102. Other MRA Applications

Beyond its most established uses, detailed in previous chapters, contrast enhanced MRA can aid in the assessment and evaluation of other vascular diseases, including in particular aneurysms. Abdominal aortic aneurysms are defined as enlargement of the aorta greater than 3 cm, and can be classified with respect to their location relative to the renal arteries. Suprarenal aneurysms lie above the origin of the renal arteries, juxtarenal aneurysms lie next to the origin of the renal arteries but do not involve them, and infrarenal aneurysms lie below the renal arteries. Abdominal aortic aneurysms greater than 5-5.5 cm are typically repaired either by surgery or stenting. MRA is useful in the pre-operative setting and prior to stenting. In such cases, the distance between the aneurysm neck and the closest renal artery origin should be reported, along with the aneurysm length (on coronal images), the distance from the aneurysm to the common iliac arteries, and the diameter of the external iliac arteries. In the case of intraaneurysmal thrombosis, the diameter including the thrombosis and of the patent lumen itself should be reported. An aneurysm of the ascending thoracic aorta is defined as being 4 cm or greater in diameter (or as a dilatation > 50% of the normal diameter), a common iliac artery aneurysm as greater than 1.5-1.7 cm, and for popliteal aneurysms a focal dilatation more than 50% of the normal vessel diameter. Indications for surgery include size, specifically > 5.5 cm in diameter for the ascending aorta, and > 6.5 cm for the descending aorta. The aforementioned lesions typically occur as a result of atherosclerotic disease. Multiple aneurysms are not uncommon with abdominal lesions increasing the probability of concomitant femoral or popliteal aneurysms, the latter which commonly thrombose.

Dissections occur between the medial layer and the adventitia (the outer layer of connective tissue) of the aorta and are more common in patients with hypertension (rarely these are caused by traumatic injury). Dissections often originate in the thoracic aorta and are propagated distally, with Ehlers-Danlos and Marfan’s syndrome (less common causes) predisposing to spontaneous development of more distal (i.e. abdominal aorta or iliac) dissections. Dissections are most commonly classified by the Stanford system, type A lesions being those involving the ascending aorta and type B lesions being those without ascending aortic involvement. Figure 102.1 illustrates a volume-rendered image of an aortic dissection extending into the right common iliac artery. Such images often help elucidate whether a given vascular structure is fed from the true or false vessel lumen—an important finding particularly with respect to the renal arteries. In Fig. 102.1, the false and true lumens feed the right and left renal arteries, respectively. Coronal MIP images in Fig. 102.2A provide similar information, while an axial MIP (Fig. 102.2B) confirms extension

