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Postobstructive Pulmonary Edema in a Yorkshire Terrier Dog

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Abstract : A 6 month-old castrated male Yorkshire terrier (weighing 1.0 kg) was presented with acute respiratory distress. Diagnostic imaging studies found post-obstructive pulmonary edema sequel to upper airway obstruction by a rubber plug lodged at thoracic esophagus. The rubber plug was removed endoscopically. After removal of this rubber plug with conventional therapy for pulmonary edema, the clinical condition of dog was stabilized. To the best knowledge of authors, this is the first case report describing postobstructive pulmonary edema in a dog in Korea.

Key words **:** pulmonary edema, postobstructive pulmonary edema, noncardiogenic pulmonary edema, upper airway obstruction, dog.

Introduction

Pulmonary edema (PE) is a life-threatening complication from various diseases including congestive heart failure and acute airway obstruction. PE is broadly divided into cardiogenic or non-cardiogenic PE. Non-cardiogenic pulmonary edema (NCPE) is generally occurred by systemic inflammation or neurogenic stimulation (1). Sudden catecholamine release with subsequent rise in pulmonary capillary pressure and microvascular permeability might be responsible for NCPE. Major causes of NCPE are systemic inflammatory response syndrome, electrocution, seizures, traumatic brain injury, and upper airway obstruction. Postobstructive pulmonary edema (POPE) is a type of NCPE, which is generally occurred by sudden and severe upper airway obstruction (2). POPE has been described in dogs (1,8). This case report described POPE in a puppy after accidentally swallowing a rubber plug and obstructing upper airway.

Case

A 6 month-old castrated male Yorkshire terrier (weighing 1.0 kg) was presented with major complaints of acute respiratory distress. According to owner, the dog was perfectly normal before presentation. The dog was fully vaccinated and dewormed regularly. There were no heart murmur and other abnormalities in laboratory tests including complete blood cell counts, serum biochemistry and urinalysis, when the dog was castrated one month ago. The dog suddenly showed gagging and retching followed by breathing difficulty. The dog was then unconscious. Then the owner tried to rescue this dog by doing cardiopulmonary resuscitation. After then, the dog returned consciousness but labor-breathed. When the dog was presented, the dog still breathed difficult (panting) and markedly depressed. His respiration and pulse rate were 60 breaths per min and 170 beats per min. His systolic blood pressure measured by Doppler flow detector (Model 811B, Parks Medical Electronitcs, Inc., Las Vegas, Nevada 89119, USA) was 105 mmHg. Thoracic auscultation revealed loud crackles over all lung fields without obvious heart murmur. Further echocardiography was postponed due to unstable condition of the dog. Since acute PE was suspected, furosemide (4 mg/kg, IV, Lasix, Handok Pharmaceuticals, Korea) was administered. Thoracic radiography was then taken and revealed massive PE in all lung fields. There was a radiopaque materials lodged on thoracic esophagus (Fig 1A and B). Due to respiratory difficulty of this dog, we postponed all further examination and took this dog to oxygen cage. To lessen clinical signs from acute PE, we started treatment against acute cardiogenic PE including furosemide (4 mg/kg/hr, CRI), dobutamine (5 ug/kg/min, CRI, Dobutamine premix, CJ Pharmaceuticals, Korea) and sodium nitroprusside (5 ug/kg/min, CRI, Nitropress, Mckesson Pharmaceuticals, USA). Despite this therapy for four hours, the dog was still unstable. Then we suspected a chocking on upper airway and took a contrast radiography with a barium (Ledix, Dongindang Pharmaceuticals, Korea). On contrast radiography, there was a large foreign body on thoracic esophagus obstructing trachea (Fig 2A and B). We decided to remove this foreign body endoscopically. The dog was anesthetized with alfaxalone (2 mg/kg, IV, Jurox, Australia) and butorphanol (0.2 mg/kg, SC, Butophan Inj., Myoung-Moon, Korea) maintained by 1-5% isoflurane (Foran, USA). The foreign body was a 1.8 × 2.0 cm rubber plug for a climbing stick (Fig 2C and D). There was a small stone lodged inside this rubber plug. We suspected the radiopaque material on the plain radiography was this small stone on the rubber plug.

After the removal of this foreign body, clinical condition was rapidly improved. Thoracic radiography taken 12 hours

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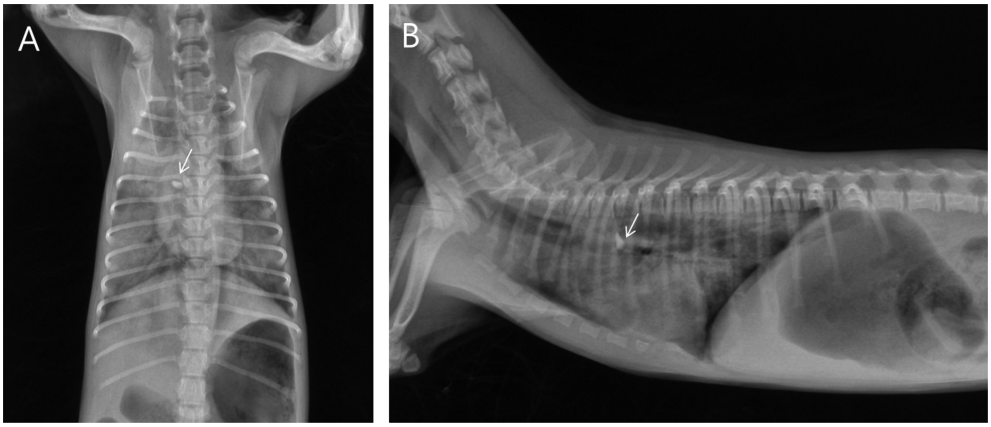

Fig 1. Thoracic radiography of this case. A: Ventrodorsal projection of thoracic radiography. There was massive pulmonary infiltration over all lung fields. However, there was no cardiac enlargement. In addition, a radiopaque material was lodged on thoracic esophagus (arrow). B: Right lateral projection of thoracic radiography. There was massive pulmonary infiltration over all lung fields. Although no obvious cardiac enlargement was noticed, the stomach was enlarged with gas, indicating massive aerophagia. In addition, a radiopaque material was lodged on thoracic esophagus (arrow).

