Surgical anastomoses
- Hepatic Artery: from the common hepatic-splenic branch point of the donor to either the right/left hepatic bifurcation or the GDA-proper hepatic bifurcation of the recipient
- Jump grafts arise from the recipient’s infrarenal abdominal aorta, and are employed in recipients of a second transplant or recipients with celiac artery stenosis
- The suprarenal IVC, infrarenal IVC, and extrahepatic portal vein anastomoses are typically end-to-end

MRA technique
- For the investigation of suspected arterial complications, a standard contrast-enhanced MRA of the abdomen using a Gd-based agent is typically employed
- If the patient has an estimated GFR<30, a non-contrast MRA technique may be preferable, using either a quiescent-interval single-shot (Fig. 1) or of steady-state free precession technique
- If assessing the venules system for thrombosis or occlusion, a blood-pool agent such as gadofosveset can be employed

Hepatic artery thrombosis
- Most common complication (incidence as high as 12%)
- Acute fulminant hepatic necrosis and failure secondary to rapid ischemia and necrosis of the biliary epithelium, as it depends solely on the hepatic artery for its blood supply
- Subacute scenario, in which patients develop bile leaks, bile peritonitis, recurrent bacteremia, and sepsis
- Risk factors for thrombosis include: prolonged cold ischemia of the donor liver, rejection of the transplant, the presence of an end-to-end anastomosis, vascular reconstruction with an interposition conduit, ABO blood type incompatibility, and preexisting celiac artery stenosis
- Treatment: thrombolysis and thromectomy may be attempted, but the majority of cases require re-transplantation

Hepatic artery stenosis
- Incidence: up to 11% of transplant recipients, typically within the first 3 months after surgery
- Location: almost always occurs at the anastomosis site
- Risk factors: surgical clamp injury, transplant rejection
- Also results in biliary ischemia and graft dysfunction; though more likely to cause proximal worsening biliary strictures than rapid fulminant hepatic failure
- Diagnosis is critical, as stenosis can be treated via balloon angioplasty and stenting, avoiding need to re-transplant

Efficacy of MRA
Performance has been evaluated in several dedicated studies:
- Stafford-Johnson et al.
- GDA was highly accurate: its staging agreed with gold standard in 91/112 cases of suspected hepatic artery thrombosis and 10/10 cases of portal vein evaluation
- Glownien et al.
- Significant false positive rate: only 6/9 cases of hepatic artery stenosis were confirmed at angiography
- Thrombosis that elevated end-organ resistance → little contrast flowed into the artery’s branches
- Highly accurate (7/7) for dx of hepatic artery thrombosis
- Ishigami et al. – 36 MRA studies with angiography or surgical correlation
- High incidence of poor image quality (30%)
- Patient motion, poor arterial enhancement, surgical clips, insufficient imaging volume to cover jump grafts
- 67% sensitive, 90% specific, and 81% accurate in identifying >50% stenosis or occlusion
- Improperly graded stenoses in 40% of cases
- Kim et al. – 76 patients (recipients of living transplants)
- 96% technical success – pt motion responsible for failures
- High sensitivity: 100% sensitive for the presence of >50% stenosis
- Limited specificity: overestimated the degree & presence of stenosis (29% PPV)
- MRA concluded complete occlusion in seven cases, but zero were confirmed at angiography
- Similar trend for portal vein thrombosis: 100% sensitive for occlusions >50% but only 84% specific (PPV=35%)

Role of MRA in diagnosis
- Doppler US is typically the first exam in the immediate post-transplant period. However, it has several limitations:
- Patient positioning, bandages, ascites, bowel gas
- Limited specificity and sensitivity
- CT is also frequently used in the evaluation of equivocal cases, or can take longer to perform – much more rapid, which provides benefit in the critically ill patient
- However, there are clinical circumstances in which MRA is of benefit:
- Patients unable to tolerate CT contrast
- Patients in which there is discordance between their clinical and ultrasound findings, as MRA is highly sensitive and can rule out the presence of significant stenosis, though patients must be assessed for their ability to cooperate with the required breath-hold
- Can be combined with MRI and MRCP for a comprehensive evaluation of parenchymal, biliary, and vascular complications in liver transplant recipients
- In evaluation of children with suspected complications to reduce radiation dose

References