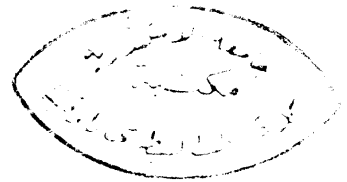


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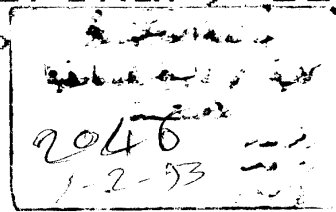
STUDIES ON SOME SURGICAL
AFFECTIONS OF THE DIGESTIVE
SYSTEM IN DOGS WITH SPECIAL
REFERENCE TO THE RADIOGRAPHY

A THESIS PRESENTED
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(Surgery)

To



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Theriogenology
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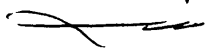
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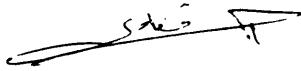
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INTRODUCTION

The X-rays (Roentgen rays) were discovered by the physicist Wilhelm Konrad Roentgen in 1895. The diagnostic radiograph is a permanent image made by passing x-rays through a subject and recording the effect of the x-rays photographically. The purpose of radiography is to produce an image that will aid the veterinarian in making an accurate diagnosis by depicting the density, shape, size and location of internal body structures. The normal must be known in order to recognize the abnormal (Kleine and Warren 1983).

Radiography is a fascinating aspect of veterinary medicine. It literally offers insight into the internal hidden structures of an animal's body. Mastery in radiographic interpretation requires the deepest understanding of all aspects of disease processes. On other hand, radiography cannot be considered as a separate independent means to an end (Gillette, Thrall and Lebel 1977).

The purpose of veterinary radiology is to provide useful and reliable information about the health of animal patient.

The photographic films are either plain, survey (without contrast study) or contrast films (with using of a contrast media). Survey abdominal radiographs are part of the initial database, and the contrast radiographs of the gastro-intestinal tract may supply additional information. The survey radiography can help in evaluating a variety of the gastro-intestinal disturbances, both acute and chronic. It is also used to evaluate

the viscera of other organ systems such as the kidneys and the liver (Kantrowitz and Biller 1992).

The radiography is commonly used to confirm the diagnosis not for the diagnosis, it is more useful and helpful for demonstrating obstructive lesions, luminal filling defects or masses of the gastro-intestinal tract.

Suturing of the tissues is one of the most important steps of the operative technique and is indicated to insure the best possible apposition of the severed tissues until normal healing takes place, and this is achieved by the simplest method and by using of the minimum amount of suture materials.

The suture materials are classified into :

A-Absorbable suture materials :

- 1- surgical gut, that may be plain or chromic catgut.
- 2- collagen.
- 3- polyglycolic acid (P.G.A.) that is called dexon.
- 4- polyglactin 910 (vicryl).
- 5- polylactic acid.

B- Non-Absorbable suture materials :

a- non-metallic, non-absorbable suture materials :

- 1- silk.
- 2- nylon
- 3- polypropylene (prolene).
- 4- polyesters. which include :
 - a- plain (uncoated) polyesters as the mersiline and the dacron.
 - b- coated polyesters as the teflon and polydek.

b- metallic, non-absorbable suture materials :

1- stainless steel. 2- Michel clips.

Because of the large number of sutures currently available personal preference of the surgeon is considered in suture selection (Fouad, Saleh and Shokry, 1985).

Intestine is considered the chief portion of the alimentary tract from which the foodstuffs are absorbed. Removal of a greater or lesser portion of the intestine may be necessary as a surgical treatment for some diseased conditions, such as cases of gangrene resulting from strangulation or occlusion of mesenteric blood vessels, removal of a malignant disease, some cases of intestinal tuberculosis, serious injuries of the bowel and to remove chronically distended & overgrown portions of the bowel (Hassan, Mottaleb, Bolbol, and Misk, 1981). The length of the resected intestine that not alter the animal condition is still undetermined, and needs to more further studies.

AIM OF THE WORK

The aim of this work is directed toward three main points, that are, studying the ability of the x-rays (with and without barium) to examine the G.I.T. in both normal and experimentally affected animals. The second main point is to determine the most suitable suture materials for treatment of some surgical affections of the G.I.T.. And lastly to conduct some experimental studies on the esophagus, stomach, and intestine and recording their effect on the general health of the animals.

REVIEW OF LITERATURE

ESOPHAGUS

Surgical affections:

Reizel and Brinker (1956) found that the dog with a pork chop bone as a foreign body in the esophagus suffered from cough and all signs of illness.

The surgical affections of the esophagus mentioned by different authors in this study were collected including, small bone and other objects, that were lodged in either cervical or thoracic parts of the esophagus (*Berge and Westhues, 1966*); Foreign body obstruction (*Pearson, 1966*); Achalasia, that may be acquired or congenital (*Bojrab, 1975*); Acquired achalasia (*Ryer and Ryer, 1980*); Esophageal obstruction or choke (*Fouad, Saleh and Shokry, 1985*); Megaesophagus (*Hoenig, Mahaffey, Farnel and Styles, 1990*); Megaesophagus, obstruction, rupture, stenosis and diverticulum. (*Singh, Sharma, Behl, Gahlot and Ghandna, 1991*); And obstruction in the esophagus of colts due to intrathoracic esophageal division diverticulum (*Ford, Schumacher, Vacek, Brumbaugh and Crossland, 1991*).

Misk (1992) classified the surgical affections of the esophagus of dogs and cats into, congenital or developmental anomalies include, esophageal diverticulum, achalasia or dilatation of megaesophagus, vascular ring anomalies (aortic

arch) as PRAA & gastro-esophageal intussusception, and acquired affections include, esophagitis, esophageal stenosis or stricture, choking or obstruction, esophageal perforation, tumors, & parasitic infestation and granuloma formation.

Megaesophagus in most reported cases was caused by persistent right aortic arch (PRAA), which is a vascular-ring anomaly causes constriction and subsequent dilatation of the esophagus cranial to the base of the heart, or was attributed to the pyloric dysfunction. Megaesophagus, unassociated with either PRAA or pyloric dysfunction was rare (*Pearson, Gaskell, and Gibbs, 1974; and Bishop, Kelly and Gibbs, 1979*).

Pearson, Gibbs and Kelly (1978) mentioned that the esophageal diverticulum formation was an uncommon sequel to the foreign body impaction. It was commonly either to be congenital or developmental and rarely to be acquired.

Dehoff (1987) reported that the most foreign bodies lodged in the cervical or post cardiac portion of the esophagus and about 20% of these cases occurred in the precardiac region.

Esophageal hiatal hernia was defined as a displacement of the esophagogastric junction and part of the proximal portion of the stomach through the esophageal hiatus of diaphragm into the caudal mediastinum (*Alexander, Hoffer and MacDonald, 1975; and*

Ellison, Lewis and Phillips, 1987). While, van Sluijs and Happe (1985) added that this displacement resulted in compromise of lower esophageal sphincter, because it must now withstand not only the intra-gastric pressure, but intra-abdominal as well.

Incompetence of the lower esophageal sphincter resulted in gastric reflux and regurgitation, with subsequent esophagitis and megaesophagus (Merdan, Dhein, Rawlings and Rosin, 1980; and Granaizni, DeNegris and Persaresi, 1983).

Basher, Hogan, Hanna, Runyon and Shaw (1991) studied a case of dog suffering from congenital bronchoesophageal fistula and mentioned that the main clinical sign was chronic coughing.

Diagnosis of such affections:

Kleine and Warren (1983) mentioned that the patient preparation involved removing of the dirt, large hair mats, bandages, splints and aluminium troughs and drying the animal's hair. Collars must be removed before cervical radiography, also medications that contain bismuth paste or large amounts of iodine applied to the skin should be removed before radiographs were made for medicated area to avoid its interference with radiographic visualization.

The esophagus was not seen on plain radiographs of the neck

or the thorax, since in its normal collapsed state its density is the same as that of the neck muscles and mediastinum. Air or food materials within its lumen would partly outline it. Following a barium swallow, some barium lodged in the longitudinal crypts between the folds of its mucosa, (Kealy, 1987).

Fouad *et. al* (1985) diagnosed the esophageal obstruction (choke) in the dog by radiography after plain suffice, however, a small amount of barium sulphate could be necessary to delineate a non-radiopaque foreign body.

Gillette, Thrall, and Lebel (1977) reported that the normal esophagus usually was not visualized in radiographs of thoracic cavity of an unanesthetized dog and cat. While in anaesthetized animals, some air might be visible in the esophagus. If the esophagus was evident, the presence of a pathologic lesion must be suspected.

Contrast radiographs should be taken immediately following administration of the contrast, then at 15 minutes and again 30 minutes, after that they should be taken at hourly intervals until adequate information was obtained (Gillette *et. al.*, 1977); Quick and Rendano, 1978; and Kealy, 1987).

Contrast radiographic examination of the esophagus was valuable in the investigation of the horses with dysphagia.

choke, and nasogastric reflux (*Greet, 1982*), and in the diagnosis of grass sickness (*Greet and Whitwell, 1986*).

Sedatives and/or analgesic drugs were suggested to affect esophageal motility and confused results of studies of contrast swallows (*King, Davies and Gerring, 1990*).

Reizel and Brinker (1956) used the survey radiograph as a confirmatory aid of diagnosis for pork chop bone as a foreign body in the esophagus of a dog, as the symptoms alone were not enough.

Lawson and Pirie (1966) stated that the tumors at the thoracic inlet was identified radiographically by presence of soft tissue mass density. Also, the barium paste might be obstructed at this level. This condition was not amenable to any current form of the therapy either medical or surgical.

Mass lesions of the abdominal cavity include neoplasms, abscesses, cysts, granulomas, and haematomas, were common but the neoplastic masses were most common particularly in older animals. These masses were not detected on survey radiographs if their outlines were not clearly visible, but the displacement of adjacent structures used to suggest the presence of such masses (*Kantrowitz and Biller, 1992*).

Hall (1966) mentioned that although the use of relaxants was not essential for the esophageal surgery due to its effect on the motility, the stationary field which then provided can be of considerable help to the radiologist since there was no risk of respiratory blurring of the film.

Pearson (1966) indicated the radiography of the thorax for accurate localization of the foreign body obstruction of the esophagus.

Douglas and Williamson (1972) mentioned that it was necessary to radiograph the part under examination in two planes in order to enable the veterinarian to visualize the part accurately, as the radiograph is a two-dimensional impression of a three-dimensional structure. They used the contrast radiography to the gastro-intestinal tract for evaluation of obstruction of the digestive tract by such cases as non-radiopaque foreign bodies (as soft rubber, cloth...etc.), tumor masses, or stenosis of the tract, distortion of the tract wall (as esophageal dilatation, enlargement of the stomach resulting from pyloric stenosis,...etc.). The lesions of the tract wall as neoplasms (tumors), ulcers,...etc. And displacement of the tract due to presence of an intra-abdominal mass, or associated with ruptured diaphragm. They also reported that to produce a good thoracic radiograph, the elimination of both voluntary and involuntary movements, the use of as long as focal spot film

distance and precise positioning of the patient. The radiography of canine chest must be undertaken in the dorso-ventral and lateral planes in contrary to those of the abdomen that is done in the ventro-dorsal and lateral planes using a compression band. On the other hand, *Kealy (1987)* reported that the lateral and ventro-dorsal views should be made at first for esophageal examination by survey radiographs. While for esophagram, the lateral view gave the most information, since in the ventro-dorsal view there were superimposition of the structures related to the esophagus as the spine in the neck. Therefore a ventral-right dorsal-left view (right ventro-dorsal oblique) was recommended to separate esophageal outline from the spine. In contrary, *Quick and Rendano (1978)* used the lateral and ventro-dorsal views for usual examination of the esophagus by contrast media.

Kleine and Warren (1983) indicated the abdominal radiography for many types of G.I.T. disorders as well as abdominal trauma. They advised to fast the patient 12-24 hour, followed by a laxative and enema to empty the intestine and colon, as the ingesta in the stomach and intestine, feces in the colon and rectum obscured other abdominal viscera, for abdominal contrast examination and some non-contrast radiographs.

Gillette et. al. (1977) reported that the barium examination of the intestinal tract was relatively easy to perform. No

sedation was necessary and was undesirable as animal should be free of all medication that might influence intestinal motility.

The ventro-dorsal projections (views) were essential to confirm the midline location and for detailed evaluation of pulmonary changes after lateral ones. For contrast studies, lateral and ventro-dorsal views must be taken approximately 5 minutes after administration of the contrast substance which is barium sulphate (*Pearson, Gibbs and Kelly, 1978*).

Hoening, Mahaffey, Parnel and Styles (1990) diagnosed the megaesophagus in cats by plain radiographs and mentioned that the contrast radiography detected the milder changes.

Ford, Schumacher, Chaffin, Vacek, Brumbaugh and Crossland (1991) found that the episodes of esophageal obstruction in colts due to intra-thoracic esophageal pulsion diverticulum could be diagnosed by endoscopy, positive contrast radiography and pleuroscopy.

Dieringer and Wolf (1991) advised that the thoracic radiography as part of the diagnosis during evaluation of dogs suspecting of having tetanus was seemed to be prudent as it was found that the esophageal hiatal hernia and megaesophagus usually complicating tetanus in dogs.

Radiographically, increased density would be evident in the caudo-dorsal thoracic region (owing to the presence of part of the stomach), and distal esophageal dilatation (megaesophagus) would be apparent for diagnosis of esophageal hiatal hernia (*Merdan Dhein, Rawlings and Rosin, 1980; and Granaizni, De Nigris and Pesaresi, 1983*).

Watson and Sullivan (1991) stated that the radiographic features associated with the grass sickness were thus very similar to those observed after the administration of the detomidine (is a non-narcotic analgesic, used for sedation of horses before radiography and minor surgical operations) to healthy horses. Therefore, the antemortem diagnosis of grass sickness should not be made on the bases of contrast radiography by swallowing the contrast agent, in animals which have been sedated with detomidine.

Basher, Hogan, Hanna, Runyon and Shaw (1991) found that the clinical symptom alone was not enough for diagnosis of a case of congenital bronchoesophageal fistula in a dog. The thoracic radiography was indicated and revealed an air-filled megaesophagus, with ventral esophageal diverticulum in the caudal mediastinal region. On contrast radiograph, the radiography confirmed the connection between the bronchus and the esophageal diverticulum.

Christoph (1975) reported that the esophageal examination by palpation is restricted to the neck region. He mentioned also that the contrast demonstration of foreign bodies of esophagus is interest and succeeded only when there is occlusion. Various sized capsules of barium sulphate could be used for the diagnosis of occlusion of the esophagus. These are given during the screening and were very useful in the elucidation of doubtful cases.

Treatment of such affections:

Christoph (1975) indicated the esophagotomy to remove a foreign body by preparing the middle 1/3 of the neck on the left side. Skin incision parallel to and on the left side of the trachea for about 10 centimeters, dissection by careful cutting through platysma myoides muscle. The esophagus was recognized by its bluish-red colour, then it is incised longitudinally between two pairs of forceps. The incision was being long enough to enable the foreign body to be extracted smoothly through the wound. The wound was then closed by inverting suture of mucosa, continuous suture of muscosa and interrupted suture of the muscles by catgut, then skin was routinely sutured by silk. Post operatively, the dog was fasted for 2-3 days, pure water was given during the following days. The skin suture was removed after 8 days.

Hall (1966) reported that the local analgesia could not provide suitable operating conditions for esophageal surgery, and good general anaesthesia with its adequate relaxation was indicated. Therefore, to induce relaxation of the esophageal wall for esophageal surgery, either deep general anaesthesia must be used or a muscle relaxants must be administered to the lightly anaesthetized animal. The anaesthetic depression made must be kept to the lightest permissible level when radiography was done by using of the contrast media, as most of the contrast agents produced depression of the central nervous system.

Reizel and Brinker (1956) attempted to remove a pork chop bone as a foreign body from the esophagus by use of gastric forceps. Since this were unsuccessful, the right thoracic wall was prepared for surgery. After thoracotomy, a longitudinal incision was made through the esophagus and there was a fistulous tract between esophagus and trachea. Then the esophageal incision was sutured by simple interrupted suture, and the thoracic wall was then closed.

Berge and Westheus (1966) reported that the esophagotomy in the small animals was indicated when a small bone or other objects were lodged in either cervical or thoracic parts of the esophagus. When extraction of the foreign body was not possible through the mouth or stomach. The operation was preferred from the left side with the animal recumbent. Depending on the

position of the foreign body, the esophagus was opened either close to the pharynx or lower down. For esophageal wound closure, the mucosa was sutured with catgut or with thin silk continuously. The musculosa sutured with interrupted suture, while the skin was sutured with mattress suture.

Pearson (1966) reported that the presternal esophagotomy or gastrotomy was performed for the relieve of an intra-thoracic esophageal foreign body obstruction. Presternal esophagotomy might sometimes be helpful if the forceps available was not long enough to reach the obstruction per os. The inversion suture of the esophagus was best avoided because of danger of stenosis. Mucosa was normally closed by 3\0 catgut continuous suture, that was covered by simple interrupted suture uniting the submucosa, musculosa and mediastinum. Great care should be taken throughout the operation to avoid the accidental puncture of the lungs during the work upon the thoracic part of the esophagus.

Bojrab (1975) mentioned that the treatment of the achalasia in dogs and cats did not respond to conservative therapy. The Heller's operation (esophagomyotomy) was recommended. The operation was directed toward enlarging the lumen of the constricted cardia and allowing ingesta to gravitate or spill into the stomach.

Ryer and Ryer (1980) reported that the treatment of patients

with acquired achalasia varied from conservative treatment (vertical feeding) to the surgical one utilizing the Heller's operation (esophagomyotomy). Personal communication with Dr. D.M. MacCoy, also was helpful, said that papaverine was not particularly helpful. He and coauthors advocated the modified Heller's operation for patients that not respond to the vertical feeding favorably.

Fouad et. al. (1985) preferred the suturing of the esophageal wall using 4/0 non-absorbable sutures using an everting single interrupted horizontal mattress pattern passing through the full thickness of the wall. While, *Berge and Westheus (1966)* preferred the longitudinal incision and mentioned that the esophageal wound should heal without suture, and if necessary, a drainage tube or strip of gauze could be inserted.

Dehoff (1987) mentioned also, that a transverse closure should be attempted for the induced longitudinal incision in the esophagus to prevent stricture formation. Some surgeons recommended always doing a transverse incision and closure.

Hoening, Mahaffey, Parnel and Styles (1990) stated that the prognosis of megaesophagus in cats was guarded and proposed the surgical correction but was associated with complications.

Singh, Sharma, Behl, Gahlot and Ghandna (1991) applied the

surgical treatment for megaesophagus (three cases), obstruction (two cases), rupture (two cases), stenosis and diverticulum (one case of each) in esophagus of buffaloes aged 4-6 years. All animals except three cases (one case of megaesophagus, one of obstruction and one of ruptured esophagus) recovered after the surgical procedure and the post operative care.

Ford, Schumacher, Chaffin, Vacek, Brumbaugh and Crossland (1991) treated the episodes of esophageal obstruction in colts by surgical excision of the diverticulum. The clinical signs were alleviated and the horse was able to resume a normal diet by day 6. After 9 months, the colt remained asymptomatic.

Basher, Hogan, Hanna and Runyon (1991) treated a case of congenital bronchoesophageal fistula in a dog by surgical operation under the effect of general anaesthesia. It was induced through thoracotomy at the right eighth intercostal space with the patient in the left lateral recumbency. The treatment aimed to be corrective by surgical exploration and division of the fistula. There was no observed complications.

STOMACH***The surgical affections:***

Misk (1992) classified the surgical affections of the stomach into, gastritis, gastric ulcer, gastric tumors, gastric foreign bodies, gastric volvulus and pyloric canal obstruction.

The surgical affections of the stomach mentioned by different authors in this study included, foreign bodies (*Annis and Allen, 1967; Gillette et. al., 1977; Kealy, 1987; and Kantrowitz and Biller, 1992*), gastric stenosis (*Peterson, Donawik, Merrit, Paker, Reid and Rooney, 1972*), gastric torsion (*Funkquist, 1979*), foreign body and gastric dilatation (*Annis and Allen, 1967*) and gastric dilatation volvulus (*Funkquist and Garmel, 1967; Parks and Greene, 1976; and Leib, Konde, Wingfield and Twedt, 1985*).

Becht and Byars (1986) found that there were four forms of the gastro-duodenal ulceration in foals. These were, silent ulcer (asymptomatic ulcer), active ulcer, perforating ulcer and pyloric or duodenal obstruction from a healing ulcer or from an ulcer relating stricture.

Rebhun, Dill and Power (1982) and also, *Gross and Mayhew (1983)* reported that some affected foals with gastro-duodenal ulceration were sensitive to palpation over the paracostal

regions or near to the xiphoid.

Bright (1987) mentioned that the chronic hypertrophic pyloric gastropathy (CHPG) which called pyloric stenosis was characterized by intermittent vomiting.

