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CT Lymphangiography with Contrast Medium Injection into the Perianal Subcutaneous Region in a Dog with Chylothorax

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Abstract : A 7-year-old intact female Shih-Tzu with chylothorax was presented. Percutaneous popliteal computed tomographic lymphangiography was performed to evaluate the thoracic duct and seek any potential cause of chylothorax. Despite two attempts, visualization of the thoracic duct failed and perianal subcutaneous computed tomographic lymphangiography with injection of iodinated, nonionic water-soluble contrast medium (0.6 ml/kg) was performed. A single branch of intact thoracic duct and dilated and tortuous lymphatics were detected. It was diagnosed as idiopathic chylothorax. Perianal subcutaneous lymphangiography is considered a less-invasive, easy and reliable method to visualize lymphatics in patients with chylothorax.

Key words **:** chylothorax, CT lymphangiography, perianal region, subcutaneous, dog.

Introduction

Chylothorax is a disease characterized by accumulation of chyle in the pleural space. It can be occurred by congenital abnormality or trauma of thoracic duct, pulmonary neoplasia, cardiac disease, lung lobe torsion, and diaphragmatic hernia (9,17). If all the causes of chylothorax are ruled out, idiopathic chylothorax can be diagnosed (17). Laboratory evaluation and several diagnostic imaging modalities including radiography, ultrasonography, and computed tomography (CT) are used to determine underlying causes of chylothorax (3,16). CT lymphangiography can be used to evaluate the anatomy and integrity of thoracic duct, to identify characteristics of chyle leakage, and preoperative planning for thoracic duct ligation (7,17,18). To perform CT lymphangiography, contrast medium can be injected into mesenteric lymphatic vessel, mesenteric lymph node, popliteal lymph node and perianal subcutaneous region (1,2,5,6). In this case, contrast medium was injected into subcutaneous tissue surrounding anus in a patient with chylothorax. The purpose of this case is to apply CT lymphangiography using perianal subcutaneous contrast medium injection to the patient with chylothorax and to demonstrate the availability of this technique.

Case

A 7-year-old intact female Shih-Tzu weighing 3.79 kg was presented with the chief complaint of hyperpnea for the past 6 months. On thoracic radiograph, pleural effusion was found by referring veterinarian. Ultrasound guided thoracocentesis was performed immediately to remove pleural fluid. However, pleural fluid volume subsequently increased and the second thoracocentesis performed. During the second thoracocentesis, blood pressure dropped significantly.

At the initial physical examination performed in our hospital, grade II murmur was ausculated on the left side of the chest and hyperpnea was found. The results of complete blood cell count were within normal range and serum biochemistry showed elevation of glucose (150 mg/dL: reference range 75-128). Thoracic radiography showed thick interlobar fissure lines and lung retraction characterized by scalloping of the ventral lung fields on the lateral view. No specific abnormalities were found on abdominal radiographic examination. Echocardiography revealed no abnormalities. On abdominal ultrasonographs, there were no findings of dilation of caudal vena cava, ascites and hepatic vein dilation. Thoracocentesis were performed followed by cytologic analysis of pleural fluid. Pleural fluid was chylous characterized by hyperglyceridemic fluid (> 500 mg/dL) with low cholesterol:triglyceride ratio (0.18).

CT lymphangiography was performed to differentiate the cause of chylothorax and confirm the position and course of thoracic duct and cisterna chyli using a 64-row MDCT scanner (Aquillion 64; Toshiba, Tochigi, Japan). General anesthesia was induced using a combination of 0.4 mg/kg midazolam (Midazolam; Bukwang Pharm. Co. Ltd), 1 mg/kg ketamine (Ketalar; Yuhan Pharm. Co. Ltd), 0.025 mg/kg hydromorphone (Dilid; Hana Pharm. Co. Ltd) and 2 mg/kg alfaxalone (Alfaxan; Jurox) and maintained with isoflurane (I-fran liquid; Hana Pharm. Co. Ltd) and oxygen. Percutaneous popliteal lymphangiography was performed using 2 ml Iohexol (300 mg iodine /ml, Omnipaque; GE healthcare) with a 26 gauge catheter and then massaged the injected area gently (11). However, it failed to depict the thoracic duct and second trial was made with same protocol, which was also failed.

