

# Complications post laparoscopic cholecystectomy – top tips and misplaced clips

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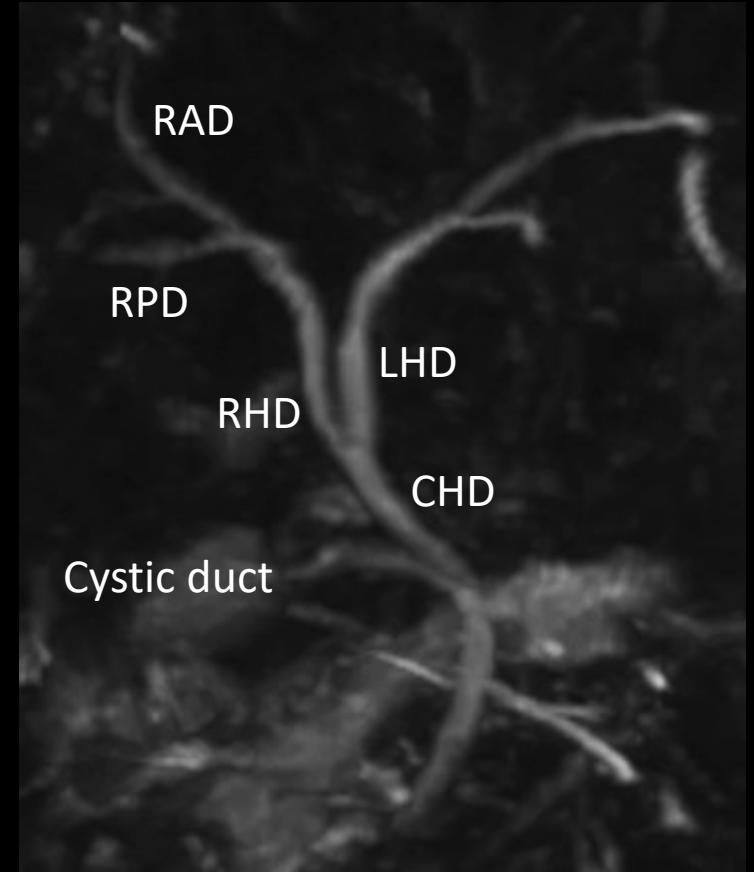
# Background

- Laparoscopic cholecystectomy (lap chole) is recommended by NICE for management of symptomatic gallbladder calculi, ideally as a day case.
- Whilst complications are uncommon, given the procedure's ubiquity, it is important for radiologists to recognise them, and know which imaging modality is appropriate.
- Complications often present non-specifically e.g. with pain or fever.
- In this multimodality educational exhibit, we will cover the key post-operative complications, illustrating them with cases from our tertiary HPB referral centre.

# Pre-operative biliary anatomy

- Biliary injury is the major common complication post lap chole.
- As radiologists, we can aid our surgeons in preventing this by identifying key anatomical variants that put the patient at higher risk of injury.
- Conventional biliary anatomy is seen in ~60%.

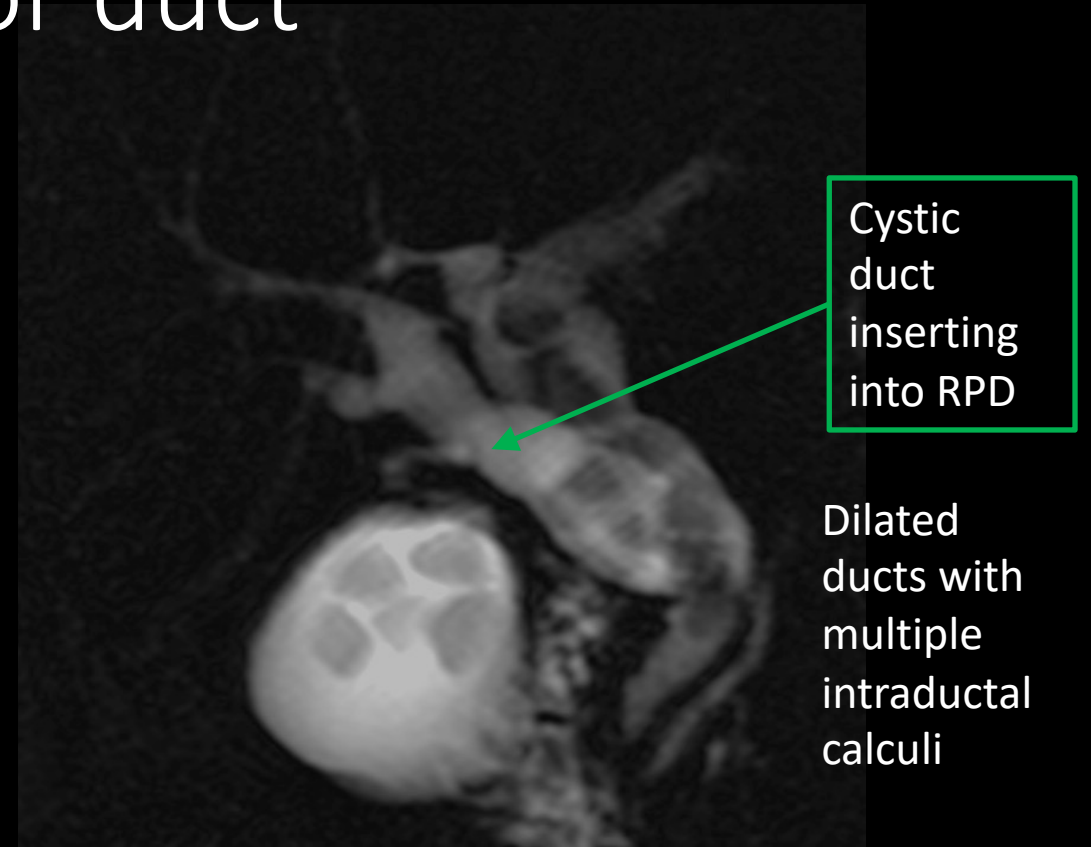
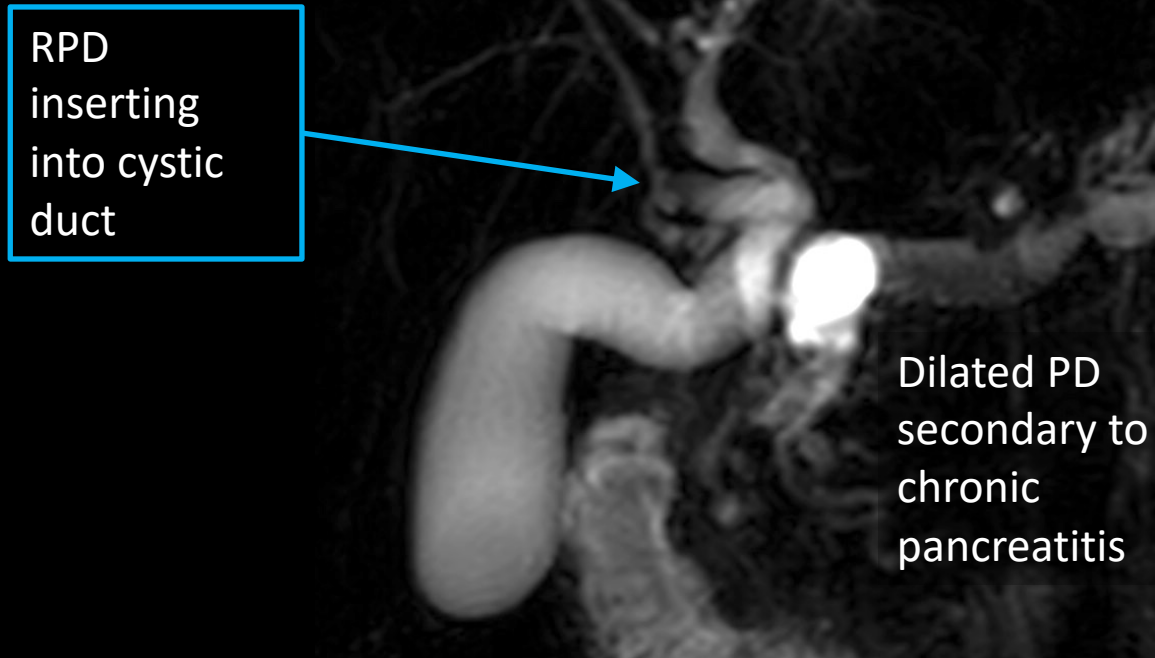
The major clinically important anatomical variant is a **low insertion of the right posterior duct** into the common hepatic duct, which can be mistaken for the cystic duct intraoperatively.



