Interventional Radiology Management of Vascular Obstruction

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KEYWORDS

• Canine • Feline • Intervention • Stent • Angioplasty • Coagulation • Thrombosis

KEY POINTS

- Vascular obstructions may develop secondary to intraluminal obstruction or extraluminal compression, with thrombosis a common sequela.
- Interventional options for vascular obstruction include catheter-directed thrombolysis, angioplasty, and vascular stenting. Concurrent medical management of thrombosis is required, involving antiplatelet and anticoagulant therapy.
- Acute presentation of vascular obstruction requires urgent intervention both to improve vascular flow and to prevent thrombus maturation that may limit response to therapy.
- Dogs and cats with more chronic, insidious signs of vascular obstruction may have a good outcome with medical therapy alone.

INTRODUCTION

Vascular obstructions may result from intraluminal obstruction (thrombus, neoplasia, foreign body) or from extraluminal compression (neoplasia, malformation, granuloma) resulting in altered blow flow downstream and congestion upstream of the obstruction. Regardless of underlying cause, thrombosis often occurs secondary to the altered flow dynamics present in an obstruction.

In veterinary medicine, thrombosis is recognized as a common complication of many acquired diseases, including cardiac, endocrine, immunologic, inflammatory, and neoplastic disorders (**Table 1**).[1] Due to challenges in confirming the diagnosis

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Table 1
Common conditions associated with venous and arterial thrombosis in dogs and cats

	Dog	Cat
Arterial	Protein-losing nephropathy Hyperadrenocorticism Neoplasia Immune-mediated disease (eg, hemolytic anemia) Glucocorticoid therapy	Left-sided cardiovascular disease Pulmonary neoplasia
Venous	Adrenal neoplasia Liver disease (inflammatory, neoplastic, other) Immune-mediated disease (hemolytic anemia, etc)	Adrenal neoplasia Liver disease (inflammatory, neoplastic, other)
Mixed (including pulmonary thromboembolism)	Sepsis Pancreatitis Immune-mediated disease (eg, hemolytic anemia)	Sepsis Pancreatitis

of vascular obstruction and thrombosis in veterinary medicine, it is likely that many patients go undiagnosed, making the true prevalence of these conditions difficult to estimate. Even when the presence of an obstruction or thrombus is confirmed, limited therapeutic options and confusion regarding medical management leads to uncertainty in treatment plans. A multimodal approach involving a combination of interventional radiology, antiplatelet therapy, anticoagulant therapy, and thrombolytics likely holds the greatest promise for management of vascular obstructions in small animal patients.

This article describes interventional options for vascular obstructions including arterial, central venous, and portal obstructions. No large-scale prospective studies have evaluated these techniques or therapeutic strategies in animals; therefore, this article represents the authors' opinion and clinical experience in managing these conditions.

GENERAL CONSIDERATION FOR VASCULAR OBSTRUCTIONS

Normal hemostasis is maintained through a delicate balance between endogenous anticoagulants and procoagulants. The net effect is preservation of blood flow in the systemic vasculature with localized coagulation at sites of vessel injury. Changes in this balance can tip to either excessive bleeding or thrombus formation, depending on underlying disease state. The primary disorder influences the site of thrombus formation (arterial or venous) as well as the composition of the occluding thrombus. The relative proportions of platelets and fibrin in the thrombus depend on the shear forces within the injured vessel. Arterial thrombi form under high shear forces and therefore tend to contain a large number of platelets held together by fibrin strands. Venous thrombi form under low shear forces and consist primarily of fibrin and red blood cells. Mixed thrombi are an intermediate form and occur in the pulmonary vasculature. Some of these long-held beliefs are now being challenged and the role of platelets in venous thrombosis may have been underestimated.[2] Strategies to inhibit arterial thrombogenesis typically include the use of antiplatelet drugs, whereas anticoagulants are the mainstay of venous thromboprophylaxis.

An important consideration in the decision-making process in a thrombotic patient is the site of the thrombus. An arterial thrombus is often considered an emergency and