

MR imaging findings in acute infectious cholangitis: Role of Diffusion Weighted Imaging

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Purpose

- Acute cholangitis, otherwise known as ascending cholangitis, is a clinical syndrome characterized by fever, jaundice and abdominal pain.
- It results from bacterial infection of the biliary tree, with biliary stasis being the most important predisposing factor.
- For this reason early recognition and biliary tract decompression is paramount.
- The aims of this study were:
 - To evaluate the MR imaging findings observed in patients presenting with acute infectious cholangitis at our centre.
 - To determine any added value of diffusion weighted imaging (DWI).

Materials and Methods

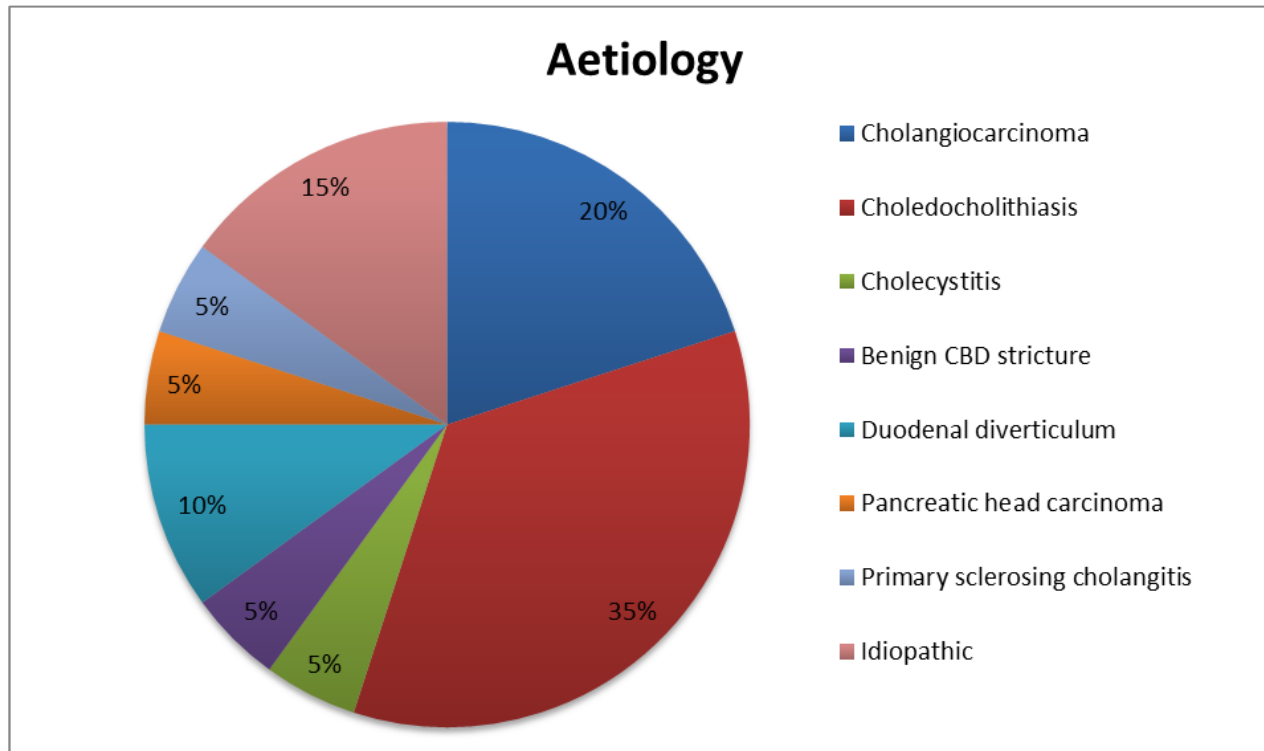
- Patients with a clinical diagnosis of acute infectious cholangitis who had imaging performed within 24 hours of admission, between July 2014 and December 2017 were identified.
- The MR imaging findings were reviewed retrospectively by two board certified radiologists.

