

Lung Lobe Torsion with Concurrent Intestinal Lymphangiectasia in a Maltese Dog

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Abstract : A 4-year-old intact male, Maltese dog weighing 2.2 kg was presented for evaluation of tachypnea and hyperthermia. On initial evaluation, the dog was dyspneic, but alert and responsive. Muffled heart sound was noted with auscultation of the right hemithorax. The radiographic findings were consolidation of the right middle lung lobe, pleural effusion, and abdominal fluid accumulation. Thoracic computed tomography confirmed a contrast-enhancing mass within the right middle lung lobe. Surgical exploration of the thoracic cavity was performed using a right fifth intercostal thoracotomy. Examination of the right lung lobe revealed 360° torsion of the right middle lung lobe at the level of the hilus, in a clockwise direction. Lung lobectomy was performed using a thoracoabdominal stapling device with 2.5-mm vascular staples. Full-thickness intestinal biopsy by exploratory laparotomy was taken from the jejunum for histological assessment. Histopathologic examination of the full-thickness intestinal biopsy revealed distended lacteal located within the submucosa of the jejunum. Intestinal lymphangiectasia was resolved with prednisone and low fat diets. Subsequent communication with the owner revealed that the patient was in good health 6 months post-discharge.

Key words : lung lobe torsion, lymphangiectasia, dog.

Introduction

Lung lobe torsion (LLT) is the axial rotation of a lung lobe at the hilus (3,17). Lung lobe torsion is considered an unusual condition in dogs and cats, but can be a life-threatening condition that requires surgical intervention (2,3,17,18). The majority of the reported affected dogs are large and deep chested; however, LLT was recently described in toy breeds (2,17,23). The cause of LLT has been described as spontaneous or secondary to trauma, pleural space disease, diaphragmatic hernia, or thoracic surgery (19,24). Radiography, ultrasonography, bronchoscopy, thoracoscopy, and computed tomography have been used for assessment of LLT (19-21).

Underlying clinical features may be a risk factor for LLT in dogs. Lung lobe torsion may contribute to respiratory signs with coughing and progressive dyspnea, and pleural effusion with chylothorax that were reported as causes of morbidity and mortality (12,18).

The purpose of this report was to describe the presentation, diagnosis, management, and outcome of LLT with concurrent intestinal lymphangiectasia in a Maltese dog.

Case

A 4-year-old intact male, Maltese dog weighing 2.2 kg was

referred to the Konkuk University Veterinary Medicine Teaching Hospital (KUVMT) for evaluation of tachypnea and hyperthermia. The owner reported that the dog had fallen from a table 4 months ago and progressive respiratory difficulty was noted over the past several days. The radiographic findings from the referring veterinarian were: consolidation of the right middle lung lobe, pleural effusion, and abdominal fluid accumulation. Thoracic computed tomography confirmed a contrast-enhancing mass within the right middle lung lobe. The mass appeared to be closely associated with the right middle lobar bronchus. Thoracocentesis and abdominocentesis yielded 150 mL and 100 mL of serosanguineous fluid respectively and cytologic analysis showed numerous erythrocytes and neutrophils with no evidence of organisms or neoplastic cells.

On initial evaluation at the KUVMT, the dog was dyspneic, but alert and responsive. Rectal temperature was elevated at 39.8°C and respiratory rate was 88 breaths/min. Muffled heart sound was noted with auscultation of the right hemithorax. A complete blood count revealed a slight anemia (packed cell volume 27.7%; reference range, 37 to 55%) and low concentration of hemoglobin (9.94 g/dL; reference range, 12 to 18 g/dL). Serum biochemical analyses revealed low concentrations of albumin (1.6 g/dL; reference range, 2.3 to 3.9 g/dL), total protein (3.9 g/dL; reference range, 4.9 to 7.2 g/dL), and calcium (7.3 mg/dL; reference range, 9.1 to 11.7 mg/dL) and high concentration of amylase (2375 U/L; reference range, 388 to 1007 U/L). Lateral and ventrodorsal thoracic radiographs were repeated and revealed consolidation of the right

