ENDOSCOPIC EVALUATION OF GASTRIC LESIONS AND ITS MANAGEMENT IN DOG

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by

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CERTIFICATE – I

This is to certify that the thesis entitled "**ENDOSCOPIC EVALUATION OF GASTRIC LESIONS AND ITS MANAGEMENT IN DOG"** submitted in partial fulfillment of the requirements for the degree of **MASTER OF VETERINARY SCIENCE** in **VETERINARY SURGERY AND RADIOLOGY** of Nanaji Deshmukh Veterinary Science University, Jabalpur, is a record of the bonafide research work carried out by **RAJAY VERMA** under my guidance and supervision. The subject of the thesis has been approved by the Student's Advisory Committee and the Director Instructions.

No part of the thesis has been submitted/published for any other degree or diploma programme. All the assistance and help received during the course of the investigation has been acknowledged by him.

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CERTIFICATE – II

This is to certify that the thesis entitled "**ENDOSCOPIC EVALUATION OF GASTRIC LESIONS AND ITS MANAGEMENT IN DOG"** submitted by **RAJAY VERMA**" to the, Nanaji Deshmukh Veterinary Science University, Jabalpur, in partial fulfillment of the requirements for the degree of M.V.Sc. & A.H. in the Department of **VETERINARY SURGERY AND RADIOLOGY**" after evaluation by the External Examiner and an oral examination, is hereby approved by the External Examiner and Student's Advisory Committee.

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ABBREVIATIONS

Abbreviations	Stands For
%	Per cent
<	Less than
>	Greater than
i.e.,	That is
Fig.	Figure
nos.	Numbers
et al.,	And others
etc.	And the rest / and so forth
ml	Millilitre
mm	Millimeter
µg	Micro gram
I/M	Intramuscular
DLC	Differential leukocyte count
BID	Bilirubin direct
PO	Per os
10^3	Thousand
10^6	Million
I/V	Intra venous
Hb	haemoglobin
TLC	Total leukocyte count
PCV	Packed cell volume
Inj	Injection
S/C	Sub cutaneous
NPO	Nothing per os
NDVSU	Nanaji Deshmukh Veterinary Science University
TVCC	Teaching Veterinary Clinical Complex, Jabalpur
COVAS	College of Veterinary and Animal Sciences, Palampur
CSKHPKV	Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya
AVMA	American Veterinary Medical Association
ISVS	Indian Society for Veterinary Surgery

1. INTRODUCTION

Since start of civilization, one curiosity was there to know the actual functioning and activities of inside of body system to understand various normal and pathological status of organs, which is greatly satisfied with the advent of numerous inventions like USG, radiography, laparoscopy, endoscopy, CT scan and MRI.

Endoscopy is a non invasive, atraumatic and sensitive tool for detection of morphologic alteration in the gastrointestinal tract. It also allows descriptive or photographic documentation of findings and has advantage of providing accurate diagnosis through biopsy, cytological examination and fluid estimation (Strombeck and Guildford, 1991).

As per the organ or portion of gastrointestinal tract is involved, it is termed as gastroscopy for upper GIT (oesophagus, stomach and upper duodenum) or colonoscopy for lower GIT (anus, rectum and colon). It can be performed with two types *i.e.* Rigid and Flexible endoscope having varying diameter and lengths with multiple, tiny and delicate forceps, snares, baskets and cauteries (Katsinelos *et al.,* 2006).

Gastroscopic examination of the upper gastrointestinal tract (GIT) has been used as a diagnostic and therapeutic tool for gastric oesophageal reflux disease (GERD), haemorrhagic gastritis, pyloric stenosis and understanding of pathophysiology of gastric erosion, ulceration, chronic gastritis, gastric neoplasia and gastric parasites (Tams,1999).

Pathological lesions due to various disorders of upper gastro intestinal tract are frequently seen in dogs due to their habit, nature and quality of food, habitat, dietary discretion, NSAID’s intolerance, drug or toxin ingestion, systemic illness, infection, antigenic stimulation or injury. Mostly the symptoms and their clinical examination, laboratory findings are not enough to make accurate diagnosis (Lavin, 2010).

Inflammation and infection of gastric lining cause gastritis, which if neglected may turn into erosions. Disruption of gastric mucosal barrier occurs secondary to vast array of drugs and diseases, leading to development of inflammatory, erosive and ultimately ulcerative lesions, which are round or oval punctured out lesions of gastric mucosa, ranging from 1-4 cm in diameter (Parrah *et al.,* 2013). The common clinical sign of gastritis are anorexia, vomiting, haemoptysis, melina, weight loss and anaemia (DeNovo, 2003).

These primary clinical symptoms with elevated temperature must immediately be attended with supportive therapy and gastric protectants, and if response is not achieved, an endoscopic examination is of great help for direct examination of stomach walls and to decide multimodal treatment including combination of antibiotics (Ettinger and Feldman, 2010).

Gastroscopy has been proved effective in retrieval of foreign body without surgical intervention (Sivak, 2004 and Mathai *et al.,* 2013). Follow-up gastroscopy is a valuable aid for monitoring therapeutic response in patient with gastric ulcers or chronic gastritis. Gastroscopic biopsies are especially important in animals with chronic severe histolytic and granulomatous gastritis, chronic fibrosing gastritis and gastric lymphosarcoma (MacCarthy, 2005).

Significant advances have occurred in diagnostic and therapeutic endoscopy in human being since last two decades. However in animals therapeutic application of endoscope is confined up to the observation of lesions and foreign body. Apart from this recurrent abdominal pain or upper gastrointestinal bleeding also account for the most common indications for endoscopic intervention in the upper gastrointestinal tract in canine. Therefore, looking to the importance of gastroscopy in dogs the present study has been planned with the following objectives.**OBJECTIVES:-**

1. To diagnose the gastric lesions on the basis of symptoms, haematological estimation, gastroscopy and histopathological examination.

2. Evaluation of interventional gastroscopy for various gastric lesions.

2. REVIEW OF LITERATURE

Endoscopy is an established tool for diagnosis and treatment of gastro intestinal tract disturbances in medical science and is slowly but firmly stepping ahead in veterinary field.

Applications of endoscopy in veterinary field are of utmost importance as an animal cannot speak up about its distress. Lack of external visibility, complex anatomy and inaccessibility for palpation leave only option of symptomatic treatment. Such cases are often presented to clinician with compromised condition which further makes the interventions prognostically grave. Endoscopy plays an important role for an early and accurate diagnosis of such life threatening conditions at initial stage to get favourable prognostic outcome (Tams, 1990).

The first attempt to observe the living human body directly through a tube was in 1805 when Philip Bozzini created an instrument known as a *Lichtleiter* (light guided instrument) to examine the urinary tract, rectum and pharynx. In 1853, Antoine Jean Desormeaux of France developed an instrument specially designed to examine solely the urinary tract and the bladder; he named it the “endoscope”, and it was the first time this term was used in history (Rahman *et al.,* 2015).

2.1 Anamnesis and clinical examination

Jenkins *et al*. (1991) observed that the clinical signs in dogs and cats associated with gastric ulcerations and erosions include vomiting, haematemesis, anorexia or inappetence, anaemia, melina, abdominal pain, septicaemia, weight-loss, weakness and increased salivation.

Ogilvie and Moore (1995) examined 20 dogs for upper gastrointestinal tract disturbances and noticed the common clinical signs like anorexia, lethargy, vomiting, diarrhoea, abdominal pain and abdominal distension. Schaer (2006) also reported that in majority of gastrointestinal disturbances in dog anorexia, vomiting, dehydration and weight loss are the common findings.

