LAPAROSCOPIC BIOPSY OF THE STOMACH AND DUODENUM

MARIUSZ CHYCZEWSKI, ZBIGNIEW ADAMIAK, PIOTR HOLAK, MAREK JAŁYŃSKI, AND WIEŚŁAW PESTA¹

Department of Surgery and Roentgenology, Faculty of Veterinary Medicine, ¹Department of Surgery, Faculty of Medical Sciences, University of Warmia and Mazury, 10-719 Olsztyn, Poland
mchycz@uwm.edu.pl

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Abstract

The objective of this study was to evaluate the usefulness of the laparoscopic technique for performing a biopsy of the gastric and duodenal wall in dogs. Endoscopic examinations were performed in five dogs, which were not conclusively diagnosed based on symptoms and the results of clinical and laboratory tests. A histopathological analysis of laparoscopically collected tissue samples supported the diagnosis of a chronic inflammation of the gastric and duodenal wall. The results of the experiment indicate that laparoscopy permits accurate mapping of the biopsy site and supports the collection of tissue samples for histopathological analyses.

Key words: dog, stomach, duodenum, biopsy, laparoscopy.

Tissue biopsy is a special diagnostic procedure and a relatively non-invasive method of collecting biological material from pathologically changed tissue, which is then evaluated histopathologically. Tissue samples collected by biopsy are also used for virological or biochemical analyses. The collection of tissue samples for histopathological analysis and test results supports the determination of an appropriate treatment.

The diagnosis of gastric inflammations in dogs involves clinical and laboratory tests, radiological screening (radiograms, contrast radiograms), ultrasound imaging, and endoscopic examinations of the gastrointestinal tract. Additional diagnostic procedures include blood count tests, stool tests, and histopathological analysis of gastric wall sections showing pathological changes.

The popularly applied endoscopic biopsy or suction biopsy (using the Crosby capsule) techniques support the examination of gastric mucosal changes. Other biopsy techniques, such as percutaneous fine-needle aspiration biopsy, enable the collection of tissue (tumour) samples from the digestive tract on the side of the peritoneal cavity, but only under endoscopic or ultrasonographic control, which, however, does not guarantee sampling precision. The above method supports the collection of small quantities of material, which are often insufficient for the needs of histopathological analysis.

The main advantages of laparoscopic biopsy include visual control during sampling, collection of diagnostically valuable fragments of the gastric wall, and the relatively non-invasive character of this technique. Laparoscopic biopsy involves the smallest risk of complications, which may result from damage to blood vessels or other tissues, leading to infections in the abdominal cavity.

Material and Methods

The experiment involved five dogs showing non-specific gastric problems, including lack of appetite, vomiting, and diarrhea. Laboratory tests, including haematological examination, biochemical analyses, and radiological and ultrasonographic examinations did not produce a conclusive diagnosis. In view of non-specific and non-conclusive test results, all patients were subjected to laparoscopic biopsy of the gastric and duodenal wall.

Laparoscopic biopsy was performed under general anaesthesia. The patients were premedicated with 0.05 mg/kg b.w. of atropine sulfate (Atropinum sulfuricum, Polfa, Poland) and 0.5 mg/kg b.w. of acetylpromazine maleate (Calmivet, Vetoquinol, France). Anaesthesia was induced with a combination of 2 mg/kg b.w. of ketamine (Narkamon, SPOFA, Czech Republic) and 0.5 mg/kg b.w. of diazepam (Relanium, Polfa, Poland). It was maintained with 2% halothane (Narcotan-Leciva, Czech Republic) and an oxygen carrier using a semi-closed rebreathing circle system. Laparoscopy was performed using a standard video
channel. The laparoscopic column comprised a monitor, camera, insufflator, and a cold light source. The biopsy was performed with the involvement of spoon forceps.

The operative area was prepared in accordance with the generally observed surgical standards. Patients were placed on the operating table in dorsal recumbency. A Veress needle was inserted at a 45° angle, it was connected to the insufflator, and pneumoperitoneum was created using carbon dioxide under the pressure of 12 mmHg at an average gas flow volume of around 1 l/min. The needle was replaced with an optical port using a 10 mm NOPA wide-angle, rigid telescope with a 30° visual angle.

During laparoscopic exploration of the gastrointestinal tract, the appearance, colour, and condition of visceral peritoneum were evaluated. The organs were viewed at different angles to determine the degree of gastric and duodenal hyperaemia. The sampling site was selected based on the results of the above evaluation.

A trocar with a diameter of 5 mm was introduced into the sampling site. Spoon forceps were inserted through the port (Fig. 1). They were directed towards the part of the stomach or duodenum from which biopsy specimens were collected to grasp the largest possible quantity of tissue material. A section of the stomach or the duodenum was grasped with spoon forceps and pressure was applied to the tissue for 2-3 min. The forceps and the tissue sample were retracted. This procedure was repeated to collect the largest possible representative fragment of the gastric wall. Serosa and muscular coat tissue samples collected from gastric and duodenal wall fragments showing pathological changes were fixed in 4% buffered formalin. The collected material was embedded in paraffin and referred for histopathological analyses. Haematoxylin and eosin stained sections were subjected to a histopathological evaluation.

