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ORGAN TORSIONS AND INTUSSUSCEPTION OF INTESTINE IN SMALL ANIMALS: A REVIEW

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ABSTRACT

Torsion of Organs (volvulus) and intussusception of intestines are major causes of death and infertility in small animals especially dogs and cats. This paper reviewed the incidence, aetiology, pathogenesis, symptoms, diagnosis and treatment of these conditions. Incidences of these conditions vary between breed, sex and age with no specific aetiology for all the conditions. Edema and venous congestion are commonly associated with organ torsion and intestinal intussusception. However, the symptoms vary considerably between young and adult animals and depending on how long the conditions lasted. The conditions are usually difficult to diagnose because of lack of specific and pathognomonic signs. X-ray, ultrasonography and computed tomography are valuable in reaching tentative diagnosis of the conditions, while for confirmatory diagnosis surgical exploration should be conducted. Treatment of these conditions is usually by the administration of fluid, antimicrobial and/or corticosteroid therapy and surgical explorations such as laparotomy for gastrointestinal torsions and intussusceptions and orchidectomy for testicular torsions

Keywords: *Torsion, intussusception, gastrointestinal, testicle, dogs, cats.*

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INTRODUCTION

Torsion or volvulus is the twisting of an organ around its root [1] or along the longitudinal axis of the digestive tract (stomach) or on itself [2,3]. Intestinal intussusception, on the other hand, is the telescoping of a proximal segment of the intestinal tract within the lumen of the adjacent distal segment of the tract [4,5]. The proximal segment that pushes in is referred to as the intussusceptum while the distal segment into which it pushes is known as the intussuscipiens. Gastrointestinal torsion and intussusception are life threatening conditions [3,6] while testicular torsion may lead to testicular necrosis and infertility [7].

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INCIDENCE

Gastric dilatation volvulus and intestinal torsion are common in large-chested breeds of dog and young adult and older dogs are especially vulnerable [6,8,9,10]. They occur more in male than in female dogs [8]. Intussusception and testicular torsion occur most commonly in young animals [5, 11]. According to Lamb and Martins [12], intussusceptions have no breed predisposition and can also occur in older dogs.

CAUSES

There is no specific cause for gastric dilatation volvulus, intestinal torsion, intestinal intussusceptions, splenic and testicular torsion. Any factor that predisposes to dysfunction of the sphincter between the oesophagus and stomach or obstructs the outflow through the pylorus may cause gastric dilatation volvulus [13]. These factors include old age, heavy, deep and narrow chest, stress, over-feeding and too much water intake prior to or post exercise. Intestinal torsions have been associated with several factors including treatment for worm infestation, parvoviral infections, intussusceptions, vigorous exercise, closed abdominal trauma, concurrent gastric dilatation and volvulus, gastrointestinal foreign bodies, lymphocytic plasmacytic enteritis, ileocolic carcinoma and exocrine pancreatic insufficiency [2]. Intestinal intussusceptions may be secondary to endoparasites such as round worms, hook worms and whipworms, parvoviral infections, bacterial gastroenteritis, foreign body infections (plastic, bone or wood) or neoplasia [5]. Testicular torsion may also be idiopathic in origin but may be due to injury to the scrotum or groin, vigorous physical activity, sertoli cell tumor, cryptochidism and seminoma [14,15]. Splenic torsion on the other hand may occur independently or along with gastric dilatation volvulus [6].

PATHOPHYSIOLOGY

One common finding of torsion in different organs and intussusceptions is the constriction of blood flow to the affected organs with constant oedema and venous congestion [16,17,18]. In gastric dilatation volvulus, the stomach rotates clockwise up to 360° and occasionally 90° in anti-clockwise direction. If the volvulus or rotation is more than 180°, there will be stomach occlusion at the gastro-oesophageal and gastro-duedonal junctions thereby preventing the patient from belching or vomiting; leading to gas distension and distortion in the normal anatomy of the stomach. The overall effect will include hypotension, decreased return of blood to the heart and stomach ischaemia. There is also decreased flow of blood to the liver due to pressure on the portal vein which reduces the detoxifying ability of the liver and its ability to absorb bacteria from the blood [17]. There could be splenic infarction, shock and death if no intervention is made quickly [19].