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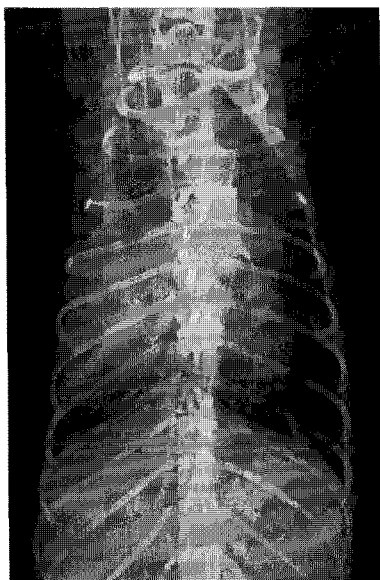


Fig 1. Pre-operative ventrodorsal thoracic radiographic findings. Consolidation of the right middle lung lobe and pleural effusion are observed in the right hemithorax. The heart is displaced to the left.

middle lung lobe and pleural effusion (Fig 1). Lateral and ventrodorsal abdominal radiographs were repeated and showed evidence of abdominal fluid accumulation.

The following day, the dog was premedicated for surgery with butorphanol (0.4 mg/kg intramuscularly; Butophan; Myungmoon Pharm Co Ltd, Seoul, Korea) and atropine (0.02 mg/kg intramuscularly; Atropine sulfate; Jeil Pharmacentrical Co Ltd, Seoul, Korea), followed by anesthetic induction with propofol (6 mg/kg intravenously; Provive inj; Claris Lifesciences, Ahmedabad, India). The dog was intubated and anesthesia was maintained with isoflurane (Isoflurane; Choongwae Co Ltd, Seoul, Korea) and oxygen. Lactated Ringer's solution was administered at a rate of 5 mL/kg/h through a 24 gauge intravenous catheter placed in the cephalic vein until completion of the surgical procedure. The dog received cephadrine (30 mg/kg intravenously; Safdin; Daehan Newpharm Co Ltd, Seoul, Korea) at the time of anesthetic induction. The dog was positioned in the left lateral recumbence and prepared for sterile surgery. Surgical exploration of the thoracic cavity was performed using a right fifth intercostal thoracotomy. Opening the right thoracic cavity revealed a serosanguineous effusion and a total of 80 mL of fluid was aspirated from the thoracic cavity. Examination of the right lung lobe revealed 360° torsion of the right middle lung lobe at the level of the hilus, in a clockwise direction (Fig 2). Grossly, the right middle lung lobe appeared consolidated and engorged. A thoracoabdominal stapling device with 2.5-mm vascular staples was used to ligate the affected lobe at its hilus (Fig 3). The middle lobe was excised without detorsion and submitted for histopathology. Thoracic cavity was lavaged with sterile saline, and the lungs were inflated to identify any air leakage. No evidence of air leakage was noted. The thoracostomy tube was placed to allow aspiration of fluid



Fig 2. Surgical exploration of the thoracic cavity using a right fifth intercostal thoracotomy. 360° torsion of the right middle lung lobe at the level of the hilus, in a clockwise direction, is observed. Grossly, the right middle lung lobe appears consolidated and engorged.



Fig 3. Excision of the right middle lobe. A thoracoabdominal stapling device with 2.5-mm vascular staples is used to ligate the affected lobe at its hilus.

and air until negative pressure was obtained. The thoracostomy tube remained to allow further aspiration of fluid. Routine closure of the thoracic cavity was performed. Recovery from anesthesia was uneventful. Post-operatively, the dog was maintained on cephadrine (30 mg/kg intravenously, q 12 h; Safdin; Daehan Newpharm Co Ltd, Seoul, Korea) and tramadol (2 mg/kg orally, q 12 h; Tridol, Yuhan Co, Seoul, Korea).