Wallace, Wilson, Halenda, Turk and Ross (1992) stated that the administration of certain drugs as the Non-Steroidal Anti-inflammatory Drugs (NSAD) repeatedly might be enough to convert the common harmless gastrolith into a potentially lethal one, as these drugs implicated in the pathogenesis of gastric ulcer in horses, a perforation may be created by the non-pathogenic gastrolith due to reduced level of protective mucus formation by these drugs.

The diagnosis of such affections:

The stomach usually contains some fluids and some gases. On the right lateral recumbency the gas is in the fundus and body, conversely, in left lateral recumbency the gas is in the pyloric antrum, as the gas in a hollow organ tends to rise to the highest point possible. On lateral view a line drawn through the fundus, body and pylorus may be perpendicular to the vertebral column, may be parallel to the ribs. The position of the stomach varies with respiration. On the ventro-dorsal view a line drawn through the fundus and pylorus will be perpendicular to the vertebral

column. The lateral and ventro-dorsal views were usually adequate as survey radiographs. (Kealy, 1987). He also mentioned that many foreign bodies are radiopaque and were therefore, readily seen on the plain films of the abdomen. Occasionally, radiolucent objects were encountered, they were best demonstrated using positive contrast although they are sometimes outlined by gas within the stomach. Small amount of barium should be used because of too much may obscure the outline of the foreign body. Pyloric dysfunction (as due to its obstruction by foreign body, hypertrophy, stenosis, pylorospasm, or neoplasia as well as hepatic and pancreatic masses pressure) led to retention of barium within the stomach for several hours, although in normal conditions, the barium should be seen in the duodenum within few minutes of administration.

Kantrowitz and Biller (1992) mentioned that the radiopaque foreign bodies (e.g. rocks & metallic objects) were readily detected in survey radiographs, non-radiopaque ones (e.g. corn cobs, fruit pits and cloth) might be detected by their characteristic luminal soft tissue appearance and abnormal gas patterns. survey radiographs might not detect non-radiopaque foreign bodies or partial obstructions that did not result in recognizable bowel distension.

Gillette et. al. (1977) reported also that the survey radiographs of the abdomen were adequate for detection of a

radiopaque foreign bodies. However, because survey radiographs would not reveal a non-radiopaque foreign bodies, a barium swallow was indicated.

Douglas and Williamson (1972) mentioned that the barium sulphate was preferred to be used in a concentration of 100% suspension for the examination of the stomach by the contrast radiography. While for intestine, the barium was administered in a more diluted form (as 25% solution). But for the examination of the large intestine, the barium was given by the enema rather than by the mouth. Also *Misk (1992)* stated that both of positive and negative contrast could be used for radiography of the G.I.T. but most studies were performed with positive one. Barium sulphate was the positive contrast used most often, although iodinated products were used in some instances.

Misk (1992) reported that the contrast radiography of the G.I.T. indicated for any alteration in the shape, size, or position of the stomach and intestine that could not be detected by plain radiography, for suspected complete or partial obstruction, radiolucent foreign bodies not noted on survey film, and for evaluation of the G.I.T. functions. While *Stowater (1980)* added that, if a primary gastric lesion was suspected, the radiographic study should include four views of the stomach, left lateral, right lateral, ventro-dorsal and dorso-ventral. Contrast study would also helping outlining foreign bodies, masses on

gastric wall, mucosal erosions or ulcerations and hypertrophic gastric rugae. Either a barium sulphate suspension or an organic iodine compound could be used as a contrast media, however, barium was more potentially irritating to the peritoneum than was organic iodine. When gastrotomy or enterotomy considered, organic iodine was to be used. The same was true when perforation of the stomach or bowel suspected. The disadvantages of organic iodine agents were their hypertonicity, irritating effect on the bowel, and poor coating of the mucosal surface.

Rebhun, Dill and power (1982) and also, *Gross and Mayhew (1983)* diagnosed the gastro-duodenal ulceration from its symptoms mainly their sensitivity to the palpation over the paracostal region or near the xiphoid, but the confirmation of the presence of ulceration was extremely difficult.

Bright (1987) diagnosed the pyloric stenosis by its characteristic intermittent vomiting and confirmed by radiography and endoscopy, where there was a polyp-like well defined mass.

Bartelsmann (1984) reported that the radiography was only useful for detection of severe abnormalities and preclude accurate quantification of gastric emptying.

Treatment of such affections:

Gohar (1975) reported that about 3/5 (60%) of the stomach

size could be excised and the dog could bear that efficiently.

Markowitz (1954) stated that removal of more or less of pyloric portion of the stomach could be done by tying the arteries and veins along the curvature and excising the required area between the clamps after freeing it from the greater or lesser omentum. The gastro-intestinal continuity was re-established by End-to-End anastomosis with the duodenum, this procedure was called Billroth 1 operation. The author also described Billroth 2 operation in which the gastric and duodenal stumps were closed and gastro-jejunostomy via Side-to-Side anastomosis was performed. However this procedure required three areas of suturing. The author also mentioned a third type of gastrectomy at which he implanted the duodenum of the dog into the stomach via End-to-End anastomosis using Connell suture, such procedure is called polya operation. After that, *Horsley and Branes (1957)* modified the Billroth 1 operation or technique, at which they resected $2/5$ and $3/5$ of stomach by clamping the stomach and cutting in between, the stomach wound was anastomosed to the duodenum which was fixed along the lesser curvature. Then, another modification for the Billroth 1 operation by anastomosing the duodenum along the great curvature of the stomach was carried out by *(Polak and Vojtisek, 1959)*, who mentioned that the modification gave the best results.

Temkin (1957) applied experimental pylorectomy on dogs and

rabbits. However, all of his experiments gave unfavorable results.

Douglas, Hall and Walker (1970) relieved surgically gastric lesions from 7 dogs by performing partial gastrectomy on 6 of them. They anastomosed the gastric remnant to the jejunum. All the patients survived post surgical interference.

Peterson, Donawik, Merrit, Paker, Reid and Rooney (1972) treated a gastric stenosis in a horse by performing a left thoracotomy and removal of the 8th. rib. Then incised the pleura and the diaphragm to expose the stomach where an incision was made in the gastric curvature and the affected portion was then removed. Then the stomach was sutured with 3 rows of the silk using simple continuous suture in the mucosa and 2 rows of horizontal mattress suture in the serosa.

Pearson and Henderson (1973) excised the lower part of the esophagus including the cardiovascular sphincter due to esophageal stricture complicating esophagitis and is replaced with gastric tube of esophageal diameter prepared from the greater curvature of the stomach simulating the relationships between the distal part of esophagus and the stomach which resulted after gastroplasty. The gastro-esophageal reflux could be prevented in the dog by interposing a gastric tube of esophageal diameter between the distal part of the esophagus and

the gastric fundus with at least 6 centimeters of the tube secured in an intra-abdominal position.

Samy (1974) mentioned that the application of sulphur compounds over the stomach after gastrotomy would not produce adhesions or side effects.

Bojrab (1975) stated that the stomach should be packed away (exteriorized) from the other abdominal organs through the laparotomy wound during gastrotomy or partial gastrectomy with warm, saline-moistened towels. An incision was made in the least vascular area between the greater and lesser curvature. After end of the operation, a Connell suture of 00 chromic catgut was used to close the first layer of gastrotomy incision. A layer of Halsted suture was used in the second row of closure.

It was difficult to produce with certainty permanent adhesions between the stomach and abdominal wall (*Dehoff, and Greene 1972; Betts, Wingfield, and Greene 1974; Wingfield, Betts, and Greene 1975; and Betts, Wingfield, and Rosin 1976*). While, *Funkquist (1979)* mentioned that fixation of the fundus after correction of gastric torsion by its simple suturing in the abdominal wall was not sufficient to achieve a permanent adhesion between fundus and abdominal wall. The increasing of the inflammatory reaction between them by any cause as thermocautery or diathermy insured no relapse occurred in operated animals

upon.

Fouad et.al. (1985) reported that the ventral approach through the midline or the paramedian incision was often preferred for laparotomy in canine. The incision was made large enough to admit the hand. They also reported that the gastrotomy was indicated for removal of foreign bodies from the stomach or the lower esophagus.

Annis and Allen (1967) indicated the gastrotomy to relieve foreign bodies from stomach or lower esophagus and to relieve pressure from gastric dilatation. They exposed it and after its packing off an incision in a relatively bloodless area parallel to the greater curvature, cut down to the mucosa with a scalpel and finish the incision with a scissors. An incision perpendicular to the greater curvature could be made if desired, the foreign body removed and the incision was closed with Lembert or Cushing suture pattern. On the other hand, *Tate (1987)* mentioned that the gastrotomy was best done midway between the greater and lesser curvature. With the incision placed parallel to the segmental gastric vessels, it had a rich blood supply and healing was rapidly.

Parks and Greene (1976) described the use of tube gastrostomy in dogs with gastric dilatation volvulus. An incisional gastropexy technique was also used in clinical cases without clinical recurrence of G.D.V.. Postoperative evaluation

was performed by physical examination, radiography, and occasional direct inspection at subsequent abdominal surgery.

Experimentally, *MacCoy, Sykes and Hoffer (1982)* made an incisional gastropexy that led to fibrous adhesions 6 months after surgery in healthy laboratory dogs. Also, *Fallah, Lumb and Nelson (1982)*, published experimental results with the circumcostal gastropexy, the gastric adhesions were demonstrated in all dogs.

Leib, Konde, Wingfield and Twedt (1985) evaluated 30 cases with gastric dilatation volvulus in dogs that had been surgically treated with circumcostal gastropexy that produced a long-lasting gastric attachment. It did not markedly alter the gastrointestinal functions.

Becht and Byars (1986) found that the fourth form of the gastro-duodenal ulceration (pyloric or duodenal obstruction) required surgical exploration and correction by gastro-duodenostomy, duodeno-jejunostomy, jejuno-jejunostomy, and gastro-jejunostomy. In spite of that, the patient survival had been limited because of re-obstruction, perforation and adhesions.

Probst, Schneider, Hubbell and Hart (1983) reported the successful surgical correction of a perforated gastric ulcer in

foals that was sealed partially by omentum and fibrous adhesions.

Bright (1987) reported the successful treatment for the pyloric stenosis (CHPG) which was the surgical one applying the Y-U pyloroplasty procedure. He also reported that the peptic ulcer could be diagnosed by radiographic study when an ulcer crater was present, and contrast study could demonstrate the mucosal defects. The surgical treatment was indicated when severe haemorrhagic, perforation, obstruction or a poor response to medical therapy occurred by partial gastrectomy or resection of the stomach wall containing the ulcer.

Funkquist and Garner (1967) considered the surgical methods to widen the gastric outlet in dogs with G.D.V. to accelerate gastric emptying which was found to be delayed in 6 dogs with G.D.V..

Stampley, Burrows, Ellison and Tooker (1992) reported that the tube gastrotomies alone or in combination with gastric dilatation volvulus disrupted normal gastric myoelectric activity more than the experimental gastric dilatation volvulus alone.

Van Sluijis and Vanden Brom (1988) studied the gastric emptying rate in dogs that had been treated surgically for gastric dilatation volvulus and also in another control group. They found that there was no significant differences between the gastric emptying rates and patterns in both groups. thus they

advised that there were no indications for pyloric surgery in dogs with this (G.D.V.) as there was no delayed gastric emptying rate in dogs after recovery from the G.D.V.

INTESTINE***The surgical affections:***

Stashak (1987) classified the pathology occurring within the large intestine into non-strangulating obstruction (NSO), strangulating obstruction (SO) and non-strangulating infarction (NSI).

Kantrowitz and Biller (1992) classified the intestinal affections into, functional obstruction not required surgery (as proximal enteritis, post-operative ileus and idiopathic ileus) and physical obstruction which required exploratory surgery including physical non-strangulating obstruction and physical strangulating obstruction (as volvulus, hernias, intussusception and neoplasms).

Annis and Allen (1967) indicated the enterotomy for removal of an intestinal foreign bodies in the absence of gangrene.

Berge and Wethues (1966) indicated the enterotomy for ileus that was caused by foreign body lodged in the intestine. The intestinal resection was indicated for neoplasia of the intestine, perforation or necrosis of the gut wall, torsion, foreign bodies, adhesions or intussusception which could not be corrected.

Shackelford and Dugan (1961) and Geib and Abrevaya (1965) reported that colotomy or colectomy were required as a surgical treatment for polyps of the gastro-intestinal tract.

Pearson (1971) mentioned that the intestinal intussusception either to be simple or compound.

Fellenbaum (1978) indicated the partial colectomy for recurrent megacolon in cats, colonic spasms and non salvageable injuries of the colon.

Dutoit, Homan, Smith, McShane, French, Denton and Merris (1981) found that the intussusception of small intestine had developed in dogs given renal transplants and in puppies given intrasplenic autographs of dispersed pancreatic fragments after total pancreatectomy. Factors contributing to the development of the intussusception in the puppies included, round worm infestation, recent dietary changes following weaning, malabsorption and diarrhoea due to pancreatic insufficiency following pancreatectomy, in addition to the respiratory infections suggesting an infective origin for the intussusception.

Speirs, van Venedal, Christie, Lavelle and Gay (1981) considered the possibility of traumatic haematoma, as well as the more dramatic rectal perforation, particularly if abdominal pain

become worse after rectal palpation when these haematomas acted as intramural mass obstructing the colon or rectum and may lead to perforation.

Fouad et. al. (1985) indicated the intestinal resection and anastomosis in either mechanical or strangulating obstruction of the intestine. On the other hand, *Tate (1987)* indicated the resection of the cecum and large colon in cases of infarction, intussusception, hypertrophy, torsion and strangulation.

Edwards (1986) studied about 27 horses of 310 undergoing laparotomy because of abdominal pain were found to have intussusception involving the small intestine (16) cases, and cecum (11) cases. After the surgical management of such cases, the author found that the ileal-ileal intussusception and ceco-cecal intussusception carrying a better prognosis than jejunal or ileo-cecal types that resulted in complete occlusion of the intestinal lumen and were accompanied by a greater degree of infarctive changes. The prognosis in these cases depended on the length of bowel involved but particularly up on the interval which elapsed between the onset of the clinical signs and the surgery.

White (1987) reported that the physical obstruction of the small intestine was due to an impaction or stricture caused by adhesion. While that of the large intestine was due to impaction

or displacement of the colon and /or cecum.

Wheaton (1987) reported that the intestinal obstruction either to be simple due to intraluminal masses, or be strangulated due to intussusception, volvulus and strangulated hernias.

Greene (1987) mentioned that the intestinal surgery or enterotomy in dogs and cats was usually for emergency-type conditions. It is indicated for partial or complete obstruction, traumas, intussusception, foreign bodies, neoplasm and for performing intestinal biopsies.

Tate (1987) mentioned that the surgical intervention was indicated for the abdominal diseases not respond to the medical therapy in equine, but it was contra-indicated when deterioration or devitalization of the bowel to the point that surgical correction would not resolve the problem.

Strombeck (1979) and Burrows (1980) reported that the acquired megacolon resulted from mechanical obstruction caused by rectal or colonic neoplasms, stricture, or extraluminal masses and from neurologic or endocrine diseases.

Vaughan (1974) reported that rectovaginal fistulae occurred in mares at parturition when one or two of the foal's feet

perforated the vagina and rectum. Some cases passed unrecognized in otherwise healthy mares and small defects even closed spontaneously by contraction. While, large recto-vaginal fistulae gave rise to faecal contamination of the vagina, secondary infections and infertility, straining and even rectal prolapse.

Orton (1986) found that the most of the patient in his study were able to maintain their pre-operative weight inspite of at times, prolonged period of no oral feeding that was through an enteral hyperalimentation via needle catheter-jejunostoma. The absolute benefit of enteral hyperalimentation via needle catheter-jejunostoma was difficult to prove because of many variables involved in each case.

Diagnosis of such affections:

Douglas and Williamson (1972) mentioned that the alimentary tract must be emptied by starving the patient and by giving laxatives or enemas if necessary for the investigation of suspected neoplasms, ulcers, or other small lesions of the bowel wall.

On plain lateral and ventro-dorsal radiographs of the abdomen, the small intestine could be recognized because of the mixture of food material and gas within it. The duodenum, is fairly fixed in position and was not seen on plain radiograph.

Jejunum and ileum, have a wide range of movement, they should be evenly distributed throughout the mid-ventral abdomen. They are readily displaced by other organs or by masses within the abdomen. Detailed studies required a contrast medium. On the other hand, the large intestine was seen on plain radiographs because of the feces and gases within it. Colon was seen with varying degree of clarity depending on its content, lies roughly parallel to the spine and ventral abdominal wall. On the ventro-dorsal view, the ascending colon was seen to the right side, while the descending colon was to the left. Cecum, was identified to the right of the midline because of its contents of some gases. The detailed studies required a barium enema, *Kealy (1987)*.

Palminteri (1966) used in addition to the rectal examination, the endoscopy and radiography using the barium, diatrizoate sodium and air as contrast media in the confirmation of the diagnosis of the lower part bowel polyps in dogs.

Shealy and Henderson (1991) stated that despite of early suspicion and intensive management, the mortality rate in canine intestinal volvulus was nearly 100%. Positive prognostic factors were not known and survival seemed fortuitous. Incidental diagnosis, rotation limited to 180°, and timely operative intervention were the factors associated with successful outcome, but they might be difficult to produce.

Radiographs provided substantiating evidence of intestinal intussusception, obstruction, or both (*Frimann-Dahl 1974*).

Stowater (1978) used two basic radiographic principles concerning studies of the gastro-intestinal tract using barium for full evaluation of the entire small intestine, and any abnormal areas of barium retention. The first was, the colon should be properly identified so it would not be confused with a distended loop of the small intestine. The second was, the study should be considered incomplete until most of the barium had reached the colon.

Wolfe (1978) diagnosed a case of compound intussusception in a kitten by a physical examination and confirmed by survey radiographs that demonstrated the soft tissue density of the intussusception and localized gaseous distension of the small intestine.

Quick and Rendano (1978) reported that the contrast enemas were indicated by chronic bloody diarrhoea, tenesmus and ileocolic intussusception. They were contraindicated following colonic wall biopsy or in suspected colonic ruptures or perforations. On the same time, *Misk (1992)* reported that the radiographic examination of the large intestine and colon was performed by rectal administration of barium sulphate, iodinated compounds, and/or air. Barium enema was indicated for colonic or

rectal neoplasia, granulomatous colitis, intussusception, and extraluminal mass lesions displacing the colon or involve it. And also for strictures and paralysis of the large bowel (*Gillette et al 1977*).

The abdominal radiographical examination with air contrast (pneumocolon) was used for examination of colon in cats suffering from megacolon. There was not any significant subclinical adverse effects of the subtotal colectomy in these cats *Gregory, Guilford, Berry, Olsen and Pederson (1990)*.

White (1987) reported that the diagnostic features of the physical obstruction of the small intestine due to impaction or stricture were the pain, distended intestine and massive distention of the bowel felt rectally.

Bright (1987) mentioned that the cecal inversion could be diagnosed by abdominal radiography, where a soft tissue density was seen in the region of cecum. There was absence of the gas-filled cecum in cases of plain films. While the use of barium enema was helpful and added immeasurably to the diagnosis, where, a radiolucent filling defect in the proximal colon was seen.

Rosin, Walshaw, Mehlhaffey, Matthiesen, Orsher and Kusba (1988) used the radiography for confirmation of the diagnosis of chronic constipation in cats non responsive to the medical

treatment and associated with idiopathic megacolon.

Kantrowitz and Biller (1992) mentioned that the survey, and when indicated, contrast radiographs could be useful in the evaluation of the vomiting patient. Radiography was most useful in evaluating obstructive disorders or lesions involving luminal filling defects as mass lesions or foreign bodies.

The radiographic contrast procedures were frequently employed to supplement or confirm the diagnosis obtained from survey radiographs. These procedures enhanced the visualization of individual organs and structures which were not adequately visible on survey radiographs. The contrast radiography was indicated for confirmation of suspected diagnosis, qualitative evaluation of organ function, and evaluation of the anatomy or integrity of an organ or structures (*Misk 1992*).

Treatment of such affections:

The philosophy of using two-layer inverting patterns in hollow organs originated in principles established for the small intestine in the early 1800s, when Lembert and Trevors stated that the serosa had healing properties superior to other tissue layers. They concluded that an inverting pattern was essential to create a tight serosa-to-serosa seal for a leakproof anastomosis and an adequate gain in wound strength. A two-layer inverting

suture, such as a Cushing followed by Lembert pattern is usually recommended (*Radasch, Merkley, Wilson and Barstad, 1990*).

Annis and Allen (1967) removed the intestinal foreign bodies by enterotomy as they isolated the loop and packed it off, then an incision of sufficient length was done to remove the foreign body. Sponging the incision and routine closure was then made. While *Tate (1987)* performed the enterotomy on the long axis along the antimesenteric surface. Prior to enterotomy, the bowel proximal and distal to the site was occluded with non-crushing clamps. This enterotomies could be closed with a single continuous inverting layer, a two-layer inverting pattern, or a one-layer interrupted pattern.