Leib (2005) reported that animals, especially young, that present with regurgitation, vomiting, diarrhoea, or signs of intestinal obstruction, should always be considered suspects for foreign body ingestion.

Simpson (2005) stated that because of their exploring nature and picking behaviour, retriever breeds i.e. Labradors, Spaniels and Pointers are prone to foreign body ingestion which may lead to gastrointestinal tract affections.

Leib and Sartor (2008) examined 31 dogs and found Gastrointestinal foreign bodies are commonly encountered in dogs due to indiscriminate eating habits.

Sellon (2009) found that dogs showing clinical symptoms of gastric affections suddenly collapsed and died had revealed gastric wall perforation and its associated complications in necropsy examinations.

Dogra *et al.* (2013) found that rectal temperature, pulse rate, and respiration rate did not vary much with the base values and remained within normal physiological limits during gastric affections.

2.2 Haematological parameters

Hall and Twedt (1988) reported statistically significant association between PCV and gastric ulceration in dogs. The higher the PCV, less likely the dog was having gastric ulcers.

Tyagi *et al.* (2010) concluded haematological examination of 16 dogs with upper gastrointestinal disturbances and reported that gradual reduction in haemoglobin level, packed cell volume and total erythrocyte count while rise in total leukocyte count were consistent laboratory findings in experimental studies of non steroidal anti inflammatory drugs (NSAID) induced ulceration and erosion under controlled conditions with maintenance of hydration.

Dogra *et al.* (2013) concluded that in general, a gradual rise in Hb, PCV, and TEC levels was observed from 0 day till the end of study However; the rises were statistically insignificant within as well as in between groups with gastric affections.

Parrah *et al.* (2013) found neutrophillic leukocytosis was prominent laboratory finding in piroxicam associated gastric ulceration in dog.

Hassibi *et al*. (2017) found increased leukocyte count in dogs with prolonged intussusceptions of duodenum caused by foreign body *i.e.* long bone piece causing anorexia and other gastrointestinal tract affections.

2.3 Upper gastrointestinal tract affections

Sorjonen *et al.* (1983) reported that, gastric and duodenal ulcers are associated with high doses of corticosteroids in dogs. Similar findings were also suggested by Boston *et al.* (2003) who reported that when corticosteroids and NSAIDs were used in combination they resulted in more severe gastric lesions in dogs as compared to when used alone.

Silen (1987) observed that the mucosal blood flow, epithelial cell renewal and reconstitution, thick mucus layer, electrical potential difference and bicarbonate buffer are the primary components of the gastric mucosal barrier and the breakdown in this intricate gastric mucosal defence mechanism during various clinical conditions was considered to be the primary cause of gastric ulceration and erosion in man and animals.

Stanton and Bright (1989) defined gastric ulcerations and erosions (GUE) as the defects of variable depth in gastric mucosa and mucosal defects penetrating through the gastric muscularis mucosa as gastric ulceration.

Guilford and Strombeck (1996) reported that activated endothelial inflammatory cells release histamine, leukotrienes, platelet-activating factor, proteolytic enzymes, and free radicals. Histamine release causes further acid secretion, whereas other mediators promote vasodilation, increased capillary permeability, oedema, translocation of inflammatory cells and capillary plugging, damage increases when the mucosa loses its ability to sufficiently protect itself through secretion of bicarbonate with mucus epithelisation and also suggested that trauma to gastric mucosa can result in development of ulcers. Besides direct trauma, the use of non-steroidal or/and

steroidal anti-inflammatory drugs for treatment of various diseases, primary and secondary tumours of stomach, systemic diseases and ingestion of poisonous and other harmful substances can result in gastric ulcerations in animals.

Shulman and Krawiec (2000) reported that when the integrity of the mucosal barrier is compromised; a cascade of pathologic events follows, contributing to further damage of the mucosal layer and increased back diffusion of gastric acid and pepsin, leading to inflammation and haemorrhage.

Steiner (2008) stated that various oesophageal affections can be diagnosed and corrected by gastroendoscopy with precision.

Maddison *et al.* (2008) reported that prolonged use of non-steroidal anti-inflammatory drugs (NSAIDs) is the major cause of gastric ulcerations in dogs effecting gastric mucosal blood flow and vascular haemostasis.

Parrah *et al*. (2013) also enumerated the pathophysiological factors of gastric ulceration as physical damage to gastric mucosa, impaired mucosal defence and chemical alteration to the mucosa and its rapid repair process in dogs with NPO.

Boysen and Jantina (2015) suggested that the prognosis of gastrointestinal haemorrhage in companion animal varies from fair to poor with a mortality rate of 29-45% depending upon the underlying causes.

Davis and Williamson (2016) concluded that Sucralfate, a gastrointestinal protectant that binds to proteinaceous exudates found at ulcer sites, should be administered to dogs with confirmed or suspected gastric ulcers to check further damage from gastric acid, bile, and pepsin. It has also been shown to have cytoprotective and antacid effects. Supportive care may include adequate hydration and nutrition along with transfusions in the case of excessive blood loss.

Mitchell (2017) stated that chronic gastritis should be considered in animals when intermittent or persistent vomiting lasts for more 7 days and that cannot be attributed to dietary indiscretion or intolerance.

Reddy *et al.* (2018) reported excellent results in dog which was treated with Amoxicillin-Cloxacillin and Pantoprazole for three days after successful retrieval of nails and hair ball containing iron spring and animal started taking normal food from day 5 post gastroscopy.

2.4 Gastroscopic observation and evaluation

Moore and Withrow (1982) performed gastroduodenoscopy to determine the prevalence of subclinical gastric ulcerations in 30 Dachshunds receiving corticosteroids and reported an overall 76% prevalence rate of gastric ulcerations.

Sorjonen *et al.* (1983) found that gastroscopy of gastric lesions correlates well with gross lesions identified at necropsy and is reliable method to evaluate gastric hemorrhage and ulceration.

Hungerford (1990) in endoscopic evaluation found that the ulcers are mainly located at the body of stomach, the pylorus and proximal duodenum. Gastric ulcerations and erosions have been reported to occur commonly in all domestic animals including dogs.

Tams (1990) also suggested that endoscopy is best method for diagnosis of gastric ulceration and erosions in dogs. He described that upon gastro-endoscopy, gastric erosions might be observed as small spots of fresh or digested blood on the mucosa. If their surfaces were wiped to remove the blood clot away with biopsy forceps, renewed bleeding occurred.

Antonio *et al.* (1998) reported that the use of endoscopy in veterinary profession resulted in more frequent detection of sub-clinical and clinical gastric ulcerations in different animals' species. These techniques revealed far greater prevalence of gastric ulcerations and erosions than believed earlier in few groups of animals.

Ramesh *et al.* (2001) performed gastroscopy on 20 dogs and showed that oral Nimesulide produced gastric erosions and ulcers.

Davis *et al.* (2003) endoscopically investigated and reported the prevalence of gastric disease in racing sled dogs and found that 48.5% of dogs had ulcers, erosions and gastric haemorrhage after 5 days of competition.

Luna *et al.* (2007) gastroscopically evaluated 16 dogs and reported the side effects of long-term oral administration of various NSAIDs and reported that gastrointestinal bleeding was significantly longer in groups treated with meloxicam, ketoprofen and flunixin meglimine as Compared to control groups.

Tacheci *et al.* (2010) used wireless capsule endoscopy in NSAID-induced enteropathy in pigs and found it highly accurate non-invasive method for evaluation.

