

Prophylactic Surgical Removal of Asymptomatic Large Pedunculated Hepatic Focal Nodular Hyperplasia in a Dog

Key words

pedunculated liver mass;
focal nodular hyperplasia;
pedunculated focal nodular hyperplasia

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Abstract: A Shetland sheepdog was referred to us for splenomegaly. Blood examination revealed elevated activities of hepatic enzymes. Computed tomography revealed a hypoattenuated splenic mass and a large hepatic mass (size: 97 × 81 × 31 mm) connected to the left lateral lobe by a pedicle and iso-attenuating to the normal hepatic parenchyma. Imaging findings of the liver mass were consistent with benign changes. Surgical resection and definitive diagnosis through histopathological assessment were performed. Intraoperatively, partial torsion of the pedicle was observed. A thoracoabdominal stapler was used for resecting the pedunculated liver mass. Diagnoses of splenic hematoma and pedunculated focal nodular hyperplasia of the liver were confirmed and surgical resection normalized the hepatic enzyme levels and eliminated the risk of rupture and torsion. This is the first report of a pedunculated focal nodular hyperplasia with a size of > 5 cm and good clinical outcome after surgical resection in a dog. In veterinary medicine, there is no definitive indication for the resection of pedunculated hepatic nodular hyperplasia. Even without imaging evidence of torsion or rupture of large pedunculated liver masses, it is important to consider prophylactic removal.

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Introduction

Focal nodular hyperplasia (FNH) is a common benign hepatic tumor. Hepatic nodular hyperplasia tends to have a size of <5 cm in both animals and humans (1, 2). Although its etiology remains unclear, it is usually asymptomatic and lacks a malignancy risk (1, 3).

A rare type of FNH is characterized by a protruding mass shape connected to the liver by a pedicle, which is termed as a “pedunculated liver mass” or “exophytic liver mass” (4). Very few case reports of pedunculated liver masses in human and veterinary medicine exist in the literature (4, 5). Most cases of FNH are usually not clinically significant; however, a pedunculated FNH can present clinical signs and complications more frequently, including compression of other organs, hemorrhage, and infarction caused by pedicle torsion (6, 7, 8). Consequently, prophylactic resection of a pedunculated mass

should be considered even in asymptomatic patients. This article presents a case of prophylactic resection of a pedunculated mass in an asymptomatic canine patient, which was performed owing to its large size and to allow a definitive diagnosis. To the best of our knowledge, this is the first veterinary report of pedunculated FNH with a size of >5 cm and describes the surgical resection of the mass and perioperative assessment.

Case Presentation

An 8-year-old castrated male Shetland sheepdog was referred to the University Veterinary Medical Teaching Hospital in November 2023 for asymptomatic splenomegaly, which was confirmed radiographically at a regular medical check.

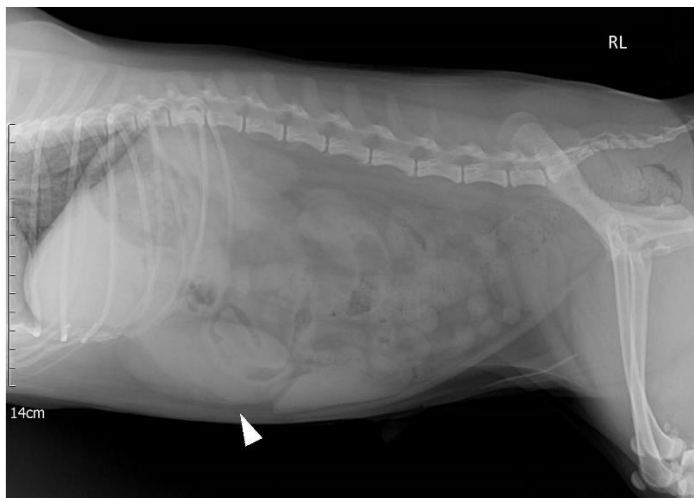


Figure 1: Lateral radiographic view of the abdominal cavity. The ventral margin of the liver is not evident. In addition, there is an abdominal mass (arrowhead) with soft-tissue density between the liver and spleen



Figure 2: Ultrasonographic images of the abdominal mass (A) and splenic head mass (B). The abdominal mass is connected to the left division of the liver. The splenic head mass has an irregular margin and heterogenous echotexture (asterisk)

Physical examination revealed that the body weight was 10.5 kg, with a body condition score of seven out of nine. No abdominal pain was detected, and the patient had a hypertensive systolic blood pressure of 160 mmHg. Blood examination revealed elevated activities of canine pancreatic lipase, total protein, globulin, aspartate aminotransferase (AST; 93 U/L), and alkaline phosphatase (ALP; 295 U/L), and raised level of D-dimer (368.02 ng/mL).