Berge and Westhues (1966) used enterotomy to treat the ileus caused by foreign body lodged in the intestine. The incision was made in the side opposite to the mesentery and in a healthy part. The schmieden's suture could be inserted quickly and easily and was particularly indicated for an intestine with very narrow lumen. It was also buried by a second Lembert sero-muscular suture. The post operative intestinal stasis was prevented by intravenous injection of 5-15 ml. of 10% solution of sodium chloride, immediately after the operation, a heart and circulatory stimulants were indicated also.

Falminteri (1966) accomplished the surgical removal of the

lower part bowel polyps in dogs per rectum by using tonsil snare, electrocautery, and ligation of the pedicle between clamps, and by segmental colectomy in some instances.

Shackelford and Dugan (1961) and Geib and Abrevaya (1965) used the midline incision extending from umbilicus to about 7.5 centimeters or more for colotomy or colectomy for treatment of polyps of the gastro-intestinal tract. Careful inspection of the entire intestinal tract followed laparotomy. Polyps found in the region of the ileum and jejunum considered for excision owing to their propensity to cause intussusception or haemorrhage.

McLachlin and Denton (1973) excised the entire intussusception and the bowel was repaired with an End-to-End oblique anastomosis, an omental patch was placed over the site of the anastomosis.

Pearson (1971) reported that the enterotomy of the intussusception allowed reduction of the lesion. Reduction, if possible was preferable to excision (*Wolfe, 1977*). While, *Edwards (1977)* added that if manipulation after enterotomy reduced the intussusception, the enterotomy should be closed with an inverting crushing suture pattern.

Samy (1974) reported that, it was not worthy that the application of a part of the omentum to cover the line of suture

ensured protection against spoiling of the peritoneal cavity and prevent adhesions between the line of suturing and the adjacent viscera.

Tate (1987) reported that the diameter differences precluded the use of an End-to-End anastomosis and supported the necessity of using a Side-to-Side anastomosis in equine. While *Bojrab (1975)* made the anastomosis of the intestine by End-to-End, Side-to-Side, or End-to-Side anastomosis. And *Fouad et al. (1985)* used the Side-to-Side anastomosis to avoid the possibility of stenosis and differences in the diameters of the bowel stumps. Both of them reported also that many dogs would tolerate loss of up to 80% of the small intestine if the ileo-colic valve was intact. While, when this valve was resected, not more than 50% of the small intestine could be resected. On the other hand, *White (1987)* mentioned that the amount of the bowel which could be safely removed during treatment of certain intestinal affections of equine was 50% of the total length. Removal of more than this could result in weight loss, and chronic malnutrition unless the diet was modified to substitute a highly digestible food stuff. It was cited also by *Tate (1987)* that an experimental work in ponies showed, at a point between resection of about 40 and 60% of the small intestine, malabsorption, weight loss and liver damage developed.

Wolfe (1978) reported that the enterotomy of the

intussusception allowed the reduction of the lesion. then. the enterotomy was closed with an inverting Cushing suture pattern. But, if the intussusception could not be reduced, or there was loss of vascular integrity, the involved bowel should be resected and the intestine was then anastomosed.

Fellenbaum (1978) used the partial colectomy and anastomosis of ileum to the descending colon for treatment of cases of recurrent megacolon in cats that did not respond to conservative treatment or therapy.

Dutoit, Homan, Smith, McShane, French, Denton and Merris (1981) advised that the early operative intervention was to be essential to save the dogs in cases of small intestinal intussusception. The treatment in this study was by manual reduction and in one case by intestinal resection and anastomosis after laparotomy due to irreducibility.

Speirs, va Veenedaal, Christie, Lavelle and Gay (1981) made exploratory laparotomy via the ventral midline. incision for resection and anastomosis of the colon and rectum to treat the traumatic haematoma that acted as intramural mass obstructing the colon or rectum.

Buchman, Weterman, Keighley, Pena, Allan and Alexander-Williams (1981) reported the most important role of the ileo-

rectal anastomosis after colectomy in the management of patient with Crohn's colitis.

Richardson; Duckett; Krahwinkel; and Shipman (1982) used two different techniques for colonic anastomosis in the dogs which were End-to-End simple interrupted crushing suture pattern and the End-to-End interrupted inverting (Connell) suture pattern using 3/0 dexon. They also reported that the crushing pattern had a comparatively weaker intestinal strength at 28 days post surgery but closure return to presurgical anatomy. The inverted pattern equaled normal intestine in bursting strength at the same time, but maintained a large degree of stenosis at anastomotic site. The adhesions were minimal and did not grossly interfere with mechanical function of the intestine. Generally, neither showed a clear-cut clinical superiority.

Donawick, Christie and Stewert (1971) did not recommend the resection of a section of ileum and its anastomosis to the remaining portion. If it needed to be resected, an occlusive and non-crushing clamp was placed across the ileum as close to the ileo-cecal junction as possible. An ileal branch of the ileo-cecal artery supplying the ileal stump should be ligated separately.

Wheaton (1987) treated the intussusception firstly manually after the exploratory laparotomy. If not succeeded, the incision

was indicated and reduction was occurred even after an intestinal resection and anastomosis using End-to-End, End-to-Side, or Side-to-Side anastomosis.

Greene (1987) mentioned that the surgical procedure of choice for treatment of megacolon was the subtotal colectomy with or without the removal of the ileocolic valve performing ileocolostomy, or colocolostomy respectively.

Rosin, Walshaw, Mehlhaffy, Matthiesen, Orsher and kusba (1988) used the subtotal colectomy and enterocolostomy in cats for treatment of chronic constipation associated with idiopathic megacolon, in which, the ileum or the distal part of the jejunum was joined to a 2-4 centimeters segment of distal portion of the colon by End-to-End anastomosis. After surgery, there were no significant abnormalities.

The ileocecal region thought to be an important barrier to the colonization of small intestine by large numbers of colonic bacteria. Its removal during subtotal colectomy predisposed a patient to bacterial overgrowth of the small intestine (*Strombeck, 1979*). Despite of the physiologic importance of the colon, clinical observation by *Bright, Burrows and Gorring (1986)* and others after removal of large portions of the feline colon and ileocecal region showed remarkably little evidence of abnormality.

Success had been reported in one case in which 70% of the colon including transverse and descending colon, was removed and an End-to-End anastomosis was performed (*Yoder, Dragsted and Starch, 1968*).

When megacolon was present, constipation responded poorly to the medical therapy. Surgical treatment was considered including longitudinal resection of a full-thickness segment of the colon wall (*Bruce 1959 and Leighton, 1978*).

Subtotal colectomy with preservation of the ileocolic valve or with its resection was successful in treating cats with chronic constipation (*Bright, Burrows, and Gorring 1986; Yoder et al. 1968; and Fellenbaum, 1978*).

Everting and inverting stapled End-to-End triangulation methods of small intestinal anastomosis, similar to those performed in human resulted in significant adhesion formation in horses and therefore, were not recommended (*Sullins, Stashak and Mero 1985; Bristol and Cullen 1989; as well as Pascoe and Peterson 1989*). On the same time, *Bristol and Cullen (1989)* found that little or no advantages to performing an inverting, triangulated, stapled anastomosis comparing to the previously reported results using an everting technique.

The usage of an End-to-End stapling devices was limited to

young horses and ponies, due to the small diameter of the resulting anastomosis, there was not postoperative colic and the adhesion involving 23% of the circumference of the bowel at necropsy despite the inverted nature of the anastomosis (Robertson-Smith and Adams 1987).

Van der velden (1989) advised that the intussusception could be corrected by simple reduction as the wall of the intestine was judged to be viable. But if the judgement was to be inviable, anastomosis after resection was indicated. He found that the post operative hernia (ventro-abdominal hernia) might be the result of both laparotomy wound infection and the partial cutting of the suture during the violent recovery from anaesthesia.

Dyess, Curreri and Ferrara (1990) applied a new technique for intestinal anastomosis through a prospective, randomized, clinical trial using the Biofragmentable Anastomosis Ring (BAR) which is a device composed of absorbable polyglycolic acid (dexon) and barium sulphate had been designed for performance of sutureless colonic anastomosis. The use of this BAR was compared with conventional technique where the authors concluded that, the BAR was a rapid, safe and not time consumer during the operation. The only drawback was the long-term follow-up of the BAR patients that would be necessary to identify the incidence of complications as stricture and stenosis.

Exploratory surgery with reduction of the intestinal obstruction by manual extraluminal massage yield the best prognosis. If resection and anastomosis or bypass of the ileocecal junction (ileocecostomy or jejunocecostomy) was required to relieve the obstruction. The prognosis for survival was not as good (Parks 1989).

Sandh (1991) modified the cutting thread technique for intestinal anastomosis using diathermy. The use of diathermy with application of steering sutures, eliminated the main disadvantages of the original cutting thread technique which were, uncontrollable traumatization of the intestinal wall, risk of cutting of the suture, and severe bleeding from vessel in the intestinal wall.

Eric Mueller, Parks and Baxter (1992) reported that if more than 50% of the small intestine was non viable and would require resection, euthanasia should be considered because of the problem of post operative malabsorption, weight loss, and liver damage. The small intestinal resection and anastomosis in horses was accomplished using either traditional sutures or intestinal stapling devices. Although there were many techniques for End-to-End anastomosis, we preferred a two layer anastomosis using 2/0 synthetic monofilament absorbable suture materials in a simple continuous pattern in the mucosa, followed by a continuous Cushing or Lembert in the seromuscular layer.

Baxter, Hunt, Tyler, Parks and Jackman (1992) made two different techniques for intestinal anastomosis in horses which were, hand sutured End-to-End, and stapled Side-to-Side small intestinal anastomosis. There were no significance differences in operating times, stomal areas, histo-pathological scores, or intra-abdominal adhesions in the horses. Both techniques should prove useful for intestinal anastomosis in the horses.

Corman, Pregar, Hardy, Bubrick, and the valtrac (BAR) study group (1989) made a comparison of the valtrac Biofragmentable Anastomosis Ring (BAR), which is a special device composed of absorbable P.G.A.(dexon) and barium sulphate that designed for performance of sutureless intestinal anastomosis, with conventional suture and stapled anastomosis in colon surgery, as the BAR could effect the re-establishment of the intestinal continuity somewhat more rapidly and permitted an uniform applicability to all areas of the intestinal tract, while the primary drawback was its lack applicability to the low rectal anastomosis.

In European study there was a trend towards decreased anastomotic failure (*Cahill, Betzler, Gruwez, Jeekel, Patel and Zederfeldt, 1989*).

On the same time, both of *Dyess, Curreri, and Ferrara (1990)* used a new technique for sutureless intestinal anastomosis using the BAR with its comparison to the conventional technique. They

concluded that, the BAR was a rapid, safe method and not time consumer. The only drawback was the long-term follow-up of the BAR patients post operatively to identify the incidence of complications as stricture and stenosis.

The data obtained from a prospective, randomized trial of the BAR was a safe and satisfactory alternative to the sutured or stapled colorectal anastomosis. As it allowed the operator to make a completely inverted anastomosis within the abdominal cavity, also the stricture formation which was the late problem had not been a problem with the application of this device. *Bubrick, Corman, Cahill, Hardy, Nance, and Shatney (1991).*

Bone, Duckett, Patton, and Krahwinkel (1983) used two different techniques for evaluation of anastomosis of small intestine in dogs applying the crushing and non-crushing suture techniques, and based on the results of these evaluation, both techniques were successful and appeared to be of equal value and recommended for use in small intestinal anastomosis in dogs. The only variation was during evaluation of the luminal diameters at the anastomotic site that revealed that slightly more stenosis in the non-crushing technique. The authors also reported that the single-layer approximating pattern was preferred for anastomosis of the small intestine at the university of Tennessee Veterinary Teaching Hospital Small Animal clinic. While *Tate (1987)* mentioned that the one-layer appositional crushing or Gambee

techniques were the most popular for End-to-End small intestinal anastomosis, although some preferred a two-layer closure with simple continuous apposition of the mucosa and a second continuous or interrupted Lembert layer that slightly invert the seromuscular layer.

A comparison had been made of inverting versus everting, inverting versus approximating and everting versus approximating pattern. The studies revealed that the approximating patterns had found to be superior in most of the variables evaluated, *Bone et al (1983)*. On the other hand a comparative study was made between End-to-End simple interrupted crushing suture pattern and the End-to-End interrupted inverting (Connell) suture pattern using 3/0 dexon. The crushing pattern had a comparatively weaker intestinal strength but a closer return to presurgical anatomy. While, the inverted one equaled normal intestine in bursting strength, but maintained a large degree of stenosis at anastomotic site. The adhesions were minimal and did not grossly interfere with mechanical function of the intestines. Neither showed a clear-cut clinical superiority, *Richardson, Duckett, Krahwinkel, and Shipman (1982)*.

An other comparison of three techniques for anastomosis of the small intestine in the horse was made by *Dean and Robertson (1985)* and their study revealed that the two-layer inverting technique of the small intestinal closure was superior to the

single-layer technique because of its reduced incidence of adhesions, with maintenance of adequate lumen diameter.

It was cited by *Dean and Robertson (1985)* that the intestinal anastomotic techniques were classified as to whether they invert, evert, or oppose the incised edges of bowel. As whether they were performed in single or double rows.

The single-layer opposing suture patterns in dogs had the advantages of excellent apposition of intestinal layers (*Dehoff, Nelson, and Lumb 1973; Bennett, and Zydeck 1970; Reinerston 1976; as well as Loeb 1967*).

Halsted (1887); Jensen, Becker, Brummelkamp (1981); as well as Lord, Valies, and Broughton (1977) agreed that the submucosal layer should be incorporated into the suture line of intestinal incisions. On the same time, although the double-row inverting pattern was thought of as the 'standard' surgical anastomosis, *Halsted* wrote in 1887 that, more than one complete row of sutures was unnecessary.

The safety of bowel anastomosis in irradiated tissues using a canine model was examined by *Smith, Bubrick, and Mestitz (1988); Schauer, Bubrick, and Feeney (1982); Bubrick, Rolfsmeyer, and Schauer (1982) as well as Blake, Bubrick, and Kochsiek (1984)* and the study demonstrated the safety of low anterior anastomosis

with low (2000 rad) and moderate (4000 rad) levels of irradiation exposure. While the studies with high level (6000 rad) of irradiation demonstrated leak rates of 70-80 % for stapled and hand sewn low anterior anastomosis.

The safety of the BAR was assessed by its using in bowel anastomosis in dogs those were pre-operatively irradiated with the equivalent of 6000 rad. The results suggested that the BAR added safety to an anastomosis after pre-operative irradiation, whether, this effect was due to the traumatic technique of placing the device, improved blood flow to the anastomotic margins, or other factors those still undetermined (*Croston, Jacobs, Kelly, Feeney, Johnston, Strom, and Bubrick, 1990*).

For cecal impaction in horses, surgical infusion and massage had not proven effective. Enterotomy and evacuation appeared to be more effective (*Campbel 1984*). While, *Ross (1986)* had poor results with enterotomy and evacuation and used Side-to-Side anastomosis of the cecum to the right ventral colon appeared to offer the best option.

Resection of the affected region of the cecum with non-strangulating infarction and up to 2/3 of its size could be removed, or even complete typhlectomy with ileo-colostomy (*Foerner 1982*).

Treatment of cecal intussusception involved reduction and partial typhlectomy, an enterotomy in the right ventral colon could be performed to reduce it (*Robertson and Johnson, 1980*).

Despite of the prognosis of the surgical treatment of enterolith and foreign body of the large intestine was fair provided that there was minimal damage to the bowel and the abdomen was not contaminated during enterotomy and retrieval of the objects (*Boles 1977; Blue 1979 & 1981; Gay 1979; Foerner, 1982; and Stashak, 1982*). There were four approaches applied by *Gay (1979) and Tylor (1979)* to remove an enterolith or foreign body, which were, enterotomy adjacent to the object. Remote enterotomy at the diaphragmatic flexure using the gloved arm for retrieval, retrograde manipulation, and retrograde flushing.

The routine repair of recto-vaginal fistulae was left at least 6-8 weeks after parturition, by this time the defect would have contracted and the wound edges would be clearly defined (*Vaughan, 1974*). A new modified method for repairing a recto-vaginal fistulae in mares was done through the vulva leaving the anus and perineal body intact under the effect of general anaesthesia (*Hilbert, 1981*).

Robertson (1982) reported that the abdominal adhesions rarely caused post operative complications in dogs. However, adhesions involving the small intestine of horses might cause

colic and obstruction.

Early investigators believed that removal of more than one third ($1/3$) of the small intestine is fatal, and the danger increased when the resection progresses toward the stomach (*Senn, 1903*).

Recently, various reports in the literature indicated that removal of large portions of small intestine is not incompatible with life (*Brezin, Oren, 1952 and Althausen, et. al., 1950*).

TISSUE REACTIONS

Fouad et al. (1985) mentioned that all sutures produced tissue reactions that lasted at least 5 days. This was due partly to the trauma of passing the needle and suture materials through tissues and partly to the physicochemical properties of the suture materials. Synthetic monofilament sutures produced less tissue reactions than multifilament sutures, while catgut produced the greatest reactions. The tensile strength of the polyglycolic acid was greater than that of the surgical gut, silk and cotton.

Varma, Johnson, Ferguson and Lumb (1981) reported that the cellular reactions varied with the suture materials. There were large number of neutrophils indicating local infection in wounds containing plain catgut, chromic catgut, silk and braided Dacron. While with nylon, steel and polyglycolic acid (Dexon) the numbers of neutrophils decreased rapidly.

Ee, R.T.van, Nasisse, Helman and Sanders (1986) studied the effects of monofilament polyglactin 910 and nylon on standardized perforating perilimbal clear corneal wound healing. The results showed that the inflammatory responses were similar. Epithelization and suppuration around the suture tracts were observed more frequently when polyglactin 910 was used. Both nylon and polyglactin 910 were associated with a foreign body

(granulomatous) response. The authors advised that, the corneal tissue suture materials studied should remain in place for at least 16 days, and the absorbable ones were only appropriate if it retained tensile strength for 16 days.

Guessada, Bernis, Guimaraes, Araujo and Cordose (1987) strongly advocated the use of cotton on single layer extramucous suture of the stomach wall of the dog, as it produced a very discrete or even no reaction at all. On other hand, plain catgut produced a high degree of inflammatory reaction, and its use in gastrorrhaphy of dogs was considered inadvisable. The comparison was between the surgical gut, nylon, silk and cotton.

Freeman, Pettit, Robinette, Lincoln and Person (1987) studied the tissue reactions to the suture materials in feline linea alba. They found that the least inflammation occurred when the linea alba was sutured with polyglactin 910 and the subcutaneous tissue were not sutured. Rather than when it was sutured with surgical gut and polydioxanone with and without subcutaneous tissue closure.

AL-Dahash, AL-Sultan, Yasin and Singh (1990) used a three techniques of suturing and three suture materials which were chromic catgut, silk and nylon by single-layer inverting suture, double-layer inverting suture and Schmieden's technique. The authors found on days 7, 14 and 21 an omental adhesions more

marked with Schmieden's technique and around suture of catgut rather other suture patterns and other suture materials. All sutures induced varying tissue reactions with peak on day 7. However, reactions were more intense to catgut and were least to nylon. While at latter stages, reaction to catgut remained the same but regressed progressively to nylon. Initially, neutrophils were the predominant cells, but later, macrophage and fibroblasts predominated. Occasionally, plasma cells, lymphocytes, esinophils and giant cells were seen. The healing was better where nylon and silk were used as suture materials.

Hickman and Walker (1980) reported that the plain catgut subjected to rapid disintegration (within 3-7 days) and produced intense inflammatory reactions and lost its tensile strength very rapidly. Therefore, it should not be used when the tissue layers are subjected to tension. The plain catgut caused more tissue reactions than the chromic. It was seldom used except in plastic surgery and for ligating small blood vessels. Chromic catgut was the most universally used catgut, it was used to ligate blood vessels, co-apt muscles, fascia and for suturing of peritoneum, stomach, intestine and urinary bladder. Dexon might be used in all body tissues both buried and a skin suture and it produced minimal tissue reactions. The braided nature of it was slightly abrasive and might have a sawing effect on chronically inflamed tissues, making it less suitable than catgut for intestinal anastomosis and bladder surgery.

Sharma, Kumar and Singh (1986) used the polyglycolic acid and catgut in clean and contaminated experimental wounds either treated or untreated. They found that dextron sutured wounds exhibited slightly higher values of tissue hexosamine than catgut sutured wounds. A steady rise in tissue hydroxyproline and collagen was observed in all the groups of animals up to 30 days.

MATERIALS AND METHODS

The experimental animals used in this work were 44 dogs (stray dogs) males and females of different ages ranged from few months to about 10 years and their body weight ranged from 5-30 kg., their feeding stuffs were bread and restaurant's remnants. They were clinically examined for any infectious or zoonotic diseases (as they kept before study for about 15 days as a period within which any clinical signs of a disease could be detected). The all were clinically healthy and subjected to this study.