**Fig.1** Using “spoon forceps” for laparoscopic biopsy.

**Results**

In the produced endoscopic images, the observed inflammation of the gastric and duodenal mucosa showed no neoplastic changes. The procured image was typical for mucosal inflammations, showing hyperaemia, oedema, and tissue proliferation. A gastric wall biopsy in three dogs revealed chronic proliferative inflammation. Plasma cell and macrophage infiltrations were observed in the gastric submucosa with vascular hyperaemia and proliferation of glandular epithelial cells (Figs 2 and 3). In one patient, neoplastic changes were observed in the pylorus region. Foci of leiomyosarcoma cells were noted in the muscular coat of the stomach (Fig. 4). In two dogs, biopsies of the duodenum revealed extensive inflammatory changes in all layers of the gastric wall. Infiltrations of plasma cells, lymphocytes, and macrophages in the submucosa and the proliferation of glandular epithelial cells were seen (Fig. 5). The average time of the procedure from the introduction of the Veress needle to abdominal closure did not exceed 30 min.

**Discussion**

In gastrointestinal tract surgery, clinical symptoms may clearly suggest a disease of abdominal organs. A suspicion based on an interview, clinical examination, and results of selected laboratory tests may, however, prove to be unfounded in the light of other tests, and the causes of the disease may be difficult to determine.

Inflammations of the gastrointestinal tract relatively often affect dogs, and in most cases they are easy to diagnose. Yet some proliferative changes continue to pose a diagnostic problem. Non-specific symptoms and inconclusive results of haematological examination, biochemical analyses, and endoscopic examination of the digestive tract necessitate other tests to effectively diagnose the problem. Most proliferative inflammatory changes in the stomach and duodenum are observed in the form of infiltrations that are not detected in a radiological examination. Such cases have the greatest diagnostic challenge. The results of haematological examination and biochemical analyses often do not reveal changes suggesting a neoplastic disease. In such cases, a biopsy is needed to make an accurate diagnosis and propose a further course of treatment based on the nature of the observed pathological changes (5, 7).

In an endoscopic examination, the absence of neoplastic changes in the gastric and duodenal mucosa does not exclude changes in other parts of the gastric and duodenal wall. Every “suspect”, proliferative changes of the gastric wall, cell foci determined in a clinical, radiological, ultrasonographic, or endoscopic examinations constitute an indication for conventional biopsy regardless of the location of the affected site.
A gastric biopsy via a percutaneous endoscopically assisted transenteric approach is often performed in dogs to obtain cross-section samples from the entire gastric wall (3). The gastroscopic procedure, the selection of the incision point, and tissue sampling from the affected gastric wall are well tolerated by the patient, and they supply valuable diagnostic material. In the absence of focal changes in the intestinal lumen, an endoscopically assisted biopsy is similar to blind percutaneous biopsy. Laparoscopic biopsy supports the collection of adequate tissue samples from the affected part of the gastrointestinal wall without complications that frequently follow a conventional percutaneous biopsy. The collection of cross-section samples from the entire gastric wall and the mucosa via a conventional biopsy technique requires rinsing of the peritoneal cavity as well as bacteriological and cytological monitoring of the rinsing fluid (8). Complications such as narrowing of the intestinal lumen are very frequently noted, and they can be significantly minimised by mechanical suturing using a linear stapler (1, 2).

A full diagnosis of proliferative changes in the gastrointestinal tract should involve an examination of a relatively large biopsy sample. The results of a
histopathological examination of biopsy material determine further course of treatment. A single biopsy often produces false negative results, that is why several biopsies are recommended over a given period of time. In some cases, larger tissue samples may also be required. The submucosal location of proliferative changes may sometimes require staining for accurate determination of the biopsy site (4).

Laparoscopic biopsy is the only direct visualisation technique that does not require direct surgical access. The resulting image supports a macroscopic evaluation of pathological changes in the gastric and duodenal wall and it enables the precise selection of the tissue sampling site. The direct visualisation of the sampling site minimises the probability of false negative results. In human medicine, laparoscopic biopsy in children poses an alternative to direct biopsy preceded by laparotomy (6). It supports multiple biopsies of the stomach and duodenum in children affected by various gastrointestinal diseases. It is a safe and effective sampling technique, which is marked by a little pain and low risk of complications.

As an additional advantage, laparoscopic biopsy delivers a view of the visceral surface of the gastric and duodenal wall, which supports full haemorrhage management at the sampling site. In addition, the insertion of an optical device into the abdominal cavity “enforces” laparoscopic inspection of internal organs, which often leads to the diagnosis of a problem, which was not a direct indication for explorative laparoscopy.

References