Materials and Methods

- 1.5T (GE SIGNA Explorer) and 3T (Philips Ingenia) scanners were utilised.
- Post-contrast imaging was performed using an extracellular contrast agent (Gadobutrol, Gadovist® 1.0mmol/ml, Bayer)
- Imaging sequences included:
 - Chemical shift T1-weighted imaging
 - T2-weighted imaging with & without spectral fat-suppression
 - Serial pre & post-gadolinium T1-weighted 3D sequences with spectral fat-suppression
 - DWI (b=0, 50, 800)
 - Radial and 3D MR-cholangiopancreatography

Results

- A total of 20 patients were included in this study.
 - 6 of these had a non-contrast protocol due to contrast medium-related contraindications.

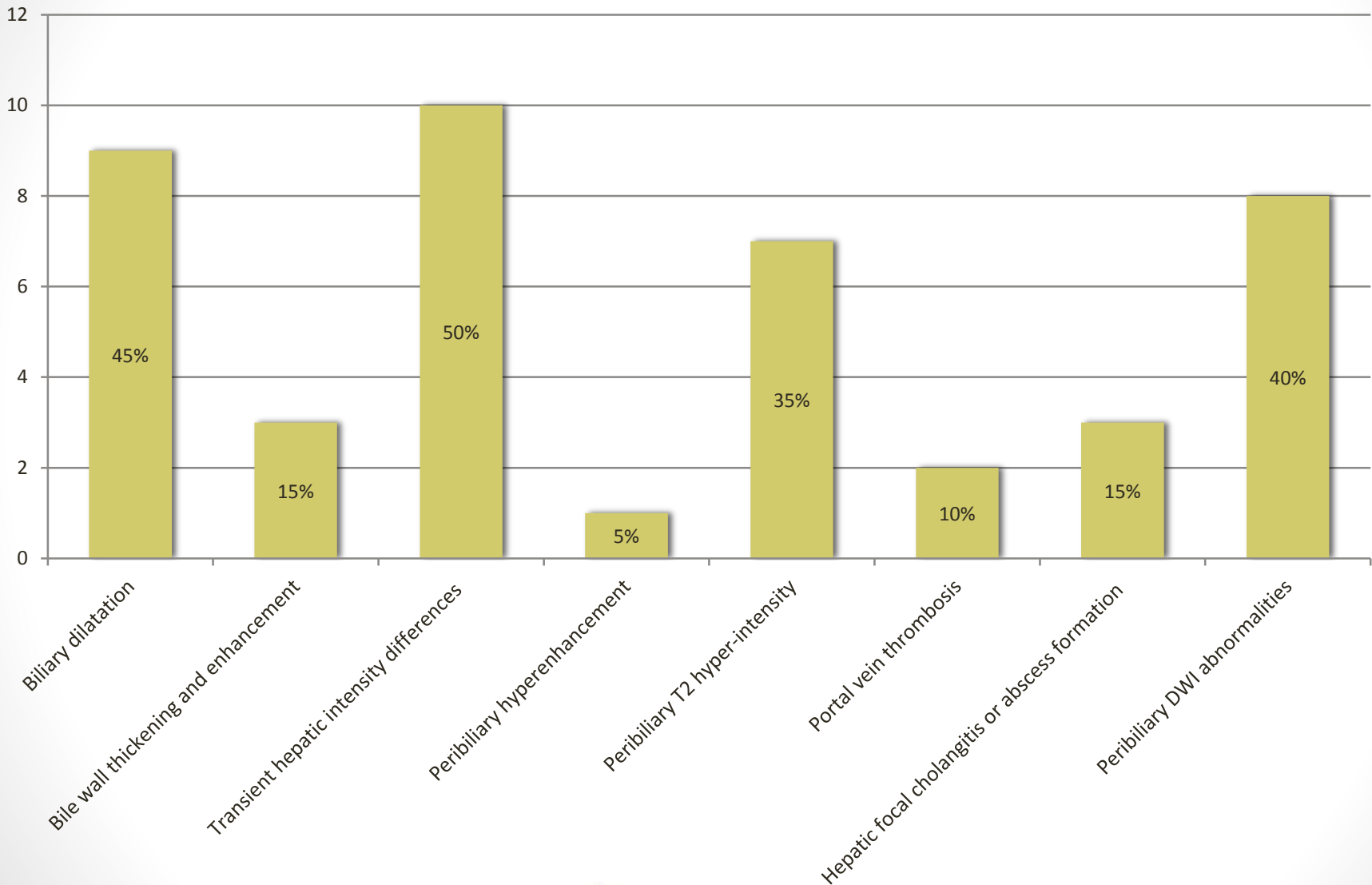


Results

- Findings included:
 - Biliary dilatation (n=9)
 - Bile wall thickening and enhancement (n=3)
 - Transient hepatic intensity differences (THIDs, n=10)
 - Peribiliary hyperenhancement (n=1)
 - Peribiliary T2 hyperintensity (n=7)
 - Portal vein thrombosis (n=2)
 - Hepatic focal cholangitis or abscess formation (n=3)
 - Peribiliary/biliary abnormalities on DWI (n=8)