The dogs were grouped into two main groups (table 1), the first included 4 dogs used for the radiographical study of the normal G.I.T. by plain and contrast radiographs, with special reference to the suitable time for contrast radiography. The second group (40 dogs) was subdivided into two subgroups, the first subgroup included 20 dogs was used for radiographical study (using different views) of the experimentally affected dogs with different foreign bodies (f.b.) of different sizes. These f.b. included sharp f.b. (needles, nails & scalpel blades) and blunt ones (coins, vials, rubber pieces & tennis ball). These f.b. were introduced to the animals by two ways, the first was through the mouth manually using forceps and in the food stuff. The second way by passing of the f.b. through the abdominal wall from exterior. A surgical operations for the treatment of such affections using different suture materials to evaluate which one(s) is better after visual and microscopical examination was

Table (1) showing the animal grouping, or the number of dogs used for different operations :

group	no.	different operations
First	4	plain and contrast radiographs of normal G.I.T. of dogs.
Second	40 divided to :	
Subgroup (1)	20	surgical treatment of f.b. and using of prolene, mersiline, plain catgut, chromic catgut and dexon as sutures.
Subgroup (2)	20 divided into :	
	2	longitudinal esophageal closure.
	2	transverse esophageal closure.
	2	gastrectomy of 25 % of stomach size (5x15cm ²).
	2	gastrectomy of 30 % of stomach size (5x20cm ²).
	2	gastrectomy of 50 % of stomach size (10x15cm ²).
	2	resection* of 0.5 meter of intestine.
	2	resection of 1 meter of intestine.
	3	resection of 1.5 meters of intestine.
	3	resection of 2 meters of intestine.
Total	44	

* The intestinal resection was ascending beginning from jejunum.

The second subgroup included the rest 20 dogs, was used for experimental surgical studies on the esophagus including exposure, esophagotomy by longitudinal incision and closed by longitudinal closure (2 dogs) and transverse closure (2 animals) and the resulted stricture degree was recorded. On the stomach, a partial gastrectomies for different parts of the stomach size was done. A flap of 5x15 dimension representing about 25% of stomach size, flap of 5x20 dimension representing about 30% of its size and flap of 10x15 dimension representing about 50% of stomach size. On the intestine, an ascending resections of 0.5, 1, 1.5 and 2 meters of its length beginning from the jejunum. The health condition of animals were evaluated following surgery. This evaluation was done by recording of the animal appetite, the psychic condition, temperature, pulse and respiration.

For radiography, the materials used were:

X-ray machine, of a power of 90 KV and 200 mAs. The doses used during radiography differed according to the animal body weight, organs to be studied, and the nature of the study if was plain or contrast, and it ranged from 40-65 KVs and 10-25 mAs.

The x-ray films*, of the size 14 x 17 inches (35 x 43 cm) and 10 x 12 inches (22.5 x 30 cm).

The contrast media, we aimed to use two media in this study which were:

* Agfa curix-Belgia.

1- Barium sulphate* powder, used as a positive contrast in form of barium paste for the esophagram using rubber stomach tube or by its putting in the buccal pouch, in form of suspension as 100% weight per volume (W/V) for the gastrogram, and in form of solution up to 50% W/V for the enterogram, by drenching bottle and mixed with milk. It was used also to evaluate the degree of stenosis resulted after using of different sutures for intestinal anastomosis in form of a solution injected in the loop that had the seat of anastomosis after euthanasia.

2- The air, used as a negative contrast for the same aforementioned purpose (determination of the degree of stenosis after healing of the intestinal anastomosis) that was applied on intestinal loop after euthanasia.

3- Urographine**, is an organic iodinated preparation to be used when there is suspicion of perforation of the G.I.T.

The methods of the radiographical procedures included the following points:

* Preparation of the animals for radiography, that by fasting not less than 12-24 hrs. but had free access to water up to 1 hr. before radiography of the G.I.T. particularly the contrast one (*Douglas and Williamson 1972; Quick and Rendano 1978; and Kealy 1987*). A rectal enemas used prior to the contrast study of the colon by barium enema using worm water or saline.

† El-Nasr for pharmaceutical & chemicals co.

** Amp.20 al, Shering AG Berlin/Bergkamen.

* The control of animals during radiography was performed by their sedation (2 dogs) and general anaesthesia (another 2 dogs). The sedation was done using the propionyl promazine* as a tranquilizer in a dose of 0.2 mg. / Kg.B.wt. injected intramuscular. While the anaesthesia was conducted by using of thiopental sodium** (4%) in a dose of 20 mg./kg. body weight injected intravenously, that was priored by combelen injected intramuscular. The animals were controlled in addition by two assistants during radiography.

* The different views used: Table (2) shows the different views used which differed according to the organ to be studied :

organ	views
Neck (cervical esophagus):	lateral view ventro-dorsal view. dorso-ventral view. oblique view.
Chest (thoracic esophagus):	lateral view. ventro-dorsal view. dorso-ventral view.
Abdomen (stomach & intestine)	lateral view. ventro-dorsal view. dorso-ventral view. __

* Combelen (Bayer)

** Nesdonal (Specia-Paris).

* The time of contrast radiography differed according to each organ :

For the esophagram, immediately after swallowing, then 10 & 20 minutes after swallowing.

For gastrogram and enterogram, the x-ray procedure was done 15 minutes, 30 minutes, 60 minutes, 2 hrs., 3 hrs.,.....up to 20 hrs. till the excretion of the barium through the anus.

For contrast study of the colon, there were two techniques, the first was the continuation of the enterogram, that needed to longer time up to over night, the second was by the using of barium enema after the application of the rectal enema, that was done immediately after enema and then 15 minutes after.

For the surgery:

The surgical approach was done in the following steps

* **Pre-operative technique**, that included the animal fasting 12 hrs. before surgery particularly for operations in the bowel. determination and preparation of the seat of surgery for each organ as follow :

* **Esophagus**, by ventral approach of cervical part.

* **Stomach and intestine**, by laparotomy in the ventral abdominal wall from the xiphoid to the pubic prim including the umbilicus (cranial, middle and caudal laparotomy). The seat was clipped, shaved with razor, washed with water and then smeared with 2% tr. iodine in one direction beginning from the line of incision then extended to the periphery.

Anaesthesia :

There were two methods for anaesthesia, the first was by intravenous injection using 5% thiopental sodium in a dose of 20-30 mg./ kg. body weight priored by propionyl promazine by intramuscular injection about 15 minutes before in a dose of 0.2 mg./kg. body weight. The second was by using of ketamine hydrochloride* in a dose of 10 mg./ kg. body weight intramuscular, priored by zylazine hydrochloride** in a dose of 0.3 mg./ kg. body weight intramuscular by about 15-20 minutes.

Operative technique, included these points :

* Incision, that was done by using of a scalpel, the wound was wide enough.

For esophagotomy, the ventral exposure of the cervical esophagus along the whole length of the neck was done. A midline incision at the ventral surface of the neck was made through the skin. The two sterno-hyoid muscles were separated from each other by blunt dissection. The trachea was well exposed, and from its left side the esophageal wall was lifted by two sutures passing through it (Misk and Hifny, 1976). Then punctured by a scalpel and the incision completed by a scissor. The incision was made, longitudinally including the whole layers of esophagus (adventitia, musculosa and mucosa).

* Ketalar (Parke-Davis, S.A., Barcelona-Spain).

** Rompun (Bayer).

For laparotomy, the median (linea alba), and paramedian incision were used.

For gastrotomy, to remove a foreign body, the stomach grasped through the laparotomy wound as possible, then the incision was made in the greater curvature (most avascular part) by puncturing of the wall using a scalpel then completed by a scissor. The foreign body was then removed by long forceps.

For partial gastrectomy, the part to be resected was determined, isolated by long untoothed forceps. All blood vessels supply this part was ligated to avoid haemorrhage. Then removed by a scalpel or a scissor.

For enterotomy, to remove a recent foreign body (as the wall of intestine was still healthy), the seat of the foreign body was determined. The intestinal loop was exteriorized through the laparotomy wound. Then caught from both ends few centimeters away of the seat of incision using two intestinal forceps after pushing of the intestinal content away to avoid its leakage to the peritoneal cavity during incision causing peritonitis. An incision was done at the antimesentric aspect closely caudally related to the foreign body that was then removed by suitable forceps.

For intestinal resection and anastomosis, we measured the length to be resected, closed the intestinal loop from both ends as with enterotomy. The mesenteric blood supply of this segment was then ligated by chromic catgut making double ligations to cut in between to avoid haemorrhage. The loop was then removed and

the two stumps were prepared for anastomosis.

* **Wound closure.** the hollow organs closed by using of different suture materials sized 2/0 that included plain catgut, chromic catgut, and dexon (P.G.A.) as absorbable suture materials and prolene, as well as mersiline as a non-absorbable suture materials. The suture pattern used in case of esophagus and stomach was inverted pattern using double row of Cushing pattern. While for intestine the pattern was one row of inverted suture using of Cushing pattern. The End-to-End anastomosis was the technique used after intestinal resection.

The abdominal wound was routinely closed after powdering of the seat of suturing with sulphanilamide* to save guard against adhesion of the abdominal contents (*Samy 1974*). The peritoneum closed by simple continuous suture using catgut 2/0. In addition an antibiotic suspension was injected in the peritoneal cavity to avoid the peritonitis. The muscles sutured by 00 chromic catgut using interrupted pattern, then the skin using silk number 1 was closed by either simple interrupted or horizontal mattress. In addition, a staying stitches or covering suture applied to protect the primary skin suture using a piece of gauze for 2-3 days.

Post-operative care, the food was withheld for the first two days post surgery allowing water intake, and replaced the feeding by fluid therapy using Dextrose** 5% or 10% by subcutaneous

* & ** EL-nasr for pharmaceutical and chemicals co.

injection in a dose of 100-200 ml / day, also 10 ml Cal-De-Mag* and 10 ml normal saline** were given daily for the first two days post surgery by intramuscular and intravenous respectively. A course of antibiotic using 400,000 i.u penicillin and 0.5 gm streptomycin*** as a daily dose used for successive 3 days.

Collection of samples for histopathology:

After healing took place, we examine the macroscopical appearance of the seat of surgery at different times (1, 2, 3, and 4 weeks) and a part of sutured organ including the seat of sutures and a healthy part collected in form of flap 5x10 cm. or in form of tube 5-10 cm. length, that ligated from both ends after washing in buffered formalin 10% and injected with the formalin and sent for microscopical examination by histopathological techniques.

Euthanization of the experimental dogs was done by using over dose of thiopental sodium, about 60 mg./ kg. B.Wt. injected intravenous.

† Bottle 500 ml (Pfizer).

** Normal saline (EL-nasr for pharmaceutical and chemicals co.).

*** Neobiotic vials (the Nile co. for pharmaceutical & chemicals industries).

RESULTS**Radiographic studies :**

In this radiographic study the plain x-ray films, did not show the normal esophagus (fig. 1) as it was empty and collapsed.

The contrast x-ray films gave the chance for evaluation and examination of the shape, where the mucosal folds appeared as a longitudinal streaks. The size, about 2-3 cm. in diameter & about 40-60 cm. length. And the course of the normal esophagus, as it begins dorsal to the trachea, then to the left at the thoracic inlet and again to the dorsal at the mediastinum (fig. 2 & 3).

The radiopaque foreign bodies (that of high density and of high atomic number, as the metal objects as nails, needles, coins and bones) were easily and clearly seen in the plain radiographs of esophagus (fig. 4, that shows a radiopaque sharp foreign body, and fig. 5, that shows a radiopaque blunt foreign body). While the radiotranslucent ones (those of low density and low atomic number as the rubber objects, wood, clothes and plastics) did not appear in the plain radiographs except those filled with air (as tennis ball) and/or make great dilatation to the esophagus (fig. 6). These caused retention for barium and appeared as a filling defect when we used the contrast radiographs (fig. 7 & 8).

The contrast study had no role in the evaluation of the

radiopaque foreign objects, due to the similarity of the density of both of the subjects and the contrast media, in the time that they were evaluated easily by the plain films on contrary to the radiotranslucent objects.

The foreign bodies that had been taken orally were not retained for long time in certain areas in the esophagus, except 4 cases which retained at the cervical part of the esophagus near the pharynx and near the thoracic inlet (fig. 4, 5, 6 & 8).

The suitable time for contrast study of the esophagus (during esophagram) was directly after the swallowing of the barium paste, and not exceed 5-10 minutes later (fig. 2 & 3).

In this radiographic study, the position and size of the normal stomach could be clearly determined caudal to and in contact with the liver within the rib cage in the plain radiographs due to the presence of gases (fig. 1 & 9).

The rugal folds of gastric mucosa appeared clearly in normal empty stomach by using of small amount of barium. Therefore, the presence of any ingested materials or large amount of water in the stomach is better to be avoided to insure full evaluation and examination (fig. 10).

In 10 cases of the all 16, the foreign bodies that had been

taken through the mouth were localized in the stomach without any dangerous effect to the animal behavior or animal health as it ate and defecated normal for a long time particularly when the foreign body was blunt (fig. 11). The sharp ones caused some troubles (fig. 12). While the 4 cases that passed through the abdominal wall from the exterior and punctured the alimentary tract from anywhere caused peritonitis and death when not removed surgically as rapidly as possible. These foreign bodies caused a case of discomfort to the animal and made its motion limited.

For the gastrogram, the suitable time was about 10 minutes after the administration of the barium suspension and extended to 1 hour in the anaesthetic animals (fig. 13 & 14). The gastrogram added more information about the stomach position, as its axis is vertical in lateral view and is horizontal in ventro-dorsal view.

The contrast radiographs showed that they are able to measure the size of the stomach after partial gastrectomy giving an idea about its condition after the operation (fig. 15). It is also considered as a guide for detection of presence of fistulae in stomach or intestine after surgery.

In this radiographic study, the normal small intestine did not appear in the plain radiographs, but its position is predicted in the area between the stomach anteriorly and colon posteriorly (fig. 9 & 11). The small intestine appeared in the

contrast radiographs (fig. 16, 19 & 20).

The sharp foreign bodies that passed through esophagus to stomach rarely pass to the intestine except four cases and caused more troubles (fig. 17 & 18 & fig. 14).

For the enterogram, the suitable time was not less than 30 minutes after administration of barium solution and extended till the barium excretion. In the generally anaesthetized animals the time was prolonged to about over night (fig. 16, 19 & 20).

In this radiographic study, the colon examination by x-rays without contrast was possible (plain radiography) due to presence of some gases (fig. 21). But for the colon examination by the contrast study, using the 1st. technique (the continuation of the enterogram), the suitable time was not less than 3-5 hours in the tranquilized non-anaesthetized animals (fig. 22). The time was elongated to about 12-20 hours in the generally anaesthetized animals (fig. 23 & 24). The 2nd. technique (through the rectum using rectal enema with barium as a contrast media) which was rapid and easily applied, the radiography was better done immediately after the barium enema (fig. 25 & 26) and not after to avoid the rapid excretion of the barium.

The plain radiographs had poor job in perfect determination of the seat of a radiopaque objects in the abdominal cavity, if

was in the peritoneal cavity or inside the alimentary tract. Such objects that entered through the skin from exterior and may pinch the intestine, these are perfectly determined by exploratory laparotomy (fig. 21 & 27).

The different radiographic views (ventro-dorsal and dorso-ventral) in addition to the lateral one had no effect on the shape, characters, or even on the accuracy of the radiographs, but only the possibility and feasibility of the animal control was the point taken in the consideration. The suitable views were concluded in the following table:

Table (3): shows the different suitable views for different organs.

Anaesthetic animals	Non-Anaesthetic animals
# Cervical esophagus :	# Cervical esophagus :
1- lateral view.	1- lateral view.
2- ventro-dorsal view.	2- dorso-ventral view.
3- oblique view.	3- oblique view.
# Thoracic esophagus :	# Thoracic esophagus :
1- lateral view.	1- lateral view.
2- ventro-dorsal view.	2- dorso-ventral view.
# Abdomen :	# Abdomen :
1- lateral view.	1- lateral view.
2- ventro-dorsal view.	2- dorso-ventral view.

The x-rays (with barium) gave an information about the condition of the mucosa in some area of the G.I.T. (fig. 10 and fig.15).

The contrast radiographs using positive contrast (barium) or negative one (air) had a role in evaluation of the different patterns of anastomotic techniques according to the degree of the related stenosis at the seat of anastomosis, and there was no significant differences in the lumen diameter after healing when we used different sutures (fig. 28).

Surgical studies :

The anaesthesia used in the second technique (Rompun & ketalar), was better than that with the first technique (using Combelen & Nesdonal), as it was easier in techniques (intramuscular injection instead of intravenous), but the recovery was rapid within 40-60 minutes within which the aimed operation might not be completed rather than the recovery after Nesdonal that retarded to an enough time giving a chance for the quite and successful surgery.

Esophagus :

The transverse closure may be indicated in cases of small incisions of the esophagus than the longitudinal one that caused more stenosis in the lumen by visual examination after closure. That is inspite of the more difficulties to apply this technique.

Stomach & intestine :

The foreign bodies passed orally made in many cases a severe troubles that varied according to the nature of them. In the sharp ones, the severity was more and appeared in form of partial loss of appetite, depression, isolation in a corner and vomition particularly after eating.

After gastrotomy and enterotomy for removal of the foreign bodies, the animals were examined macroscopically at 7, 15, 21, and 30 days post surgery. Healing was better at each time particularly at day 30 and day 21 where the seat of surgery determined with more difficulties by gross examination unless the sutures used were non-absorbable. While at day 15, the healing was good although the suture materials were still present not absorbed particularly the dexon of the absorbable ones and all non-absorbable sutures. At day 7, the healing in some instances was incomplete as the most sutures were still found not absorbed. The healing after the use of absorbable sutures was better particularly the plain & chromic rather than dexon.

The operations on the stomach (partial gastrectomies) revealed that the animal could tolerate resection of up to 50 % of the stomach size without difficulties from the surgical point of view. The only bad result was the bad condition of the animals in form of anaemia and emaciation (body loss) that occurred with increased size of the gastrectomized flap.

A case of peritonitis was met with 3 days post surgery in a dog with partial gastrectomy for about 1/4 of the stomach size. that was suspected by the elevation of body temperature (41 °C) and refused available food in this time. That was explained to be due to leakage of the ingesta to the peritoneal cavity through the sutures, or contamination of the operative field during surgery and low antibiotic dose.

The laparotomy and operations on the bowel were conducted without difficulties as the animal tolerated resection of up to 2 meters of the bowel length. The related adverse effects on the animal health condition were off food, depression, sad appearance and the emaciation (by the clinical observation) when we resected more than 2 meters.

The visual examination of the seat of anastomosis by after laparotomy to detect the characters of adhesions, and stenosis degree revealed that:

* **Adhesions,** were observed more in cases in which the non-absorbable sutures used (prolene (++) and mersiline (+++)) between the mesentery and the seat of suture, internal abdominal wall at laparotomy wound and seat of suture, as well as between the urinary bladder and the seat of suture after the colon surgery. While after suturing with absorbable sutures, it was slight particularly after the plain (+) and chromic catgut (+).

* **Stenosis,** as the lumen of the bowel is narrower than that of

the stomach it was important to take care during anastomosis avoiding many stricture or stenosis as possible. The seat of anastomosis after healing was more swollen in cases sutured with non-absorbable sutures than those sutured with absorbable ones by naked eye. the stricture degree was nearly the same with different sutures after x-ray film showed when the animal was euthanized (fig. 28).

One case after resection of 50 cm. of the jejunum showed a very bad condition as isolation in the corner of their keeping room refused food and water for 4 days post surgery. A repeated laparotomy revealed a complete obstruction at the seat of anastomosis during the previous surgery using mersiline as a suture material. Then, we resected the segment containing the obstruction and applied another anastomosis using one row of Cushing pattern with chromic catgut. The dog still alive till euthanasia after 7 days.

Histopathological examination revealed the following :

A- Non-absorbable sutures :

1- Mersiline:

It was present (in all samples collected at the different times) in the submucosa & musculosa surrounded by a thick layer of chronic inflammatory response (fig. 29 & 30) represented by numerous macrophage and fibroblasts. The adjacent area showed dilatation of the blood vessels, granulating tissue and a focal

area of destructed epithelium. Focal area of mucosa showed destruction of the mucous membrane, and the underlying submucosa was infiltrated with neutrophils and extravasated erythrocytes.

2- Prolene :

The suture material appeared (in all samples collected at different times) greenish blue colour encapsulated within fibrous tissue capsule which was infiltrated with moderate macrophage (fig. 31 & 32).

B- Absorbable sutures :

1- Plain catgut :

In samples collected after 1 week, the suture found in submucosa and was invaded with chronic inflammatory reactions mainly macrophage, lymphocytes and fibrous tissue (fig. 33). Later on, after 2 weeks the suture material was phagocytized and replaced by variable sized nodules of lymphoid cell aggregation, while, the lining epithelium was intact. The vascular response of the inflammatory process was minimal.