Coronal MIP MRCP demonstrating conventional biliary anatomy:

- right anterior and posterior ducts join to form right hepatic duct
- right and left hepatic ducts join to form common hepatic duct

# Low inserting right posterior duct



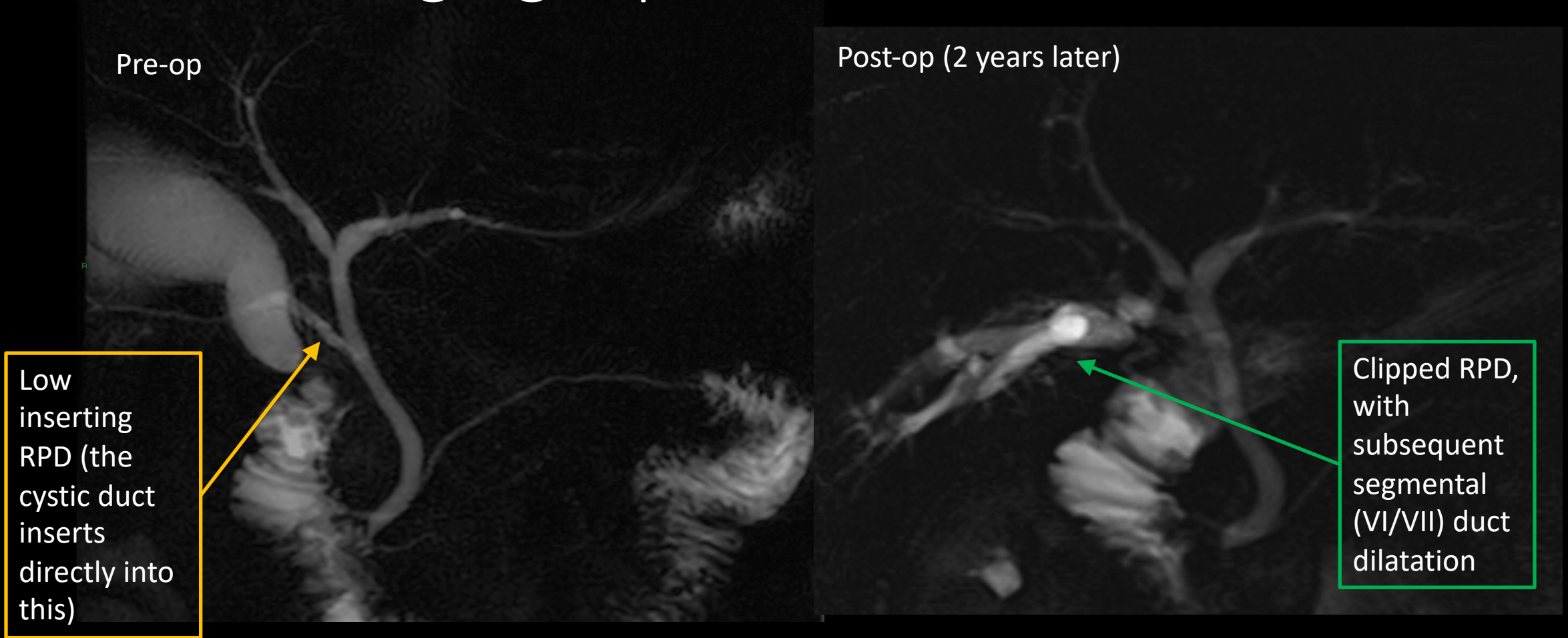
Coronal MIP MRCPs demonstrating two examples of low inserting right posterior ducts

Other anatomical variants that can predispose patients to biliary injury:

- Aberrant insertion of RPD into LHD, with low insertion of RAD into CHD
- Medial insertion of cystic duct into CHD
- Long parallel cystic duct and CBD – implies a common fibrous sheath

At our centre, we recommend all patients undergoing lap chole have a pre-operative MRCP (can also aid in identifying ductal calculi).