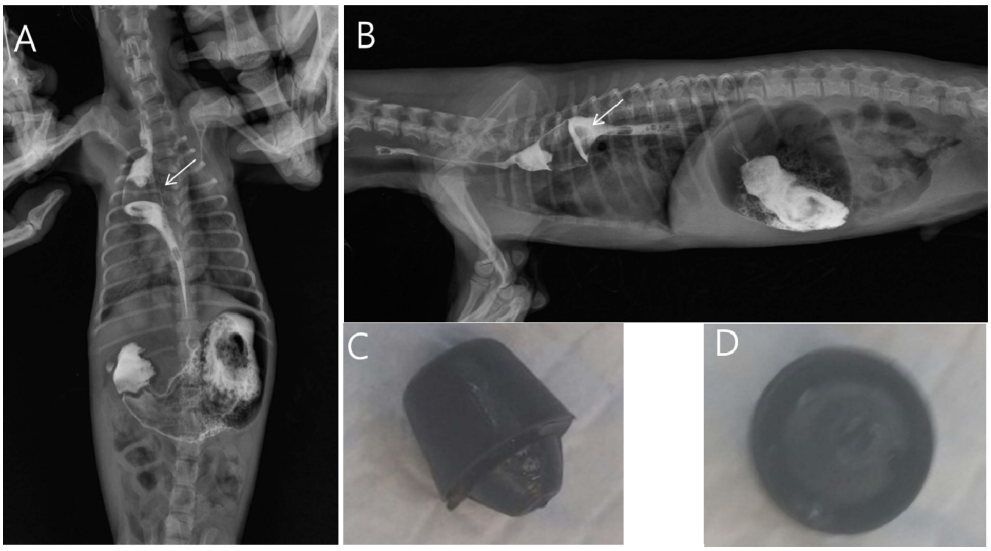

Fig 2. Contrast thoracic radiography of this case. A: Ventrodorsal projection of thoracic radiography revealed a large foreign body (arrow) on thoracic esophagus obstructing trachea. Although the pulmonary infiltration was much cleared out, compared to the beginning of emergency therapy, there was still diffuse infiltration over all lung fields. B: Right lateral projection of thoracic radiography revealed a large foreign body (arrow) on thoracic esophagus obstructing trachea. C & D: The foreign body was removed. It was a 1.8 × 2.0 cm rubber plug for a climbing stick.

after foreign body removal revealed minimal pulmonary infiltration over lung fields, although the dog breathed normally. The dog was released one day after removal of rubber plug.

Discussion

POPE is the acute pulmonary edema caused by upper airway obstruction. Type I POPE is generally occurred by sudden upper airway obstruction such as postextubation laryngospasm and choking, while type II POPE is generally occurred after surgical relief of chronic upper airway obstruction (2,4,6,7). Our case is typical type I POPE resulted from choking by rubber plug compressing upper airway. High negative intrathoracic pressure created by forceful attempts to inhale against an obstruction leads to increase venous return and to decrease cardiac output and fluid transudation into the alveolar space (3). POPE requires immediate medical intervention, since clinical signs associated with POPE are generally deteriorated very quickly, although the presence of clinical signs can be delayed (5,7). Diagnosis is often difficult, because there are lists of disease causing acute respiratory distress. Acute onset of respiratory distress with progressive oxygen desaturation and radiographical evidence of PE support the diagnosis. In this case of dog, our initial diagnosis was misled, because the owner did not notice accidental swallowing the rubber plug. We could only consider choking by foreign body after the initial medical intervention directed to cardiogenic PE was failed. Contrast radiography was useful to define the cause of airway obstruction in this study.

Treatment of POPE is directed to remove the cause for airway obstruction and to stabilize patient's condition including intubation with oxygen supply. Although synthetic colloids can rapidly shift interstitial fluid to intravascular space, it can exacerbate PE by leaking into the pulmonary parenchyma. The use of diuretics is also controversial, because overdosed diuretics can cause severe hypovolemia. In most cases of NCPE including POPE, vasoconstrictive process with elevated pulmonary hydrostatic pressure is responsible for fluid accumulation. This process is generally transient and thus is resolved spontaneously with time. In our case, we initially treated the dog, based on therapeutic strategy for cardiogenic PE (i.e. furosemide, oxygen, nitrate, and dobutamine). As described earlier, this therapy was ineffective to relieve clinical signs. The clinical signs were rapidly improved after removal of upper airway obstruction. Only with supportive care with oxygen, the clinical condition of this dog was rapidly improved. Earlier detection and earlier intervention of upper airway obstruction might lead better clinical outcome.

In conclusion, this report described a rare case of POPE by upper airway obstruction. Since POPE causes a life-threatening respiratory distress, earlier detection and earlier intervention of upper airway obstruction is necessary in clinical situation.

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