Diagnostic Laparoscopic Biopsy in Dogs and Cats

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Abstract : Four dogs and two cats received laparoscopic or laparoscopic-assisted biopsy of abdominal organs for definite diagnosis of illness. Patients were presented with a chief complaint of acute or chronic vomiting excluding case 5 (seizure). Two patients needed the liver biopsy (case 1 and 5), and others did stomach and small intestine biopsy excluding case 2 (small intestine biopsy only). Surgical procedure was performed with modified standard methods. All patients recovered uneventfully and did not require any hospitalization without complications. Laparoscopic and laparoscopic-assisted biopsy could offer benefits of reduced incision length and rapid postoperative recovery.

Key words : *laparoscopy, biopsy, abdominal organ, dog, cat.*

Introduction

Histologic examination is important to make diagnosis and treatment decisions in small animal practice. Therefore, it is necessary to perform the surgical process to obtain tissue biopsy samples from affected organ systems, particularly in cases of intra-abdominal lesions. Laparoscopic and laparoscopic-assisted surgery allow to collect the abdominal tissue samples as a diagnostic procedure, including following advantages; improved visualization of target organ, relatively non-invasive, and the smallest risk of complications with fast patient recovery (3,8). These benefits associated with laparoscopy are also applicable to biopsy approach (3). Nowadays, it is not a new technique in small animal surgery using laparoscopy in biopsy of visceral organ, including liver, spleen, lymph nodes, gastrointestinal tract, kidney, urinary bladder, pancreas, adrenal gland, and prostate (3-5,7,8,10-15). Actually, it may embrace almost any abdominal organ for biopsy with the laparoscopic procedure (8). In addition, biopsy of intra-abdominal organs would be performed during exploratory laparoscopy or other surgical interactions (1,5). The present study aimed to discuss the laparoscopic and laparoscopic-assisted biopsy in dogs and cats.

Case

Four dogs and two cats were referred to the Veterinary Teaching Hospital of Gyeongsang National University. As detailed information described in Table 1, the patients were presented with a chief complaint of acute or chronic vomiting excluding case 5 (seizure). Especially, case 4 showed

recurrent vomiting in every few months since three years ago and received symptomatic treatment at each time. Increases of ALT, AST, ALP, and GGT were identified by serum chemistry analysis in case 1 before referred to. Case 6 did not recover with administration of corticosteroid (prednisolone, unknown dose), but improved with immunosuppression (chlorambucil, unknown dose). Case 5 was provisionally diagnosed as hepatic encephalopathy by the local hospital due to history of seizure and elevation of serum hepatic enzyme and ammonia level. This dog was referred for definite diagnosis with the laparoscopic liver biopsy.

Further examinations were including physical examination, blood work, radiographic and abdominal ultrasonographic findings. Case 1 was discovered to have increased ALT (1043 U/L, reference range; 10-118) in serum chemistry analysis and irregular margin, mixed echogenicity, and 17.8 × 10.6 mm size of middle hepatic lobe mass in ultrasonographic finding. Muscular layer thickness of the small intestine was identified in case 2, 3, 4 and 6 with ultrasonography. Case 3 and 6 were found to have a submucosal thickness of the gastric wall additionally. There was no significant abnormality in case 5, but coagulation analysis was performed to evaluate risk of coagulopathy. Mild coagulopathy was diagnosed by results of prothrombin time and activated partial thromboplastin time as 13.7 s (reference range; 8.2-6.2 s) and 15.1 s (reference range; 18.0-14.0 s) respectively. Including case 5 which referred for laparoscopic liver biopsy, histologic examination was determined for definite diagnosis according to the ultrasonographic findings. Table 2 described plans to undergo laparoscopic or laparoscopic-assisted biopsy of affected organ systems. Meanwhile, we decided to localize the biopsy site with endoscopic examination simultaneously and rule out Helicobacter infection through an additional stomach biopsy in case 4.

