COMPARATIVE EVALUATION OF CONVENTIONAL AND LAPAROSCOPIC-ASSISTED TECHNIQUE FOR INTESTINAL SURGERY IN DOGS

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Eight dogs with intestinal tumour (02) and intestinal intussusception (06), were diagnosed and operated by laparoscopic-assisted technique (4cases) or conventional method (4cases) under atropine sulphate (0.02 mg/kg s/c), butorphanol tartrate (0.2 mg/kg i/v) and acepromazine maleate (0.02 mg/kg i/v) pre-medicated, propofol (4 mg/kg i/v) induction and isoflurane (2.5%) maintenance anaesthesia. No intraoperative and only minimal postoperative complications were noted in the cases of both groups in this study.

**Keywords:** Anastomoses, Intestinal biopsy, Intestinal resection, Intestinal tumour, Intussusception, Laparoscopic-assisted technique.

Minimally invasive surgery is being adopted in veterinary medicine with increasing frequency, and with a wider selection of described procedures. Laparoscopic-assisted (LA) intestinal resection and anastomosis for discrete intestinal masses is an effective treatment option for the distal duodenum to the mid-descending colon (Gower and Mayhew, 2011). The minimal invasiveness of the procedure, rapid patient recovery and diagnostic accuracy make laparoscopy a preferred technique over the invasive procedures. The present clinical study was done to optimize its application in intestinal surgery in dogs.

**Materials and Methods**

Eight clinical cases of intestinal disorders were presented at the BSDP hospital for animals affiliated to Bombay Veterinary College, Parel Mumbai, for diagnosis and management of the condition (table 1 and 2).

**Table no.1: Details about the breed, age, sex, weight, deworming status and vaccination status and symptoms of dogs in group I**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Case No.</th>
<th>Breed</th>
<th>Age</th>
<th>Sex</th>
<th>Weight (kg)</th>
<th>Deworming status</th>
<th>Vaccination status</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B₁</td>
<td>Cocker Spaniel</td>
<td>9 years</td>
<td>Male</td>
<td>23</td>
<td>upto date</td>
<td>upto date</td>
<td>Inappetance, diarrhea, haematochezia, vomiting past 3 weeks</td>
</tr>
<tr>
<td>2</td>
<td>D₁</td>
<td>Labrador</td>
<td>4 months</td>
<td>Female</td>
<td>8.7</td>
<td>not done</td>
<td>Primary vaccine</td>
<td>Vomiting, melena, anorexia, weight loss, scanty stool past 5 days</td>
</tr>
<tr>
<td>3</td>
<td>E₁</td>
<td>Mongrel</td>
<td>6 months</td>
<td>Male</td>
<td>10</td>
<td>not done</td>
<td>not done</td>
<td>Vomiting, Abdominal pain, anorexia, weight loss, scanty stool past 6 days</td>
</tr>
<tr>
<td>4</td>
<td>F₁</td>
<td>Rottweiler</td>
<td>2 months</td>
<td>Female</td>
<td>3</td>
<td>upto date</td>
<td>Primary vaccine</td>
<td>Vomiting, melena, abdominal pain, anorexia, weight loss, scanty stool past 10 days</td>
</tr>
</tbody>
</table>

*Part of M.V.Sc. Thesis*
Table no.2: Details about the breed, age, sex, weight, deworming status and vaccination status and symptoms of dogs in group II

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Case No.</th>
<th>Breed</th>
<th>Age</th>
<th>Sex</th>
<th>Weight (kg)</th>
<th>Deworming status</th>
<th>Vaccination status</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B_2</td>
<td>Labrador</td>
<td>13 years</td>
<td>Male</td>
<td>28</td>
<td>upto date</td>
<td>upto date</td>
<td>Diarrhea, weight loss, inappetence, vomiting past 1 month</td>
</tr>
<tr>
<td>2</td>
<td>D_2</td>
<td>Labrador</td>
<td>6 months</td>
<td>Female</td>
<td>15</td>
<td>upto date</td>
<td>upto date</td>
<td>Vomiting, abdominal pain, anorexia, weight loss, scanty stool past 5 days</td>
</tr>
<tr>
<td>3</td>
<td>E_2</td>
<td>Great Dane</td>
<td>2 months</td>
<td>Male</td>
<td>3</td>
<td>upto date</td>
<td>Primary vaccine</td>
<td>Vomiting, melena, anorexia, jaundice, weight loss, scanty stool past 2 weeks</td>
</tr>
<tr>
<td>4</td>
<td>F_2</td>
<td>German Shepherd</td>
<td>15 months</td>
<td>Male</td>
<td>35</td>
<td>upto date</td>
<td>upto date</td>
<td>Vomiting, melena, anorexia, weight loss, scanty stool past 2 weeks</td>
</tr>
</tbody>
</table>

Anamnesis was recorded and dogs were subjected to physical examination. Blood was collected and sent for haematological and biochemical analysis. After physical examination, surgical intervention seemed necessary in all the cases. However, most of the cases posed high anesthetic risk due to their moribund and critical state. All the cases were administered with parenteral fluid therapy prior to surgery.

