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Persistent Right Aortic Arch in a Dog

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초 록 : 식후 만성적인 구토 증상을 보이는 3개월령 암컷 Schunauzer가 본 (주)해마루 소동물 임상 의학 연구소에 내원하였다. 신체 검사시 비정상적인 소견은 보이지 않았으나, 유동식을 공급하는 중에도 식 후 1시간 이내에 포말성 역류 증상을 보였고, 기립 자세에서 식이를 공급해도 증상은 호전되지 않았다. 일반 방사선 검사에서 전반적인 식도 확장이 관찰되었고, 식도 조영술을 실시하여 심기저부 앞부분의 협착과 협착부 전후의 식도 확장을 확인하고 우대동맥궁 잔존증으로 진단하였다. 수술을 통해 식도를 압박하고 있는 인대를 제거하고 유동식을 공급하였다. 술 후 임상 증상은 다소 호전이 되었으나 여전히 고형식은 섭취하지 못하고 방사선 검사상 소견도 술전과 큰 차이를 보이지 않았다.

Key words **:** 개, 식도조영, 우대동맥궁잔존증, 역류

Introduction

Partial or complete vascular ring anomalies in dogs are the common causes of congenital esophageal stenosis. Persistent right aortic arch is the most common disease of vascular ring anomalies and is diagnosed most frequently in young, large-breed dogs[3,13]. Persistent right aortic arch is the disease showing regurgitation caused by esophageal compression and secondary megaesophagus with retained right aortic arch which must be disappeared while developed normally[13]. Other vascular ring anomalies documented as developing in the dog are double aortic arch and aberrant origination of the subclavian arteries, alone or in combination with aortic malformation[1-3,5,6,12,14]. Because these defects are congenital, clinical signs related to esophageal obstruction and dilatation usually become evident at the time of weaning[3,8,15].

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Usually clinical complications such as regurgitation or coughing secondary to aspiration pneumonia are observed when diet is converted from liquid to solid food, but in this case regurgitation still exists with upright feeding of liquid diet after weaning period around 1-month-old after birth.

Case

A 3-month-old, sexually intact female Schunauzer was referred for clinical evaluation following chronic episode of regurgitation. Regurgitation occurred several minutes after eating, and ventral bulging of the neck was observed concomitantly. The owner reported that the problem became progressively worse over the month. Upright feeding of foods was unsuccessful in diminishing the frequency and severity of the regurgitation. The dog showed the regurgitation even drinking water. Other clinical complication such as coughing did not exist.

On physical examination, the dog was emaciated but alert. Temperature, pulse and respiratory rate were in normal range.

Thoracic radiography revealed esophageal dilatation cranial to, and caudal to heartbase and focal narrowing at heartbase. And trachea was displaced ventrally in ventro-dorsal view and to right-side in lateral view. The cranial portion of esophagus was dilated severely, so it made outpouching and the food accumulated in this pouch. Usually in initial stage of megaesophagus secondary to persistent right aortic arch, the dilatation is seen only cranial to the stricture and the caudal region of esophagus is normal size. In this case esophagus was dilated generally from cervical to caudal esophagus except at heartbase(Fig 1).

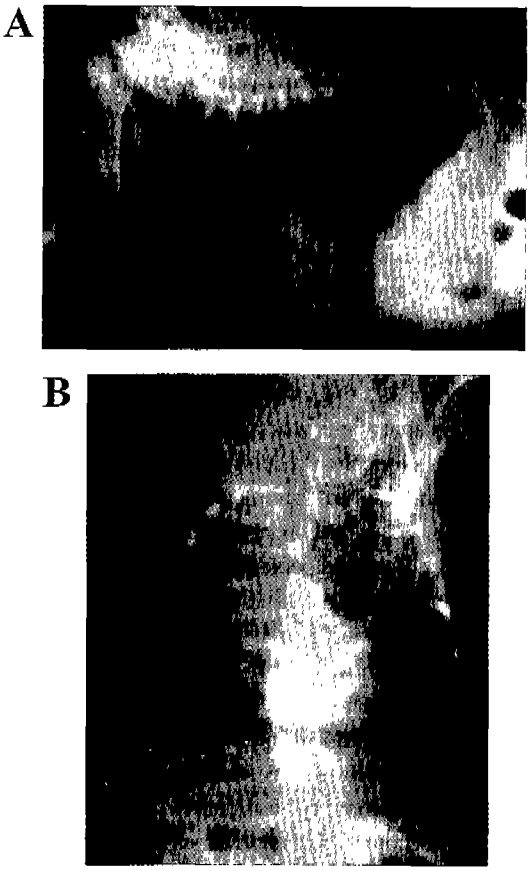

Fig 1. On thoracic radiography, esophagus was dilated generally from cervical to caudal esophagus except at heartbase and trachea was displaced ventrally in lateral view (A) and to right-side in ventro-dorsal view (B).

Fig 2. On contrast esophagram with barium paste a markedly dilated esophagus with focal stenosis and retained barium especially in the pouch cranial to stenotic region were observed on lateral view.

Contrast esophagram with barium revealed a markedly dilated esophagus with focal stenosis and retained barium especially in the pouch cranial to stenotic region. It was also revealed that esophagus caudal to the stenotic region was also dilated severely and the motility of esophagus was not observed(Fig 2).