Lokhande and Sarkute (2012a) recorded and documented the endoscopic view of normal oesophagus and evaluated comparative distances of oesophageal parts from upper incisors. The authors (2012b) also documented the endoscopic view of normal stomach, evaluated distance of different parts or structures of upper digestive tract and colour categorized gastric mucosa.

Gupta (2012), Thakur (2013) and Shastri (2014) reported that gastric ulcerations and erosion generally remains sub-clinical and mostly the condition could only be detected upon gastroendoscopy. The acute gastric ulcers appeared as deep, multifocal or linear mucosal lesions with or without active hemorrhagic base in dogs, which was otherwise not correlated with other clinical or related findings.

Shukla *et al*. (2016) reported endoscopic examination of oesophagus in 12 dogs to assess and diagnose oesophageal affections.

2.5 Foreign body retrieval

Endoscopic foreign body removal has numerous advantages over other means of treatment as the procedure is highly successful, minimally invasive, and not appreciably time-consuming (Tams, 1990).

Many foreign bodies that enter the stomach passes through the gastrointestinal tract without any difficulty but objects with sharp or irregular edges might get retained in the stomach because they are either too large to pass through the pylorus or their sharp edges become impacted in the antrum, pylorus or cardia (Michels *et al.,* 1995).

Katsinelos *et al.* (2006) concluded that gastroscopic techniques used in foreign body retrieval and food bolus impaction in the upper gastro intestinal tract disturbances in 171 dogs was 98.6 % efficaciously safe.

Leib (2005) reported that obstructive foreign bodies in the oesophagus and gastric entrum should be considered emergencies and rapidly removed once the patient is stabilized because the longer they remain in place, the greater the chances of severe oesophageal injury, perforation, and mediastinitis. The most commonly observed oesophageal foreign bodies are bones, rawhide chew toys, fish hooks, and hair balls which can be successfully removed endoscopically. Surgery of the oesophagus should be avoided if possible, due to difficult access, poor healing capability, and morbidity. Foreign bodies commonly lodge at the thoracic inlet, base of the heart, or diaphragmatic hiatus.

Juvet *et al.* (2010) also reported that dogs with oesophageal foreign bodies had significantly higher incidence of foreign body located caudal to the heart base. The majority (88.6%) of foreign bodies were bones or bone fragments.

Mathai *et al.* (2013) found endoscopy effective to diagnose different types of cases related to upper gastrointestinal tract affections along with precise location of lesions and helped in removal of foreign bodies without surgery.

Kelawala *et al.* (2015) and Kader and Haithem (2015) reported endoscopic retrieval of gastric foreign body in a Great Dane and observed pyloric obstruction caused by tubular hair like mass entangled with iron wires causing acute gastritis and ulceration. It was grasped and pulled out with gastroscopic retrieval basket.

Clark (2015) reported advanced and innovative ways for gastroscopic foreign body retrieval and other interventional methods to address gastric affections as use of Foleys catheter and customized suture applications for foreign body retrieval in dogs.

Sharma *et al.* (2017) reported endoscopic observation of oesophageal obstruction which was surgically removed in a dog as it was firmly adhered and endoscopic manipulations were not fruitful and conclude that endoscopy was of great help to assess the severity of affection.

Reddy *et al.* (2018) reported successful retrieval of nails and hair ball containing iron spring with help of endoscopic basket and found normal gastric mucosa on follow up gastroscopy.

2.6 Haemostasis

Chung *et al.* (1990) concluded that endoscopic injection sclerotherapy for bleeding oesophageal varices in human patients using Ethanolamine oleate or Sodium tetradecyl sulphate as sclerosing agents significantly reduces mortality rate.

Dutta *et al.* (2003) concluded that endoscopic application of Fibrin glue is a safe and effective treatment option in controlling gastric variceal bleeding in human.

Croffie *et al*. (2007) reported effective gastric haemostasis with either swab or injection of sclerosing agents such as sodium tetradecyl sulphate or ethanol over the bleeding vessel in human.

Mertz *et al.* (2013) reported use of monopolar cauterizing forceps for coagulation and desiccation in bleeding vessels of gastric mucosa and polypectomy in animals.

Romano *et al.* (2014) concluded that endoscopic injection like polidocanol, butyl-cyanoacrylate and sodium tetra-decylsulphate along with third generation cephlosporins and quinolone are effective and safe sclerosing agents in gastric haemorrhage.

2.7 Gastroscopic biopsy

Washabau *et al.* (2010) concluded that characterization of gastrointestinal inflammation has been hampered by lack of accepted and standard criteria for measuring the histopathological changes within a sample of mucosal tissue. The normal histology of the canine and feline gastrointestinal tract is affected by variables and therefore remains the subject of considerable controversy. Lack of agreement on normal histology has been one reason for erroneous diagnosis of gastrointestinal inflammation in many veterinary patients therefore has limited universal acceptance of grading systems in the evaluation and considerable inter animal variation in cell counts was noted in gastric mucosa.

Schiller *et al.* (2015) stated that without knowledge of the previous anamnesis the biopsy taken from a remnant of normal stomach would be misinterpreted. When a solid lesion appears to be sub mucosal, superficial biopsies are often unhelpful and other methods of obtaining material, *e.g.* 'large particle' snare biopsy, fine needle aspiration or the use of hot biopsy forceps should be considered, as mucosal abnormalities are often patchy and may not be visible endoscopically.

2.8 Gastric tumour and polyp

Willard (1995) reported that animals with mast cell tumours, mastocytosis and gastrinomas have increased circulating histamine which results in hyper-secretion of gastric acid and can be assessed endoscopically.

Foy and Butch (2010) reported endoscopic polypectomy in three dogs using endocautery and concluded that endoscopic polypectomy may be a viable alternative to surgery in veterinary patients with gastric or colonic polyps.

3. MATERIALS AND METHODS

3.1 Location of work

The present research work was carried out in the Department of Veterinary Surgery and Radiology, Teaching Veterinary Clinical Complex (TVCC), College of Veterinary Science & A.H., N.D.V.S.U., Jabalpur (M.P.).

3.2 Meteorological data and features of place

Jabalpur is situated at 23.17" latitude and 79.57" East longitudes at 410.87 mean sea levels in the southern part of second agro-climatic zone including Satpura plateau and Kymore hills. It has a tropical climate having average rainfall of 1241 mm.

3.3 Study period

The study was conducted for a period of nine months from August, 2017 to April 2018.

3.4 Material and Methods

3.4.1 Animals

Clinical cases of dogs aged above 6 months, irrespective of sex and breed, brought to TVCC were evaluated and fourteen dogs found suspected for various upper Gastro Intestinal Tract affections not responding to any symptomatic treatment and referred to the department of Veterinary Surgery and Radiology for further investigation were selected for present study.

Complete history regarding age, sex, breed, duration of illness and previous treatment given were rerecorded. Each animal was subjected to thorough physical and clinical examination *i.e*. temperature, pulse, respiration diet, stool, physical and clinical symptoms.

3.4.2 Instrumentation

The x-ray examination was done by 100 mA Multimobil10[1].Gastroscopic examination was done with Karl Storz[2] Endoscope, having 10.1 mm diameter and 3000 mm working length (Plate 01).