The following criteria was followed to operate the case by Laparoscopic-assisted (LA) or conventional method:

a. If the dog was in a critical condition and diagnosis seemed unclear, laparoscopic technique was used to perform exploratory laparoscopy for confirmatory diagnosis followed by a LA surgery if possible (case no. E_1).

b. In unstable cases suspected for abdominal tumors, exploratory laparoscopy was performed for diagnosis followed by a biopsy of the tumour either by total laparoscopic or LA method (case no. B_1).

c. In unstable cases suspected for intussusception, laparoscopy was used for confirmatory diagnosis followed by LA surgical intervention (case no. D_1, E_1, F_1).

d. In critical or stable cases, when the diagnosis was obvious by anamnesis, abdominal palpation and diagnostic imaging modalities like plain or contrast radiography and abdominal ultrasound, the conventional

![Image 1](https://via.placeholder.com/150)

**Fig. 1** A large cystic mass with some air in it possibly part of bowel was seen cranial to the urinary bladder was seen in case no. B_1.

![Image 2](https://via.placeholder.com/150)

**Fig. 2** CT scan imaging shows the presence of an abdominal suspected to be an intraluminal intestinal mass in case no. B_1.
e. approach was attempted. (case no. B₂, D₂, E₂ and F₂).

All the dogs were pre-medicated with Atropine Sulphate (0.02mg/kg body weight) s/c 15 minutes before the induction of anaesthesia. Butorphanol Tartrate (0.2mg/kg body weight) was injected i/v followed by Acepromazine maleate (0.02mg/kg body weight). Ten minutes after the administration of premedicants. Anaesthesia was induced with Propofol (4mg/kg body weight) i/v. Anaesthesia was maintained by inhalation anaesthesia using Isoflurane- Oxygen mixture.

**Procedure for Laparoscopic-assisted intestinal surgery**

The animal was positioned in dorsal recumbancy. The ventral abdomen was prepared aseptically. Veress needle was introduced near the umbilicus through a skin incision. Flexible tubing was used to connect the Veress needle to the insufflator and insufflation done with CO₂ to establish pneumoperitoneum. A laparoscopic portal (6 mm or 11 mm) was placed on the midline between the xyphoid and the umbilicus as per the requirement. The laparoscope was placed through this trocar to enable visualization of the abdominal organs. Additional ports were placed as per requirement. The abdominal contents were examined laparoscopically. A magnetic blunt probe was used to examine the abdominal contents. The diseased portion of the gastro-intestinal tract (GIT) was identified and a 5 mm laparoscopic grasping forceps was inserted through one of the additional ports which was used to grasp the portion of the GIT to be exteriorized. Laparotomy sponges were used to pack off the exteriorized portion of the GIT and extracorporeal gastro-intestinal surgery was performed as per routine method.

In case B₁, a working port was made, using a 6-mm threaded trocar on the left cranial quadrant of the abdomen almost parallel to the camera port. In case D₁, E₁ and F₁, a working port was made along the ventral midline caudal to the camera port. In case B₁ the intra-luminal intestinal tumour was located and a biopsy was taken using the biopsy cup forceps. The abdomen was lavaged with warm sterile normal saline and the fluid was removed using suction (VET PUMP). The abdominal muscles and subcutaneous tissue were closed using Catgut no. 2-0 with simple interrupted sutures. The skin was closed using Ethilon No. 0 with cross mattress suture. In case D₁, E₁ and F₁ after exploratory laparoscopy, the affected portion of intestine was identified as intussusception. In case no. D₁, E₁ and F₁, the intussusceptions were reduced manually by gently applying traction on the neck of the intussusceptum while milking its apex out of the intussuscipiens. Care was taken to avoid excessive traction, because this could lead to tears on the compromised intestine. In some cases, the intestine was milked to a point where necrosis and adhesions were minimal. The reduced intestine was then evaluated for viability and perforation. Resection and anastomosis of the non-viable portion of intestine was performed when manual reduction was impossible, and tissue is devitalized, or mesenteric vessels have been avulsed from a portion of the involved intestine. The intestinal contents were gently milked 4 to 5 cm to either side of the intended incision. The procedure for enterectomy and intestinal anastomosis was carried out.

**Procedure for Conventional Intestinal Surgery**

The procedure for enterectomy and intestinal anastomosis (case no. B₂, D₂, E₂) and enterotomy (case no. F₂) was carried out.

The following surgical parameters such as surgical operating time, pain during surgery and the length of the skin incision were noted in all the cases. All the cases were maintained on injection cefotaxime (50 mg/kg i.v. bid), metronidazole (15 mg/kg i.v. bid), RL (40-90 mg/kg i.v. as per the hydration status of the dogs), DNS (40-90 ml/kg i.v. as per the hydration status), amino acid preparation (4-6 ml/kg i.v. bid) along with B-complex and antacid injections for 5 days. The dogs were kept nil-by-mouth for 21 hours and then they were allowed on oral water intake and if no vomiting was noted...
semi solid food in the form of lapsi was provided in small quantities 3-4 times in a day. Postoperative pain scores were assessed according to the Colorado State University, canine acute pain scale. They were judged one day post operatively.

