**CHAPTER-2**

**REVIEW OF LITERATURE**

**2.1 Ileocolic intussusception**

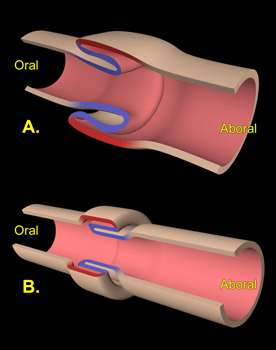
**2.1.1 Definition**

The intussusception is an invagination of a portion of the gastrointestinal tract (intussusceptum) into the lumen of an adjoining segment (intussuscepiens) (Lewis and Ellison, 1987). Intestinal

telescoping and intestinal invagination are synonymous with intussusception (Fossum *et al*., 2002). An intussusception is strictly defined as the taking up or receiving of one part within another, especially in reference to the invagination of one segment of intestine within another segment of intestine (Spraycar, 2002).

**2.1.2 Etiology**

Ileocolic intussusception is the most common form of intussusception seen in dogs (Lewis and Ellison;1987).The most frequent site is the ileocecocolic junction, but intussusception may occur at any area along the intestinal tract (Oakes, 1994). Intestinal intussusceptions may be single or multiple and normograde or retrograde and frequently involve a large percentage of the intestine (Lewis and Ellison, 1987) (Figure:1). Intussusceptions usually occur in the direction of normal peristalsis (aborally); these are referred to as **direct** or **normograde intussusceptions** (Figure:1). Intussusceptions that occur against the direction of normal peristalsis are referred to as **indirect** or **retrograde intussusceptions** (Hedlund CS;1997).



**Figure 1—**Illustration of an intussusception showing the invaginated intussusceptum *(blue)* and the invaginating intussuscipiens *(red).* (**A**) A direct or normograde intussusception

occurs in the direction of normal peristalsis. (**B**) An indirect or retrograde intussusception occurs against the normal direction of peristal.

**2.2 Mechanism of intestinal intussusception formation**

The formation of an intestinal intussusception is proposed to be the result of a lack of homogeneity of the bowel wall. This inhomoeneity may be caused by any abnormality within the bowel wall that alters local intestinal motility or pliability. As the intussusception is formed, longitudinal and circular contractions of the normal bowel wall adjacent to an area of local inhomogeneity cause displacement of that portion of the intestine and a “kink” or fold in the intestine is formed (Figure: 2,3). The fold is then propagated circumferentially, and longitudinal muscle contraction completes the invagination (Reymond , 1998).

Figure 2—Inhomogeneity model of intussusception formation.

1. A focal area of inhomogeneity *(I)* is present within the wall of the bowel. (B) Longitudinal *(F)* and circular contraction of the bowel wall occurs adjacent to the area of inhomogeneity, creating a kink. (C) Continued longitudinal force causes complete invagination of the area of inhomogeneity. (D) The kink is propagated circumferentially, and longitudinal muscle contraction completes the formation of the intussusceptions.

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**Figure:2**

**Figure 3—**Mechanical linkage model of intussusceptions formation. Lack of homogeneity of the bowel wall caused by an abnormality within the bowel wall alters intestinal motility or pliability. (**A**) Longitudinal peristalsis generates a force *(F)* on each end of the linkage between bowel segments. (**B**) Longitudinal and circular contractions of the normal bowel wall adjacent to the area of inhomogeneity *(S)* result in bowel wall displacement and kink formation. (**C**) As

longitudinal muscle contraction continues, the kink is propagated and the intussusception is formed.



**Figure:3**

**2.3 Signalment and clinical Signs**

Seventy-five percent of dogs diagnosed with intestinal intussusceptions are younger than 1 year of age (Lewis and Ellison, 1987). Although an early study suggested that German Shepherds may be predisposed to intestinal intussusception, subsequent retrospective studies have not identified a breed predilection (Oakes *et al*., 1994). Gastrointestinal intussusception cases have rarely been reported in spaniels. It is more prevalent in German shepherd dogs and 80% cases of intestinal intussusception have been reported in pups under one year of age (Dixon, 2004). The case which showed a complaint of less frequent vomiting and bloody diarrhoea that are typical signs of ileocolic intussusception (Lewis and Ellison, 1987). The most common presenting clinical signs in dogs with intestinal intussusceptions are vomiting, diarrhea with hematochezia or melena, anorexia, and weight loss (Dixon, 2004). Other clinical signs include dehydration, abdominal pain, tenesmus, and rectal prolapsed (Oakes *et al*., 1994). A palpable abdominal mass was present in 50% to 70% of dogs with intussusception, most frequently in the cranial abdomen (Lewis and Ellison, 1987). The clinical signs of intestinal intussusception may be acute or chronic in nature. The reported duration of signs from onset to presentation ranges from 1 to 90 days (Dixon, 2004). The nature, severity, and duration of clinical signs are related to the location of the intussusception within the intestinal tract. (Lewis and Ellison, 1987).