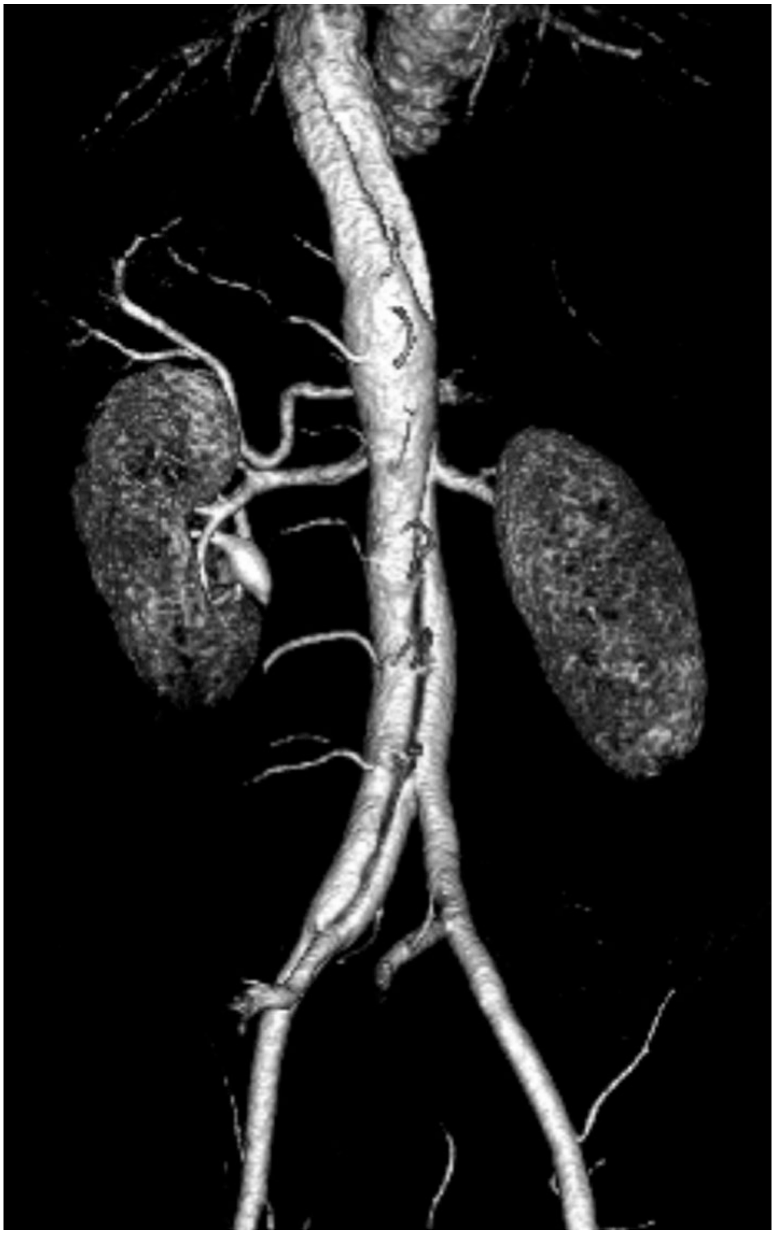

Fig. 102.1

of the dissection into the left renal artery—a more subtle finding not well-visualized on volume rendered imaging and illustrating the importance of viewing structures in multiple planes. Time-resolved studies can further help to distinguish the true and false lumens in the presence of dissection and to identify the origin of the renal vasculature, in addition to allowing visualization of renal perfusion and excluding renal infarction.

Findings associated with inflammatory arteritis may also be visualized on CE-MRA. Takayasu arteritis preferentially involves medium and large arterial structures, particularly the aorta and its supraaortic branches most classically in young females. On T1WI, Takayasu's is associated with concentric vessel wall thickening with wall enhancement

