussusception, as these can be observed in any case of intestinal ileus (Braun et al. 1995). Therefore, an exploratory laparotomy is necessary for a definitive diagnosis of intussusception.

In this case, although the general condition of the patient was emaciated, surgery was urgently needed to correct the underlying cause. Therefore, it was necessary to reduce surgical time to minimised risk to the patient and to obtain a more accurate diagnosis before surgery. CT was performed, and the exact location of the intussusception was revealed. An imaging guide was used during the surgery to minimise surgical time.

The treatment goal of intussusception is to reduce the intussusceptum from the intussusciptens and restore gastrointestinal tract patency. Previous studies have reported a reduction in intussusception using barium enema in human infants and dogs (Gierup et al. 1972; Levitt and Bauer 1992) and by percutaneous manipulation in dogs (Patsikas et al. 2008). However, most cases are managed surgically during exploratory celiotomy for a definite diagnosis. Manual reduction is possible when serosal adhesions are minimal but there is a risk of serosal tears or vascular damage (Erkert et al. 2003). If manual reduction is impossible, resection of the intussuscepted region and intestinal anastomosis, mostly end-to-end type, is performed. In cattle, the common mesentery is shorter than that in other animals, and some parts of the intestine cannot be exteriorized and palpated during surgery. This characteristic is responsible for the difficulties encountered during resection and anastomosis (Pearson 1971). The patient in this report was a young calf; thus, manipulation of the intestine was easier than that in adult cattle. It was possible to exteriorise the ileocaecocolic region, and an anastomosis was performed with particular care to preserve the common mesentery and vascular supply.

The prognosis of intussusception depends heavily on the length of time the lesion was present prior to surgical correction, anatomical location, degree of mechanical obstruction, and the predisposing cause (Levitt and Bauer 1992; Constable et al. 1997; Erkert et al. 2003). Underlying systemic disease will increase morbidity and mortality. One study reported an overall survival rate of 35% and a post-operative survival rate of 43% in cattle (Constable et al. 1997). Moreover, it takes time to diagnose intussusception on feed-yard management because of symptomatic treatment. Thus, the prognosis is more guarded for farm animal surgery. Our patient had a history of prolonged diarrhoea for three weeks and was treated for general diarrhoea before referral. The patient was severely depressed and emaciated at admission. Despite aggressive intra-

venous fluid therapy and intensive post-operative care including PPN, the calf did not recover and died the day after surgery.

In summary, an ileoceocolic intussusception is uncommon compared with other intestinal intussusceptions in cattle. An accurate diagnosis was made in this case via ultrasonography and CT and an emergency operation was performed to correct the intussusception. However, the patient subsequently died. A better prognosis can be expected if patients are referred and diagnosed earlier.

Acknowledgement

This study was carried out with support of the “Cooperative Research Program for Agriculture Science & Technology Development”, Rural Development Administration, Republic of Korea.

REFERENCES

- Archer R, Cooley A, Hinchcliff K, Smith D (1988): Jejunojejunal intussusception associated with a transmural adenocarcinoma in an aged cow. *Journal of the American Veterinary Medical Association* 192, 209–211.
- Braun U, Marmier O, Pusterla N (1995): Ultrasonographic examination of the small intestine of cows with ileus of the duodenum, jejunum or ileum. *Veterinary Record* 137, 209–215.
- Constable P, St Jean G, Hull B, Rings D, Morin D, Nelson D (1997): Intussusception in cattle: 336 cases (1964–1993). *Journal of the American Veterinary Medical Association* 210, 531–536.
- Erkert RS, Crowson CL, Moll HD, Bentz BG, Confer AW, Blaik MA (2003): Obstruction of the cecocolic orifice by ileoceocolic intussusception following jejunocecostomy in a horse. *Journal of the American Veterinary Medical Association* 222, 1743–1743.
- Gierup J, Jorulf H, Livaditis A (1972): Management of intussusception in infants and children: a survey based on 288 consecutive cases. *Pediatrics* 50, 535–546.
- Horne MM (1991): Colonic intussusception in a Holstein calf. *Canadian Veterinary Journal* 32, 493–495.
- Karapinar T, Kom M (2007): Transrectal ultrasonographic diagnosis of jejunoileal intussusception in a cow. *Irish Veterinary Journal* 60, 422–424.
- Levitt L, Bauer MS (1992): Intussusception in dogs and cats: A review of 36 cases. *Canadian Veterinary Journal* 33, 660–664.

- Okamoto M, Itoh H, Koiwa M, Inagaki M, Nadao T, Kurosawa T, Kawasako K, Komine M, Akihara Y, Shimoyama Y (2007): Intussusception of the spiral colon associated with fibroserous granulation in a heifer. *Veterinary Record* 160, 376–378.
- Patsikas MN, Papazoglou LG, Adamama-Moraitou KK (2008): Spontaneous reduction of intestinal intussusception in five young dogs. *Journal of the American Animal Hospital Association* 44, 41–47.
- Pearson H (1971): Intussusception in cattle. *Veterinary Record* 89, 426–437.
- Pravettoni D, Morandi N, Rondena M, Riccaboni P, Zani DD, Scandella M, Belloli AG (2009): Repeated occurrence of jejuno-jejunal intussusception in a calf. *Canadian Veterinary Journal* 50, 287–290.
- Rallis T, Papazoglou L, Adamama Moraitou K, Prassinou N (2000): Acute enteritis or gastroenteritis in young dogs as a predisposing factor for intestinal intussusception: a retrospective study. *Journal of Veterinary Medicine Series A* 47, 507–511.
- Smart M, Fretz P, Gudmundson J, Cymbaluk N (1977): Intussusception in a Charolais bull. *Canadian Veterinary Journal* 18, 244–246.
- Steiner A (2004): 14.2.2 Cecal intussusceptions. In: Fubini SL, Ducharme N (eds.): *Farm Animal Surgery*. 1st ed. Elsevier Inc., New York. 470–472.
- Strand E, Welker B, Modransky P (1993): Spiral colon intussusception in a three-year-old bull. *Journal of the American Veterinary Medical Association* 202, 971–972.

Received: 2013–12–05

Accepted after revision: 2013–12–10

Corresponding Author:

Namsoo Kim, Chonbuk National University, College of Veterinary Medicine, Department of Surgery, Jeonju 561-756, Republic of Korea
Tel. +82 63 270 2800, E-mail: namsoo@jbnu.ac.kr