[1]Multimobil10 - SIEMENS Ltd., Goa, India
[2]Karl Storz - Multipurpose videogastroendoscope, Germany

The anatomic parts of the gastrointestinal flexible multipurpose videogastroendoscope starting from the light source were light guide connector, umbilical cord, insertion tube and distal tip. Its features included four-way tip movement having provision for light, video camera, irrigation, insufflations, deflation and an accessory channel for suction and passage of flexible instruments (Plate 03).

Accessory Instruments were foreign body retrieval forceps, foreign body retrieval basket, foreign body retrieval snare with electrocautery, irrigation tube and biopsy forceps (Plate 04).

3.4.3 Sterilization

All instruments were sterilized with 10% Povidone Iodine mop before and after the procedure, flushed with distilled water and drained with pressurized air, and kept in gradual hanging position for 24 hours and then again painted with 10% Povidone Iodine and after drying carefully kept in casing.

3.5 Methods

3.5 .1 Plan of Experiment

Each animal was subjected to complete history, thorough clinical examination and X ray examination to assess the affections of upper gastro intestinal tract. Blood was collected for haematological analysis and gastroscopy was planned.

3.5.2 Preparation of animal

The animals were prepared for gastroscopy by 12 hours fasting, sedating and anaesthetizing the animal was followed by cleaning of buccal cavity and fixing of guard guide in oral jaw line.

3.5.3 Anaesthesia

Animals were sedated using Atropine Sulphate @ 0.02-0.04mg/kg body weight intramuscular and Xylazine Hydrochloride @ 1-1.5mg

/kg body weight intramuscular. General anaesthesia was achieved with Ketamine hydrochloride @ 5-8 mg/kg body weight intramuscular and maintenance of anaesthesia was done with Ketamine hydrochloride.

3.6 Gastroscopy

Based on history, symptoms, X-ray and haematological examination. Gastroscopy of animals was done with keeping extreme precaution and care to not to cause injury, shock and drenching to animal and damage to instruments.

3.6.1 Gastroscopic observation and evaluation:

After adequate anaesthesia and mouth gag fixation, endoscope was inserted via mouth, buccal cavity and pharynx into oesophageal entrum (Plate 02), it was proceeded in cervical and thoracic parts of oesophagus and then entered in stomach via oesophageal sphincter followed by visualization of cardia, fundus and pylorus segments of stomach. Further onwards pylorus and anterior duodenum were examined and any pathological lesion (as scarring, haemorrhage, erosions, growth, ulcers, neoplasia and inflammation) present in the gastrointestinal tract were thoroughly visualized and assessed.

The clinical symptoms, laboratory examination and gastroscopic findings were correlated and on the basis of diagnosis, appropriate interventional gastroscopic procedure was decided.

3.6.2 Foreign body retrieval: It was done with the help of grasping forceps and foreign body retrieval basket.

3.6.3 Gastroscopic biopsy: After thorough gastroscopic examination of stomach, biopsy sample of gastric lesions were collected with the help of biopsy forceps and fixed in 10% buffer formalin.

3.6.4 Endoscopic haemostasis: Gastroscopic guided haemostatic agents *i.e*. ethanol and Hemocoagulase were applied on site of haemorrhage.

3.7 Medication:

Selected dogs were treated with following therapeutic regimen:

- Amoxicillin + sulbactum @ 10mg/kg b.wt. I/V BID +Ornidazole @ 20mg/kg b.wt. I/V BID up to 5days.
- Supportive multimodal medication for 5 days

  (i) Antacid : Pantoprazole @ 1mg/kg b.wt .I/V OD

  (ii) Antiemetic : Ondansetron @ 0.1-0.2 mg/kg b.wt. I/V OD

  (iii) Gastric protectant : Sucralfate @ 250-500 mg PO BID
- Along with adequate fluid therapy and other medication as and when required.

3.8 Parameters of study

3.8.1 Anamnesis

Complete history of each animal regarding age, sex, breed, vaccination, deworming, feed intake and defecation was recorded.

3.8.2 Clinical observation and evaluation

Clinical parameters such as rectal temperature (^{0}F), pulse rate (per minute) and respiration rate (per minute) with specific symptoms of upper gastro intestinal tract disorders like vomiting, diarrhoea, dehydration, weight loss, lethargy and partial or complete anorexia were recorded on day 0, 3 and day 10 of study.

3.8.3 Haematological estimation

Approximately3 ml blood was collected aseptically from cephalic or saphenous vein in EDTA coated vaccutanor and collected samples were analyzed by automatic blood analyzer[3] and manual methods in disease diagnostic laboratory of TVCC. Following haematological estimation were done for each case before gastroscopic procedures on day 0 and day 10.

[3]automatic blood analyzer –Abacus, Arc diagnostic company, Mumbai

1. Total Leukocyte Count (TLCx 10^3/µl)

2. Differential Leukocyte Count (DLC %)

3. Haemoglobin (Hb g/dl)

4. Packed Cell Volume (PCV %)

3.8.4 Gastroscopy

Gastroscopy of selected animals was done on day 0 to observe, analyze and to perform interventional procedures for gastric lesions and followed up on day 10 to assess the alterations in lesions and the efficacy of treatment. Following parameters were evaluated at the time of gastroscopy:

Table 01: Arbitrary visual score card for inflammation and haemorrhage

No.	Parameter	Grade			
1.	Colour of Gastric mucosa	Pinkish white	Light red	Bright red	Cherry red
2.	Assessment of severity	Normal	Mild	Moderate	Severe

Table 02: Arbitrary visual score card for erosions

No.	Parameter	Grade			
1.	Mucosal Erosions	Nil	Superficial	Deep	Perforating
2.	Assessment of severity	Normal	Mild	Moderate	Severe

Table 03: Visual score card for ulcerations

No.	Parameters	Grade			
1.	Gastric ulcerations	Nil	Small patches	Medium patches	Large patches
2.	Assessment of severity	Normal	Mild	Moderate	Severe
3.	Score	1	2	3	4

Schiantarelli *et al*. (1984)

Table 04: Visual score card for Gastric lesion index

Score	Gastric lesion number scoring system
0	No lesion
1	1-2 localized lesions
2	3-5 localized lesions
3	6-10 lesions
4	>10 lesions,very large diffuse lesions
Score	**Gastric lesion severity scoring system**
0	No blood clots
1	Free floating or adharent smaller blood clotswith no detecteble hemorrhage base
2	Adharent smaller blood clots with active haemorrhage base Appearently superficial smaller focal mucosal erosion(<3mm) with or without active hemorrhage Appearently superficial linear mucosal erosion without active haemorrhage Sub mucosal haemorrhage or erythmatus mucosa Adharent larger blood clots without active haemorrhage base
3	Appearently superficial larger focal mucosal erosion(>3mm) with or without active hemorrhage Lenear erosion with active bleeding Adharent larger blood clots with active haemorrhage base Appearently deeper mucosal lesion without haemorrhage
4	Appearently deeper mucosal lesion /ulcer with adherent large blood clots or with active haemorrhage

Tyagi (2014)

3.9 Statistical Analysis

- The analysis of descriptive statistics comprising of arithmetic means and their standard errors was done by one-way Analysis of Variance (ANOVA) as suggested by Snedecor and Cochran (1994).
- The means were compared by Fisher pair-wise comparison based on least significance difference at 5% level of significance.
- The analysis of scores was performed by Log transformation of original scores. The Log transformed means were then back-Log transformed for further comparison. These back-Log transformed means are the Geometric Means of respective scores.