In intestinal torsion, there is venous occlusion and obstruction of lumen of the affected intestine. The occluded portion becomes congested and oedematous resulting in entrapment of large amount of fluid and hemodynamic stress. Over time, the obstructed intestinal segment becomes severely distended with bloody fluid and gas, causing segmental intestinal infarction and break down of mucosal barrier [18]. This results in diffusion of intestinal bacteria and toxins into the peritoneal cavity and systemic circulation [2,20]. Shock and death occur in the absence of immediate surgical intervention [2, 21,22].

In intussusception, the intestinal wall or irritant within the intestinal lumen will alter the normal peristaltic activity, thereby creating the enabling environment for the invagination of one segment of the intestine into the other [23]. This invagination of the proximal segment with its mesenteric fold within the lumen of adjacent distal segment of the intestine caused by either excessive movement or impaired peristalsis

will obstruct the free passage of intestinal contents and more severely compromising the mesenteric vascular flow of the intussuscepted segment. The overall result will be intestinal obstruction and inflammatory changes ranging from thickening to ischaemia of the intestinal wall [18].

In testicular torsion, there is strangulation of the spermatic duct (which consists of blood vessels, lymphatic vessels, nerves and vas deferens) and occlusion of blood supply to the testicles, resulting in necrosis, death and atrophy of the testicles and permanent infertility of the animal [7, 24].

CLINICAL SIGNS AND SYMPTOMS

The symptoms of gastric and intestinal torsion (volvulus) and intussusception are non-specific. They vary considerably between young and adult animals and depend on the stage of their clinical manifestation (acute stage and chronic stage) [3,18]. The symptoms found in gastric-dilatation-volvulus include non-productive retching, hypersalivation, restlessness, severe abdominal distension, recumbency, depression, abdominal tenderness and pain, tachycardia, prolonged capillary refill time, pale mucous membranes, dyspnoea, hypotension, shock and death [9]. Intestinal torsion is characterized by acute onset of vomiting, diarrhoea, haematoemesis, haematochezia, moderately distended abdomen, abdominal pain, weakness, recumbency, shock and death [3, 8 25]. In intussusception, the symptoms may include vomiting, dehydration, abdominal cramps, tensed abdomen on palpation, bloody diarrhoea, lethargy, depressed appetite, constipation or abdominal distension, hypothermia, shock, and death [5, 26]. Signs of testicular torsion include acute testicular and inguinal pain, testicular enlargement and tenderness, anorexia, nausea and locomotory difficulty. These symptoms are not specific [27].

DIAGNOSIS

Diagnosis of gastric-dilatation-volvulus, intestinal volvulus and intussusceptions, splenic and testicular torsions using clinical signs and diagnostic imaging techniques is usually challenging and difficult. There are divergent views and reports on the best methods for the diagnosis of these conditions. History and physical examination reveal signs of distended abdomen (abdominal tympany) which may be a pointer to but not diagnostic of gastric dilatation volvulus [28]. Radiography using right lateral and dorsoventral views as against ventrodorsal view is preferred for better diagnostic result. The radiographic view of a simple dilated stomach will show large volume of gas in the stomach while in gastric volvulus, there will be double-bubble-gas pattern on the x-ray with gas in two sections separated by the twisted tissue. Diagnosis of intestinal volvulus is more difficult in the cat than the dog. In the cat it is better achieved at necropsy [29]. In addition, abdominal ultrasound and exploration laparotomy have been used to diagnose intestinal volvulus in the cat [30]. In the dog, exploratory laparotomy [33,34] and abdominal radiograph [2] were used to diagnose intestinal volvulus. Similarly, computed tomography scanning alone [31] or in combination with exploration laparotomy [32] was used to diagnose intestinal volvulus in man.

In the diagnosis of intussusception, not more than 50% success may be made using imaging method [35,36]. In x-ray films, plain abdominal radiograph usually demonstrates signs of intestinal obstruction and may provide information regarding the site of obstruction [37]. Contrast radiograph may characteristically demonstrate a “stacked coin” or “coil spring” appearance of upper gastrointestinal tract or a cup-shaped filling defect or spiral or coil spring appearance in patients with colo-colic or ileo-colic intussusceptions [38].