# Low inserting right posterior duct



- 48M, pre and post lap chole MRCPs. The low inserting RPD was flagged in the pre-operative MRCP report by the reporting radiologist, but was inadvertently clipped intraoperatively, and the patient developed a bile leak.
- There was subsequent stricturing of the the right posterior duct, with atrophy of this segment.

# Clipped ducts

The presence of dilated ducts may initially raise the suspicion of a retained ductal calculus, however clipped ducts is another consideration, which CT can help identify.

Dilated, dissociated right sided ducts, with non-dilated left sided ducts

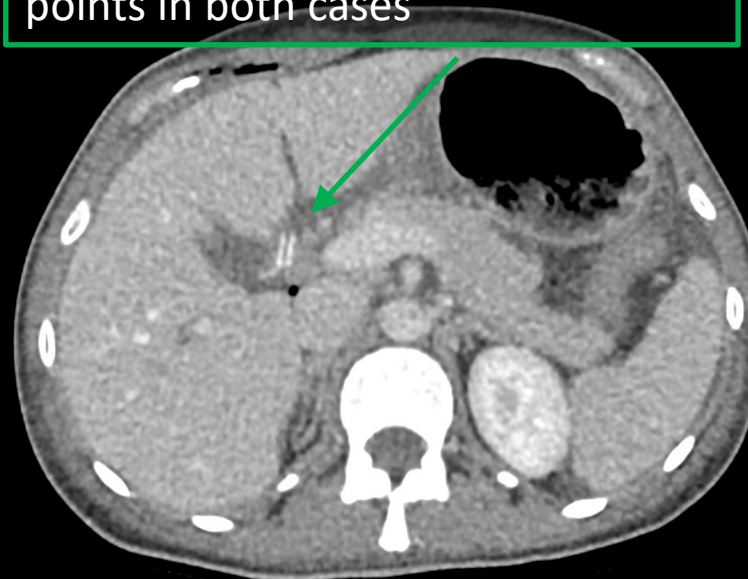


Case 1: Dilated right anterior and posterior segmental ducts, secondary to a clip.

There was subsequent atrophy of the right lobe, and the patient eventually required a right hepatectomy.

Surgical clips at the transition points in both cases

Bilobar dilated, dissociated ducts

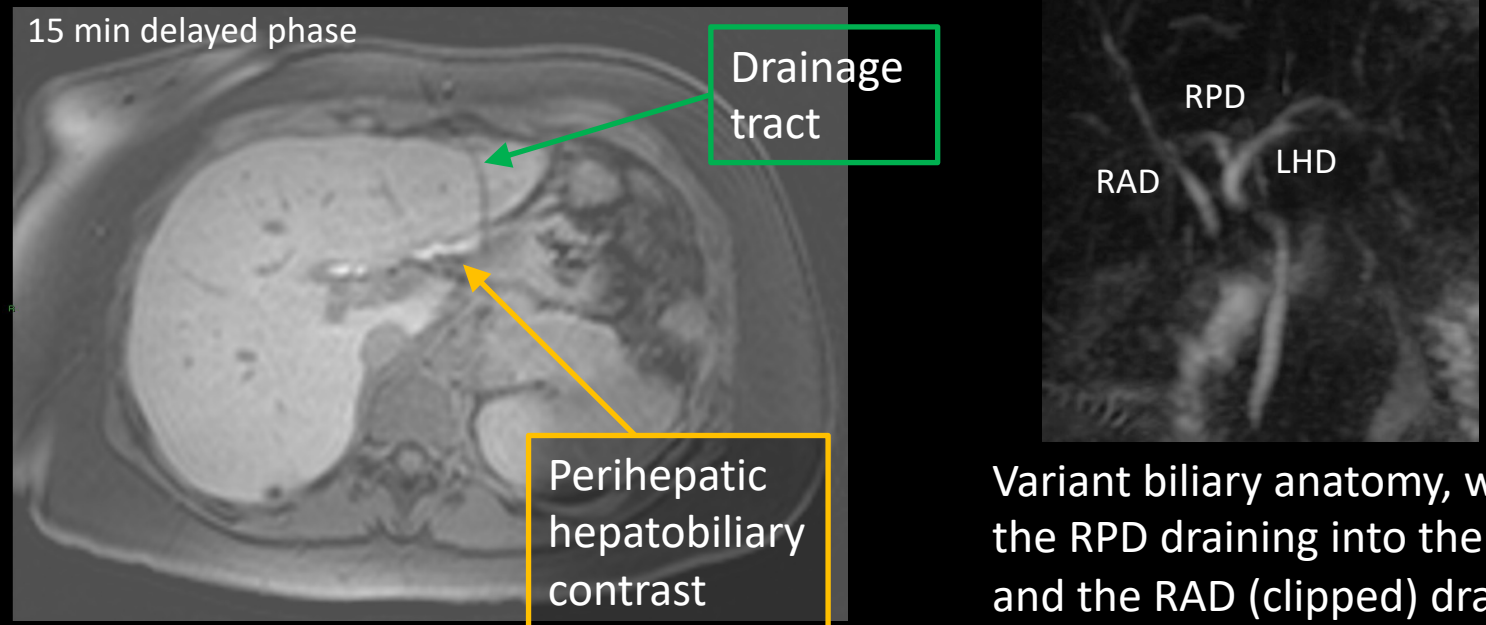
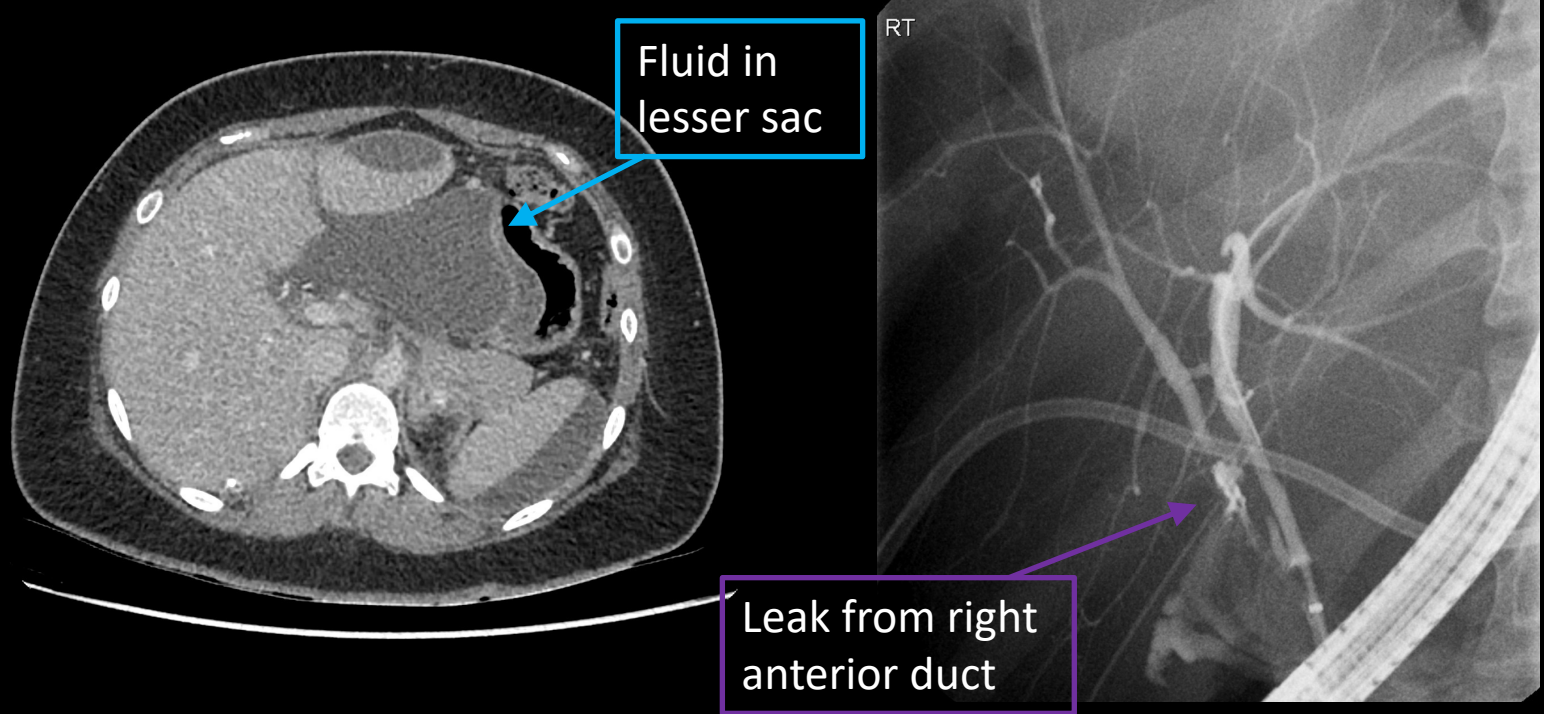