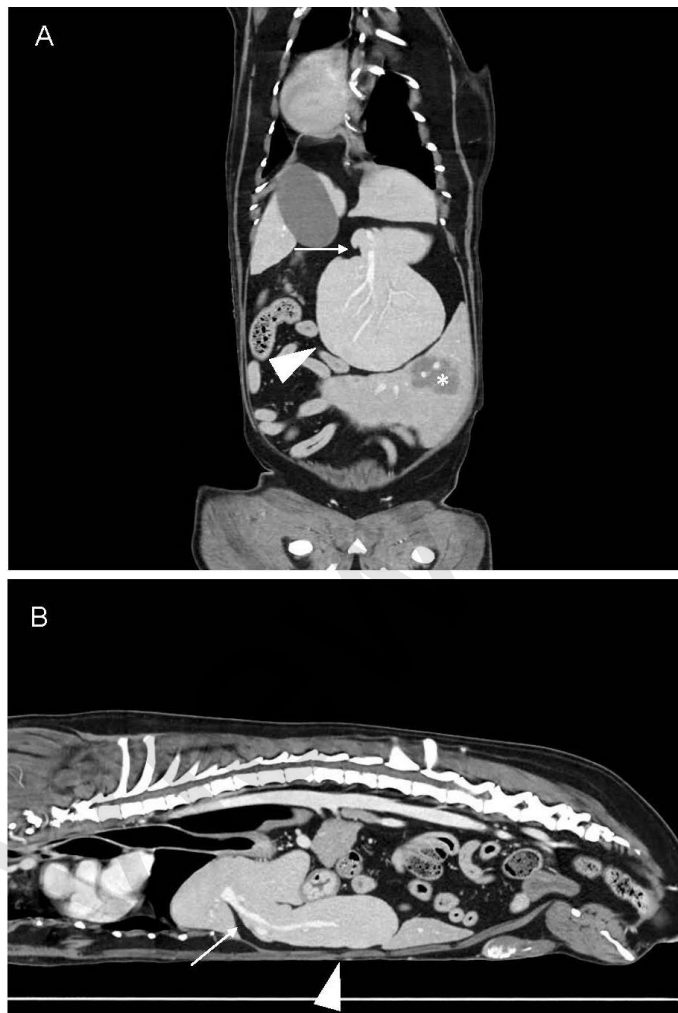


Figure 3: Computed tomography showing the abdominal cavity (A, B). A hypo-attenuated and endophytic splenic mass (asterisk) with an irregular margin and a size of 24 × 33 × 18 mm is observed. A pedunculated liver mass (arrowhead) with a parenchymal and vascular stalk (thin arrow) is observed to originate from the left lateral liver lobe. The size of the liver mass is 97 × 81 × 31 mm



Figure 4: After celiotomy, a partially torsed pedicle (thin arrow) is identified between the normal liver and liver mass (arrowhead)