Results

MRI Findings



45% - Biliary dilatation

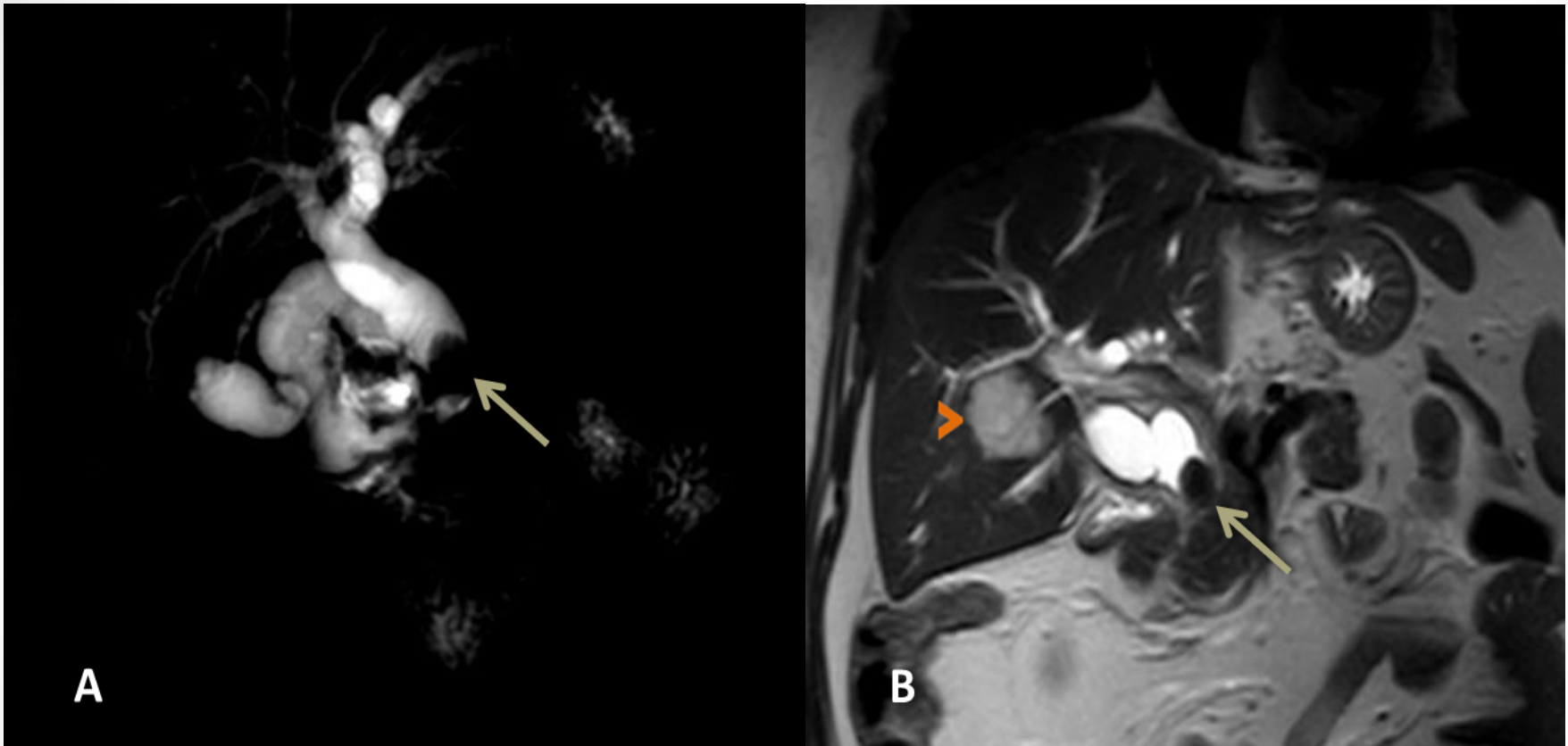


Figure 1: MRCP (A) and T2-weighted coronal (B) images demonstrating biliary dilatation in a patient presenting with ascending cholangitis secondary to choledocholithiasis (arrow). An incidental haemangioma is seen in the right liver lobe (arrowhead).



Figure 2: MRCP MIP image demonstrating biliary dilatation in a middle-aged gentleman presenting with acute cholangitis. This was found to be secondary to malignant stricture due to a lower common bile duct (CBD) cholangiocarcinoma (arrow).