Perianal subcutaneous lymphangiography was then per-

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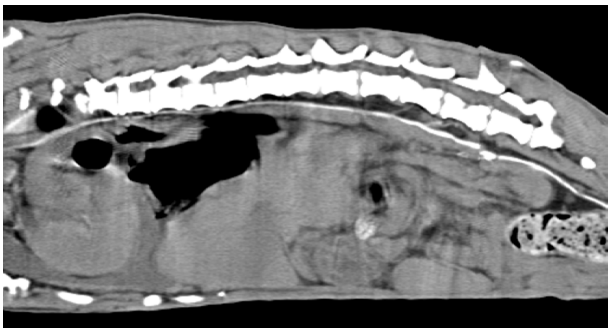

Fig 1. A curved-multi planar reformat (curved-MPR) reconstruction image of thoracic duct after CT lymphangiography. Images were obtained immediately after 2 min massage on the perianal region in which contrast medium was injected. The lymphatic duct is identified in the thoracic and abdominal cavities on the curved-MPR reconstruction image. Additional branch is not identified.

formed according to a previous report (1). An iodinated, non-ionic water-soluble contrast medium, Iohexol (Omnipaque; GE healthcare) of 300 mg iodine /ml, warmed to body temperature, was injected into subcutaneous tissue surrounding the anus with the dosage of 0.6 ml/kg. The area was massaged gently for 2 min after administration. CT scanning was carried out immediately, 5, 10 min after massage. The course of lymphatic duct was well visualized and additional branch was not found (Fig 1). Dilated and tortuous lymphatics was identified at the level of the cranial mediastinum and evidence of localized contrast medium leakage indicating thoracic duct wall rupture was not found (Fig 2). Contrast-enhanced, thickened and hyperattenuated pleurae were detected. There was no evidence of lung lobe torsion, neoplasm and venous thorombus that can cause chylothorax. Predisposing causes were not identified and the idiopathic chylothorax was considered. Client wanted to try medical management prior to surgical treatment and non-operative treatment was attempted. Chest tubes were placed bilaterally with sterile technique to prevent fluid from accumulating in the pleural space. Low-fat diets started with benzopyrone (Rutin; Solgar Inc.) and prednisolone (Solondo; Yuhan Pharm. Co. Ltd) administration. Daily monitoring of chylous fluid has been started. 110 ml of chylous fluid was collected at the time of monitoring after chest tube placement, but then decreased up to 5 ml per day on the 5th day after medical treatment. The patient was discharged and chest tube was removed on the 20th day after medical treatment. The chylous fluid decreased up to 3.1 ml on the 30th day after medical treatment. This patient has been rechecked regularly for medical prescription and thoracocentesis.

Discussion

Chylothorax is a debilitating disease that chyle leaks into the pleural space (1,13,17). In chylothorax patients, radiography and CT lymphangiography can be used to delineate anatomy of lymphatic vessels and to identify chyle leakage (7,12,17,18). Among the various method of lymphangiography, the authors adopted perianal subcutaneous region for contrast medium injection site after failure of popliteal lymphangiography. There is a suggestion that in CT lymphangiography, contrast medium may not be progress into the lymphatics in the chylothorax patients (2). However, in this case, lymphatics and thoracic duct were well visualized in this patient through perianal subcutaneous lymphangiography.

In this case report, multiple modalities were used to diagnose chylothorax and to find out causes of the disease. Each method has its own diagnostic limitation and complementary relationship with each other. Radiography is the sensitive method for identifying pleural fluid and may help to identify some primary cause of the effusion such as neoplasm. However, this diagnostic modality cannot differentiate the type of pleural fluid (12,16). Ultrasonography is applicable for detecting and characterizing pleural fluid as well as identifying underlying causes such as cardiac disease, pericaridial disease or hepatic congestion (4,10). Furthermore, ultrasound is useful to aid diagnostic or therapeutic thoracocentesis (9,10). However, ultrasound has limitation to search the causes of

