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Case Report

Right aortic arch with megaesophagus in a jack russel dog and diagnosis with contrast fluoroscopy

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ABSTRACT

The material of this case report was a 4-month-old Jack Russel female dog brought to Burdur Mehmet Akif Ersoy University Veterinary Faculty Animal Hospital with the complaint of vomiting. Anamnesis revealed that the patient had chronic vomiting, cough, and respiratory distress following food intake. As a result of examinations, it was determined that the patient had a congenital right aortic arch-type vascular ring anomaly and related megaesophagus. Treatment consisted of a surgical procedure followed by medical therapy. This case report demonstrated that fluoroscopy-guided contrast-enhanced angiography can be used to diagnose vascular ring anomaly.

INTRODUCTION

Vascular ring anomalies occur as a result of abnormal development of the embryonic aortic arches and results in a complete or partial narrowing of these structures in the esophagus and trachea (Follette et al., 2019; Yalçın et al., 2009). In the early stages of fetal life, 6 pairs of aortic arches surround the esophagus and trachea (Yalçın et al., 2009). These six pairs of aortic arches undergo selective involution and reconnect to form great vessels (Follette et al., 2019). If this process works normally, an adult vascular system is formed (Yalçın et al., 2009). The first and second aortic arches degenerate early, but their ventral roots remain as the external carotid arteries. Dorsal roots continue as the distal parts of the internal carotid arteries. The dorsal aortic root of the third arch disappears and the arch becomes the proximal part of the internal carotid arteries. The ventral aortic roots of the third arch elongate and become the right and left common carotid arteries (Ellison, 1980). at the end of the involution of the fourth left aortic arch, it becomes the adult aortic arch. The right 4th aortic arch partially regresses and becomes the right subclavian artery (Follette et al., 2019). Abnormal placement or development of the aortic arches can cause pressure on the organs adjacent to the arches. It is suggested that 0.5-1% of the general population has a congenital heart defect. Approximately 10% of these anomalies are vascular ring formations, of which a permanent right aortic arch is the most common type (Figure 4) (Yalçın et al., 2009).

In this case report, it is aimed to show that vascular ring anomalies can be diagnosed quickly with fluoroscopy.

MATERIALS and METHODS

The material of this case report consisted of a 4-month-old, female Jack Russel dog brought to Burdur Mehmet Akif Ersoy University Veterinary Faculty Animal Hospital with the complaint of vomiting. Anamnesis revealed that the patient had chronic vomiting, cough, and respiratory distress following food intake. It was also informed the dog was smaller than her siblings in size, despite living in the same environment and conditions. On clinical examination, the patient's body temperature was 39.1 ° C and had mild dyspnea. Aspiration pneumonia findings were detected on radiography and auscultation. Radiographic examination revealed that the esophagus was dilated in the cranial aspect of the aortic arch, while the trachea was in normal structure and position. Contrast enhanced radiographic examination with barium sulphate did show massive dilated esophageal segment cranial to the base of the heart (Figure 1). In light of all this information, vascular ring was revealed as a suspicious diagnosis. For the definitive diagnosis, angiography was performed by intravenous iohexol via the cephalic vein under the guidance of fluoroscopy, and the patient was found to have a persistent right aortic arch type vascular ring anomaly (Figure 2). An operation was planned for treatment. Following induction with propofol at a dose of 4 mg/kg for patient anaesthesia, the patient was quickly intubated and the anesthesia was maintained with sevoflurane. Prophy-

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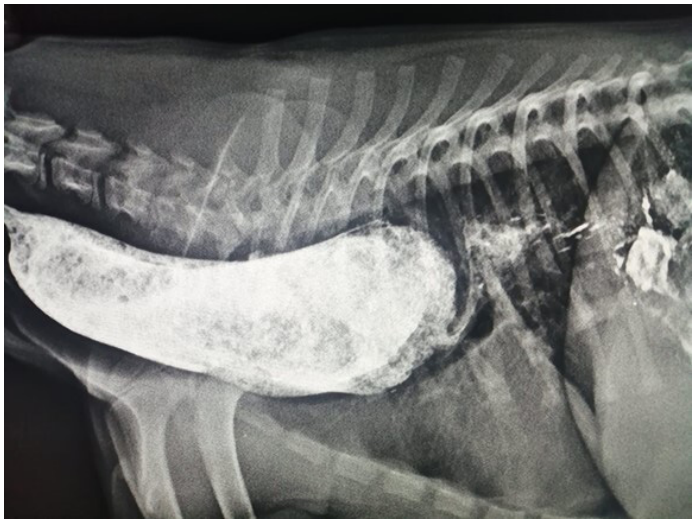