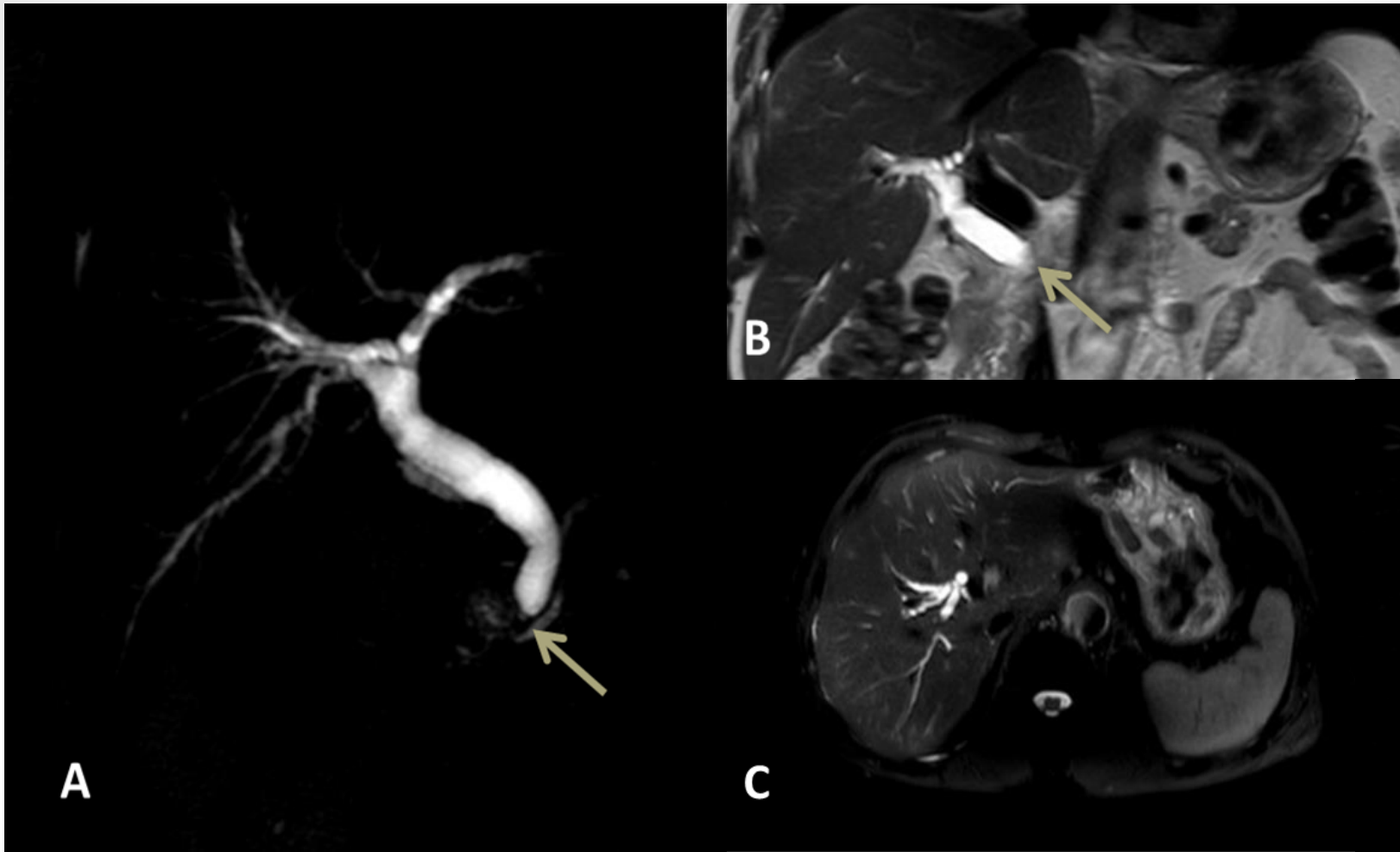


Figure 3: MRCP (A), T2 coronal (B) and axial (C) images demonstrating biliary dilatation in a female presenting with infectious cholangitis. A 1 cm long stricture is seen at the lowermost CBD, corresponding to a cholangiocarcinoma (arrow).

15% - Bile wall thickening and enhancement

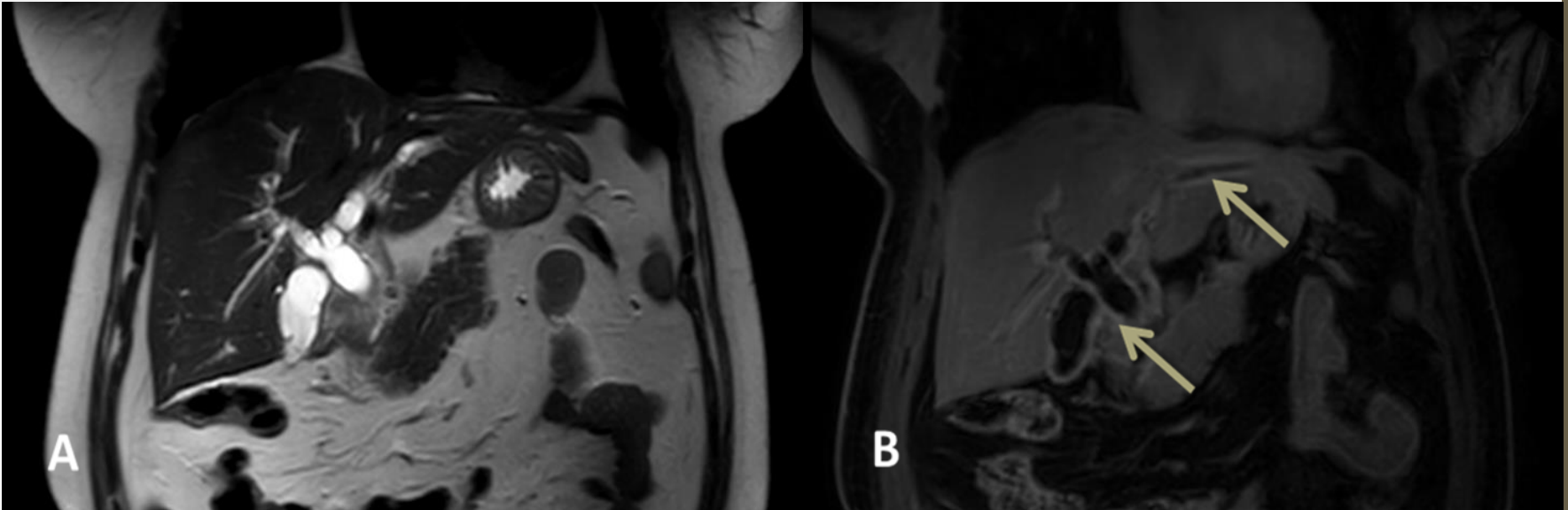


Figure 4: Middle-aged female presenting with recurrent episodes of jaundice, nausea and vomiting. Coronal T2-weighted (A) and coronal contrast-enhanced image in the equilibrium phase (B) showing gross intra- and extra-hepatic biliary dilatation (due to a large calculus in the distal CBD – not shown on these images) with mural enhancement of the same ducts (arrows).