Case 2: Abrupt cut off of the common duct, with bilobar biliary dilatation, secondary to a clip.

The patient required urgent hepaticojejunostomy formation.

# Bile leak

- 25F developed a post lap chole collection in the lesser sac – first seen on CT (often the initial imaging modality).
- Percutaneous transhepatic drainage revealed this to be bile.
- Drainage also reduces the chance of superadded infection.
- Perihepatic contrast was seen on the hepatobiliary phase of an MRI with Primovist, confirming an ongoing leak.
- ERCP identified the origin as an injury to the right anterior duct.
- A CBD stent was placed, allowing preferential bile flow through the ampulla, and the leak to heal.



Variant biliary anatomy, with the RPD draining into the LHD, and the RAD (clipped) draining into the CHD.

# Bile leak

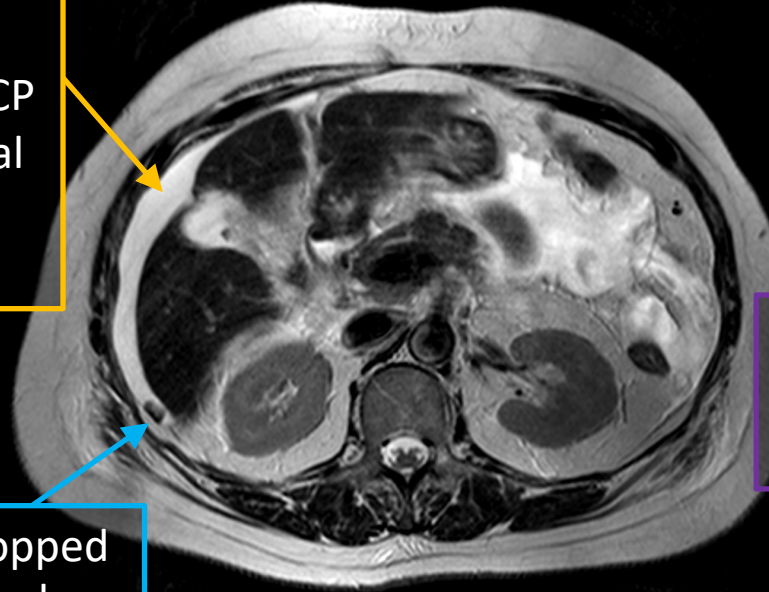
- 65M similarly developed a post-operative collection – perihepatic and in the lesser sac. There were also several dropped calculi.
- Tc 99m HIDA scan confirmed perihepatic tracer, outside the biliary tree.
- The leak was seen on ERCP, and similarly managed by percutaneous drainage and CBD stenting.

The most common site for a bile leak is the cystic duct stump.