4. RESULTS

4.1 History

4.1.1 Incidence of Gastric affections

Total cases registered at Teaching Veterinary Clinical Complex (TVCC), Jabalpur from August 2017 to April 2018 were 12927 out of which canine cases were 10219 *i.e.* 79.05%. Among them, cases entertained as gastroenteritis in Department of Veterinary Medicine was 1127 and 52 cases were referred to Department of surgery and Radiology for further investigations and treatment. Endoscopy was performed in 14 cases which were chosen for this study (Table 05).

Table 05: Incidence of gastric affections in dogs at TVCC

S. No.	Detail of cases	No. of cases	Per cent
1	Total cases registered at TVCC	12927	--
2	Canine cases registered at TVCC	10219	79.05
3	Canine cases of gastro intestinal tract affections	1127	10.96
4	Canine cases selected for gastroscopy	14	0.12

4.1.2 Age, Sex and Breed

Complete history of 14 cases was recorded including age, sex, breed, diet, duration of condition and previous medication if given. Maximum incidence (57.14%) of gastro intestinal tract affections diagnosed during study was related to age group 0.5 -3 years followed by 11 -14 years (table 06 and fig. 01) and the incidence was much higher in male dogs (71.42%) followed by female dogs (28.5%) (Table 07 and fig. 02).

Breed wise highest incidence was observed in Labrador (28.5%) followed by Samoyed and Mongrel (21.42%), Lhasa (14.28%) and least incidence were recorded in Rottweiler and Pug (7.15%) (Table 08 and fig. 03).

Among the 14 dogs, ingestion of foreign bodies or inedible substances was maximum in the younger male dogs particularly Labradors.

Table 06: Gastroscopy in different age groups of dog

S. No.	Age Group (Years)	No. of Animals	Per cent
1	5-3	8	57.14
2	4-6	2	14.28
3	7-10	1	07.14
4	11-14	3	21.42

Table 07: Gastroscopy in different sex of dog

S. No.	Sex	No. of Animals	Per cent
1	Male	10	71.42
2	Female	4	28.58

Table 08: Gastroscopy in different breeds of dog

S. No.	Breed of animal	No. of Animals	Percent
1	Labrador	4	28.58
2	Samoyed	3	21.42
3	Mongrel	3	21.42
4	Lhasa	2	14.28
5	Rottweiler	1	7.15
6	Pug	1	7.15

4.2 Clinical examination

4.2.1 Clinical Parameters

In all the dogs rectal temperature, pulse rate and respiration rate was recorded before the gastroscopy followed by day 3 and day 10 revealed non- significant changes at different time intervals and the values fluctuated between 101.10 ±0.15 to 101.52± 0.27 ^{0}F rectal temperature, 77.00 ±1.77 to 79.29 ± 1.87 pulse per minute and 22.00± 0.49 to 22.62± 0.94 respiration per minute. (Table 09 and Fig. 04, 05, 06)

Table 09: Clinical Parameters at different time interval in dogs

S. No.	Parameter / Interval	Day 0	Day 3	Day 10	Mean ± S.E.
1.	Temperature ^{0}F	101.52±0.27	101.33±0.13	101.10±0.15	101.33 ±0.12
2.	Pulse Rate / Minute	79.29±1.87	77.69 ±1.65	77.00±1.77	79.29±1.87
3.	Respiration Rate/Minute	22.00±0.98	22.65±0.95	22.00±0.50	22.00±0.98

4.3 Haematological examination

In all the animals mean value of total leukocyte count (TLC), haemoglobin (Hb), neutrophil count, lymphocyte and monocyte count were within the normal physiological range before the gastroscopy and then on day 10(Table 10 and Fig. 07 - 11).

Table 10: Haematological parameters with non significant changes at different time interval

S. No.	Parameter / Interval	Day 0	Day 10	Mean ± S.E.
1.	Hemoglobin (g/dl)	13.36 ± 0.99	12.71 ± 0.63	13.06 ± 0.60
2.	TLC (×10^{3}/µL)	13.10 ± 2.06	10.26 ± 1.31	11.79 ± 1.27
3.	Neutrophil (%)	74.36 ± 2.39	69.75 ± 1.51	72.23 ± 1.51
4.	Lymphocyte (%)	20.71 ± 2.56	21.83± 1.57	21.23 ± 1.53
5.	Monocyte (%)	4.21 ± 0.52	5.17 ± 0.56	4.65 ± 0.38

However, significant increase ($p < 0.05$) was noticed in the eosinophil count with the mean value of 3.58 ± 0.33 percent on 10th day of gastroscopy from the control value of 0.71 ± 0.24 percent on day 0.While mean value of packed cell volume (PCV) was significantly decreased ($p < 0.05$) on day 10 with minimum value of 38.01 ± 1.49 from the control value of 46.68 ± 3.28 percent (Table 11, Fig. 12, 13).

Table11: Haematological parameters with significant changes at different time interval

S. No.	Parameter / interval	Day 0	Day 10	Mean ± S.E.
1.	Eosinophil	0.71^{b} ± 0.24	3.58^{a} ± 0.33	2.04 ± 0.34
2.	PCV	46.68^{a} ± 3.28	38.01^{b} ± 1.49	42.68 ± 2.05

Values with different superscripts within a row differ significantly ($p<0.05$) between intervals.

4.4 Gastroscopy:

Gastroscopy was performed in 14 animals which were further divided into 4 subgroups depending upon their affections of varying nature. Gastric lesions were assessed on day 0 and efficacy of treatment was judged by gastroscopy on day 10 (Table 12 and Fig.14).

Table 12: Different lesions on the basis of gastroscopy in dogs

Sub group No.	Description	No. of cases	Per cent	Recovery
1	Identification and retrieval of foreign body with instrumental support	4	28.57	Excellent
2	Identification and retrieval of foreign body without instrumental support	5	35.71	Excellent
3	Gastritis with thickened and erythematous mucosa	3	21.42	Fair
4	Severe generalized haemorrhage of gastric mucosa	2	14.28	Poor

Gastroscopic examination of all 14 dogs was done on day 0 while 2 dogs died on day 3 and day 5 post gastroscopy, in spite of appropriate medical management. So day 10 gastroscopy was performed in 12 dogs to diagnose, observe and document the extent and amount of affections i.e. gastritis, inflammation, haemorrhage, erosion and ulceration then analysed as per arbitrary visual score card for haemorrhage and erosion (Table 13)

Table 13: Arbitrary visual score card for Gastric inflammation, haemorrhage and erosion

Case No.	Inflammation/Haemorrhage		Erosion	
	Day 0	Day 10	Day 0	Day 10
1.1	Severe	Normal	Moderate	Normal
1.2	Mild	Normal	Mild	Normal
1.3	Severe	Mild	Severe	Normal
1.4	Mild	Normal	Moderate	Normal
2.1	Mild	Normal	Mild	Normal
2.2	Moderate	Normal	Mild	Normal
2.3	Severe	Mild	Mild	Normal
2.4	Mild	Normal	Mild	Normal
2.5.	Moderate	Normal	Mild	Normal
3.1	Moderate	Mild	Moderate	Mild
3.2	Mild	Normal	Mild	Normal
3.3	Mild	Normal	Mild	Normal
4.1	Severe	-	Severe	-
4.2	Severe	-	Severe	-

Gastric ulcer index for ulceration, number of lesion and severity of lesion were analyzed as per score card standardized by Schiantarelli *et al*. (1984) and Tyagi 2014 (Table 14).