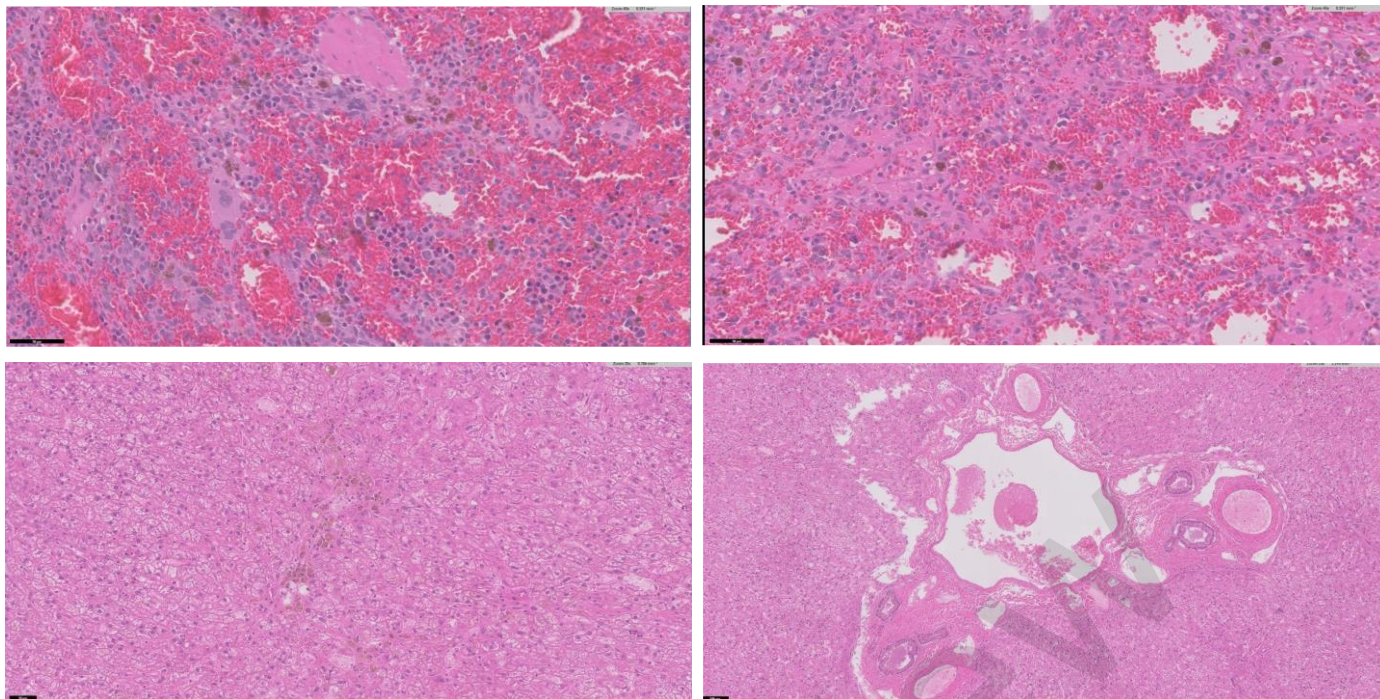


Figure 5: Histopathological images of the resected spleen (A, B) and pedunculated liver mass (C, D). Aggregation of erythroid precursors and megakaryocyte and infiltrates of leukocytes are present adjacent to the splenic mass (A). At the splenic body, spindle cells forming blood-filled vascular structures are also observed (B). In the pedunculated liver mass, there are lipogranulomas (C) and portal tracts, centrilobular veins, mild biliary proliferation, accumulation of hemosiderophages, and dilated centrilobular lymphatics with congestion (D)

Radiography revealed a mass effect of soft tissue density between the liver and spleen; the mass had a length and height of 95 mm and 44 mm, respectively (Fig. 1). Ultrasonography revealed a mid-abdominal mass connected to the left liver lobe (Fig. 2A). In addition to the hepatic mass, a 28-mm irregular splenic nodule was observed at the head of the spleen (Fig. 2B). Although gravity-independent echogenic gallbladder sludge was observed, there was no evidence of biliary obstruction. Computed tomography (CT) demonstrated that the iso-attenuated hepatic mass originated from the left lateral hepatic lobe and had a pedunculated shape that included the parenchymal and vascular stalk. The pedicle size was 14 mm with a maximal vessel diameter of up to 8 mm. The mass size was 97 × 81 × 31 mm. The hypo-attenuated splenic endophytic mass of 24 × 33 × 18 mm was observed to have an irregular margin (Fig. 3). The superficial and abdominal lymph nodes were normal in size.

A prophylactic surgical resection of the pedunculated liver mass and a complete splenectomy were performed. For resection, we initially made a ventral para-midline incision for laparotomy. After the spleen and splenic vessels were identified, splenic vessels were ligated and transected using a vessel-sealing device. Subsequently, we identified the large pedunculated liver mass connected to the left liver lobe. Additionally, we identified the pedicle of mass, which was found to be partially torsed (Fig. 4), which had not been observed on preoperative CT imaging. For mass resection, the pedicle was clamped using two Kelly hemostatic forceps after applying a thoracoabdominal stapler. Given that the diameters of the pedicle and blood vessel were

in excess of 7 mm, we selected a thoracoabdominal stapler in preference to a vessel sealing device. Following transection of the pedicle using a scalpel blade, there was no excessive bleeding. The abdominal wall, subcutaneous tissue, and skin were routinely closed. The patient recovered uneventfully from anesthesia and was discharged without any complications.

On the basis of the histopathological examination, the patient was diagnosed with splenic hematoma and lymphoid nodular hyperplasia, along with a pedunculated FNH of the liver (Fig. 5). At 13 days postoperatively, a blood examination revealed normalization of the preoperatively elevated hepatic enzyme levels, including AST (27 U/L) and ALP (167 U/L). No complications were reported as of the most recent follow-up at 5 months postoperatively.

Discussion

This article describes a case of pedunculated FNH in a dog. There are rare reports of pedunculated liver masses in human and veterinary medicine (4, 7). To our knowledge, this is the first report of surgical resection of a large pedunculated FNH >5 cm in size.