Surgical procedure was performed according to the previ-

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Table 1. Signalment and chief complaints of the presented patients

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Species	Canine	Feline	Feline	Feline	Canine	Feline
Breed	Maltese	Turkish Angora	Korean Domestic Shorthair	Korean Domestic Shorthair	Yorkshire Terrier	Persian
Age	6-month-old	2-year-old	9-year-old	7-year-old	5-year-old	3-year-old
Sex	Intact female	Castrated male	Castrated male	Spayed female	Intact female	Castrated male
Body weight	2.6 kg	3.5 kg	4.8 kg	4.0 kg	2.9 kg	3.1 kg
Chief complaints	Vomiting, mild depression	Vomiting, diarrhea, anorexia	Vomiting	Vomiting	Seizure	Vomiting, weight loss
Duration	1 day	7 days	3 weeks	3 years	25 days	Unknown, but chronic

Table 2. Results of abdominal ultrasonographic findings, differential diagnosis and plans for diagnostic biopsy via laparoscopic approach

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Abdominal ultrasonographic findings	Irregular margin, mixed echogenicity, and 17.8 × 10.6 mm size of middle hepatic lobe mass	Muscular layer thickness of diffuse small intestine	Submucosal thickness of gastric wall Muscular layer thickness of entire small intestine	Muscular layer thickness of small intestine Lymphadenopathy of abdominal lymph node	NRF	Submucosal thickness of gastric wall Muscular layer thickness of entire small intestine Mild enlargement of mesenteric lymph node
Differential diagnosis	1. Hepatic abscess 2. Hepatic neoplasia 3. Others	1. Alimentary lymphoma 2. Inflammatory Bowel Disease 3. Others	1. Alimentary lymphoma 2. Inflammatory Bowel Disease 3. Others	1. Chronic Inflammatory Bowel Disease 2. Intestinal tumor 3. Helicobacter infection 4. Gastritis 5. Others	1. Hepatic encephalopathy 2. Others	1. Inflammatory Bowel Disease 2. Alimentary lymphoma 3. Others
Plan	Laparoscopic liver biopsy	Laparoscopic small intestine biopsy	Laparoscopic stomach and small intestine biopsy	Laparoscopic stomach and small intestine biopsy with endoscopic localization	Laparoscopic liver biopsy	Laparoscopic stomach and small intestine biopsy

Table 3. Target organs, number of portals and histopathologic diagnosis of patients

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Target organs	Liver	Duodenum	Stomach Duodenum	Stomach Duodenum Ileum	Liver	Stomach Duodenum Ileum
Portals	3 portals (5 mm × 3)	1 portal (10 mm)	2 portals (5 mm × 2)	2 portals (5 mm × 2)	2 portals (5 mm × 2)	1 portal (10 mm)
Histopathologic findings	Hematoma	Chronic duodenitis of muscular layer	Stomach: Moderate multifocal lymphocytic gastritis Duodenum: no significant lesion	Stomach: no significant lesion Duodenum and ileum: Eosinophilic enteritis	Hydropic degeneration of hepatocytes and precipitation of hemosiderin Mild microvascular dysplasia	Eosinophilic gastroenteritis with Helicobacter infection

Fig 1. Laparoscopic and laparoscopic-assisted biopsy was performed for histopathologic diagnosis. (A) 17.8×10.6 mm size of middle hepatic lobe mass of case 1. (B) Laparoscopic liver biopsy using laparoscopic cup forceps in case 5. (C) Exposure of small intestine by atraumatic grasping forceps in case 6.

ous studies (1,3,5), but modified. Patients were prepared on the surgical table in dorsal recumbency with the clipped abdomen, as the standard manner. During general anesthesia, mechanical ventilator was adjusted to maintaining the end tidal CO_2 partial pressure around 35-45 mmHg throughout the laparoscopic procedure. Initially, CO_2 pneumoperitoneum was induced via Veress needle, which was positioned on the caudal portion of the xiphoid process. The maximum abdominal pressures of 10 mmHg in dogs and 5 mmHg in cats were maintained. A 30° forward-oblique, 5 mm laparoscope (Panoview Plus, Richard Wolf GmbH, Germany) was used for 2- and 3-port technique in case 1, 3, 4 and 5. Case 2 and 6 were adopted to perform single port technique with a 10 mm operative laparoscope with a 6×270 mm operating channel (OP-Telescope 429-62000, MGB, Germany).