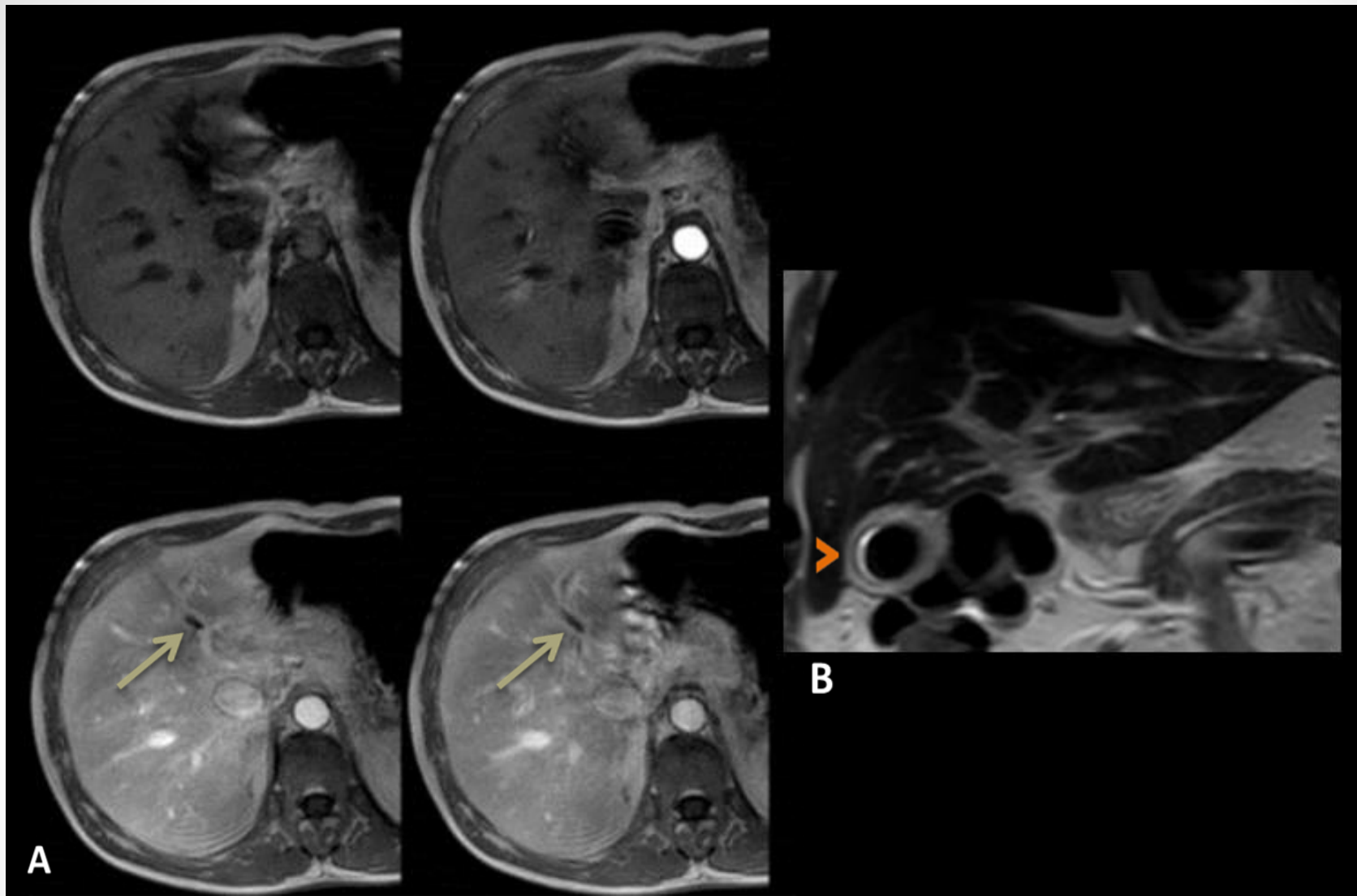


Figure 5: Dynamic contrast enhanced T1-weighted axial (A) and T2-weighted coronal (B) images, demonstrating bile wall thickening and enhancement in a patient presenting with ascending cholangitis. This was found to be secondary to cholelithiasis with cholecystitis (arrowhead).