2- Chromic catgut :

In samples collected after 2 weeks the submucosa contained remnants of the suture material which appeared as homogenous eosinophilic structureless material surrounded by a thick layer of chronic inflammatory reactions consisted of macrophage, lymphocytes, and fibroblasts (fig. 34). After 4 weeks, the margin of the suture was invaded by tissue phagocyte which is macrophage (fig. 35), also, few neutrophils were present.

3- Dexon :

In samples collected at 7 and 14 days, there was focal area of necrotic enteritis characterized by severe destruction of the lining epithelium which represented by leukocytes mainly neutrophils and macrophage (fig. 36). A line of demarkation was present between the necrotic and healthy area. While, in samples taken after 3 and 4 weeks, the suture material was invaded by leukocytes and parts of the suture material were phagocytized by phagocyte (fig. 37). The lamina propria showed severe hyperemia (fig. 38). The mucosa exhibited focal oedema, with dilatation of blood capillaries (fig. 39), and other area showed infiltration of inflammatory cells mainly neutrophils.

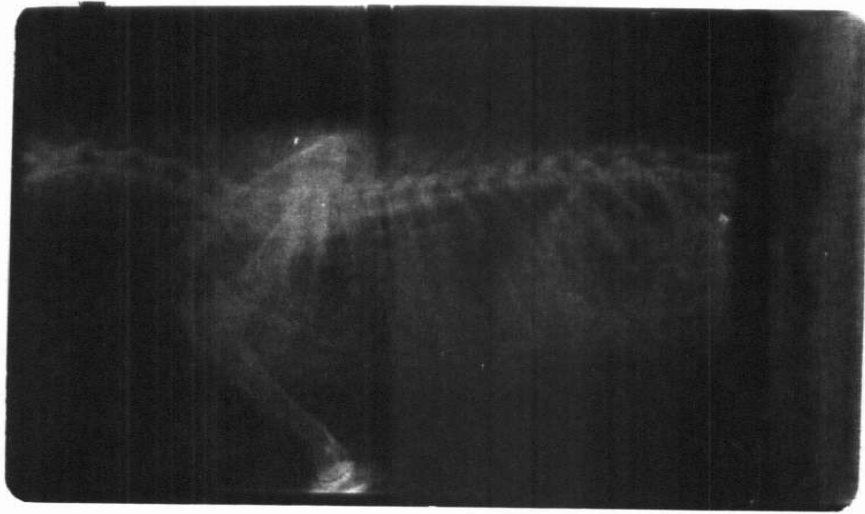


fig. (1) Plainx-ray film does not show the normal esophagus of a dog, lateral view.

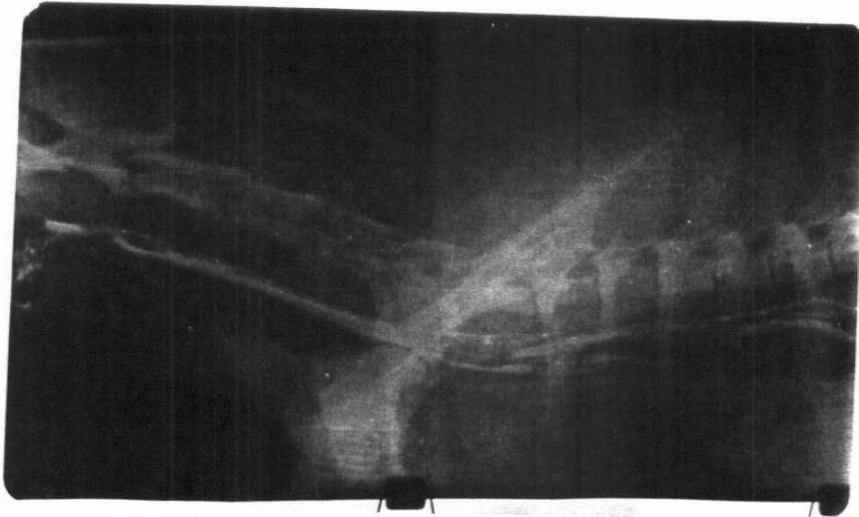


fig. (2) x-ray film shows the normal esophagus by using of barium, lateral view.

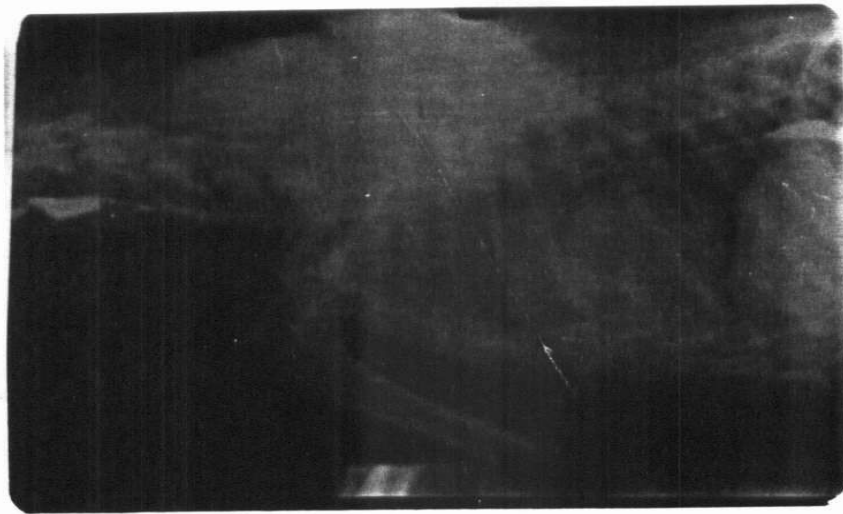


fig. (3) x-ray film shows the normal esophagus by using of barium, oblique view.

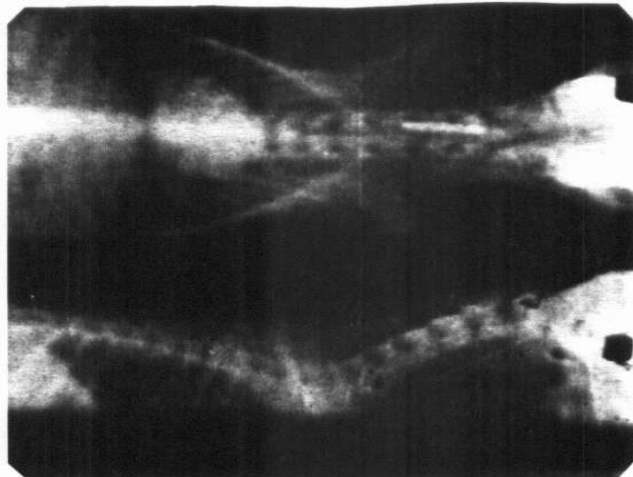


fig. (4) x-ray film shows a radiopaque sharp foreign body in the esophagus, lateral and dorso-ventral views.

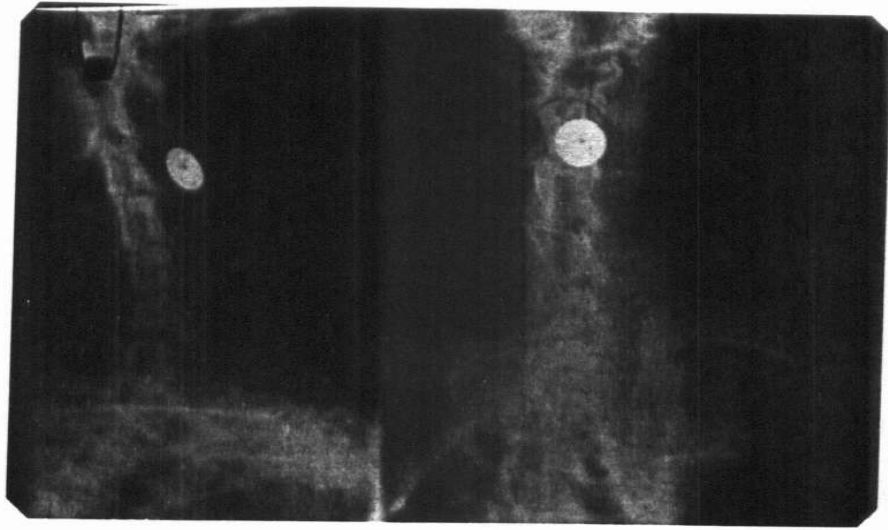


fig. (5) x-ray film shows a radiopaque blunt foreign body partially occlude the esophagus. lateral and dorso-ventral views.



fig. (6) x-ray film shows a radiotranslucent blunt foreign body in the esophagus. lateral view.



fig. (7) x-ray film shows a radiolucent object retained the barium when we used the contrast radiograph. lateral view.

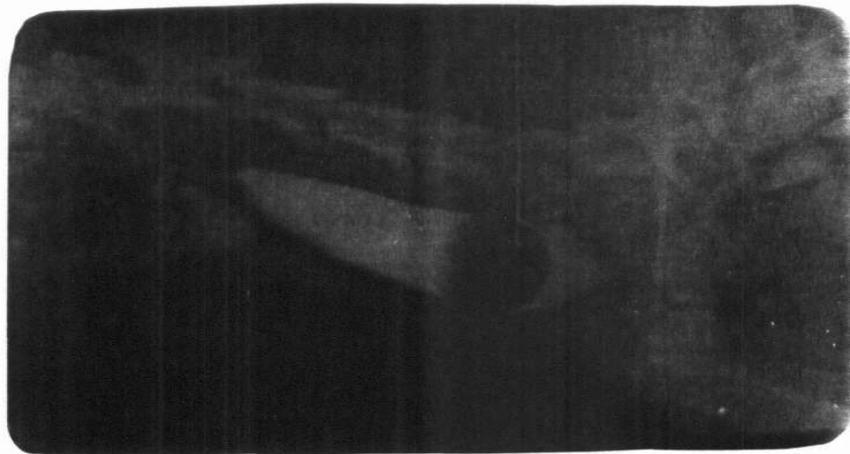


fig. (8) Contrast x-ray film shows a filling defect in the esophagus due to radiolucent foreign body. lateral view.

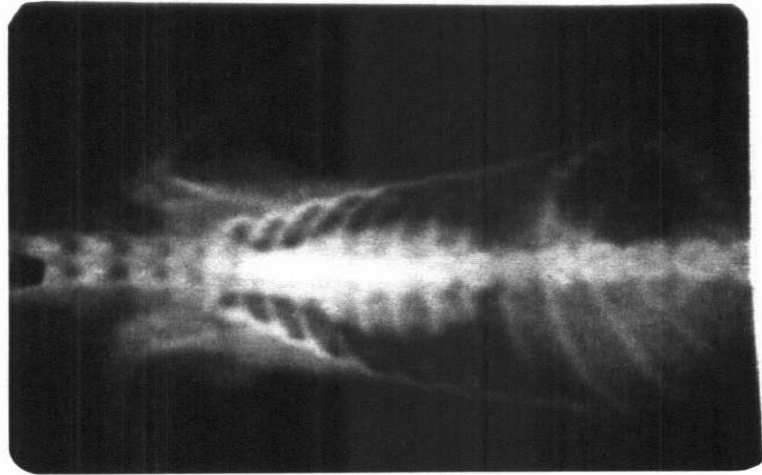


fig. (9) x-ray film shows the position of the normal stomach after plain radiography, due to presence of more gases, ventro-dorsal view.

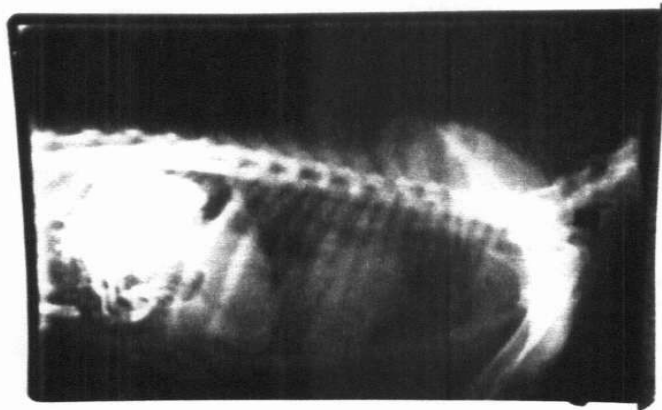


fig. (10) x-ray film shows the rugal folds of the stomach after using of small amount of barium, lateral view.

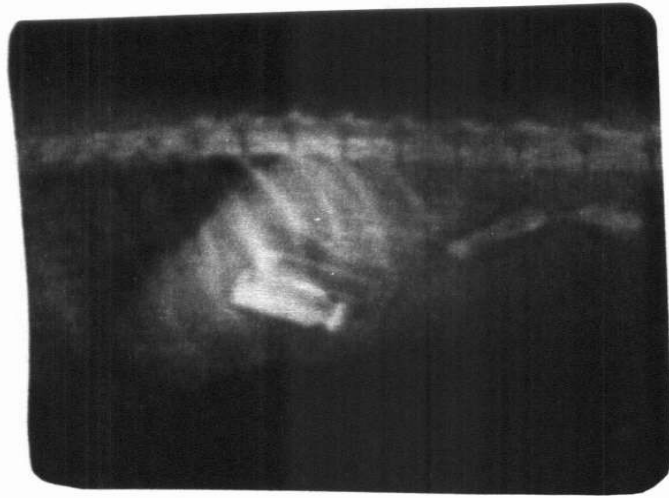


fig. (11) x-ray film shows blunt foreign bodies in the stomach and small intestine of moderate density, lateral view.

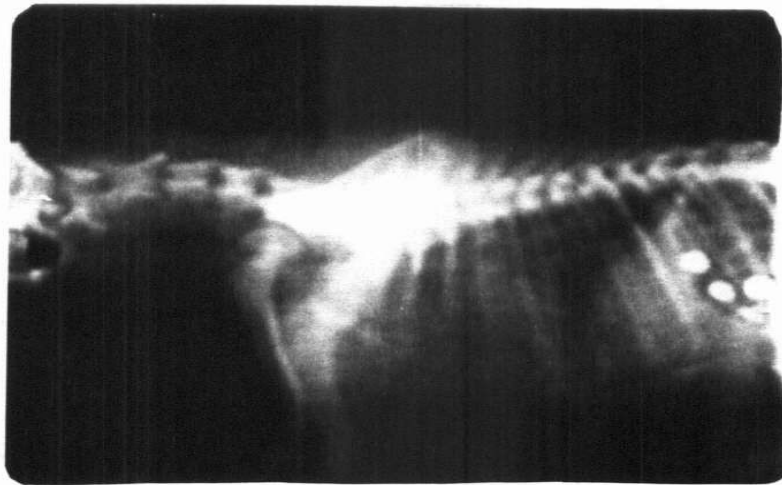


fig. (12) x-ray film shows sharp radiopaque foreign bodies in the stomach, lateral view.

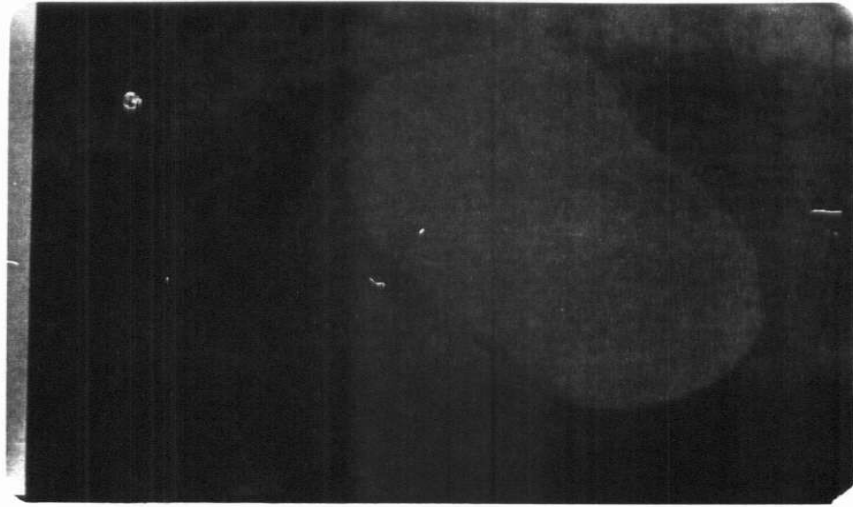


fig. (13) x-ray film shows the stomach filled with barium 10 minutes after administration, lateral view.

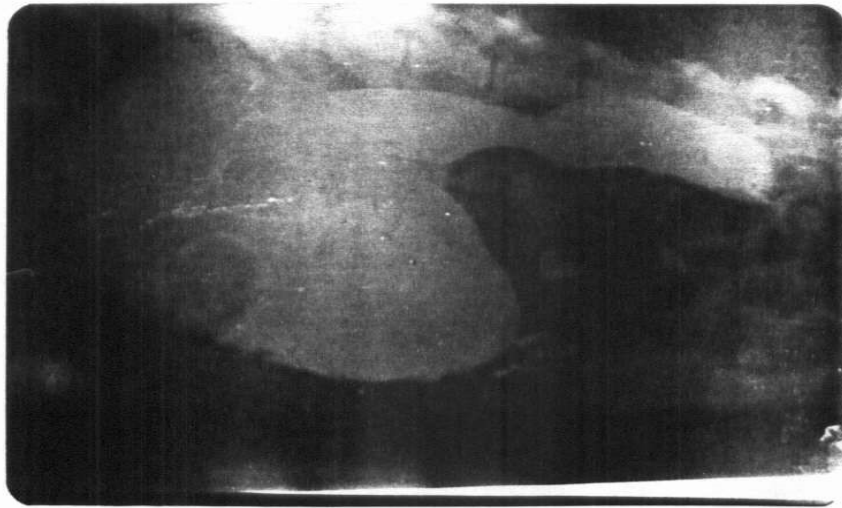


fig. (14) x-ray film shows the stomach & duodenum 1 hour after barium administration in anaesthetized dog, lateral view.

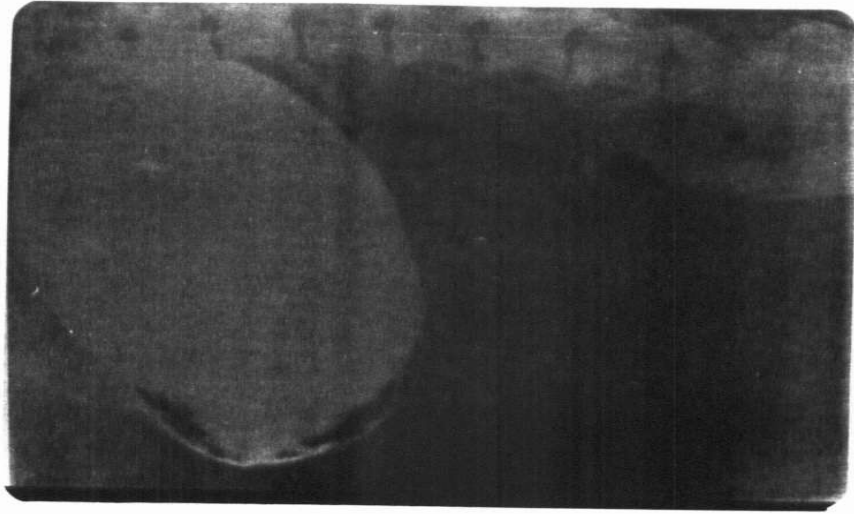


fig. (15) x-ray film shows the stomach filled with barium giving an idea about its condition after partial gastrectomy, lateral view.

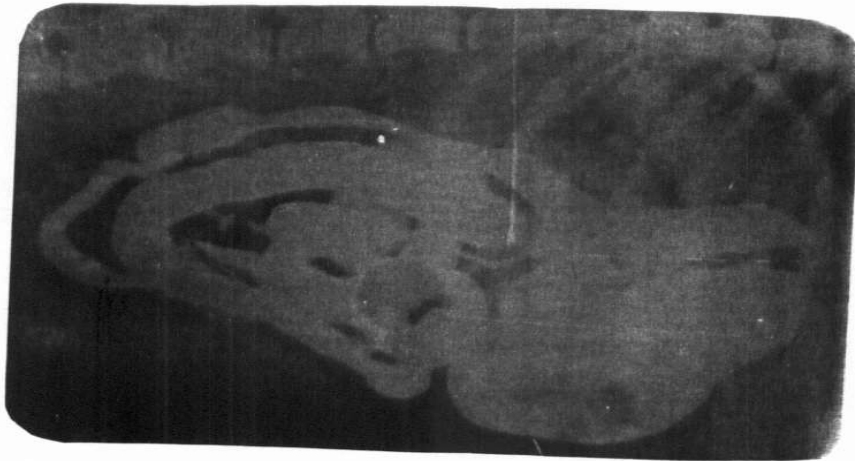


fig. (16) x-ray film shows the course of barium through the small intestine 30 minutes after administration, lateral view.