Laparoscopic liver biopsy was performed in case 1 and 5. In case 1, blackish-red hepatic mass (Fig 1A) was revealed when the middle lobe of liver was retracted ventrally with a 5 mm atraumatic grasping forceps (Richard Wolf GmbH). Because it showed partially good separation, pulling the mass out of the liver allowed to gain sufficient amount of sample using a 5 mm Babcock grasping forceps (Richard Wolf GmbH). It was possible to collect the liver sample via a standard technique with 5 mm laparoscopic cup biopsy forceps (Richard Wolf GmbH) in case 5 (Fig 1B). In this case, the liver appeared normally in laparoscopic finding. For biopsy of GI tract, laparoscopic-assisted technique was prepared. Except case 2 (small intestinal biopsy only), case 3, 4 and 6 needed both stomach and small intestinal biopsy. Exposure of target organs was performed using atraumatic grasping forceps (Fig 1C). Full-thickness biopsy of each of the hollow visceral organs was performed after stay suture with 3-0 polyglyconate. All abdominal organ incisions and portal sites were closed routinely. Patients recovered uneventfully and did not require any hospitalization. Moreover, there were no intra- or postoperative complications related to the surgical procedure, including hemorrhage, peritonitis and wound dehiscence. All tissue samples were submitted to the pathology laboratory. Histopathologic diagnosis of entire patients is enumerated in Table 3.

Discussion

Various instruments and techniques have been introduced for biopsy of abdominal organs that available both in laparoscopic and traditional open approach (1,5,14). According to the previous study, most of the standard biopsy methods were shown to provide great diagnostic outcomes with no complications relating the surgical procedure (1). However, Vasanjee et al. commented that biopsy needle had a risk of unreadability in case of liver biopsy, which associated with size of sample and its fragility (14). In these cases, we performed the liver biopsy by using laparoscopic cup biopsy forceps and GI biopsy via incisional full-thickness sampling individually. Histological evaluation of all the samples was achieved without any problem.

In this study, the patients did not exhibit any perioperative complications associated with laparoscopic procedures and required no hospitalization. There are various kinds of complications relevant to the laparoscopic surgery which may be implicated in hemorrhage, peritonitis, port site incisions, or adhesion formation after surgery as well as intraoperative anesthesia, pneumoperitoneum, equipment malfunction, trocar insertion, organ manipulation and biopsy (8). Therefore, it is important to take into account these contraindications of the laparoscopic operation to avoid unfavorable prognosis. Patient-specific factors are relative to contraindications that may increase risk for complications, including distended bowel, ascites, coagulopathies, peritonitis, cardiac, respiratory, and liver disease (8,9). The case 5 in the present study was revealed to harbor a mild coagulopathy. However, none of the additional hemorrhage controls were needed after laparoscopic liver biopsy, although similar patients had been warned of any blood loss (14).

Conversion to laparotomy may occur due to the several risk factors during any laparoscopic intervention regardless of the complications (8). In human medicine, conversion from laparoscopy to laparotomy has been discriminated between elective (conversion without complication) and emergent (conversion due to development of complication) conversion (6). Another study about conversion reported various risk factors for conversion to celiotomy from diagnostic laparoscopic procedures in dogs and cat; low total solids, presence of a solitary liver tumor, and diagnosis of neoplasia (2). Adhesions of abdominal organ, poor exposure, uncontrollable bleeding, hollow viscus rupture, anesthesia-related issues and surgeon inexperience were also believed to influence on the decision of conversion (2,8).

This study describes about the biopsy that using laparoscopy in the small animal practice. Laparoscopic and laparoscopic-assisted biopsy may offer benefits of reduced incision length and rapid postoperative recovery with minimized sur-

gical complication.

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개와 고양이에서 복강경을 이용한 생검 증례

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요 약 : 4마리의 개와 2마리의 고양이에서 질병의 정확한 진단을 위해 복강경을 이용한 생검을 시행하였다. 환견 및 환묘들의 주요호소증상은 1마리(case 5, 발작)를 제외하고 구토였다. 2마리의 환견(case 1, 5)은 간 생검이, case 2(소장)를 제외한 나머지 환묘들은 위와 소장의 생검이 지시되었다. 수술은 일반적인 수술 방법을 응용하여 시행하였다. 모든 환견 및 환묘들은 특별한 이상 없이 회복하였고 입원 치료는 불필요하였으며 어떠한 부작용도 관찰되지 않았다. 복강경을 이용한 생검은 절개 길이를 줄이고 회복을 빠르게 하는 이점을 지닌 것으로 생각된다.

주요어 : 복강경, 생검, 복강 장기, 개, 고양이