Figure 1. Contrast-enhanced radiography of the megaesophagus

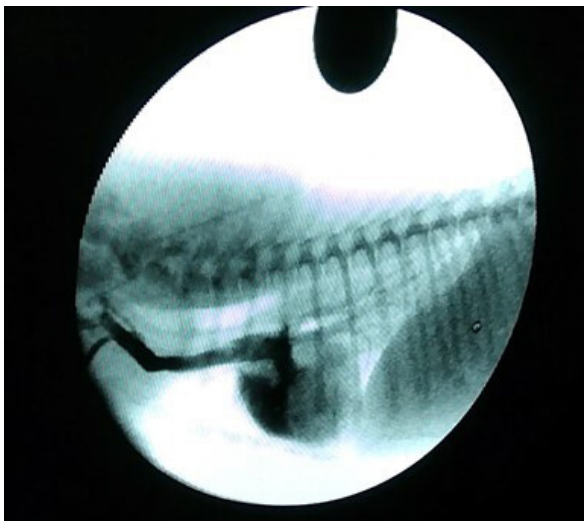

Figure 2. Right aortic arch image on angiography

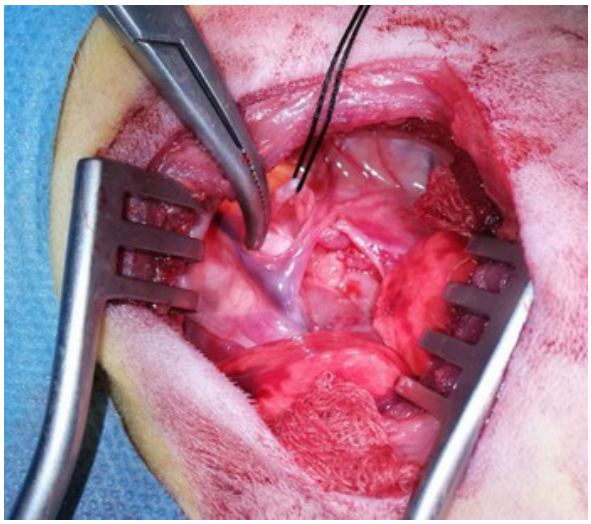

Figure 3. Nervus vagus (separated by suture) and right aortic arch

lactic antibiotherapy with cefazolin was established at a dose of 22 mg/kg intravenous injection. Intraoperative infusion with 0.9% isotonic NaCl at a rate of 5 ml / h was continued as needed. The patient was positioned in right lateral recumbency and related area was prepared for surgery (Follette et al., 2019).

The 4th-5th intercosatal thoracotomy incision was performed. The left lung lobes were directed cranially with soaked gauze and the heart was reached. Then, a dilated esophagus and the right aortic arch just above it were detected. Veins (vena cava cranialis and vena cava caudalis) and the vagus nerve around the structure and the nervus accelarantes were preserved, and the structure (arch) was separated from other tissues by blunt dissection with mixter right angle hemostat (Figure 3). The structure was dissected in a controlled manner by applying a ligature to the dorsal and ventral ends of the tissue with 3/0 prolene. After making sure that the patient had no signs of hypotension, hypertension, bradycardia, or tachycardia, the operation area was closed and a feeding tube was placed with esophagotomy, and she was awakened. Butorphanol sodium was administered to the patient at a dose of 1 mg/kg for analgesia. The patient was handed over in the postoperative period at the request of the patient's owner. The patient was given furosemide sodium (2-6 mg/kg), cefazolin (22 mg/kg), butorphanol sodium (0.1-1 mg/kg), metoclopramide HCl (0.2-0.5 mg/kg) supportive medical treatment and follow-up was started.