Histopathologic examination of the resected lung lobe revealed acute to subacute hemorrhagic infarction of the pulmonary parenchyma, consistent with lobar torsion. Subpleural fibroplasia was present, suggesting that infarction had occurred for at least 5 days. There was no evidence of neoplasia, aspirated foreign body materials, or infectious agents.

Thoracic fluid was aspirated via the thoracostomy tube every 6 hours; approximately 27 mL/kg/day of serosanguineous fluid

was removed 1 day post-operatively. Approximately 1.8 mL/kg/day of serosanguineous fluid was removed 4 days post-operatively; the thoracostomy tube was removed 4 days post-operatively. Abdominal fluid was aspirated using abdominocentesis 4 days and 7 days post-operatively; approximately 100 mL of serosanguineous fluid was removed each day.

On 7 days post-operatively, serum biochemical analyses revealed low concentrations of albumin (1.3 g/dL; reference range, 2.3 to 3.9 g/dL) and total protein (4.3 g/dL; reference range, 4.9 to 7.2 g/dL). Protein-losing enteropathy was suspected. Empirical therapy with prednisone (4 mg/kg/day, PO; Solondo, Yuhan Co, Seoul, Korea) was initiated and low fat diets (medium chain triglyceride) were added to the diet.

The following day, full-thickness intestinal biopsy by exploratory laparotomy was taken from the jejunum for histological assessment. Grossly, the multifocal lipogranulomatous nodules were identified on the mesentery and the serosal surface of the jejunum (Fig 4). Histopathologic examination of the full-thickness intestinal biopsy revealed distended lacteal located within the submucosa of the jejunum.

On 10 and 14 days post-operatively, abdominal fluid was aspirated using abdominocentesis; approximately 35 mL and 5 mL of serosanguineous fluid were removed respectively. There was no evidence of respiratory difficulty, diarrhea, or subcutaneous edema. The patient was discharged 14 days post-operatively. Subsequent communication with the owner revealed that the patient was in good health 6 months post-discharge.

Discussion

Breed-specific conformation may be a risk factor for LLT in dogs. Large and deep chested breeds appear to be more com-



Fig 4. Intraoperative appearance of mesenteric and serosal lymph vessels. The focal enlargements that are lipogranulomas are observed on the serosal surface and mesentery.

monly affected; however, LLT has been recently described in small breeds such as Pug, Lhasa Apso, Pekinese, Shih Tzu, Yorkshire terrier, Miniature Pinscher, but not in a Maltese dog (2,8,17,23,25). In both dogs and cats, the right middle lobe was involved more frequently (1,14). This case was presented with torsion of this lobe. It has been suggested that the right middle lobe is predisposed to torsion because of the narrowness of the lobe, weak attachment, localization among mobile structures such as the chest wall, heart, and right cranial lobe (25). The cause of LLT has been described as spontaneous or secondary to a predisposing condition (1,4,12,14,17,24). In this case report, there was long-term history of trauma prior to presentation. Lung lobe torsion may be defined as the rotation of a lung lobe along its long axis with twisting of the bronchovascular pedicle at the hilus (3,17). During torsions, the muscular walled arteries often remain partially patent and allow persistent arteries blood flow to the affected lobe (9,10). This causes the affected lobe to undergo venous congestion and consolidation of the torted lobe, contributing to thoracic fluid and respiratory signs with coughing and progressive dyspnea that were reported as causes of morbidity and mortality (9,10).