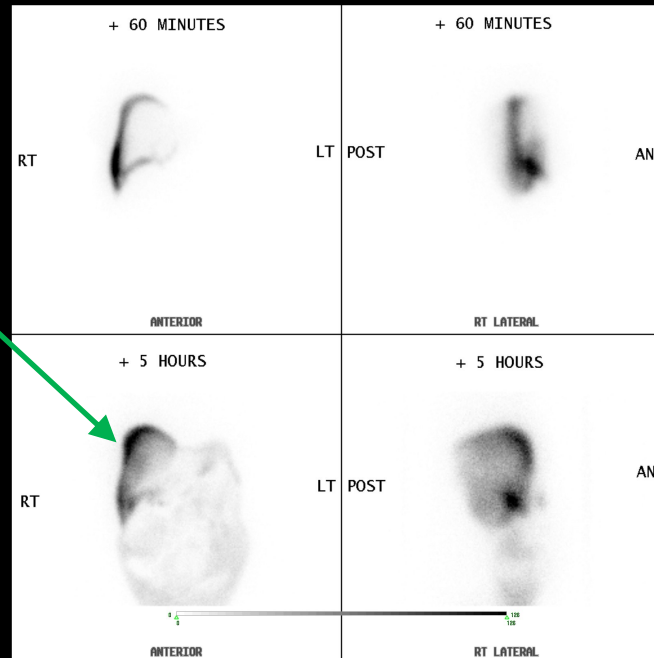
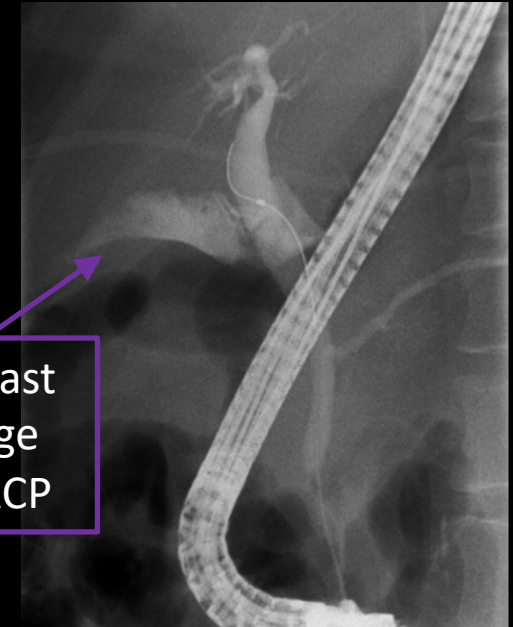
Upper abdominal fluid on MRCP (conventional biliary anatomy)

Dropped calculus

Perihepatic tracer seen on delayed HIDA images



Contrast leakage on ERCP



- Primovist and HIDA are useful for problem solving tools – i.e. is there an ongoing bile leak?
- HIDA can be performed in more unwell patients, so may be more useful immediately post-op, but provides less anatomical detail.



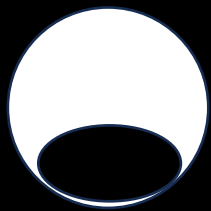
# Dropped and retained calculi

Calculi in the perihepatic space - a classic location

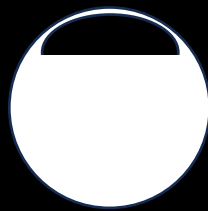


Dropped calculi are common post lap chole, and are often asymptomatic, but can form a nidus for infection.

As for gallbladder calculi, many dropped calculi are not visible on CT, but could simply present as an unexplained abscess.



