Acute aortic thromboembolism in Dogs: Case reports

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Introduction
Aortic thromboembolism (ATE) has been reported in both cats and dogs. It is an important disease described as an obstruction due to aggregation of platelets often found at the distal aorta, therefore, causes interruption of the circulation to the pelvic limbs. In cats, this condition is primarily associated with underlying cardiac disease. ATE in dogs is less common and is associated with various underlying causes such as protein losing nephropathy (PLN), sepsis, disseminated intravascular coagulopathy (DIC), immune-mediated hemolytic anemia (IMHA), hyperadrenocorticism, enteropathy and cardiac disease. Alterations of any of the three factors of the Virchow’s triad, a decrease in blood flow, injury to the vessel wall and a change of systemic balance of procoagulant and anticoagulant factors (2), can initiate thrombosis.

Materials and Methods

Case 1

History: A thirteen-year-old, castrated male, Bangkaw dog was referred to the Small Animal Teaching Hospital, Faculty of Veterinary Science, Chulalongkorn University with acute right hind limb lameness, and weak femoral pulse. On neurological examination, proprioceptive reflex of the right hind limb was absent.

Imaging: Radiography of three parts (thoracic, abdominal and pelvic), abdominal ultrasonography and echocardiography were used to identify the site of thrombosis and any underlying causes.

Blood collection and urinalysis: Baseline tests that were initially performed include CBC, serum blood chemistry and urinalysis. After ATE is suspected, coagulation tests (prothrombin, partial thromboplastin and thrombin time) were significant factors to confirm the final diagnosis.

Treatment: This dog was treated with antithrombotic agent (Enoxaparin (Clexane®), dose 0.8 mg/ml tid), platelet aggregation inhibitor (Clopidogrel (Plavix®), dose 3.75 mg/kg sid) and analgesic drugs (Gabapentin, dose 10 mg/kg tid and Tramadol, dose 5 mg/kg bid).

Case 2

History: A 10-year-old, male, mixed breed dog had a history of sudden paralysis of both hind limbs. The MRI found aortic thromboembolism at the caudal abdominal aorta. The dog died with acute clinical signs of tachypnea and fever. The owner brought the dog to the Pathological Unit, Faculty of Veterinary Science, Chulalongkorn University for necropsy.

Histopathological examination: After necropsy, tissue samples were collected and fixed in 10% neutral buffered formaldehyde, embedded in paraffin, sectioned and stained with hematoxylin and eosin (H&E).

Results and Discussions

Case 1: The ultrasonography showed thrombus obstruction in the distal aorta, measuring 0.83 cm (figure 1a). Other findings include splenomegaly and mild left adrenal hyperplasia. Echocardiography revealed normal cardiac function. Blood results and urinalysis showed mild azotemia, hypoalbuminemia, rapid coagulation time, high D-dimer and glomerular proteinuria. Proteinuria in this case decrease antithrombin (AT) concentration and result in hypercoagulation. AT, acts as an anticoagulant, can be loss or decreased from several conditions by glomerulonephropathy (2). In dogs with protein losing glomerulopathy, AT is assumed to be loss due to glomerular dysfunction. Another cause of depletion of AT is hyperadrenocorticism, however, the exact pathogenesis is still unknown (4). After medical treatment for 1 month, there was significant improvement of clinical signs. The dog had partial weight bearing of the right hind limb with range of motion that was nearly returned to normal comparing with other limbs. Because Enoxaparin is an indirect factor Xa inhibitors and Clopidogrel is an inhibitor of platelet aggregation, the thrombus that was found in the distal aorta decreased in size (from 0.83 to 0.34 cm.) (Figure 1b). Platelet inhibitors are commonly used in veterinary medicine such as aspirin and clopidogrel (1). There are reports of successful treatment of dogs with ATE using aspirin in combination with anticoagulant therapy (6). No specific treatment protocol has been established for dogs with ATE. However, there are some recommendations. Low molecular weight heparin at 100 U/kg q 12 h for the
first 5 days and Clopidogrel at 2-4 mg/kg/d can be used for treatment (2).

**Figure 1** Two-dimentionalultrasonographic image of distal aorta before treatment; thrombus size 0.83cm (1a).Two-dimentionalultrasonographic image of distal aorta after treatment; diminished size of thrombus (0.34cm.) (1b).

**Case 2:** Necropsy examination of this dog revealed a thrombus attached to the abdominal aorta wall, severe diffuse submucosal hemorrhage of urinary bladder with moderate chronic multifocal follicular cystitis, severe pulmonary congestion and edema, severe splenic hemosiderosis with focal emboli, moderate chronic interstitial nephritis and membranous glomerulonephritis with multifocal infarctions, hypertrophic cardiomyopathy, moderate multifocal myocardial fibrosis with mild myocardial degeneration and calcification.

**Figure 2A** thrombus completely obstructing the caudal abdominal aorta, measuring 4 cm. in length (2a). Cross section of the thrombus, attached to the endothelium with recanalization. (2b,2c H&E stain 10x).

**Figure 3** Heart: Hypertrophic cardiomyopathy with multifocal patchy yellowish white stripes and foci of the myocardium(3a). Multifocal myocardial fibrosis and calcification (3b H&E stain 10x).

**Figure 4** Kidneys: Severely contracted, multifocal infarctions, focal cyst atrenalpelvis(4a). Membranous glomerulonephritis, Interstitial fibrosis (4b H&E stain 10x).

Aortic thromboembolism interrupts blood supply of the aorta causing infarctions in many organs due to ischemia(3). Alterations of the endothelium are the most important factor that cause thrombosis and can result from increase of coagulant substances due to endothelial injury. Abnormal blood flow also increases the risk of thrombosis (5). In this case, membranous glomerulonephritis and cardiomyopathy may be the predisposing factors that can lead to ATE. Cardiomyopathy is an important cause of reduced blood flow.

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Reference