The evidence of abdominal fluid is commonly noted as well as thoracic fluid in LLT. The primary events leading to the development of abdominal fluid are increased portal hydrostatic pressure, decreased plasma colloid oncotic pressure associated with hypoalbuminemia, or increased permeability of the capillary endothelium secondary to inflammation (6). In this case report, hypoproteinemia was marked on serum biochemical analyses. Hypoproteinemia would be a plausible explanation for the abdominal fluid since intestinal lymphangiectasia was diagnosed by histological assessment using full-thickness intestinal biopsy. When pressure in the mesenteric or intestinal lymph vessels increase, the intestinal lacteals can dilate and rupture easily. Lymph leaks from the ruptured lacteals into the intestinal lumen, carrying all its contents, such as proteins (15).

In this case report, intestinal lymphangiectasia was diagnosed by histological assessment using full-thickness intestinal biopsy. Lymphangiectasia can be caused by increased pressure in lymph vessels (12). Underlying causes are: obstruction of lymph vessels by an inflammation and neoplasm, and increase of venous hydrostatic pressure such as right-sided heart failure, pericardial effusion, or pericarditis (5). Lung lobe torsion does not seem to be directly associated with development of intestinal lymphangiectasia; however, pulmonary venous congestion would contribute to increase of venous hydrostatic pressure. In addition, when intrapleural pressure caused by thoracic fluid accumulation and consolidated lobe exceeds cardiac filling pressure, the increase of venous hydrostatic pressure, that might be the same as that resulted from right-sided heart failure or pericardial effusion, would develop (15). In this case report, pulmonary venous congestion, consolidated and engorged torted lobe, large thoracic fluid were grossly identified during surgery and these clinical figures would be exacerbated by long-term history of trauma. A study of a large case series is warranted to better determine the relationship between LLT and

lymphangiectasia.

Treatment of LLT should be directed at the cause of thoracic fluid. Whether there is a cause-and-effect relationship between thoracic fluid and LLT has been debated (8). Therapeutic options for LLT include removal of the affected lobe in conjunction with continuous thoracic drainage through thoracostomy tube until thoracic fluid volumes of less than 2 ml/kg/day (1,7,22). In this case report, the affected lobe was removed using a thoracoabdominal stapling device with 2.5-mm vascular staples without detorsion and thoracostomy tube was maintained to drain thoracic fluid for 4 days.

Treatment of lymphangiectasia in dogs has three main goals: resolution of the underlying disease; dietary manipulation; and symptomatic therapy (11,13,15,16). In this case report, underlying disease, LLT, was managed by removal of the affected lobe. Prednisone at immunosuppressive doses was used in the initial management. Dietary fat restriction, especially of long-chain triglycerides, is associated with increased concentration of serum proteins. Low-fat diets are believed to decrease lymph flow in the mesentery up to tenfold compared with high-fat diets and help decrease the pressure in the lymphatic system (15). Medium-chain triglycerides were added to the diet in this case. The owner did not consent further serum biochemical analyses; however, decrease of abdominal fluid was verified after medical and dietary managements. No evidence of large amount of abdominal fluid was identified 7 days after medical and dietary managements.

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Maltese 개에서 림프관 확장증을 동반한 폐염전 발생 증례

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요 약 : 체중 2.2 kg 4년령 수컷 Maltese 개가 호흡곤란과 고체온증 평가를 위해 건국대학교 부속 동물병원에 내원하였다. 신체 검사에서 호흡곤란을 확인 하였으며, 오른쪽 흉강 청진상에서 희미한 심음을 확인하였다. 방사선 검사와 CT검사서 오른쪽 중간엽의 경화와 흉수 및 복수를 확인하였다. 탐색적 개흉술을 통해 360° 염전 된 오른쪽 중간엽을 확인하였으며 TA 장치를 이용 염전된 폐엽을 절제하였다. 복수 원인을 확인하기 위해 탐색적 개복술을 통한 소장 생검을 실시하였으며, 조직 검사를 통해 림프관 확장증을 확인 하였다. 림프관 확장증 치료를 위해 prednisone과 저지방 사료를 사용하였으며, 임상증상의 개선을 확인하였다.

주요어 : 폐염전, 림프관확장증, 개