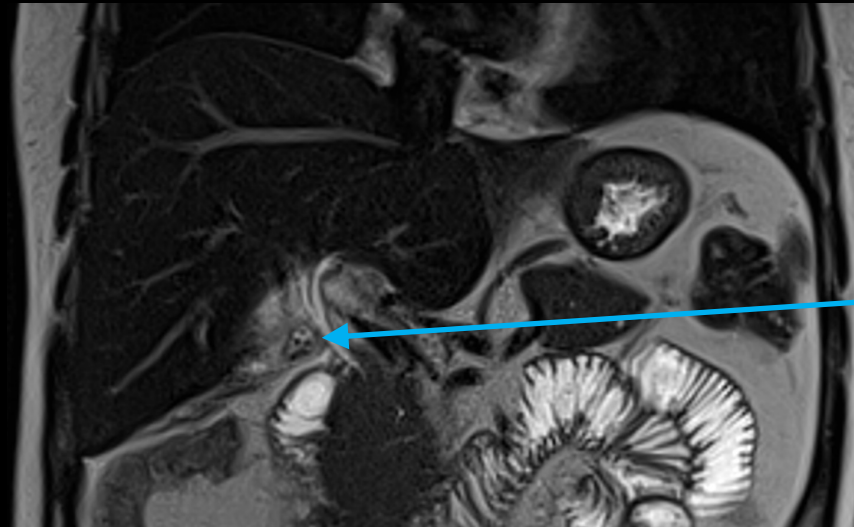
Calculus



Air

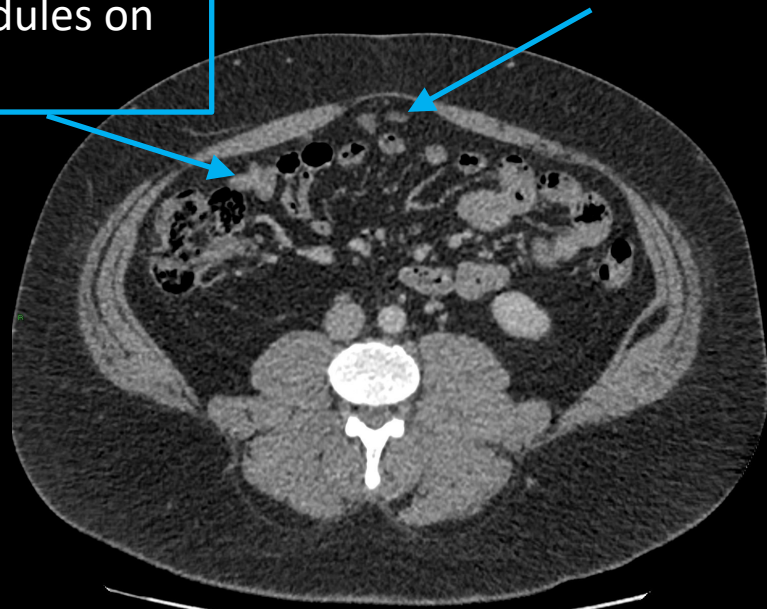
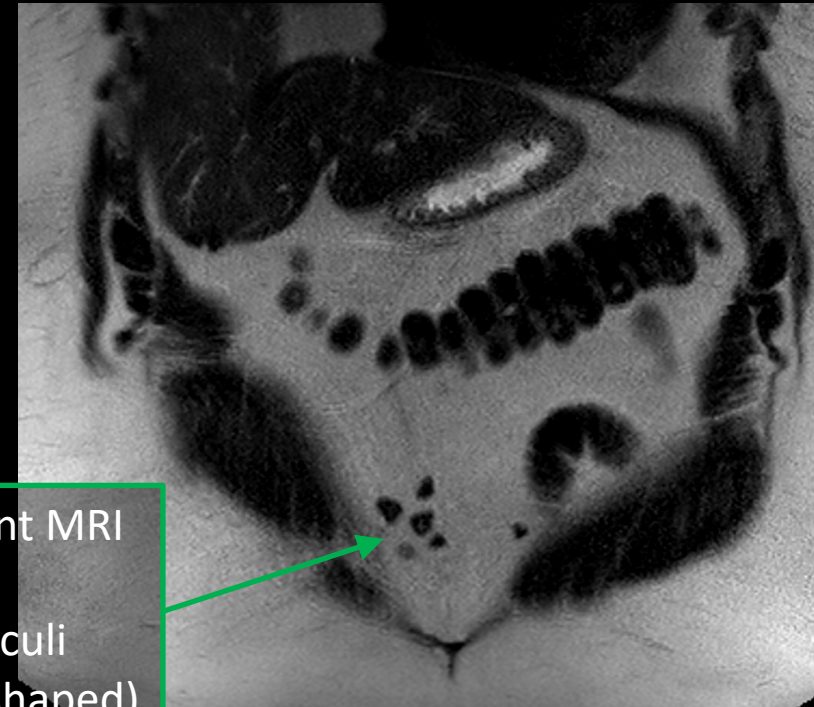
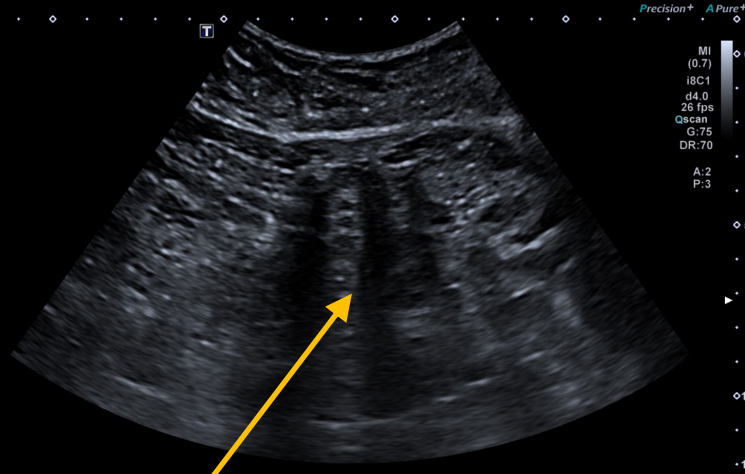
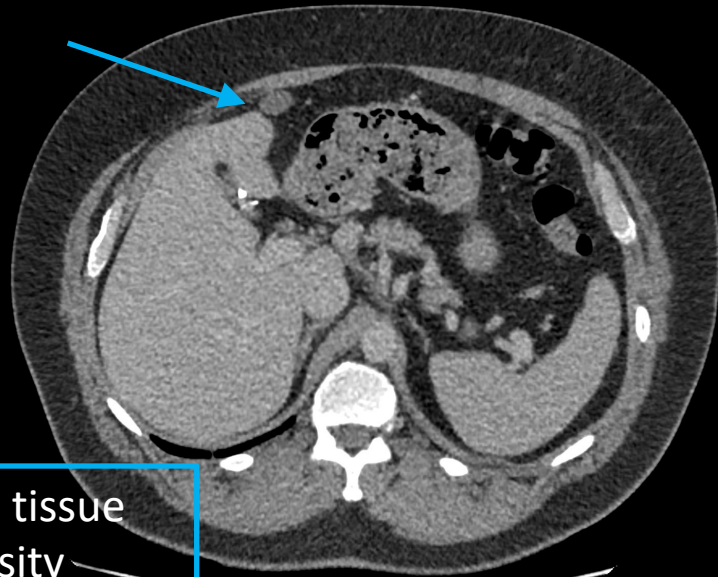
Intraductal filling defects seen on thin slice MRCP should be fully evaluated by reformatting into the axial plane to distinguish calculi (dependent) from air (antidependent)

Retained calculi are best identified on MRCP.



Retained calculi within gallbladder remnant after a subtotal cholecystectomy

# Dropped calculi



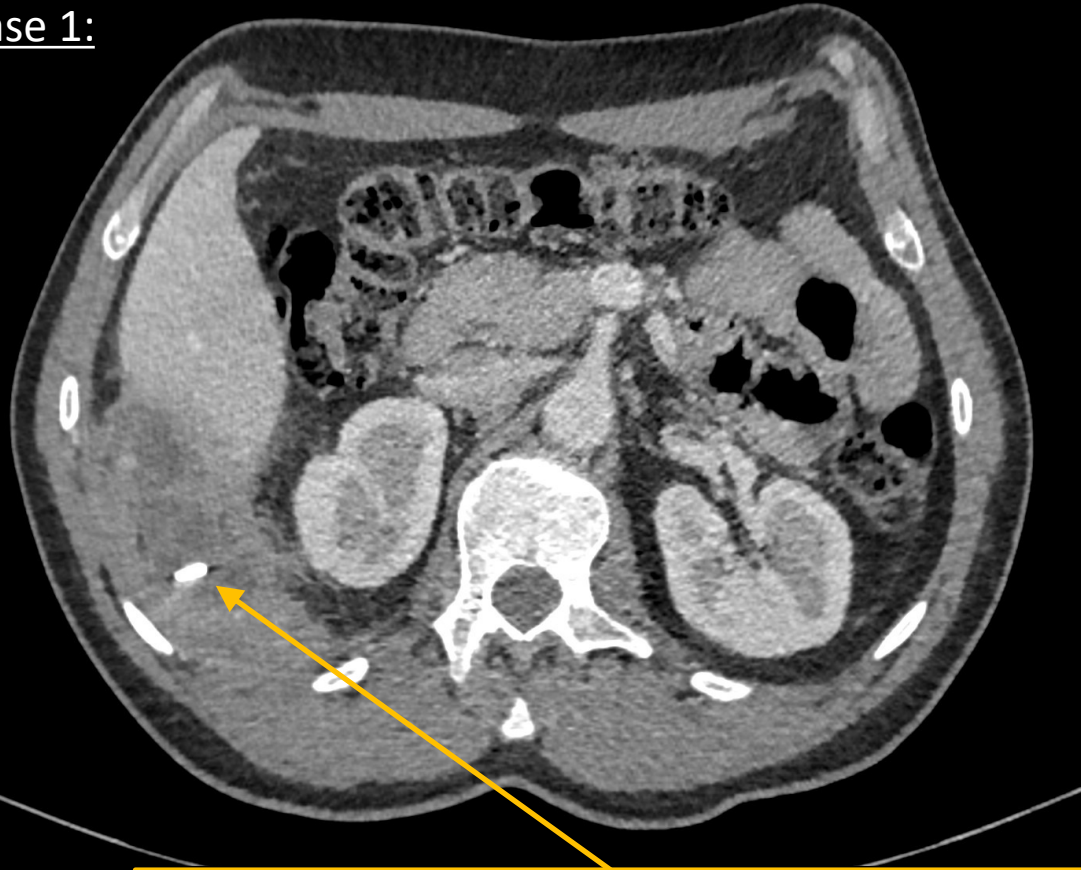
- 47M had a CT performed for acutely in A+E for ?diverticulitis, with a prior history of lap chole. Multiple small peritoneal nodules were noted, raising the suspicion of cancer of unknown primary.
- After a negative PET scan, these were targeted for biopsy, which was abandoned after they had the characteristic appearance of gallstones on US.