Results and Discussion

Skin sutures were removed on the 12th day post-surgery. The post-operative care and follow up done was adequate and led to good healing with no complication.

Laparoscopic-assisted procedure:

Though the laparoscopic assisted method is more challenging to master and execute requiring hours of practice and patience, it has its own advantages over the traditional method of GI surgery. The most important factor that was experienced during surgery was the visibility. The same level of magnification or visibility cannot be achieved by the naked eye. Similar advantages, associated with magnification have been documented by Rawlings et al. (2003), Rawlings (2009), Pinel et al. (2013) and Case and Ellison (2013). During laparoscopy, a sweeping examination could also be carried out of all abdominal organs to detect abnormality. Biopsies can also be taken if necessary, as also described by Rawlings et al., (2003). In case B1, in addition to exploratory laparoscopy for confirmatory diagnosis of the intestinal mass, an intestinal biopsy was also obtained, which was much easier compared to conventional method. Claudio et al. (2011) opined that minimal invasive procedures like biopsies could be taken directly from the desired site with

Fig. 3 Port placement for Case B1

Fig. 4 Laparoscopic intestinal biopsy of intestinal mass using Clickline biopsy forceps (case no.B1)

Fig. 5. End-to-end anastomoses of intestine and Omentalization after intestinal end-to-end anastomoses
minimal post-operative discomfort. It helped in confirmatory diagnosis of the gastrointestinal disorder, especially in cases when diagnosis was doubtful using other modes of diagnostic imaging like radiography (plain or contrast x-rays, ultrasound and CT-scan). This procedure may be preferred, when surgical intervention seemed necessary especially in critical cases.

**Conventional intestinal surgery:**

Surgical procedures viz. enterectomy and anastomosis and intestinal biopsy were performed by the conventional method via ventral midline abdominal incision. The procedures were performed without difficulty and with minimal complications.

The mean surgical time was 109.50 ± 21.67min and 97.50 ± 16.03min for group I and group II respectively. There was no significant difference between the groups. Almost similar surgical time for both groups could be due the conversion of LA technique to open method in majority of the procedures performed in group I. The group I took longer time due to multiple additional steps like insufflation, insertion of trocars and telescope, removal of trocars and desufflation.

The mean incision length was 5.43 ± 1.32 in group I and 8.88 ± 1.21 in group II. There was no significant difference between the groups. This could be due to lengthening of the incision to exteriorize the intussusception (case no. D₁, E₁, F₁) depending on its size.

In case F₁, peritonitis was noted on exploratory laparotomy as also reported by Ralphas et al. (2003). The intestines also seemed friable. Lesser pain was felt in Group I, possibly due to lesser tissue trauma. Though both groups were provided with the same postoperative analgesia, dogs in group II showed more discomfort. Case and Ellison (2013) has also stated that laparoscopic assisted technique is associated with decreased pain. Case no F₁ showed extreme signs of abdominal pain on palpation due to peritonitis and anastomoses leak 3 days post-surgery.

On comparing the two techniques, visibility, magnification and lower incidence of infection and pain were found to be major advantages in the technique employed in group I. However, bigger sized tumors, foreign bodies (linear), intussusceptions etc. seem to be a limitation to laparoscopic assisted GI surgery (Table3 and 4).

<table>
<thead>
<tr>
<th>Table no.3: Details about the symptoms, diagnostic imaging, diagnosis, treatment and outcome of dogs in group I</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group I (Laparoscopic-assisted intestinal surgery)</strong></td>
</tr>
<tr>
<td><strong>Case No.</strong></td>
</tr>
<tr>
<td>B₁</td>
</tr>
<tr>
<td>D₁</td>
</tr>
<tr>
<td>E₁</td>
</tr>
<tr>
<td>F₁</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Table no.4: Details about the symptoms, diagnostic imaging, diagnosis, treatment and outcome of dogs in group II</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group II (Conventional Intestinal surgery)</strong></td>
</tr>
<tr>
<td><strong>Case No.</strong></td>
</tr>
</tbody>
</table>

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B2 | x-ray, USG | Exploratory laparotomy, Intestinal biopsy Spleenectomy | Intestinal Tumour, metastasis to spleen Intestinal biopsy | died 4 days post-surgery due to peritonitis, metastasis in chest

D2 | x-ray | Enterectomy and anastomosis | Intussusception | survived

E2 | Plain and contrast X-ray, USG | Enterectomy and anastomosis | Intussusception | Died due to liver failure and renal failure

F2 | x-ray, USG | Enterotomy | Foreign body (mango seed) in small intestine | survived

References