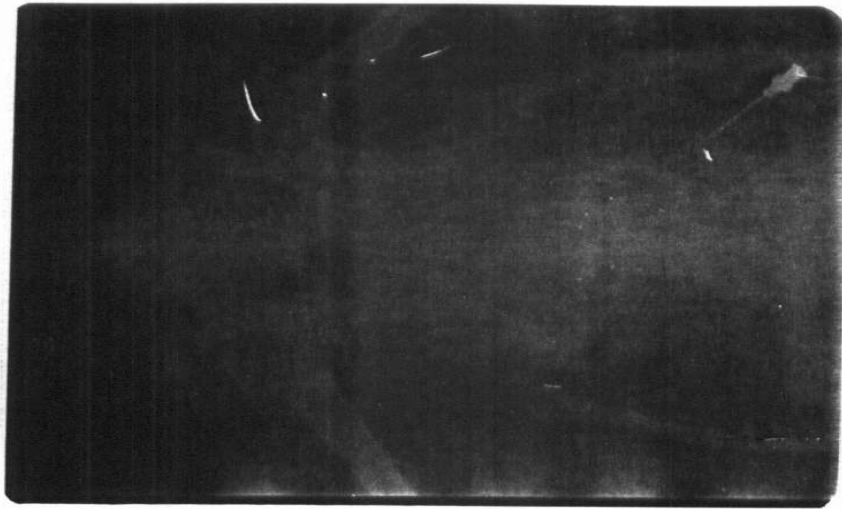


fig. (17) x-ray film shows a sharp radiopaque foreign body (needle) in the intestine, ventro-dorsal view.



fig. (18) x-ray film shows a sharp radiopaque foreign body (needle) in the intestine, lateral view.

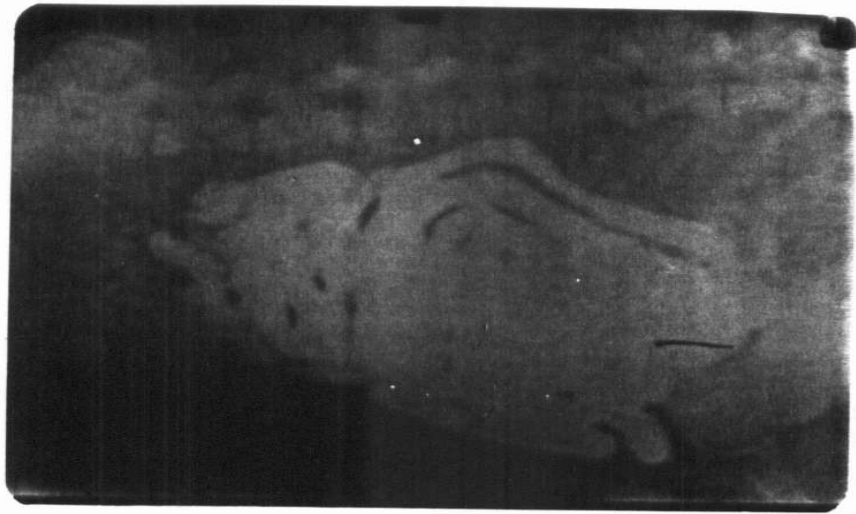


fig. (19) x-ray film shows the barium course in the intestine 1.5 hours after administration of the barium. lateral view.

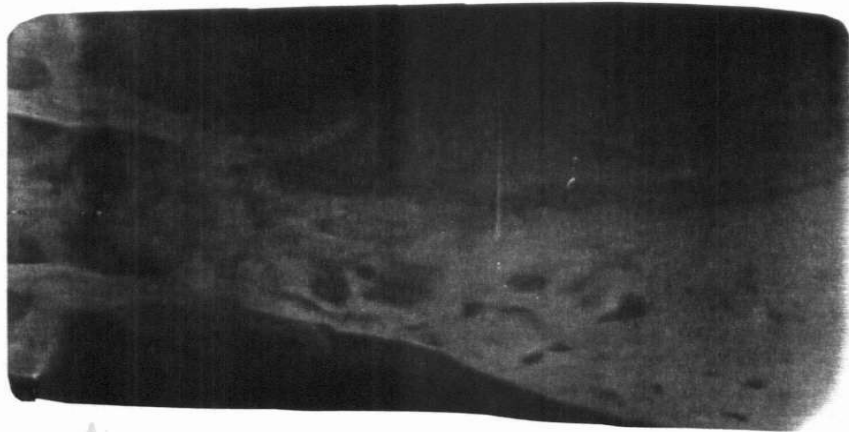


fig. (20) x-ray film shows the barium course in intestine 1.5 hours after administration of barium. ventro-dorsal view.

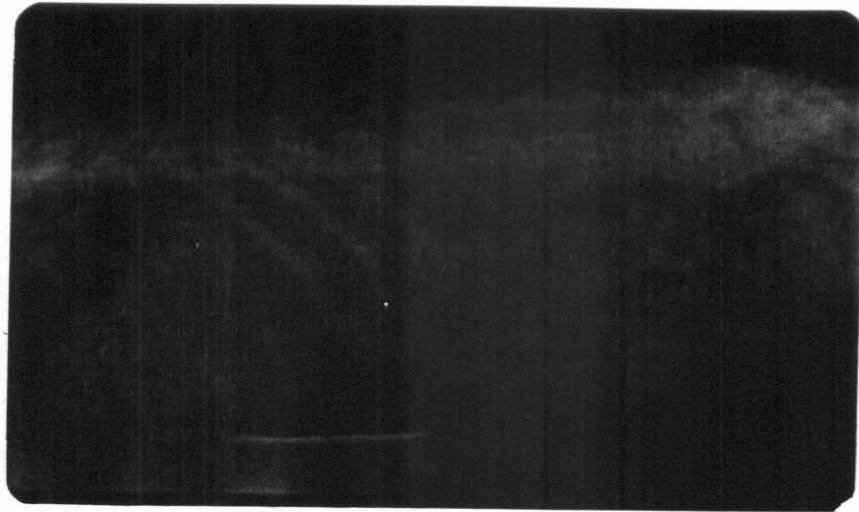


fig. (21) x-ray film shows the abdomen without contrast, the seat of colon appears due to presence of gases and also there is a sharp radiopaque foreign body in the peritoneal cavity, lateral view.

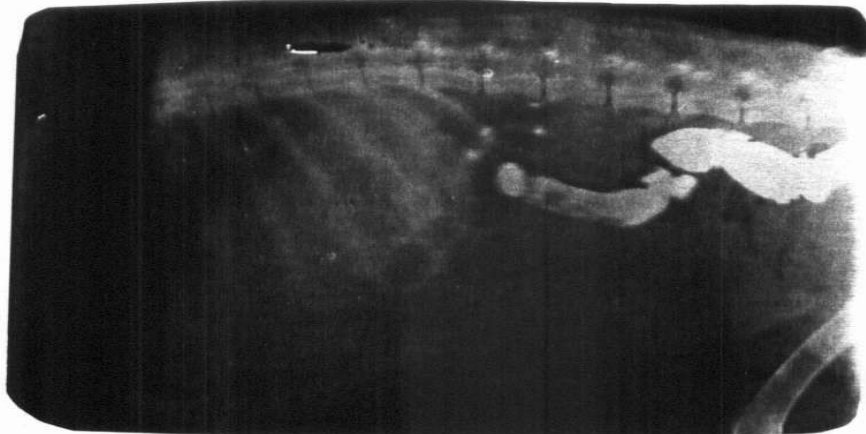


fig. (22) x-ray film shows the barium passing through the small intestine, 4 hours after administration, lateral view.



fig. (23) x-ray film shows the barium excretion from the intestine, 20 hours after administration in anaesthetized dog, ventro-dorsal view.

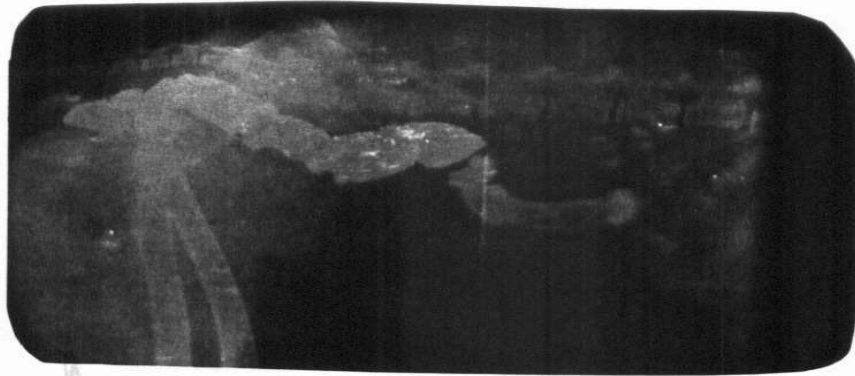


fig. (24) x-ray film shows the barium excretion from the intestine, 20 hours after administration in anesthetized dog, lateral view.



fig. (25) x-ray film shows the barium in the rectum after enema, ventro-dorsal view.

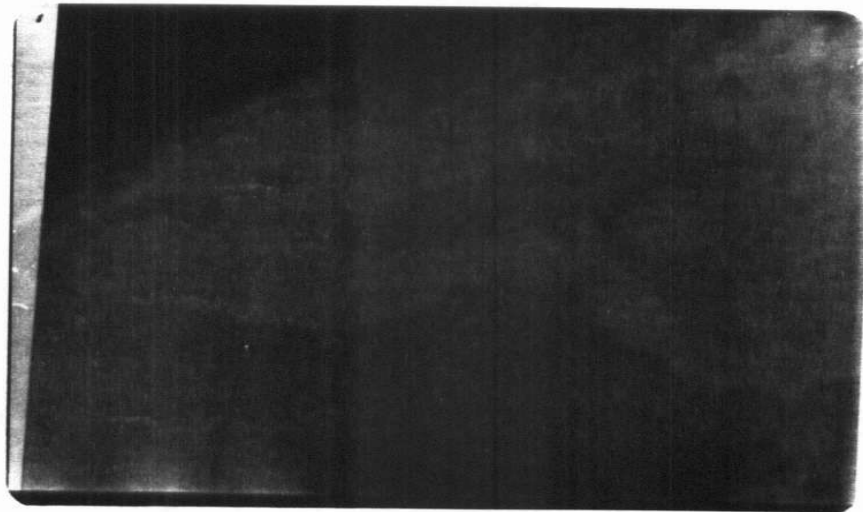


fig. (26) x-ray film shows the barium in the rectum directly after enema, lateral view.

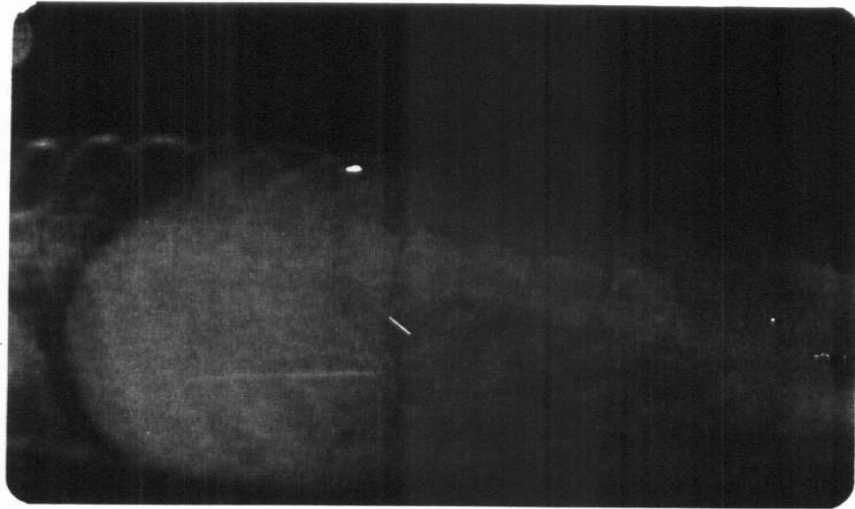


fig. (27) x-ray film shows a sharp foreign body either in the peritoneal cavity or in the G.I.T., the seat of the colon appears due to presence of gases, ventro-dorsal view.

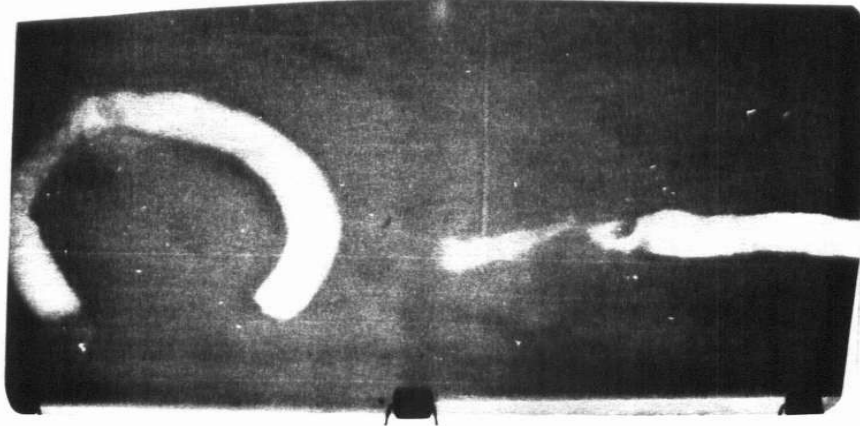


fig. (28) x-ray film shows the seat of surgery in the sample collected after euthanasia, as a stricture, by using of barium sulphate.

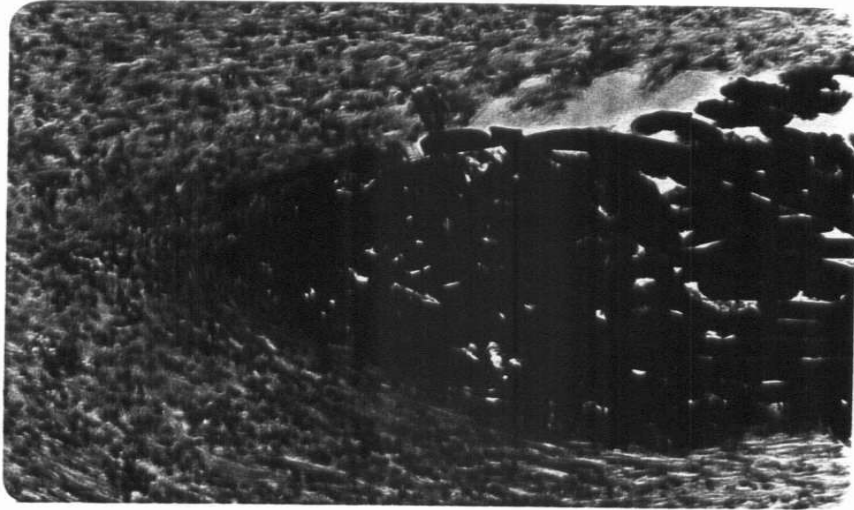


fig. (29) stomach shows the suture material (mersiline) in the submucosa & muscularis surrounded by numerous macrophage and fibroblasts. H & E stain Mic. Mag. (X 63).

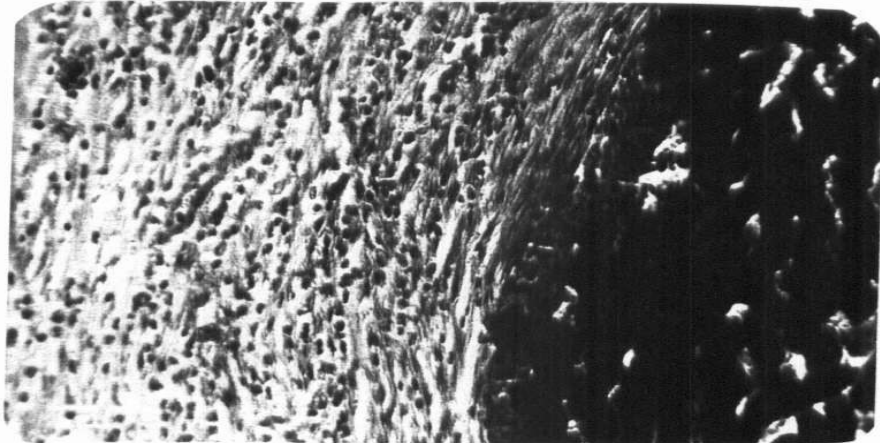


fig. (30) stomach shows the mersiline surrounded by the inflammatory reaction that is the same in above fig. H & E stain Mic. Mag. (X 160).

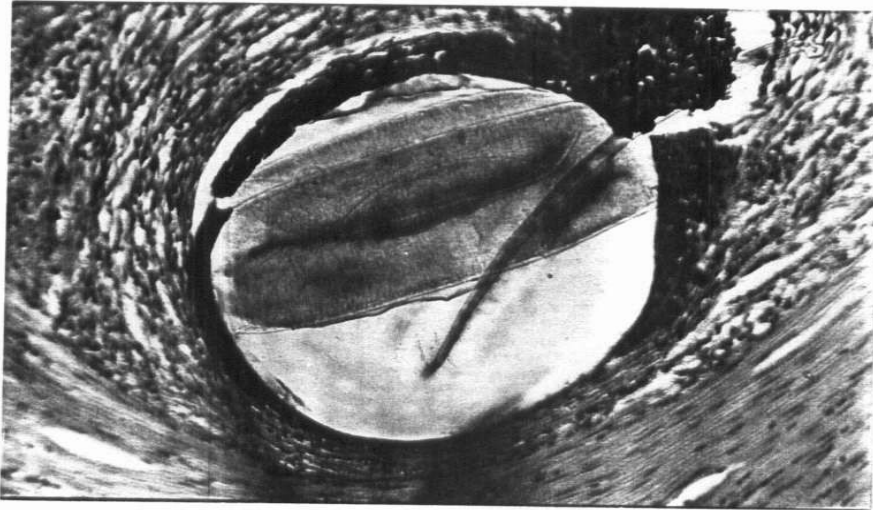


fig. (31) small intestine shows the suture material (prolene) encapsulated within fibrous tissue capsule. H & E stain.

Mic. Mag. (X 160).

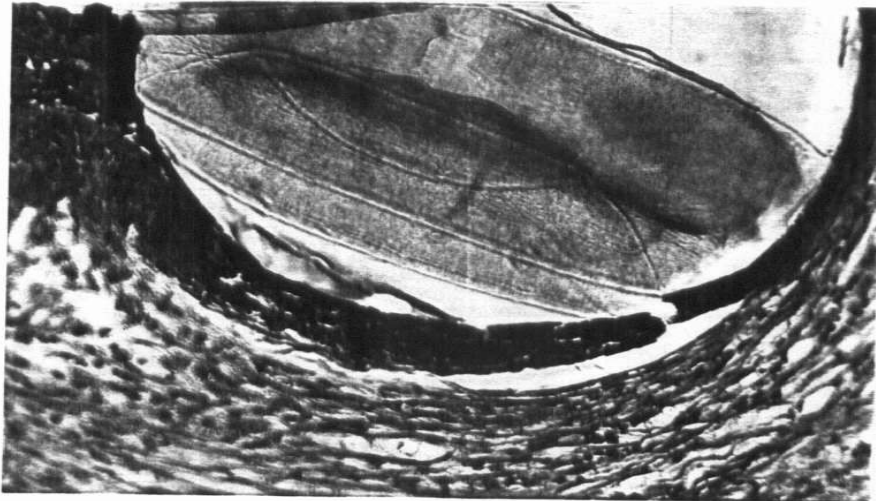


fig. (32) small intestine showing that few macrophage surround and infiltrate the capsule. H & E stain. Mic. Mag. (X 250).

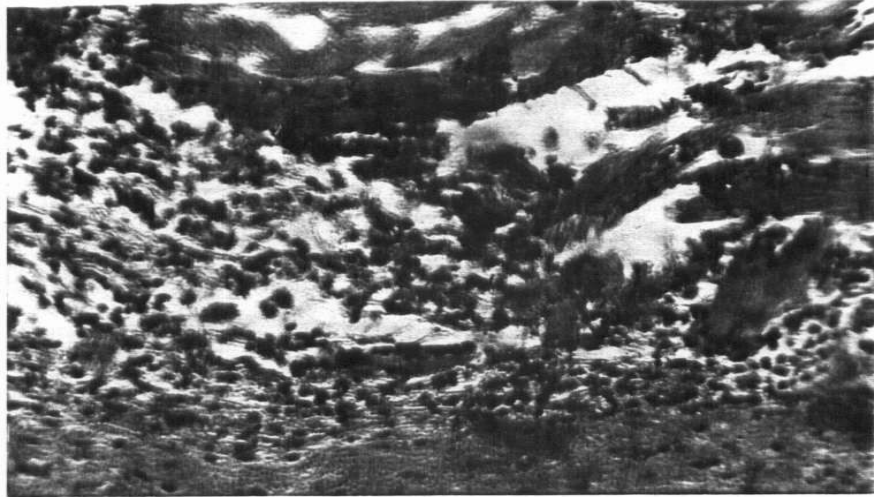


fig. (33) small intestine showing the plain catgut as a suture material invaded with leukocytes that are responsible for its lysis. 1 week post surgery. H & E stain. Mic. Mag. (X 160).



fig. (34) stomach showing the chromic catgut surrounded by numerous inflammatory cells. 2 weeks post surgery. H & E stain. Mic. Mag. (X 63).