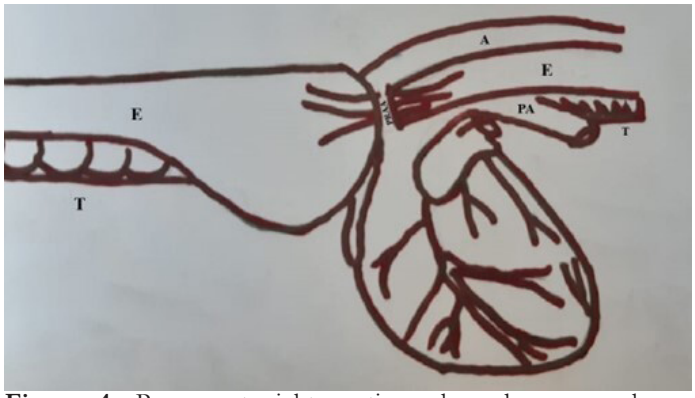

Figure 4. Permanent right aortic arch and megaesophagus representative image.
E: Esophagus, T: Trachea, A: Aorta, PA: Pulmoner Arter, PRAA: Permanent Right Aortic Arch

DISCUSSION

The persistent right aortic arch with a left ligamentum arteriosum or patent ductus arteriosus has been recognised as the most common vascular ring anomalies in the dog, occurring in approximately 95% of cases (Bottorff and Sisson, 2012; Loughin and Marino, 2008; Menzel and Distl, 2011). Epidemiological and breeding studies have shown that German shepherds, Irish Setters and Greyhounds are genetically predisposed to the development of persistent right aortic arch (Gunby et al., 2004; Morgan and Bray, 2019). The material in this case was a Jack Russell with a permanent right aortic arch. Affected dogs can have poor growth compared to littermates (Olson et al., 2021). The affected dog remained smaller than its littermates. Multiple other vascular anomalies have also been described that cause esophageal or tracheal compression (Bottorff and Sisson, 2012; Menzel and Distl, 2011). In this case, there was constriction in the esophagus. Regurgitation secondary to esophageal narrowing is a clinical finding that may occur, and this may result in aspiration pneumonia (Bascunan et al., 2020). In this case, compression in the esophagus was thought to cause vomiting and aspiration pneumonia. The diagnosis of is based on signaling, history, clinical signs, physical examination findings, plain and contrast radiography, and endoscopy (Loughin and Marino, 2008). The diagnosis was made using history, clinical symptoms, direct and contrast radiography, and fluoroscopy. Contrast radiographs of the thorax show esophageal dilatation to the heart with constriction at the level of the heart base. In this case, dilatation of the cranial oesophagus was observed on the contrast-enhanced radiograph of the thorax. Surgical treatment is required to eliminate the constriction (Menzel and Distl, 2011). Medical management is insufficient to address the underlying esophageal obstruction (Morgan and Bray, 2019). In this case, surgical treatment was used to relieve the stenosis and was supported by medical treatment. The survival and outcomes of persistent right aortic arch surgery have varied within the previous literature. Survival rates between studies have ranged between approximately 78% and 94% (Olson et al., 2021). However, it was learnt that after the patient did not continue medical treatment, the patient died due to aspiration after regurgitation.

CONCLUSION

As a result, vascular ring anomalies often affect dogs. In this case report, we tried to provide information on the anomaly of the vascular ring in an affected jack russell dogs. The right permanent aortic arch is the most common vascular ring anomaly. It can negatively affect life by causing symptoms such as developmental delay and vomiting. In general, such patients do not respond to medical treatment. Early diagnosis and early surgical intervention are important in vascular ring anomalies. Early surgical intervention reduces the risk of permanent damage and increases patient survival rates. Fluoroscopy with contrast-enhanced fluoroscopy under mild sedation was sig-

nificantly helpful in the diagnosis of vascular ring anomaly in the patient. Although no other imaging technique was applied to the patient, the location of the anomaly was determined by contrast-enhanced radiography and contrast-enhanced fluoroscopy and the patient was successfully operated.

DECLARATIONS

Ethics Approval

This study does not present any ethical concers.

Conflict of Interest

The authors declared that there is no conflict of interest.

Consent for Publication

Not applicable.

Author contribution

Idea, concept and design: YSŞ, MYŞ, MNÇ

Data collection and analysis: YSŞ, MYŞ, MNÇ

Drafting of the manuscript: YSŞ, MYŞ, MNÇ

Critical review: YSŞ, MYŞ, MNÇ

Data Availability

The author has provided the required data availability statement and if applicable, included functional and accurate links to said data therein.

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