Table 14: Score card for ulceration, number of lesion and severity of lesion

Case No.	Ulceration		Lesion No. Score		Lesion Severity score	
	Day 0	Day 10	Day 0	Day 10	Day 0	Day 10
1.1	3	1	3	0	2	0
1.2	2	1	3	0	2	0
1.3	4	1	1	0	4	1
1.4	2	1	3	0	3	0
2.1	2	1	3	0	3	0
2.2	3	1	1	0	4	0
2.3	4	2	4	1	1	0
2.4	3	1	2	0	3	1
2.5.	2	1	2	0	3	0
3.1	3	1	2	0	4	1
3.2	2	1	4	0	3	1
3.3	3	1	3	1	3	1
4.1	4	-	4	-	4	-
4.2	4	-	4	-	4	-

Those gastroscopic lesion scores were analyzed by back-log transformed means which showed significant reduction in lesion score that also correlated with clinical examination and gastroscopy on day 10 (table 15 and fig.15).

Table 15: Back-log Transformed Means for various gastric scores

Interval	Lesion Visual Score	Lesion Number Score	Lesion Severity Score
00 Day	3.36^{a}	3.59^{a}	2.92^{a}
10 Day	1.57^{b}	0.66^{b}	0.72^{b}

Scores with different superscripts within a column differ significantly between intervals.

4.4.1 Identification and retrieval of foreign body with instrumental support

4.4.1.1 History

Out of 14 dogs 10 cases reported with a history of consuming either some inedible object or large bone piece, were showing the symptoms of anorexia, vomiting and scanty faeces. All the animals were dull, depressed, dehydrated, with reduced and guarded activity and not responding to medicinal treatment. The colour of mucous membrane was pale to normal. X-ray examination also indicated that case 1.1 had consumed glass marbles (Plate 05) case 1.2 spectacle glasses and plastic bottle. Whereas case 1.3 had eaten a large bone piece and case 1.4 had swallowed fish bones with straws.

4.4.1.2 Gastroscopic evaluation and retrieval of foreign bodies

Gastroscopic examination of case 1.1 revealed focal erosion and haemorrhagic foci with presence of a big glass marble in the stomach. Foreign body retrieval basket was tried to catch the marble, grasped and very carefully retrieved. After that the dog was managed under intravenous medication with fluid therapy. Gastroscopy on 10^{th} day revealed normal texture and colour of gastric mucosa with uneventful recovery (Plate 06-08).

While case 1.2 showed gastritis, petechial haemorrhage, presence of plastic debris, shiny objects and dates seed in stomach which was pulled towards cardia with endoscopic basket, animal was kept in forward and downward recumbency which resulted in regurgitation with evacuation of date seed along with plastic debris. Recovery of dog was excellent and normal texture of gastric mucosa was seen on day 10 (Plate 09).

Radiograph of case 1.3 showed presence of big bone pieces in thoracic part of oesophagus. Gastroscopic examination confirmed its presence at cardia with two fragments causing severe inflammation, haemorrhage and perforation of mucosal lining. Attempts were made to dislodge bone pieces with multiple instruments, so that the bone pieces were gradually displaced, grasped and retrieved with extreme care (Plate 10 - 12). The local haemostat *i.e.* Hemocoagulase was applied with the help of irrigation tube inserted via the instrument channel. The dog was kept under

observation with intravenous medication, fluid therapy and strict NPO. The dog recovered uneventfully and day 10 gastroscopy showed marked improvement in gastric mucosa (Plate 13 and 14).

Gastroscopic examination of case 1.4 showed gastritis and focal haemorrhages with presence of clutter of fish bone and straws in dog stomach which were retrieved with foreign body retrieval forceps and follow-up gastroscopy on day10 depicted excellent recovery.

4.4.2 Identification and retrieval of foreign body without instrumental support

4.4.2.1History

The case 2.1 had consumed dancing bells (Ghungru) while other four animals were referred with the history of ingestion of bone pieces and since then were showing symptoms of upper gastrointestinal disturbance. X-ray examination also showed presence of radio opaque mass in the stomach.

4.4.2.2 Gastroscopic evaluation and fate of foreign bodies

Gastroscopic examination showed varying degree of gastric mucosal lesions from mild to severe gastritis, haemorrhage, erosion and ulcerations but foreign bodies were untraceable. All the animals were advised for strict NPO, fluid therapy, laxatives and rest. In two dogs foreign bodies came out in regurgitation while in three animals it was evacuated with faeces. All the animals were recovered uneventfully and 10th day gastroscopy showed excellent improvement in gastric mucosa (Plate 15 -20).

4.4.3 Gastritis with thickened and erythematous mucosa

4.4.3.1 History

Animals of this group were aged between 10 to 14 years, with history of anorexia, vomition, weakness and diarrhoea followed by constipation. X-ray and ultrasonography examination revealed changes in gastric wall and lumen.

4.4.3.2 Gastroscopic evaluation and intervention

Gastroscopic examination of case 3.1 showed varying degree of gastritis with thickened and erythematous gastric mucosa, inflammation of

rugae and haemorrhagic foci on the fundus of stomach. Tissue sample was taken in case no.3.1 with biopsy forceps. However; it was not sufficient for histopathological examination. Day 10 gastroscopy showed moderate improvement in condition (Plate 21).

Ultrasonography of Case 3.2 showed extreme thickening of gastric wall and narrowing of gastric lumen. Gastroscopy confirmed the same with presence of erosion and ulcerations also. Gastroscopy on day 10 showed moderate improvement in texture of gastric mucosa (Plate 22-24). While the case 3.3 showed corrugation of oesophageal mucosa and thickened gastric mucosa with hemorrhagic erosions and ulcerations of varying degree. All the three animals were subjected to prescribed therapeutic protocol up to five consecutive days but excellent improvement in oesophageal and gastric mucosa on day 10 was depicted in case 3.3 only (Plate 25 - 27).

4.4.4 Severe generalized haemorrhage of gastric mucosa

4.4.4.1 History

Case 4.1 had history of inappetence from last 8 days followed by vomiting and constipation since 2 days. The animal was dull, dehydrated, lethargic, coughing and regurgitating with haemoptysis. X-ray examination was not conclusive. Whereas case 4.2 was dull, depressed, weak and dehydrated and had eaten mango seed kernel three days back and since then showing anorexia, coughing, vomiting and haemoptysis. X-ray examination suspected some obstruction in upper GIT. Both cases were not responding to conservative treatment.

4.4.4.2 Gastroscopic evaluation and interpretation

Gastroscopic examination of case 4.1 and 4.2 showed gastritis, thickening of mucosa and haemorrhage in oesophageal and gastric lumen along with multiple erosion, lacerations and ulceration (Plate 28). During gastroscopic examination clotted blood and pulpy material excreted out. As haemorrhage was profuse, electro cauterization was not successful. Prescribed medication with parenteral haemostat was administered with continuous care and monitoring but both the dogs died.

5. DISCUSSION

5.1 Anamnesis

5.1.1 Age /Sex /Breed

In the present study maximum incidence of gastro intestinal tract affections were diagnosed in dogs of 0.5 to 3 years of age followed by 11 -14 years. Males were commonly affected as compared to female. Whereas breed wise highest incidence was observed in Labrador followed by Samoyed, Mongrel, Lhasa and least incidence was recorded in Rottweiler and Pug. Ingestion of foreign bodies was also most commonly observed in younger male dogs of Labrador breed.

It was due to habit of younger male dogs of indiscriminate eating, nature and quality of food, habitat and dietary discretion and also because the youngster are naturally curious and enjoy chewing.

The present findings correlates with Leib and Sartor (2008) who gastroscopically investigated prevalence of affections in 32 dogs and reported that the ingestion of foreign bodies are commonly encountered in younger male dogs due to indiscriminate eating habits.