Calculi can be a range of densities on CT

# Dropped clips

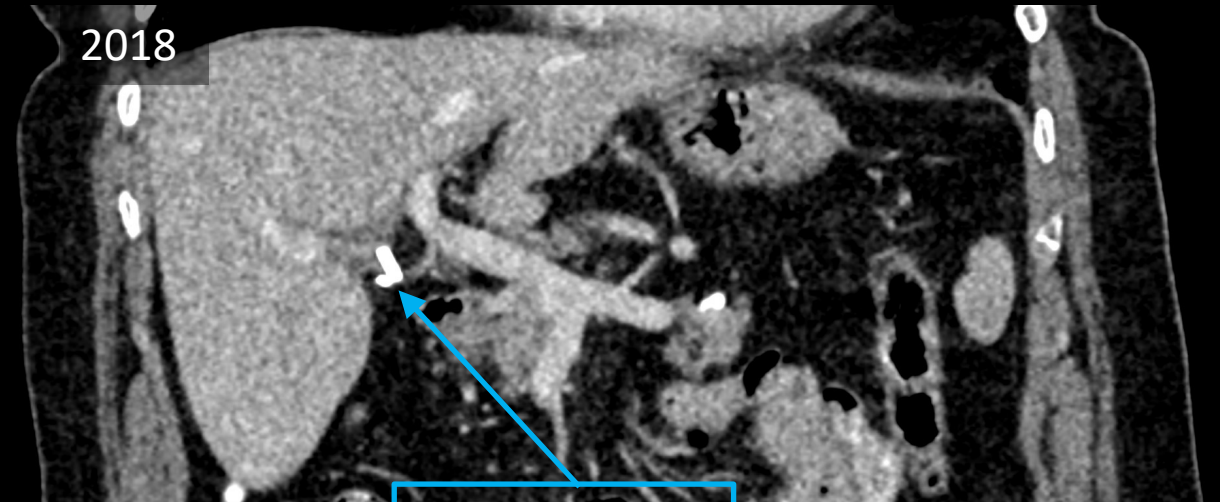
- Much less common than dropped calculi.

## Case 1:

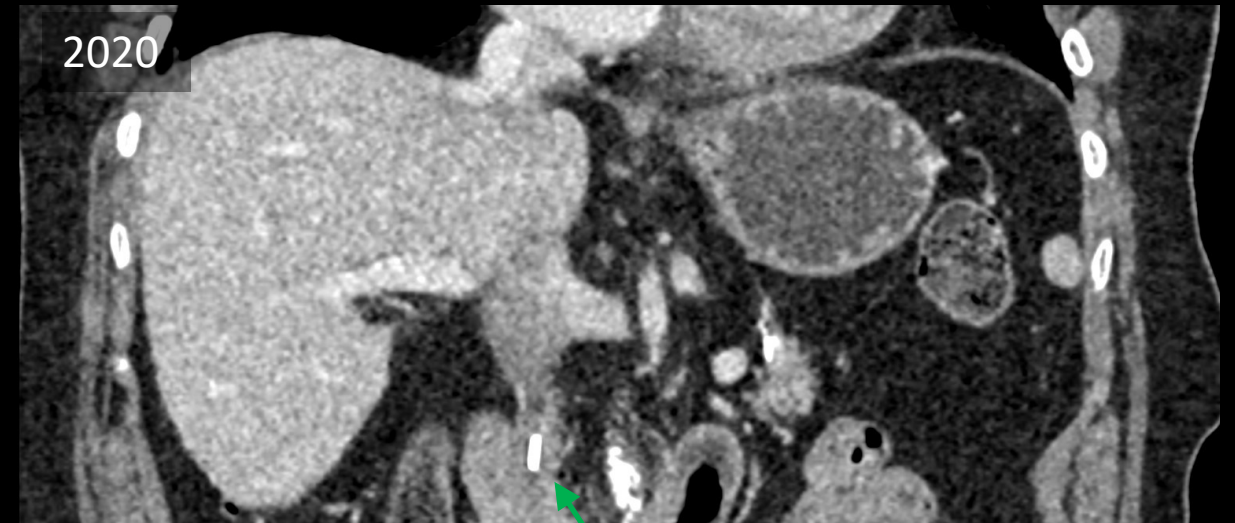


Dropped clip lying in the perihepatic space, with surrounding abscess formation.