Results of routine hematologic analysis were in normal ranges.

A preliminary diagnosis of persistent right aortic arch and secondary megaesophagus were made.

A left thoracotomy was performed through the 4th intercostal space isoflurane(AErrane®, Fort Dodge Animal Health, USA) anesthesia. Thoracic cavity was filled with dilated esophagus and the trachea was displaced ventrally. The ligamentum arteriosum was found on the left lateral aspect of the esophagus. The esophagus was compressed in a tight vascular ring formed by the aorta, ligamentum, main pulmonary artery, and the base of the heart. The ligamentum arteriosum was isolated and divided.

After surgery, the clinical sign such as regurgitation and bulging at neck were improved slightly but there was no change on radiographic findings. It was concluded that the esophageal dilatation was sustained for a prolonged period and severe, so megaesophagus with decreased motility was already developed and foods could not move downward. The stenotic region

did not return to normal size in spite of surgical correction of vascular ring. It was presumed that secondary stricture caused by irritation with continuous regurgitation was developed.

Discussion

Persistent right aortic arch represents about 90~95% of the vascular ring anomalies in dogs[3].

Diagnosis of persistent right aortic arch is performed by clinical sign and radiographic examination. Usually clinical complication is not showed before weaning. The regurgitation caused by compression is shown when solid food is given.

Use of ancillary diagnostic aids such as thoracic radiography, angiocardiography, endoscopy, esophageal fluoroscopy, CT and MRI are important in establishing the nature and extent of esophageal dysfunction, differentiating the various forms of vascular ring anomalies, and in prognostication with respect to preservation of esophageal motility[1-3,5,6,7,10,11].

More common causes of regurgitation in dogs are acute diffuse megaesophagus and acquired stricture and rare causes are esophageal diverticulum and vascular ring anomalies. Acute diffuse megaesophagus can be seen with generalized lower motor neuron disorders, neuromuscular junctionopathies, polymyositis, hypoadrenocorticism, and hypothyroidism and as an idiopathic disorder[3]. Acquired strictures usually are the result of trauma such as from penestrating foreign bodies or from caustic chemicals[3]. Esophageal diverticulum can be developed congenital or acquired form. It caused by protrusion of muscular layers through weak mucosal membrane.

Differential diagnosis is performed with thoracic radiography, angiocardiography, endoscopy and esophageal fluoroscopy. Thoracic radiography and contrast esophagram are the most common diagnostic methods. In diffuse megaesophagus, radiographic examinations reveal dilatation of esophageal lumen, gas or food in esophagus and sometimes trachea-esophageal string sign. In acquired stricture radiography reveals a stenotic region and secondary esophageal dilatation cranial to stenotic region. This sign is very similar to that of vascular ring anomalies. But in vascular ring anomalies especially persistent right aortic arch the stenosis is developed at heartbase and dilatation appears cranial to heartbase because the right fourth aortic arch and the left ligamentum arteriosum encircle the esophagus[2,4,7-9,13,15]. Aquired stricture develope not at typical site but traumatized or irritated site. In esophageal diverticulum the contrast esophagram reveals a pouch connected with esophageal lumen. The definitive diagnosis can be performed with thoracotomy but it is too invasive[3,13].

Long term results are poor with medical treatment of persistent right aortic arch using liquid diets and supportive care. Thus surgical division of the ligamentum arteriosum is the recommended method of treatment[10,13,14]. The ultimate goal of surgical treatment is alleviation of the obstruction and resultant clinical signs[13]. However, the esophageal dilatation rarely resolves completely like this case[13]. Duration of the megaesophagus, age of the dog, size of the dog, degree of intrinsic motility disorder, presence of secondary problem such as aspiration pneumonia, and complete emancipation of the stenosed esophagus are factors that affect the outcome from surgery[1-3,10].

On the basis of the results in this case, the degree of stenosis and dilatation and the duration may be important factors in the successful long term management of dog with persistent right aortic arch. A pervious study of 191 dogs with persistent right aortic arch suggested that there was an overall poor prognosis, even with surgical correction[15]. In this case the stenosis was not resolved completely in spite of removal the cause because secondary stricture caused by continuous regurgitation persists. Some authors have suggested that age at the time of surgical correction of persistent right aortic arch is an important factor in long-term prognosis and it is also presumed in this case that age and duration influence the prognosis[1,2,10,13]. Early surgical intervention has been recommended because it was thought that esophageal dilatation and motility disorders would worsen and, possibly, become irreversible if surgery was delayed. In one study, there was no correlation between age of patient and prognosis after surgery but the study agreed that the dog which had an excellent long-term outcome must have adequate esophageal motility[13].

Conclusion

A 3-month-old, female Schunauzer was referred for clinical evaluation following chronic episode of regurgitation. Thoracic radiography revealed severe esophageal dilatation and trachea was displaced ventrally. A surgical correction performed through thoracotomy. In this case, there was a little clinical improvement after surgery due to long duration and severity of esophageal dilatation. It can be concluded that radiography and contrast esophagram are useful method with which persistent right aortic arch can be diagnosed, secondary megaesophagus and aspiration pneumonia can be examined and prognosis on the basis of duration, severity and motility can be expected.

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