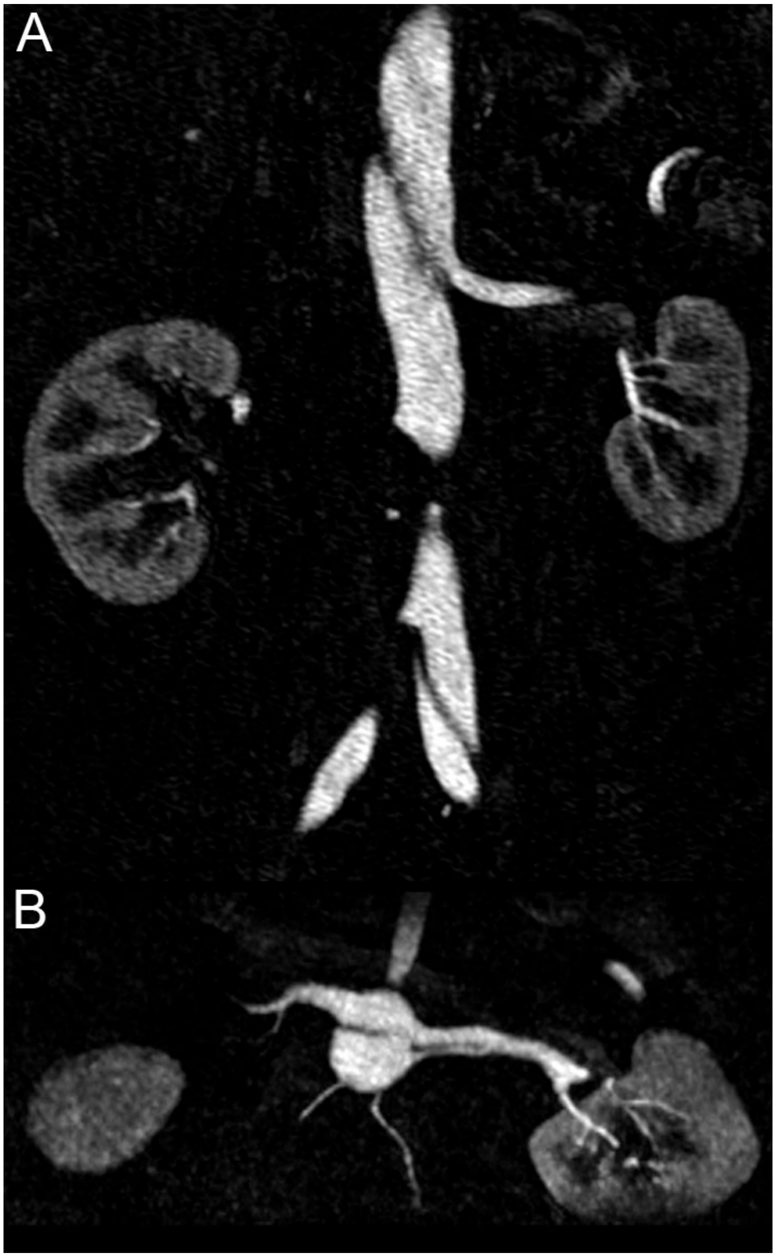

Fig. 102.2

indicating active disease. CE-MRA in this disease may help identify associated stenoses, occlusions, or aneurysms. Polyarteritis nodosa affects small and medium size vessels in a similar manner (with microaneurysms, occlusions and strictures), with multiple peripheral aneurysms commonly seen. DSA remains the gold standard for diagnosis of this condition, due to the frequent small size of findings associated with this condition.

Magnetic resonance venography (MRV) is commonly used to evaluate extent of tumor thrombus into venous structures, particularly in the setting of renal vein invasion in renal cell carcinoma. The development of peripheral MRV for the assessment of deep venous thrombosis offers the possibility of a combined thoracic MRA and peripheral MRV protocol, allowing comprehensive evaluation for venous thrombosis and pulmonary embolism in a single examination, an attractive approach particularly in patients with a low to moderate pretest possibility. Figure 102.3A,B demonstrates bilateral pulmonary emboli (white arrows) on coronal and axial CE-MRA. Additional applications for thoracic MRA, such as in evaluation of congenital anomalies and in MR ventilation-perfusion studies, are discussed further in Chapters 60 and 61.

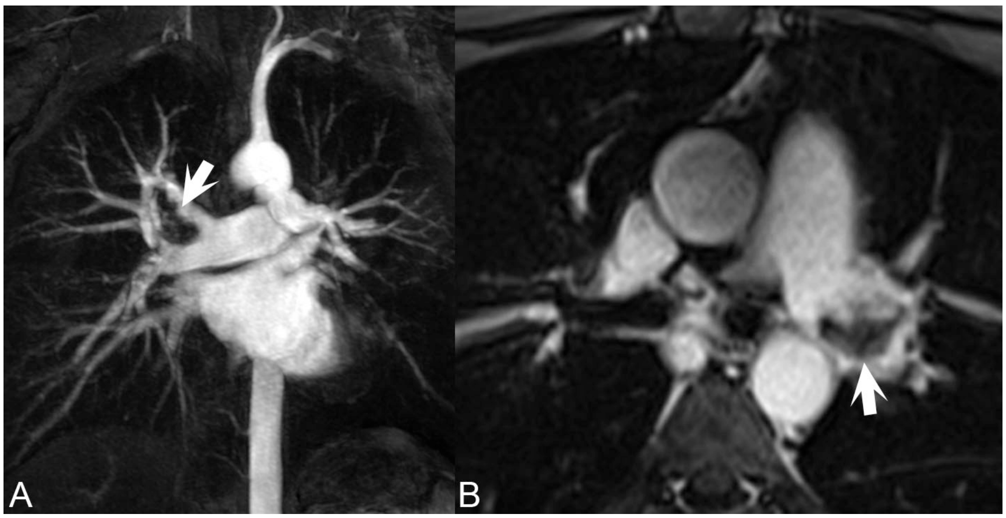

Fig. 102.3