Davis *et al.* (2003) reported incidence of exercise induced gastritis in racing Alaskan sled dogs and its prevention with antacids. Davis and Williamson (2016) also supported the findings that heavy work or exercise may result in gastritis and gastric ulcers.

Simpson *et al.* (2005) also stated that because of their exploring nature and picking behaviour, retriever breeds *i.e*. Labradors, Spaniels and Pointers are prone to foreign body ingestion which may lead to gastrointestinal tract affections.

5.2 Clinical examination

5.2.1 Clinical Parameters

In all the 14 dogs clinical examination was conducted to evaluate the animal for induction of general anaesthesia and to perform gastroscopic procedure. In all the animals rectal temperature, pulse rate and respiration rate showed non-significant changes before the gastroscopy and on day 3 and 10.

In the mild gastro intestinal disturbances, mostly there is no systemic changes thus the temperature, pulse and respiration did not show any noticeable alteration in the clinical observations.

Dogra *et al*. (2013) and Sharathchandra (2016) found that rectal temperature; respiration rate and pulse rate did not vary much with the base values and remained within normal physiological limits during gastric affections.

5.3 Haematological examination

The haematological examination was performed to assess the health status of the animal for inducing general anaesthesia for gastroscopic intervention and to correlate with the clinical and gastroscopic examination for an accurate diagnosis of gastric lesions and their therapeutic management.

In general total leukocyte count (TLC), haemoglobin (Hb) and neutrophil count showed non-significant decrease and lymphocyte and monotype count showed non-significant increase, however these changes were transient in nature and the values fluctuated within normal range on day 0 and day 10 of gastroscopy.

These fluctuation were due to haemorrhage, ulcerations, erosions, gastritis or presence of gastric foreign body, which resulted in transient decrease of haemoglobin while decrease in total leukocyte count and neutrophil count attributed to the decreased inflammation and infection on day 10 by appropriate medication and gastric protectants. Chronic gastritis in some of the dogs of present study may be reasons for transient increase in lymphocyte and monocyte.

Significant increase was noticed in the eosinophil per cent on day 10 of gastroscopy may be attributed to discontinuation of steroids, allergic or immune response of multiple focal ulcerative lesions on gastric mucosa and gastritis and adverse drug reaction due to prolonged NSAID and parenteral therapy.

While the mean value of pack cell volume percent was significantly higher on day 0 which was due to dehydration caused by continuous vomiting and inability of animal to eat and drink. That was

countered with intra venous fluid supplementation and normalisation of dietary routine of the dogs and that was reflected in significant reduction of PCV per cent on day 10. Hall and Twedt (1988) reported statistically significant association between PCV and gastric ulceration as the lower range of PCV indicates less likeliness of gastric ulcers in dogs.

Dogra (2011) and Gupta (2012) also noticed that gradual reduction in haemoglobin level, packed cell volume; total erythrocyte count and rise in total leukocyte count were consistent laboratory findings in experimental studies of non-steroidal anti-inflammatory drugs (NSAID) induced ulceration and erosion in dogs, which were also similarly observed by Thakur (2013) and Shastri (2014).

5.4 Gastroscopic evaluation

Gastroscopy was performed in 14 animals which were further divided into 4 subgroups depending upon the gastric affections of varying nature. Gastric lesions were assessed on day 0 and efficacy of treatment was judged by gastroscopy on day 10.

5.4.1 Identification and retrieval of foreign body with instrumental support

Out of 14 cases of gastrointestinal affections 4 dogs were found with ingestion of foreign bodies' *i.e.* big glass marble, plastic debris with date seed kernel, clutter of fish bone with straws and big bone pieces which were retrieved with gastroscopic basket and forceps. Along with these foreign bodies focal erosion, petechial haemorrhage, haemorrhagic foci, gastritis, inflammation and perforation of mucosal lining were also noticed on day 0. However, follow-up gastroscopy on day10 revealed normal texture and colour of gastric mucosa in all the dogs of this subgroup.

The Occurrence of gastric lesions in present findings were attributed to the hyper secretion of gastric acids leading to gastric ulcerations and erosions due to the presence of gastric foreign body which causes continuous irritation of gastric mucosa and sometimes the rough surfaces of these foreign bodies may penetrate the mucosal linings leading to trauma, haemorrhage and inflammation.

The factors involved in the pathogenesis of ulceration are gastrin or hyper acidity associated with mastocytosis. The increased pepsin concentration is capable of breaking mucosal barrier and resulted in ulceration.

Guilford (2005) also reported that gastric foreign bodies, polyps and tumorous growths can cause gastritis and ulcerations via direct irritation to the gastric mucosa.

Katsinelos *et al.* (2006) also reported the gastric techniques and management of foreign body ingestion and food bolus impaction in the upper gastro intestinal tract disturbances in 171 dogs and concluded that the gastroscopic removal of upper gastro intestinal tract foreign bodies and food bolus impaction was 98.6 % efficaciously safe.

Similarly Mathai *et al.* (2013) suggested that the endoscopy was effective to diagnose different types of cases related to upper gastrointestinal tract affections along with precise location of lesions and helped in removal of foreign bodies without surgery support by gastroscopic manoeuvres.

Sharathchandra (2016) and Reddy *et al.* (2018) also reported successful retrieval of cotton rolled bandage and hairball mass containing iron spring with the help of endoscopic basket from the stomach.

5.4.2 Identification and retrieval of foreign body without instrumental support

One dog of this subgroup had consumed dancing bells (Ghungru) while four dogs had eaten bone pieces along with meat and showing varying degree of gastric mucosal lesions from mild to severe gastritis, haemorrhage, erosion and ulcerations but foreign bodies were untraceable. Subsequently foreign bodies came out in regurgitation or defecation and 10th day gastroscopy showed excellent improvement in gastric mucosa.

It was possible that relaxation of the cardia and the oesophageal sphincter due to general anaesthesia helped such evacuation. Smooth surfaces of foreign object, its dislodgement by movements with irrigation and insufflations of oesophagus and stomach through gastroscopic channel might

have altered the condition and such gastric lavage further resulted into dislodgement of these object and removal via regurgitation or defecation.

Similarly Michels *et al.*(1995) reported that many foreign bodies which enter the stomach passes through the gastrointestinal tract without any difficulty but objects with sharp or irregular edges might get retained in the stomach because they are either too large to pass through the pylorus or their sharp edges become impacted in the antrum, pylorus or cardia.

Normal gastroscopic appearance of mucosal lining with full recovery of the animal on day 10 was indicative of the effective therapeutic management including appropriate antimicrobial administration, rehydration therapy and gastrointestinal protectant, as suggested by Gourley and Vasseur (1985) who stated that, wound healing in proximal gastrointestinal tract is more rapid than other tissue and credited to rapidly regenerating epithelium, an extensive blood supply and effective defensive mechanism, specially gut epithelial lymphoid tissue.

Davis and Williamson (2016) also suggested that Sucralfate, a gastroprotectant that binds to proteinaceous exudates found at ulcer sites, should be administered to dogs with confirmed or suspected gastric ulcers to check further damage from gastric acid, bile, and pepsin. It has also been shown to have cytoprotective and antacid effects.