## Case 2:



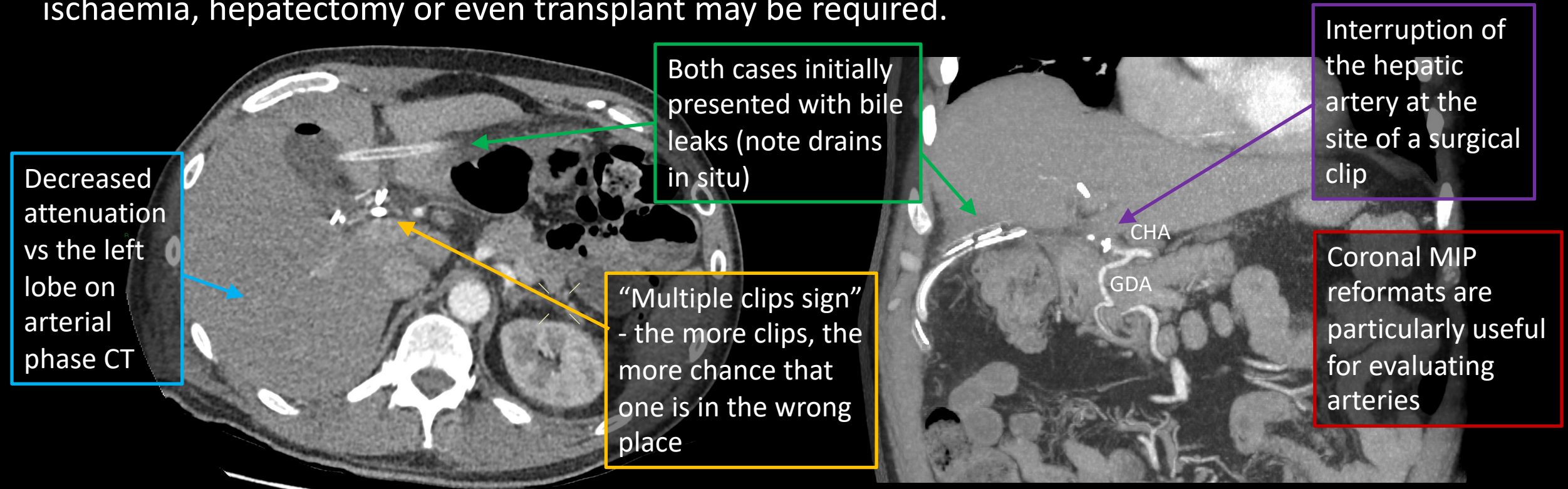
Cystic duct clip



Dropped clip lying within the distal CBD (possibly eroded through cystic duct stump).

# Vascular injury

- Rare, but often associated with with major bile duct injury. In these cases, arterial phase imaging should be performed – It is important to know the full extent of any complications prior to any intervention.
- The right hepatic artery is most vulnerable, as it courses over the common hepatic duct (hence the pulsation artefact often seen on MRCP).
- Patients can be asymptomatic. In chronic stenosis, lobar atrophy can develop. In severe cases of ischaemia, hepatectomy or even transplant may be required.



Case 1: 56M, multiple clips at the liver hilum, with reduced enhancement of the right lobe, indicative of right hepatic artery injury.

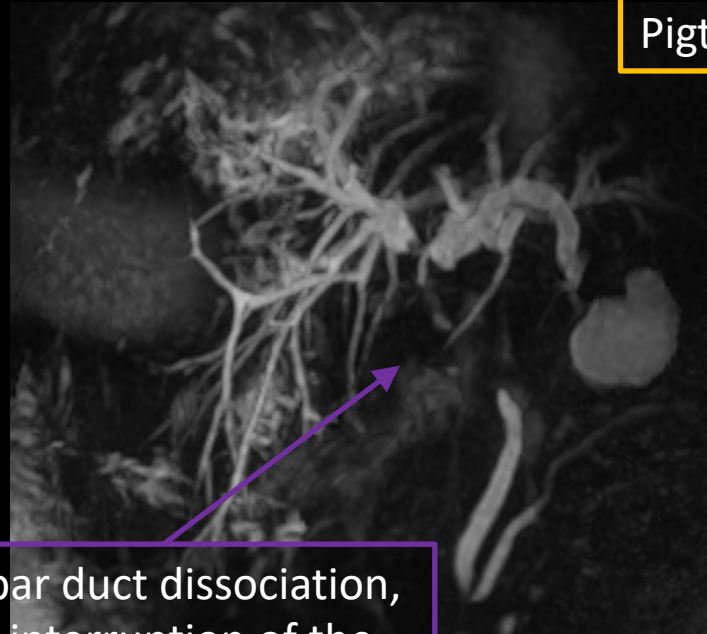
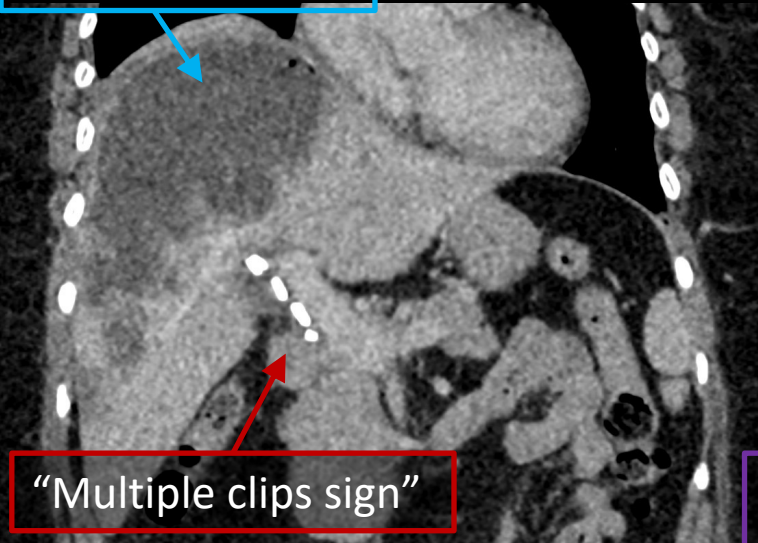
Case 2: 70M, abrupt cut-off of the hepatic artery proper just after the GDA origin, with a clip at this site.

→ both patients recovered, with development of collateral arterial supply

# Major biliary and vascular injury

64F, presented 2 weeks post lap chole with jaundice and right upper quadrant pain

Large right lobe biloma



Pigtail drain

Interruption of hepatic artery on coronal MIP



- Initial CT demonstrated a large collection replacing much of the right lobe of the liver, with, multiple clips at the liver hilum.
- Percutaneous drainage revealed this to be bile.

- The hilum could not be crossed via ERCP, and MRCP demonstrated dissociation of the left and right ducts.

- Given the major duct injury, an arterial phase CT was performed, demonstrating interruption of the common hepatic artery.
- The patient was managed with hepaticojejunostomy to decompress the biliary tree, and arterial supply was also restored to the liver intraoperatively.

# Summary and learning points

- Conventional biliary anatomy, and key variant anatomy. At our centre, we recommend a pre-operative MRCP in all cases.
- The appearances and sequela of biliary injury. Not all cases of post-operative biliary dilatation are due to retained stones.
- Bile leaks, their management, and use of multimodality imaging for assessment.
- The appearances of dropped calculi. They can be a range of densities, and may not be visible on CT.
- In cases of biliary injury, also assess for vascular injury. Arterial phase imaging in addition to standard portal venous phase imaging should be performed. Coronal MIP reformats may be helpful when assessing the hepatic artery.