Abdominal ultrasound was used provisionally to diagnose intussusception in the dog although definitive diagnosis was only confirmed at necropsy [5]. The classical features of the images produced by ultrasonography include doughnut signs on the transverse view and pseudo-kidney sign or hay fork sign on the longitudinal view [39]. The quality of these views and their subsequent diagnostic usefulness may be limited by obesity and presence of massive air in the distended bowel loops [18].

Abdominal computed tomography is currently considered alternative method to confirm intussusception with a diagnostic accuracy of above 60% to as much as 100% [40]. The characteristic features of computed tomography scan include homogeneous "sausage" shaped soft tissue mass with a layering effect and the presence of mesenteric vessels within the intestinal lumen [41].

The use of history, physical examination, clinical signs, laboratory tests and ultrasonography may only be suggestive of testicular torsion but confirmation is at surgical exploration [14,19,42,43]. Similarly, ultrasonography may be used for provisional diagnosis of testicular torsion but its confirmation should also be at surgical exploration [19,44,45]. Color Doppler ultrasonography may be helpful but should not be regarded as definitive in the diagnosis of testicular torsion because its findings were not always consistent with surgical findings [46]. Consequently, although color Doppler ultrasonography is a very valuable diagnostic tool doubtful cases of testicular torsion may be confirmed using surgical exploration[47,48]. To exclude testicular torsion using Doppler sonography, central arterial and venous perfusion must be bilaterally equal [48].

TREATMENT

Gastric-dilatation-volvulus, intestinal volvulus, intestinal intussusception and testicular torsion are often presented as emergency cases [3,18, 49]. Due to the high risks inherent in the management of these conditions, there exists variable opinions on the correct form of therapy to be adopted. Some veterinarians advocate immediate anaesthesia and surgery to relieve the distension and the twisting of the stomach and intestine with heavy intravenous fluid given before and during the operation [50]. Some have obtained more satisfactory results by first relieving the distension with a simple surgical procedure followed later by correction of the torsion when the patient is no longer in shock and better able to withstand anaesthesia and surgery [51]. Others are of the opinion that medical management which includes aggressive intravenous fluid therapy, use of broad spectrum antimicrobials, pain management and nutritional support should be followed by surgery via laparotomy in the management of intestinal intussusceptions [52].

Some other practitioners have used endoscopy to manage intussusceptions that were located at gastroesophageal junction in young pups [53]. Since the surface of the testicle rotates towards the midline of the body during testicular torsion, some practitioners suggest that manual rotation of the testicle in the opposite direction may sometimes effect non-surgical correction [15]. A lot of risks like tissue reperfusion injuries and complications such as recurrence have been associated with surgical management of these conditions [2,54,55]. The major tissue damage which does not only happen during the period of ischaemia, but also when the ischaemia is dismissed and the tissues are re-perfused with blood after correcting the torsion leads to release of oxygen-derived free radicals that eventually scavenge the tissues and does the damage [2]. To prevent the re-perfusion injuries, oxy-radical scavengers should be used as premedicant before the laparotomy [2]. Furthermore, to avoid or prevent the recurrence of these conditions, the use of surgical plication to plicate the bowel in gentle or *'Lazy'* loops using serosal sutures

to maintain the orientation have been advocated [54,55]. In addition to these, gastropexy[50] and suturing the testicle to the scrotal wall [11] have also been recommended.

CONCLUSION

Gastric-dilatation-volvulus, intestinal torsion (volvulus), intestinal intussusceptions and splenic and testicular torsion usually present as emergencies and throw enormous challenges to veterinary surgeons. Preoperative diagnosis of these conditions is usually difficult because they present non-specific and nonpathognomonic clinical signs. X-ray, ultrasonography and computed tomography may aid tentative diagnosis of the conditions but confirmatory diagnosis is usually made by surgical exploration and must be instituted immediately any of these conditions is suspected. Management of these conditions demands heavy fluid therapy, antimicrobial treatment and corticosteroid therapy before and after surgical exploration. Laparotomy should be used to manage gastrointestinal torsion and intestinal intussusceptions while orchidectomy is recommended for testicular torsion.

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