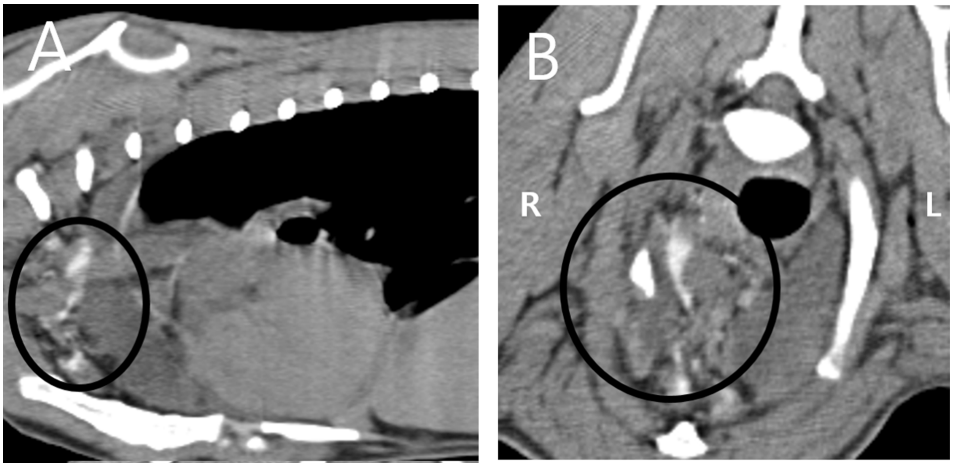

Fig 2. Sagittal (A) and transverse (B) CT images at the level of the cranial mediastinum after contrast medium administration into the perianal subcutaneous region. Dilated and tortuous lymphatic duct is identified at the cranial mediastinum level (circle). Contrast agent blurring, indicating leakage into the thoracic cavity is not found.

chylothorax such as thoracic duct rupture and cranial vena caval thrombosis. Cytologic evaluation can diagnose chylothorax by measuring the concentration of triglyceride in pleural fluid, but it cannot identify the causes at all (8). Using CT, pleural fluid and its underlying causes such as lung lobe torsion, diaphragmatic hernia and cranial vena cabal thrombosis can be recognized (11,12). If the cause of chylothorax cannot be determined despite extensive diagnostic evaluation, it is considered to be "idiopathic" as this case (17).

There are medical management and surgical management for the treatment of chylothorax (14). Medical management in dogs is rarely successful and surgical management is often required (14). There are various methods of surgical treatment such as thoracic ligation, cisterna chyli ablation, thoracic omentalization and pleurodesis. Among these, thoracic duct ligation is the most commonly performed surgical technique to treat idiopathic chylothorax (14). To visualize the thoracic duct preoperatively, CT and radiographic lymphangiography can be used (3,12,17,18).

CT lymphangiography is able to quantify the branches of the thoracic duct more accurately than radiographic lymphangiography (15).

To perform CT lymphangiography, contrast medium can be injected into mesenteric lymphatic vessel, mesenteric lymph node, popliteal lymph node and perianal subcutaneous region (1,6,7,13,17). Lymphadenography with contrast injection into mesenteric lymphatic vessel required extra surgical time, and care was needed while manipulating the patient to avoid compromising the implanted catheter (6). The success of percutaneous mesenteric lymphangiography depends on operator's experience with ultrasound-guided mesenteric lymph node injection (13). Although popliteal lymph nodes as contrast medium injection site are less invasive than mesenteric lymphadenography, many dogs may not have a palpable popliteal lymph node and it is difficult to identify a popliteal lymph node even using ultrasound (7,13).

Contrast medium injection into the perianal subcutaneous region can be performed more easily than other sites because its surface location. Moreover, contrast medium can be injected with a high dose (1). No side effects have not been reported and were not observed in this case as well.

However, in the authors' experience, there was moderate degree of bleeding in the contrast medium injection site around the anal region. Despite the fact that it was carried out through sterile procedures, the risk of infection could not be ruled out. Also, excessive pressure and frequency during massage may cause rapid movement of contrast medium, but make contrast medium out of the lymphatic system before CT scan empirically, so massage should be performed gently.

To our knowledge, this is the first case study for applying the injection of contrast medium into perianal subcutaneous region to the patient in Korea. This report is a single study and considered necessary to apply to more patients.

Conclusions

Perianal subcutaneous CT lymphangiography is considered a reliable, less invasive and easier diagnostic method in the patients with chylothorax.

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