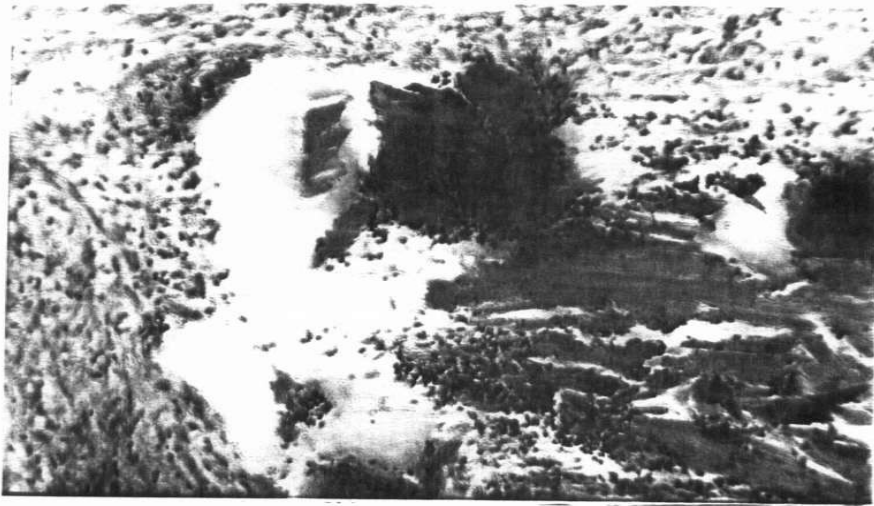


fig. (35) stomach showing the phagocytic cells invading the suture material (chromic) and lysis of some areas of the suture by these macrophage. 4 weeks post surgery. H & E stain. Mic. Mag. (X 160).

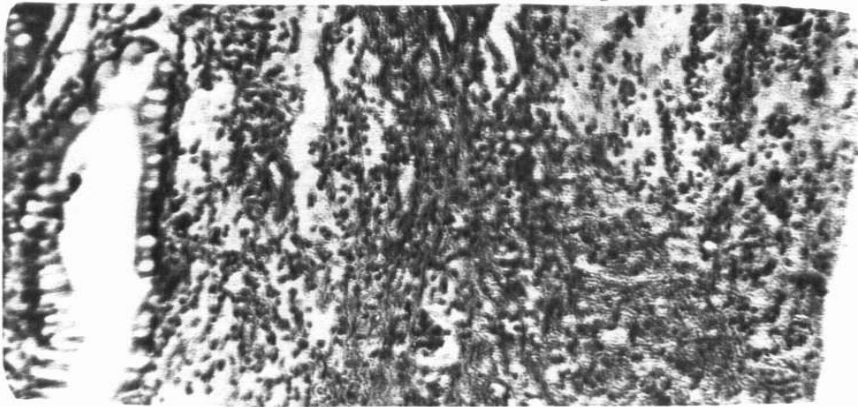


fig. (36) large intestine showing focal area of necrotic enteritis characterized by destruction of epithelial lining. 2 weeks post surgery. H & E stain. Mic. Mag. (X 160).

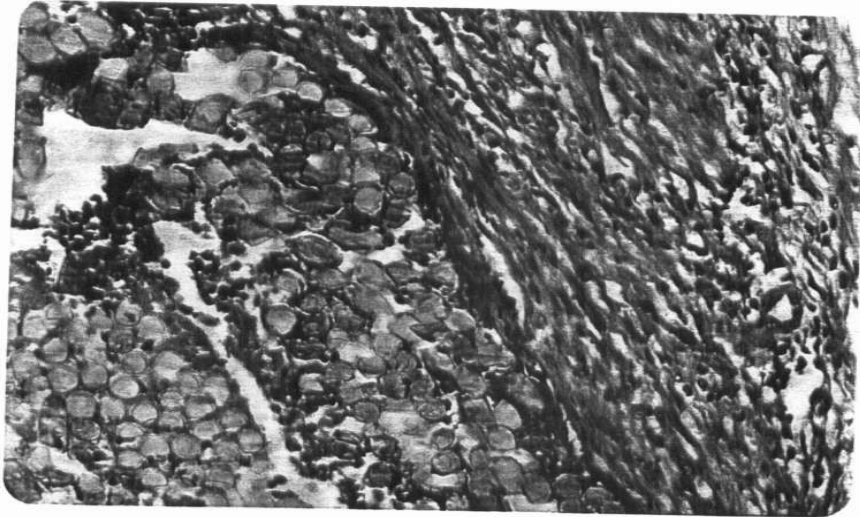


fig. (37) large intestine showing the suture (dextran) invaded by few phagocyte. 4 weeks post surgery. H & E stain. Mic. Mag. (X 63)

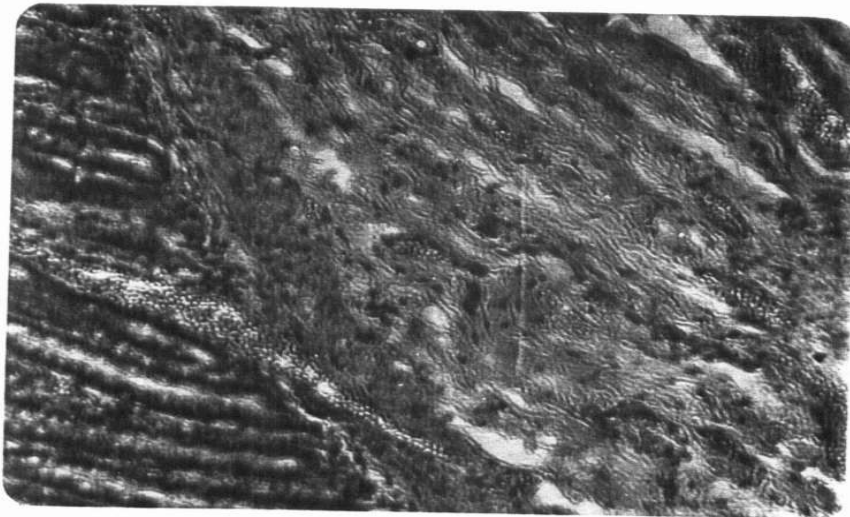


fig. (38) large intestine showing hyperaemia in the lamina propria. 4 weeks post surgery. H & E stain. Mic. Mag. (X 160)

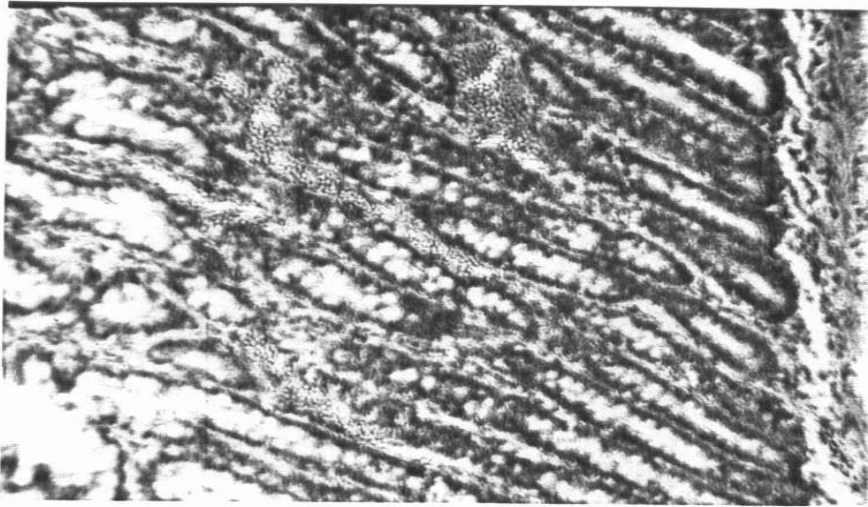


fig. (39) large intestine showing focal oedema and congestion in the mucosa 4 weeks post surgery.

H & E stain. Mic. Mag. (X 160).

DISCUSSION

As the x-rays are waves of shorter wave length, it posses the property to penetrate the solid matter to a far greater extent than light. They are used for the examination of internal structures of an animals. When the x-ray beam passes through the patient, it is then absorbed to a varying degree by the different tissues and then on emergence it becomes capable of casting the shadowgraph of the area penetrated.

The digestive system on which we made all of our study, is one of the most important systems of the body as it is responsible for digestion of the food materials to an ingredients which could be utilized by the other systems to support and supply them for completing and maintenance of their functions for continuation of animal life.

The all parts of the digestive system involved in the experiment extending from the esophagus anteriorly to the large intestine posteriorly are a soft tissues, considered to be a radiolucent organs similar to the surroundings. Therefore, the absence of most parts of the normal G.I.T. in the plain radiographs as is recorded in our results coincide with the results obtained by Gillette, et al. (1977); Kealy (1987) and Kantrowitz and Biller (1992). That is despite of determination of the seat of certain areas of the G.I.T. as the stomach and colon

by the plain radiographs, that is because of the air or gases in these organs allow passing of the x-rays without absorption and react with the radiograph on the cassette resulting in its blackening in this area. That is explained to be due to the lower density of the gases in contrary to that of other soft tissues (medium density) or substances as barium (of higher density) which used as a contrast substance during contrast study in areas that not appeared by the plain radiographs. Our results by contrast radiography, gave us an information about the shape, size and course of the luminal organs that not appeared in the plain radiographs. This comes in agreement with Douglas & Williamson (1972); Gillette, et al. (1977); Stowater (1978); Quick & Rendano (1978); Fouad et al. (1985); Kealy (1987); Hoenig, Mahaffey, Parnel & Styles (1990) and Misk (1992).

This study also revealed that the foreign bodies of metal nature as the coins, needles, nails and others of high density as bones were easily detected by the plain radiographs. That coincide with the results of Beizel and Brinker (1956) who used the survey radiography as a confirmatory aid of diagnosis for pork chop bone as a foreign body in the esophagus of dog. Also, Kealy (1987) and Kantrowitz & Biller (1992) who mentioned that many foreign bodies are radiopaque as rocks and metallic objects are readily seen on plain radiographs. In the same time, Gillette et al. (1977) reported also that the survey radiographs of the abdomen were adequate for detection of a radiopaque foreign

bodies. That is explained to be due to the high atomic number (high density) of these bodies. On the other hand, the objects of low density allow passing most of rays to the film reacting with its constituents (silver halide) that converted to metallic silver which is black in colour. Therefore, the radiolucent foreign bodies as cloths, rubbers and plastics concerned in this study did not appear in the plain radiographs. That is due to the similarity of these object's density with the surroundings except, those filled with air that appear more black or those dilate the organ in which they are lodged, as mentioned by Kantrowitz and Biller (1992).

The cases that not appeared on the plain radiograph due to the aforementioned causes, appeared clearly on the contrast radiograph as they lead to barium retention or appeared as a filling defect within the organ. The same was indicated by Fouad, et al. (1985) when advised the use of small amount of barium to delineate a non-radiopaque foreign body that not appeared on survey radiographs.

This study revealed that the suitable time for contrast radiography of esophagus (esophagram) is directly after swallowing of barium and not more than 5 minutes, while for gastrogram is 10 minutes after the administration of barium, but for the intestine the suitable time was 30 minutes after the administration and then repeated each hour till the excretion of

barium or till we reach the diagnosis. That was in dogs not subjected to any form of anaesthetic as a mode of control during radiography, and that comes in agreement with Gillette, et al. (1977); Quick & Rendano (1978) and Kealy (1987) who advised the contrast radiographs to be immediately following administration of the contrast, then 15 minutes and again after 30 minutes, after that, they should be taken at hourly intervals until adequate information was obtained. On the side, we found in our work that this time was retarded in cases controlled by the anaesthetics and that could be attributed to the effect of such drugs on the digestive tract motility by its aperistalsis leading to stagnation of the barium and retardation of its passage, that coincide with the results obtained by Watson and Sullivan (1991) when they injected detomidine as a non-narcotic analgesic, and also with Gillette, et al. (1977) when reported that the animals should be free of all medications that may influence intestinal motility. Therefore, they advised the unnecessary sedation of animals prior to contrast examination of the intestinal tract. Concerning the colon examination with contrast radiography, the barium enema was better as it does not need to a prolonged period and is considered an easier in technique rather than depending up on the continuation of the enterogram. That is similar to that reported by Gillette, et al. (1977) and Misk (1992) when they performed the examination of the large intestine and colon by rectal administration of barium, iodinated compounds and /or air.

The radiographic views needed to obtain a radiograph representing the lesion was lateral one in addition to another one. That may be ventro-dorsal or dorso-ventral according to the organ to be studied and the animal condition. The dorso-ventral view was comfort to the conscious dog during radiography. The abdominal contents are better to be radiographed in a ventro-dorsal projection, but that induce more discomfort to the conscious animal. Therefore, it was indicated for the unconscious dogs. The same was reported by Douglas and Williamson (1972) as they necessitated two planes to radiograph the part under examination in order to enable an accurate visualization as the radiograph is a two-dimensional impression of a three-dimensional structures. In addition, the oblique view for esophagus seemed to be important to give more information as it avoids the superimposition of the spine in cases of ventro-dorsal or dorso-ventral views. That comes in agreement with Kealy (1987) when he used the lateral and ventro-dorsal views for survey radiographs of the esophagus. While for esophagram, the ventro-dorsal view showed superimposition of spine. Therefore, he used the right ventro-dorsal oblique view. In spite of that, Quick and Rendano (1978) used the lateral and ventro-dorsal views for contrast study of the esophagus.

This study also showed that the animal fasting prior to the radiography enable more details during evaluation of the G.I.T. That is as the same mentioned by Douglas & Williamson (1972);

Gillette, et al. (1977); Quick & Rendano (1978) and Kleine & Warren (1983) who found that the fasting of the animals 12-24 hrs. prior to radiography and in some times giving off laxatives and enemas is necessary to obtain a good radiographs. The ingesta in the stomach and intestine, feces in the colon and rectum obscured other abdominal viscera, for abdominal contrast examination and some non-contrast radiographs.

The presence of the radiopaque foreign body in the plain radiograph in most cases not give an accurate localization of the object (foreign body) either to be inside the G.I.T. or in the peritoneal cavity. As those penetrate the abdominal wall from exterior may pinch the G.I.T. and enter inside or puncture it. That is because of the similar density of the most of all body viscera particularly the intestine. The exploration here is the aid to determine its location, although the position has no role, as its removal is the aim, no literature have been traced concerning this point.

Concerning to the study of the alimentary tract mucosa, it was found that using of small amount of barium as a contrast draws the rugal folds of the stomach. That may be coincided with Stowater (1980) who indicated the contrast radiography to help outlining of mucosal erosions or ulcerations of the stomach. While, Rebhun, Dill & Power (1982) and Gross & Mayhew (1983) reported that the foals affected with gastro-duodenal ulcerations

were sensitive to palpation of certain body areas. but confirmation of such ulcers is extremely difficult. On other hand, Douglas and Williamson (1972) mentioned that the ulcers or other small lesions of the bowel wall could be investigated by the x-rays. That is after emptying of the tract by starving the patient and by giving laxatives or enemas.

The contrast agents are also valuable for determination of the size of the hollow empty organ when it fills it totally. When the contrast solution or suspension outline the all lumen. it is then of great value during the period of after-care or during the period of follow-up of animal post surgery. To evaluate the variation in organ size and if there is any complications as uncorrected suture or fistulae that lead to leakage of ingesta to the peritoneal cavity resulting in many troubles. The use of barium for the same purpose was indicated by Basher, Hogan, Hanna, Runyon and Shaw (1991) when they used the contrast radiography for confirmation of a congenital bronchoesophageal fistula in a dog. The barium was seen in the right bronchus after its administration orally indicating a connection between the esophagus and bronchus.

The seat of suture after surgery usually subjects to a degree of stenosis specially in the organs of narrow lumen as the small intestine particularly when we use the inverted suture pattern. In our study, as we aimed to use different sutures by

one technique which was single row of inverted suture pattern to evaluate the effect of different sutures on the degree of related stricture or stenosis. It was found that the all sutures induced the same degree of stricture, and there is no literature traced concerning this aspect of the effect of suture material on the luminal diameter. Most of the literature talked about the effect of the suture patterns on the diameter as reported by Dean and Robertson (1985) who classified the these patterns as whether they invert, evert, or oppose the incised edges of the bowel, and as whether they performed in single or double rows. They also advised the use of two-layer inverting technique because of its reduced incidence of adhesions with maintenance of adequate lumen diameter.

When we aimed to study the effect of x-rays to demonstrate the foreign bodies of the G.I.T., we also studied the course of these bodies throughout the digestive tract and found that most of them passed rapidly to the stomach via esophagus except few cases that retained in the cervical part of the esophagus near to the pharynx and near to the thoracic inlet. These results may be coincided with that of Dehoff (1987) who reported that most foreign bodies are lodged in the cervical part or post cardiac portion of the esophagus and about 20% of these cases occurred in the precardiac region. We can explain the cause of this retention to be due to esophageal curvature at the first (near to the pharynx) is dorsal curvature, and near to the thoracic inlet is

ventral curvature those act as a predisposing cause or stricture for the lodgement of these bodies in these areas.

The foreign bodies in the abdominal cavity either to be inside or outside the digestive tract. In our study, the foreign bodies inside the tract lead to some troubles that varied according to their location. In esophagus, there was a trial to get ride of this bodies by shaking the head and neck, regurgitation and excitation in addition to all signs of illness. When the foreign body reached the stomach, the most of all these signs disappeared except the vomition after feeding particularly if the body was sharp and the stomach is empty. In the intestine, the most characteristic sign was the depression, off food and the frequent vomition. The cough and all signs of illness were detected in a dog with a pork chop bone as a foreign body in the esophagus, that is reported by Beizel and Brinker (1956).

Among the esophageal experimental studies, the exposure at the neck region was carried out through the ventral aspect of neck. Its identification depends up on its colour which is bluish-red and also depending up on the stomach sound as mentioned by Christoph (1975). While, Berge and Westhues (1966) took the foreign body itself as a guide to reach the esophagus through the neck incision. Therefore, we can conclude that the presence of any foreign body in the esophagus should be accurately determined firstly and then try to remove it manually

or by long forceps, or even try to push it to the stomach and apply laparo-gastrotomy.

Regarding the esophageal wound closure after removal of a foreign body, the transverse closure may be regarded to be preferred than the longitudinal one. The degree of stricture or stenosis after longitudinal closure was more than that after the transverse one even was the suture pattern applied. That comes in agreement with Dehoff (1987). He advised to attempt the transverse closure for the induced longitudinal incision of esophagus to prevent stricture formation. He also added that some surgeons recommended always doing a transverse incision and closure. This recommendation is restricted to avoid the probability of complete severing of esophagus that need to difficult technique during anastomosis.

Among the experimental studies on the stomach and intestine, It was found that gastrotomy or enterotomy to relieve a gastric or intestinal foreign body accompanied with a better healing particularly in cases sutured with absorbable sutures. That is explained among the tissue reactions toward these sutures, and as there was a time-healing relationship, i.e. the more time elapsed, the best healing is seen. That is explained because of the presence of suture in the seat of surgery in many cases that not only allow the appositioning of wound edges but stimulate the tissue to react toward it which in some cases retard or interfere

with healing. Therefore, in sutures that disappeared rapidly the healing was better. On contrary to these results, it was found that the adhesions were more with non-absorbable sutures. That could be attributed to the more reactions of tissue toward these sutures. We must not consider the abdominal adhesions in dogs a post operative complication. In contrary to the small intestinal adhesions in horse that may cause colic and obstructions (Robertson, 1982).

The stomach as a reservoir for food in the digestive tract, it is important to keep its size as possible large enough to occupy the most great amount of foodstuff. Certain surgical affection of the stomach has no way to be treated rather surgical one throughout resection of certain parts of the stomach wall as gastric ulcers and gastric tumors. It was found that up to 50% of the stomach size could be gastrectomized. This is in the same range obtained by Gohar (1975) who made experimental gastrectomies for dogs and reported that 3/5 (60%) of the stomach size could be gastrectomized. This variation could be attributed to different breeds used in both studies.

The same with intestine, as they are responsible for digestion and absorption of the food ingredients. Therefore, its full presence is important, but resection of certain lengths is obligatory to treat certain affection. It was found that the animal could tolerate the resection of up to 2 meters but that

need to a specific medical after-care. Many authors studied this point and reported that the animal could tolerate resection of up to 80% of the intestinal length if the ileocolic valve was not included in the resection. When this valve was removed, 50% only of the bowel length could be resected (Bojrab, 1972 and Fouad, et al., 1985). While, White (1987) reported that resection of more than 50% of the intestinal length in equine result in weight loss and chronic malnutrition unless the diet was modified to substitute a highly digestible food stuff. Also, Tate (1987) comes in agreement with White (1987) as he mentioned that resection of 40-60 % of the pony small intestine results in malabsorption, weight loss and liver damage. The restrictions that is aforementioned above by Bojrab and Fouad, et al. about the resection of ileocolic valve could be explained to be due to the more important role of this valve as a barrier for colonization for the large number of micro-organisms that could pass from the large intestine in which it is non-pathogenic to the small one in which it becomes more pathogenic resulting in many problems of infections that may lead to death. We can conclude that the decision of the resection of certain part of the stomach or intestine must be taken after a good examination of the case and ensure that there no any substitutional trial rather than resection. That resection must be limited to the seat of lesion and avoid any unnecessary resection of any part all over the gastro-intestinal tract.