Since FNH has a relatively low risk of bleeding, it should be distinguished from other types of benign tumors such as liver adenomas (1, 6, 7). In humans, about 20% of patients with FNH have a gross diagnostic feature, the so-called “central scar”, which serves as a key diagnostic feature (1, 6, 9). However, this

feature was not observed in dog in the present case. Based on other ultrasound and CT findings, including an isoechoic and isodense parenchyma without contrast enhancement in the portal venous phase, focal nodular hyperplasia was initially considered (6, 7).

In most cases of asymptomatic FNH in humans, conservative treatment and monitoring are considered the best approach (7). Nevertheless, clinical signs were present in most reported cases of pedunculated FNH in humans (7, 10). These included abdominal pain or discomfort. In such cases, surgical removal was indicated (6, 7, 10). The majority of previously reported cases of pedunculated FNH in dogs were asymptomatic (4). This discrepancy may be due to anatomical differences between humans and dogs. This could also be due to the relative lack of reports in veterinary medicine, the differences in the pathophysiology of pedunculated FNHs in humans and animals, and the relative difficulty in recognising complaints in animal patients.

Previous reports have reported that liver enzyme levels were normal in dogs with peduncular nodular hyperplasia, whereas elevated liver enzyme levels were found in dogs with liver tumors (4). In our case, ALP and AST levels were elevated, which normalized after resection of the mass. This finding indicates increased activities of hepatic enzymes due to the pedunculated FNH. Therefore, elevated liver enzyme levels do not necessarily indicate a tumor lesion. In addition, clinicians should consider other differential diagnoses when enzyme profiles are elevated (4).

In our case, the possibility of a malignant splenic mass was considered and a definitive histopathologic diagnosis was warranted. There was also a risk of rupture or torsion of the large hepatic pedicle mass (11). Therefore, surgery was indicated.

Although minimally invasive procedures are performed in humans and laparoscopic surgery has several advantages, such as low perioperative blood loss, short duration of hospitalisation, and rapid recovery (7, 12), removal of the large mass through a small window would have been challenging in our patient. Therefore, we opted for traditional open surgery. During surgery, incomplete torsion of the pedicle was detected, which was not seen on preoperative imaging. Pedicle torsion can be fatal as it can lead to ischemia/reperfusion injury as well as rupture and necrosis. A reduction in blood flow stimulates the breakdown of adenosine triphosphate to hypoxanthine, and in the presence of oxygen, the accumulated hypoxanthine is subsequently converted to reactive oxygen species (13). Therefore, prophylactic resection of pedunculated liver masses should be considered in asymptomatic veterinary patients (4).

Conclusions

In contrast to non-pedunculated FNH, prophylactic surgical removal should be considered for large pedunculated FNH to

prevent torsion, rupture and compression of other organs. It should also be used to make a definitive diagnosis. The need for surgical removal should be determined based on the size, location and differentiation of the tumor. Open surgery should be considered in patients with large pedunculated FNH. The findings in this report are valuable for careful consideration in the clinical setting.

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Profilaktična kirurška odstranitev asimptomatske velike pedunkularne žariščne nodularne hiperplazije jeter pri psu

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Izveček: Šetlandski ovčar je bil na kliniko napoten zaradi splenomegalije. Preiskava krvi je pokazala povišano aktivnost jetrnih encimov. Računalniška tomografija je razkrila hipoatenuirano maso vranice in veliko jetrno maso (velikost: 97 × 81 × 31 mm), ki je bila s pediklom povezana z levim stranskim lobusom in izoatenuirana z normalnim jetrnim parenhimom. Slikovni izvidi jetrne mase so bili skladni z benignimi spremembami. Opravljena je bila kirurška resekcija in s histopatološko preiskavo je bila postavljena dokončna diagnoza. Med posegom je bila opažena delna torzija pedikla. Za resekcijo jetrne mase je bil uporabljen torakoabdominalni spenjalnik. Diagnozi hematom vranice in pedunkularna žariščna nodularna hiperplazija jeter sta bili potrjeni, kirurška resekcija pa je normalizirala vrednosti jetrnih encimov ter odpravila tveganje za rupturo in torzijo. To je prvo poročilo o pedunkularni žariščni nodularni hiperplaziji z velikostjo > 5 cm in dobrim kliničnim izidom po kirurški resekciji pri psu. V veterinarski medicini ni zanesljive indikacije za resekcijo pedunkularne jetrne nodularne hiperplazije. Tudi brez slikovnih dokazov o torziji ali rupturi velikih pedunkularnih jetrnih mas je pomembno razmisliti o njihovi preventivni odstranitvi.

Ključne besede: pedunkularna jetrna masa; žariščna nodularna hiperplazija; pedunkularna žariščna nodularna hiperplazija