5.4.3 Gastritis with thickened and erythematous mucosa

Gastroscopic examination of one of the dog of this subgroup showed thickened and erythematous gastric mucosa, inflammation of rugae and haemorrhagic foci on the fundus of stomach, whose biopsy was taken through the endoscopic biopsy forceps; however the collected biopsy sample was not found suitable for histopathological examination. While in another dog corrugation of oesophageal mucosa and thickened gastric mucosa was suspected in ultra sonogram which was reported by Agthe (2009) also. Gastroscopy confirmed the affections with presence of ulcerations too. All the three animals were subjected to therapeutic protocol up to five consecutive days. Gastroscopy on day 10 revealed moderate improvement in texture of gastric mucosa in two cases while third showed excellent recovery.

These lesions in all the three animals revealed the chronic gastritis which might be because of series of pathphysiological changes which include infiltration of endothelial and inflammatory cells, including neutrophil and mast cells in the gastric mucosal lining followed by release of histamine, leukotrienes, platelet-activating factor, proteolytic enzymes and free radicals. Histamine release causes further acid secretion, whereas other mediators promote vasodilation, increased capillary permeability, oedema and capillary plugging. All these together further damaged the mucosa and reduced its ability to sufficiently protect itself through secretion of bicarbonate with mucus epithelisation which was concluded by Johnson (2012) also.

The present findings are in accordance with the Guilford and Strombeck (1996) as they also reported that when the integrity of the mucosal barrier is compromised; a cascade of pathologic events follows, contributing to further damage of the mucosal layer and increased back diffusion of gastric acid and pepsin, leading to inflammation and haemorrhage.

Washabau *et al.* (2010) also stated that histopathological characterization of gastrointestinal inflammation has been hampered due to lack of accepted and standard criteria for measuring the histopathological changes within a sample of mucosal tissue. The normal histology of the canine and feline gastrointestinal tract is affected by variables and therefore remains the subject of considerable controversy.

Schiller *et al.* (2015) also said that without knowledge of the previous anamnesis the biopsy taken from remnant of a normal stomach would be misinterpreted. When a solid lesion appear to be sub mucosal, superficial biopsies are often unhelpful and other methods of obtaining material, e.g. “large particle” snare biopsy, fine needle aspiration or the use of hot biopsy forceps should be considered as mucosal abnormalities are often patchy and may not be visible endoscopically.

5.4.4 Severe generalized haemorrhage of gastric mucosa

Gastroscopic examination of two animals of this subgroup showed gastritis, thickening of mucosa and haemorrhage in oesophageal and gastric lumen along with multiple erosion, lacerations and ulceration with

blood clots in the gastric wall. As haemorrhage was diffuse, electro cauterization was not successful. Prescribed medication with parenteral haemostat was done with continuous care and monitoring but both the dogs died on day 4 post treatment.

The profuse haemorrhage along with laceration in gastric wall was because of chronic infectious disease, coagulopathies, continuous irritation of sharp penetrating foreign object or ulceration as one of the dog of this subgroup had eaten mango seed kernel while another dog was referred for gastroscopy after prolonged treatment of gastroenteritis and suspected for gastric tumour.

The present findings were in correlation with Romano *et al.* (2014) and Boysen and Jantina (2015) as these authors also used the sclerosing agents like polidocanol, butyl-cyano acrylate and sodium tetra-decyl sulphate along with third generation cephalosporin and quinolones is effective and safe in gastric haemorrhage and stated that the prognosis of gastrointestinal haemorrhage in companion animal varies from fair to poor with a mortality rate of 29-45% depending upon the underlying causes.

6. SUMMARY, CONCLUSIONS AND SUGGESTIONS FOR FURTHER WORK

6.1 Summary

Endoscopy is a non invasive, atraumatic and sensitive tool for detection of morphologic alteration in the gastrointestinal tract. It also allows descriptive or photographic documentation of findings and has advantage of providing accurate diagnosis through biopsy, cytological examination and fluid estimation.

Therefore the present research work was planned to diagnose the gastric lesion on the basis of symptoms, haematological estimation, gastroscopy, histopathology and evaluation of interventional gastroscopy for various gastric lesions.

The study was conducted for duration of 9 months. Total 12927 cases were registered at TVCC from August 2017 to April 2018. Out of which gastroscopy and interventional procedures were performed in 14 dogs with Karl Storz Multipurpose Video Gastro Endoscope.

Complete history of all the cases was recorded; radiographs of abdomen were taken and estimation of clinical and haematological parameters was done.

Animals were prepared for gastroscopic examination by 12 hour fasting. General anaesthesia was induced and maintained. Cleaning of buccal cavity was followed with fixing of mouth gag to prevent possible damage.

Endoscope was inserted through mouth gag and forwarded into mouth, pharynx, oesophagus, sphincter and cardia than stomach. Thorough visualization of cardiac, fundus and pylorus segments of stomach was done and pathological lesion were evaluated as scarring, haemorrhage, erosions, laceration, growth, ulcers and presence of foreign body and were correlated with clinical symptoms and laboratory examination. In accordance interventional gastroscopy procedures were performed *i.e.* foreign body retrieval, haemostasis and biopsy with appropriate instruments.

Gastric mucosal haemostasis was done with Hemocoagulase application via irrigation channel. Dogs were kept under strict NPO. Parenteral nutrition with isotonic crystalloids, antibiotics *i.e.* Amoxicillin +Clauvenic acid and Ornidazole, antacids *i.e.* Pentaprozole, antiemetic *i.e* Ondansetron, gastroprotectant *i.e.* Sucralfate and supportive medication was given as and when required.

The analytical prevalence of incidence regarding age, sex and breed indicated that younger males and retriever and toy breeds were prone to consumption of foreign body and associated complications. Clinical parameters *i.e.* rectal temperature, pulse rate and respiration rate were fluctuated within normal range and no significant changes were seen during day 0, 3 and day 10 of gastroscopy.

Haematological estimation on day 0 and day 10 of study showed non-significant fluctuations of haemoglobin, TLC, neutrophil, lymphocyte, and monocyte per cent while significant decrease in PCV and increase in eosinophil percent was noticed. All the changes were within normal range.

All the animals were divided into four subgroups *i.e.* Identification and retrieval of foreign body with instrumental support, identification and retrieval of foreign body without instrumental support, gastritis with thickened and erythematous mucosa and severe generalized haemorrhage of gastric mucosa.

Various foreign bodies were retrieved with gastroscopic support, *i.e.* glass marble, big seed kernel, plastic debris, dancing bells, fishbone with lumps and bone pieces of varying sizes.

Efficacy of treatment and recovery of animals in group 1 and 2 was excellent, group 3 was guarded and group 4 was poor.

Therefore the present study concluded that Incidence of gastrointestinal affection was more in younger male dogs and in retriever and toy breeds. Ingestion of foreign body was most common gastroscopic finding (71%) followed by gastric erosions with ulceration (21%), chronic gastritis and gastric haemorrhage (8%) and Interventional gastroscopy is excellent method for removal of foreign body and haemostasis of localized gastric haemorrhage.

6.2 Conclusions

On the basis of present findings following conclusions can be drawn:

- Incidence of gastrointestinal affection was more in younger male dogs than the females.
- Ingestion of foreign body was most common gastroscopic finding (71%) followed by gastric erosions with ulceration (21%) and chronic gastritis with gastric hemorrhage (8%).
- Interventional gastroscopy was helpful for removal of foreign body and haemostasis of localized gastric hemorrhage.

6.3 Suggestion for further work

- Interventional gastroscopy should be tried in other species.
- Exploration of duodenum should be tried with gastroscopy.
- Interventional gastroscopy can be used for polypectomy.
- Gastroscopy could be used for evaluation of chemotherapeutic protocol of gastric neoplasm.

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