All the sutures in this work (absorbable and non-absorbable) produced tissue reactions particularly in samples collected after 1 and 2 weeks of suturing, that is explained to be due to a correlating factor between the all sutures that may be the process of suturing itself, as stated by Fouad et al (1985) who found that all sutures produce tissue reaction that lasts at least 5 days, and attributed such effects to the trauma during passing of the needle and suture through the tissue and to the physicochemical properties of the suture materials. The only difference is that the reactions extend here all over the period of sample collection (1,2,3, and 4 weeks) but its degree and type differed according to the type of suture material.

With plain catgut, the all samples not show the suture after 7 days and that is attributed to the rapid absorption, that is in agreement with Hickman and Walker (1980) who reported that the plain catgut undergoes rapid disintegration within 3-7 days and produce intense reactions, the presence of nodules of lymphoid cell aggregation in the mucosa and the chronic inflammatory cells (macrophage, lymphocytes, and fibroblasts) in the submucosa are a good evident for the phagocytosis as a process by which the absorption of the foreign protein (suture material) occurred. The only difference with these authors is that the degree of inflammation is not so intensive, as the vascular responses minimal and the lining epithelium is intact, that may be due to collection of samples after 7 days as the inflammatory process

was suppressed.

With chromic catgut, the presence of suture remnants in samples till 28 days as homogenous eosinophilic structureless material means that the tanning of the catgut with chromic acid retard its absorption. The proteineous nature of the suture allowed it to react with the basic part of the stain (Eosin) resulting in its appearance as eosinophilic material. The presence of thick layer of chronic inflammatory cells (macrophage, lymphocytes, and fibroblasts) surrounding the suture is referred to the subject responsible for its engalping or absorption. Presence of few neutrophils with the tissue phagocyte invading the suture indicate that they appear early before the chronic cells, that is in agreement with AL-Dahash, AL-Sultan, Yasin, and Singh (1990) who mentioned that the neutrophils are initially the predominated cells, but later, the macrophage, lymphocytes, and fibroblasts are predominate, while, the plasma cells, lymphocytes, esinophils, and giant cells are occasionally seen.

With daxon, few cases were associated with necrotic enteritis characterized by destruction of the lining epithelium that represented by leukocytes mainly neutrophils and macrophage with presence of line of demarkation between the necrotic and healthy area. Although, Hickman and Walker (1980) reported that the braided nature of the daxon is slightly abrasive and may have a sawing effect on the chronically inflamed area. We cannot attribute such pathological changes to daxon, that is confirmed

from the other results that showed that it causes only hyperemia in the lamina propria, focal oedema and dilatation of blood capillaries in submucosa and infiltration of neutrophils in other area.

With mersilene, the most inflammatory reactions anytime are seen. The thick layer of inflammatory response surrounding the suture in submucosa and muscosa, dilated blood vessels & destructed mucous membrane in mucosa, as well as infiltrated neutrophils and extravasated erythrocytes in the mucosa and underlying submucosa respectively indicate the severity of the inflammatory reactions allowing the suture unsuitable to be used in such organs. In the contrary, prolene, is the suture material inducing the least troubles. The body tissue reacted only by formation of a fibrous tissue capsule surrounding the suture. Presence of few macrophage infiltrating this capsule indicating that the tissue tried to phagocyte this foreign suture but its synthetic nature was a stand against that.

The cellular reaction varied with the suture material used. The more inflammatory cells obtained with absorbable sutures. The neutrophils were more around dextron and less in cases of plain and chromic catgut. In contrary to the results of Varma, Johnson, Ferguson, and Lumb (1981) who obtained large numbers of neutrophils indicating local infection in wounds containing plain, chromic, silk, and braided dacron, while with nylon, steel, and dextron, the numbers decreased. This difference could be

attributed to the different time of sample collection, as neutrophils appear early are due to acute inflammation (early time) and in infection. And our surgery is induced nearly under the same aseptic condition.

SUMMARY

This work was done on 44 of stray dogs (males & females) of different weights and different ages. They were divided into two main groups, the first, to study the normal gastro-intestinal tract with & without contrast media, with special reference to the suitable time needed for contrast radiography of certain organs. The second group subdivided into two subgroups, subgroup 1, for experimental induction of some surgical affections of the G.I.T. , then application of x-ray for diagnosis of such affections using different radiographic views, different methods of animal control & preparation as fasting, application of tranquilizer (Combelen) in a dose of 0.2 mg/ Kg. B.wt. injected intramuscular and general anaesthetic (Nesdonal 5%) in a dose of 20 mg./ kg. bw. injected intravenous and priored by Combelen in a dose of 0.2 mg./ kg. bw. injected intramuscular. Surgical affections were then treated surgically using different suture materials that were non-absorbable (prolene & mersiline) and absorbable ones (plain, chromic catgut and dixon) and study their effect on the tissues to evaluate which one(s) is better after visual and histopathological examination for samples obtained after euthanasia. The subgroup 11, used to conduct some experimental surgical studies on the esophagus (exposure and esophagotomy using longitudinal incisions then closed by longitudinal & transverse closure), on the stomach (gastrectomy of different segments), and on the intestine (resection for 0.5

1. 1.5 and 2 meters of its length using the ascending resection). The effect of such operations on the general condition of the animals was recorded.

The anaesthesia adopted for such surgical operations were by two methods. The first by use of Combelen in a dose of 0.2 mg./kg. bw. followed by Nesdonal 4% in a dose of 20-30 mg./kg. bw. injected intravenous, the second was by injection of ketalar intramuscular in a dose of 10 mg./kg. bw. preceded by Rompun intramuscular in a dose of 0.3 mg./kg. bw.

This study revealed that, the fasting of animals prior to the contrast radiography is of an important role in this manner. The normal G.I.T. not appeared by plain x-ray films particularly the collapsed parts while the seat or position of the parts containing air as the stomach and colon could be determined. The most suitable time for esophagram was immediately after swallowing of barium paste or even during swallowing. For the gastrogram was not less than 10 minutes. While for the enterogram, was 30 minutes then repeated hourly until excretion of barium.

The excretion of barium through the anus was very retarded in cases that were generally anaesthetized by Nesdonal preceded by Combelen inspite of the control was very easy with such cases.

The choosing of the other suitable views rather than the lateral one must depend on the degree of comfort allowed to the

animal during radiography.

When the x-ray used for diagnosis of any suspected foreign body in the abdominal cavity or G.I.T. we found that the plain films only enough to visualize the objects of high density. While the objects of low density usually need contrast films.

For the radiographical study of the colon, it was better examined by using of barium enema immediately or few minutes later.

The visual examination of the seat of surgery after gastrotomy, partial gastrectomy, enterotomy, and intestinal resection & anastomosis revealed that the healing was better in cases of plain and chromic catgut as there was difficulties to determine the seat of surgery. In contrary, the healing was bad in cases of prolene & mersiline particularly in cases examined before 21 days of surgery. The adhesion, was more in cases sutured with non-absorbable sutures. It was present between the seat of suture and the mesentery, seat of suture and internal abdominal wall at seat of laparotomy, and between the colon and urinary bladder after partial colectomy. The stenosis degree, after the anastomosis showed no differences in case of different sutures used but the thickening at seat of suture increased with prolene.

The histopathological examination revealed that the mersiline is the suture material inducing most tissue reactions, while the prolene is the suture material inducing least reactions as a non-absorbable sutures. But, for the absorbable sutures the

dexon is the suture of less reactions than plain and chromic catgut.

The experimental studies on the esophagus showed that the transverse closure may be indicated for small esophageal wound than the longitudinal one.

The animal could tolerate resection of up to 50 % of the stomach size without complications.

The intestinal resection could be done for up to 2 meters of the intestinal length without severe complications.

CONCLUSION

From the foregoing results, we can conclude that the plain x-rays is not enough for perfect & complete study of the G.I.T. although it can visualize certain affections as the radiopaque foreign bodies. But many cases need contrast radiography for thorough evaluation. Therefore, the use of x-rays for this purpose must include both plain & contrast radiography respectively, and the later one is repeated at intervals.

The prolene as a suture material is most preferable for the surgical closure of stomach and intestine, as it causes a good healing, and least tissue reactions.

The dog could tolerate resection of up to 50 % of the stomach size, and also could tolerate resection of up to 2 meters of the intestinal length without severe complications.

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بسم الله الرحمن الرحيم

دراسات عن معنى الإصابات الجراحية للجهاز
الهضمي في الكلاب مع الإشارة
الخاصة إلى تشخيصها بالأشعة

أجريت هذه الدراسات على ٤٤ من الكلاب الضالة من كلا الجنسين التي تراوحت أوزانها بين ٥ - ٣٠ كجم وكذلك أعمارها من عدة شهور إلى ما يقرب من ١٠ سنوات . قسمت هذه الحيوانات إلى مجموعتين ، الأولى منها إستهدفت الدراسة فيها معرفة قدرة اشعة إكس في دراسة القناة الهضمية للحيوانات السليمة قبل وبعد إستخدام الباريوم مع الوضع في الاعتبار صاب انسب الأوقات لدراسة كل جزء منها بعد تجريع الباريوم من الفم أو من الشرج . أما المجموعة الثانية فقد تم تقسيمها في الأخرى إلى تحت مجموعتين فرعيتين ، تحت المجموعة الأولى تم إصابتها بعدد من الإصابات الجراحية تجريبيا . فقد تم تجريع أجسام غريبة بالفم مع الأكل و باليد وكذلك تم ادخال بعضها من خلال جسم الحيوان من الخارج الى تجويف البطن . شملت هذه الأجسام أجسام حادة مثل الأبر والمسامير وأسلحة المشاط وأخرى لمساء كتقطع العملة و الزجاجات الفارغة وكذلك بعض الكرات الصغيرة . تم إستخدام الأشعة في محاولة تشخيص هذه الإصابات مع الوضع في الاعتبار الأوضاع المختلفة للتصوير وكذلك أهمية تجهيز الحيوان قبل التصوير وكذلك معرفة تأثير إستخدام كل من المهدات والمخدر الكلي على حركة القناة الهضمية و بالتالي سرعة مرور الباريوم فيها . تم إجراء العمليات الجراحية المناسبة لعلاج تلك الإصابات مع إستخدام عدد من الخيوط الجراحية المختلفة والتي شملت مجموعة لا تتمى وهي برولين وميرسيلين ، و مجموعة تتمى والتي شملت خيط أمعاء القط بولين وكروميك وكذلك خيط الديكسون وذلك بهدف معرفة التأثيرات المختلفة لهذة الخيوط على الأنسجة وذلك من خلال النقص الظاهري و النقص الهستوباثولوجي على عينات تحتوي على هذه الخيوط كمحاولة لتحديد أي من هذه الخيوط يصلح للإستخدام بعد ذلك في علاج مثل هذة الإصابات .

أما تحت المجموعة الثانية الفرعية ، فقد تم فيها عمل بعض الدراسات الجراحية التجريبية على المريء والمعدة والأمعاء ، فقد تم فتح طولي للمريء لإخراج أي جسم غريب به ثم قفل هذا الفتح قفلا طوليا وفي حيوانات أخرى قفلا عرضيا للمقارنة بين تأثير كل منها على إتساع المريء بعد الخياطة . أما على المعدة والأمعاء فقد تم إستئصال جزئي لأجزاء وأطوال منها ثم معرفة ردود الفعل المترتبة على إستئصال هذه الأطوال المختلفة من المعدة وكذا الأمعاء .

أما عن طرق التخدير المستخدمة ، فقد تم إجراء كل العمليات الجراحية في هذا البحث تحت تأثير إحدى نوعين من التخدير الكلي ، الأول بإستخدام الكيتيلار بجرعة ١٠ مجم/كجم بالحقن في العضل بعد ربع ساعة من حقن ٠,٢ مجم/كجم من الرومبون بالعضل أيضا ، أما النوع الثاني فقد كان بإستخدام النزدونال ٥% بجرعة قدرها ٢٠-٣٠ مجم/كجم بالحقن في الوريد بعد ربع ساعة من حقن ٠,٢ مجم/كجم من الكومبيلين بالحقن في العضل .

وقد اثبتت هذه الدراسة مايلي :

يعتبر تصويم الحيوان قبل التصوير بأشعة إكس خاصة بالباريوم من الأشياء الهامة لإظهار مسارة بوضوح ، كما أن أشعة إكس بدون الباريوم ليست قادرة على تحديد مكان معظم أجزاء القناة الهضمية في الحيوانات السليمة إلا ما يحتوى منها على كمية كبيرة من الهواء كالمعدة والقولون في حين أن إستخدام الباريوم لنفس الغرض يظهرها . كما إتضح أن الوضع الجانبي هو أساسيا بالإضافة إلى أي وضع آخر كالأمامي أو الخلفي والمهم إختيار أي الوضعين يحقق راحة للحيوان أثناء عملية التصوير . وفي تصوير المريء فيفضل إستخدام الوضع المائل بالإضافة للجانبي ، كما وجدنا أن أنسب الأوقات لأخذ صورة للمريء هي بعد تجرّبع عجيئة الباريوم أوخلال ٥ دقائق أي أثناء البلع أو بعده مباشرة أما بالنسبة للمعدة فبعد عشر دقائق من البلع أما الأمعاء فأنسب الأوقات هي بعد مرور نصف ساعة من تجرّبع محلول أو معلق الباريوم، على أن نكرر التصوير كل ساعة لحين الحصول على التشخيص المناسب أوإخراج الباريوم من الشرج .

أظهرت الدراسة أيضا أن إخراج الباريوم من القناة الهضمية يتم في وقت أقصاه خمس ساعات من بعد تجربة بالفم في حالة استخدام بعض المهدات كطريقة للتحكم في الحيوان أثناء عملية التموير ، بينما يتأخر إخراجه إلى مايقرب من يوم كامل في حالة استخدام المخدر الكلي كطريقة للتحكم في الحيوان أثناء التموير .

عند استخدام اشعة إكس لتشخيص الإصابات الجراحية الممطنة وجد أن الأشعة بدون الباريوم لم تظهر إلا الأجسام الغريبة ذات الكثافة العالية (الوزن الذري الكبير) مثل الأجسام المعدنية كالمشارط والمسامير وقطع العمله والإبر ، أما الأجسام الغريبة ذات الكثافة المنخفضة (الوزن الزرى الصغير) مثل قطع البلاستيك والمطاط والخشب وقطع الملابس فلم يظهر منها إلا ما يسبب إنتفاخ للعضو الموجودة به أو أن يكون الجسم الغريب نفسه ممتلىء بالهواء ، أما بعد استخدام الباريوم فقد أدت هذه الأجسام الغير ظاهره إلى حجز الباريوم حجرا كليا أو جزئيا فهي عندئذ تمثل فراغا لا يمر الباريوم خلاله .

أما عند دراسة القولون بالأشعة ، فقد وجد أنه سهل تحديد مكانه في الأفلام بدون الباريوم وذلك لوجود كمية كبيرة من الغازات به و بعد الباريوم وجد أنه من الأفضل أن يتم حقن الباريوم من خلال الشرج أفضل من أن نعتمد على الباريوم بعد نهاية مساره في القناة الهضمية بعد تجربة بالفم حيث أن هذا الطريق يحتاج إلى وقت أطول خاصة في الحيوانات التي تم حقنها بمواد مخررة تؤثر على الحركة الدودية للأمعاء عما تحتاجه الحقنة الشرجية بالباريوم ، إذ يتم حقن الباريوم بالشرج ثم أخذ صورة مباشرة بعد الحقن .

أثبتت الدراسة أيضا أن معظم الأجسام الغريبة التي تمر من خلال الفم ممكن أن تحتجز بالمريء أو تصل للمعدة أو تمر خلال الأمعاء وفي كل تسبب بعض المشاكل التي تختلف على صب مكان وجودها وتشمل في معظم الأحيان الإمتناع عن الطعام ، القيء ومعظم علامات المرض بصفة عامة وقد وجد أن وجود هذه الأجسام بالمعدة يسبب قليل من المشاكل التي قد تحدث عند وجودها

بالمريء أو الأمعاء خاصة ما هو أملس منها ليس مدببا أو حادا على عكس الأجسام التي قد تخترق جدار البطن من الخارج فمعظمها حادا وكثيرا ما يسبب العديد من المشاكل الجراحية التي تحتاج إلى تدخل جراحى سريع لإزاله هذه الأجسام .

شاهد من الفحص الظاهرى بعد الجراحات بأوقات مختلفة أن أصن درجات الإلتئام كانت بعد ٢١ يوما من الجراحة أو أكثر حيث انه كان من الصعوبة تحديد مكان الجراحة السابقة لولا وجود الخيط الذى لم يمتص فى الأنسجة فى حالة إستخدام البرولين أو الميرسيلين كما وجد أن الإلتئام أصن ما يكون فى حالة إستخدام الخيوط الجراحية التي تذوب خاصة خيط أمعاء القطن بلبين وكروميك .

أما الإلتصاقات والإلتحامات بين الأنسجة وبعضها فقد كانت أوضح فى حالة الخيوط التي لم تمتص حيث شوهد إلتحاما بين مكان الجراحة والمساريقا و بين مكان الجراحة والجدار الداخلى للبطن عند مكان الفتح و كذلك بين المثانة البولية والقولون عند عمل إستئصال جزئى للقولون أما بالنسبة لدرجة الضيق الناتجة عند ضم طرفى الأمعاء بعد إستئصال جزء منها فلم يكن هناك أى فروق واضحة بين الخيوط المختلفة وذلك بإستخدام الأشعة بالهواء و البارיום على عينات تحتوى على مكان الإلتئام بعد إعدام الحيوان أو أثناء حياته . أما عن نتيجة الفحص الهستوباثولوجى فقد أثبتت التجربة أن الميرسيلين كخيط لا يذوب قد كان أكثر الخيوط المستخدمة التي أحدثت تفاعلات وردود فعل خلوية ونسيجية تمثلت فى تطعيم فى الأنسجة المخاطية والطلائية بالإضافة إلى وجود العديد من الخلايا الدالة على الإلتهابات الحادة والمزمنة فى هذه الأنسجة مع ظهور بعض كرات الدم الحمراء خارج الأوعية، فى حين كان البرولين هو أقل الخيوط المستخدمة التي أحدثت مثل هذه التأثيرات حيث أحاطه الجسم بكبسولة من الألياف التي تحتوى على عدد بسيط من الخلايا البيضاء . أما عن الخيوط التي تذوب فقد أحدثت كلها ردود فعل وتفاعلات خلوية لكنها ليست فى خطورة ما أحدثه الميرسيلين و ليس أقل مما أحدثه البرولين وقد كان الديكسون أقل فى تأثيره من كل من خيط أمعاء القطن بلبين وكروميك .

ومن الدراسات الجراحية التجريبية على المراه فقد وجد أن القفل العرضي لجروح المراه الصغيرة قد يكون أفضل من القفل الطولي ، أما على المعدة فقد وجد أن الحيوان يستطيع تحمل إستئصال حوالي ٥٠% من حجم المعدة دون أي مضاعفات . و بالنسبة للأمعاء فقد أسفرت النتائج عن تحمل الحيوان إستئصال حوالي ٢ مترا من طول الأمعاء دون حدوث مضاعفات خطيرة لحالته المحيية بعد الإستئصال .

الخلاصة

مما سبق نستطيع أن نستخلص أن اشعة إكس بدون الباريوم وحدها ليست كافية لحماية القناء الهضمية دراسة وافية رغم أنها تظهر بعض الاصابات كالأجسام الغريبة ذات الكثافة العالية ، إلا أن معظم إصابات الأخرى تحتاج إلى الباريوم ، لذلك يجب عند إستخدام هذه الأشعة في تشخيص مثل هذه الحالات أن نبدأ بالأشعة بدون الباريوم ثم نكمل بعد ذلك بإستخدام الباريوم على أن نكررها في أوقات متفاوتة لحين إخراج الباريوم أو الوصول للتشخيص السليم . كما ثبت أن خيط البرولين هو أفضل الخيوط الجراحية لعلاج مثل هذه الإصابات حيث أنه يحقق إلتئام جيد و أقل تأثيرا على الأنسجة . كما أثبتت الدراسة أيضا أنه يمكن إستئصال حتى ٥٠% من حجم المعدة و كذلك يمكن إستئصال حوالي ٢متر من طول الأمعاء في الكلاب دون حدوث مضاعفات خطيرة .

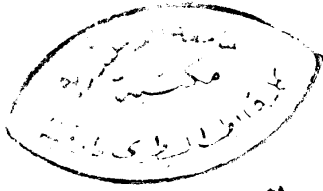
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٥٤

دراسات عن بعض الاصابات الجراحية للجهاز
الهضمي في الكلاب مع الأشاره الخاصه
الى تشخيصها بالأشعه

رسماله مقدمه من
ط.ب/ رمضان السيد عيد الواحد
بكالوريوس في العلوم الطبيه البيطريه ١٩٩٠
جامعه الألكندريه

المصقول على
درجه الماجستير في العلوم الطبيه البيطريه
(تخصص جراحه الحيوان)

الى

قسم الجراحه والولاده
كلية الطب البيطرى
جامعه الألكندريه

(١٩٩٣)