**2.4 Diagnosis**

Physical examination in dogs with intestinal intussusceptions may reveal a palpable cranial abdominal mass. In some cases, the intussusceptum may protrude from the anus, in which case the intussusceptum must be differentiated from a rectal prolapse (Lewis and Ellison, 1987).

This is accomplished by attempting to pass a blunt, lubricated probe between the rectal wall and the prolapsed tissue. In the case of a small-intestinal or colonic intussusception, the probe can be passed to a level cranial to the pubis (Matthiesen, 1993) however, the probe cannot be advanced when a rectal prolapse is present. Abdominal radiographs in dogs with intussusceptions commonly reveal fluid or gas-distended bowels, consistent with mechanical intestinal obstruction (Levitt L, 1992). A soft-tissue opacity mass may be identified on survey radiographs, but a definitive diagnosis of intussusceptions is difficult without contrast radiography or ultrasonography (Lewis and Ellison, 1987). In some cases, there is sufficient gas accumulation within the affected bowel to outline the intussusceptum on plain radiographs (Lewis and Ellison, 1987). Contrast radiography using either an upper GI study or a barium enema may increase the likelihood of diagnosing intussusceptions (Figure 4). Matthiesen and Eschel(1993, 1997).

**A**

**B**

**Figure 4—**Lateral (**A**) and ventrodorsal (**B**) views of an enterocolic intussusception following an upper GI barium study. A large filling defect (small intestine intussusceptum) is seen in the ascending colon (intussuscipiens). A “ribbonlike” line of barium is seen within the filling defect and represents barium within the lumen of the intussusceptum segment (Matthiesen ; 1993).

The characteristic ultrasonographic appearance of an intestinal intussusceptions is a series of concentric rings in the transverse plane, frequently described as a “target sign” or “bullseye lesion” (Figure 5).



**Figure 5—**Transverse sonographic image of an ileocolic intussusception. Alternating hyperechoic and hypoechoic concentric rings are present within the lumen of a distended

bowel segment, giving it the typical “target” appearance(Lamp , 1997).

**2.5 Treatment and Prevention**

Before surgical intervention, the patient’s hemodynamic and electrolyte status must be stabilized (Cornell and Selcer, 2002). Definitive treatment of intestinal intussusception must include reduction of the intussusceptum from the intussuscipiens and reestablishment of a patent GI tract. In dogs, this require exploratory celiotomy and either manual reduction of the intussusception or resection of the intussusception with anastomosis of the remaining intestine (Lewis and Ellison, 1987). Manual reduction of the intussusception should be attempted by gentle “milking” of the intussusceptum from within the intussuscipiens. This technique should employ more pressure on the intussuscipiens in an effort to reduce the intussusceptum by pushing it out rather than using traction on the intussusceptum. Care must be taken to avoid tearing the serosa. One retrospective study, however, found no statistically significant correlation between duration of clinical signs and the presence of adhesions (Brown, 2007). The recurrence rate of intestinal intussusception after surgical intervention in dogs reportedly ranges from 3% to 25% (Oakes, 1994). Historically, recurrence was reported in 22% of 18 dogs having undergone manual reduction alone and in 17% of 88 dogs having undergone resection and anastomosis (Oakes, 1994). Butorphanol tartrate has been reported to decrease the occurrence of intussusceptions formation in a canine model of renal transplantion (Klinger, 1990). It is hypothesized that opioid administration increases the tone of the small intestine and reduces or prevents local bowel wall inhomogeneity and segmental ileus and, therefore, decreases the likelihood of intussusceptions (Klinger;1990). Enteroplication, defined as the formation of permanent serosal adhesions between adjacent loops of small intestine, has been advocated as a means to prevent recurrence of intussusception in dogs (Engen, 1983). In a recent retrospective study, enteroplication performed for the prevention of recurrent intestinal intussusception in dogs included intestinal obstruction with vegetative material and strangulation of enteroplicated loops of jejunum between enteroplication sutures (Crowe, 1990) (Figure:6).



**Figure 6—**The appropriate technique for enteroplication. Plication begins at the duodenocolic ligament and extends tothe ileocecocolic junction, incorporating gentle bends in the intestine. Plication sutures (**A**) must be close enough together to prevent entrapment of other organs and incorporate the submucosal layer of both loops of bowel (**B**).

**2.6 Prognosis**

The prognosis for dogs with intestinal intussusceptions depends on many factors. Rapid identification of the intussusception with correction of fluid and electrolyte disorders, followed by immediate surgical intervention, is being possible to the long-term outcome. Although early reports suggested recovery rates ranging from 35% to 65% (Wilson, 1994) recent studies in which dogs received aggressive fluid therapy and rapid surgical intervention suggest a survival rate greater than 80% (Applewhite, 1999). The location of the intussusceptions within the GI tract affects the disease process. Patients with intussusceptions of the proximal GI tract are more severely affected by electrolyte imbalances secondary to vomiting and loss of gastric secretions (Lantz , 1981).The presence of generalized peritonitis, secondary to perforation of the bowel, also worsens the prognosis for this disease.