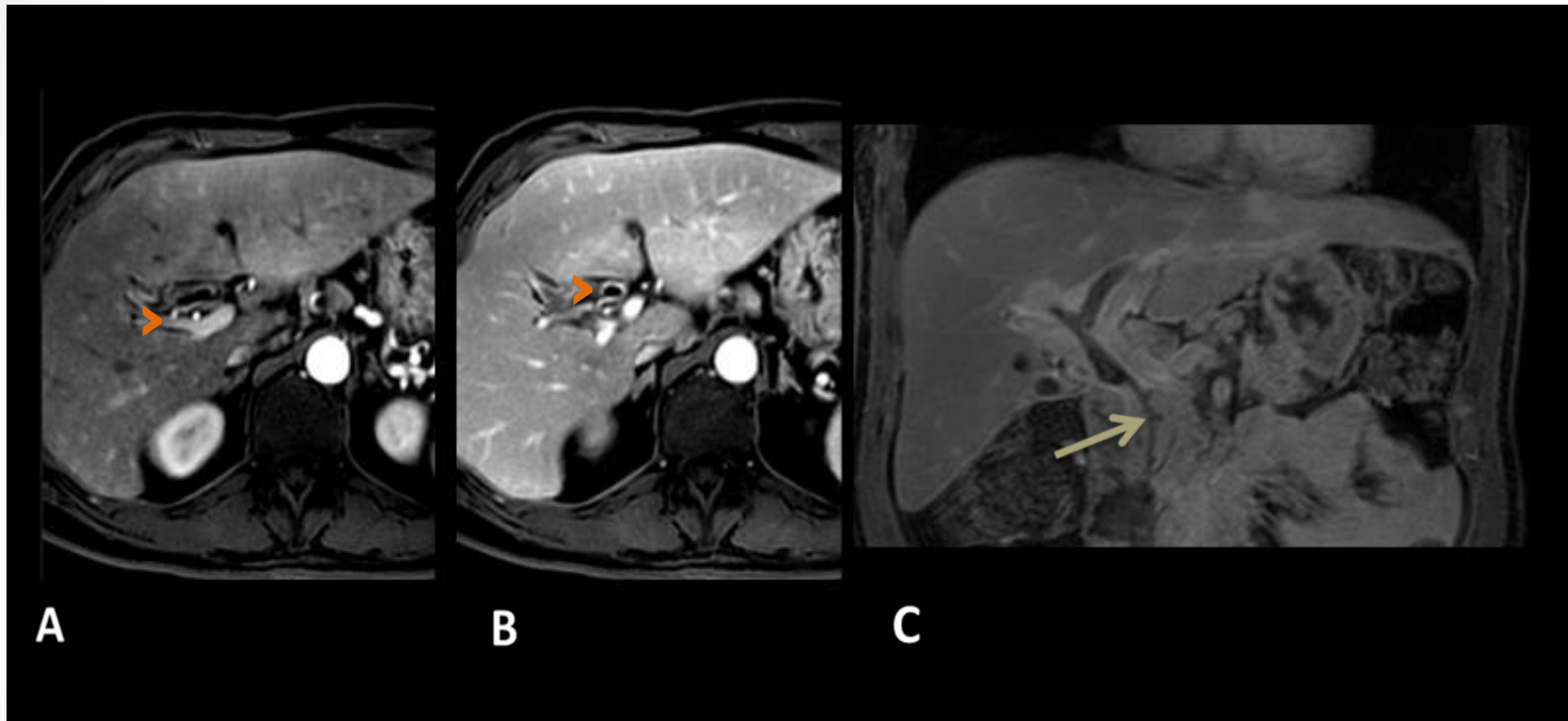


Figure 6: T1-weighted contrast enhanced arterial phase axial (A), portal venous phase axial (B) and delayed venous phase coronal (C) images, demonstrating bile wall thickening and mural enhancement (arrowheads) in a known case of CBD cholangiocarcinoma. Biliary stent in situ (arrow).

50% - Transient hepatic intensity differences (THIDs)

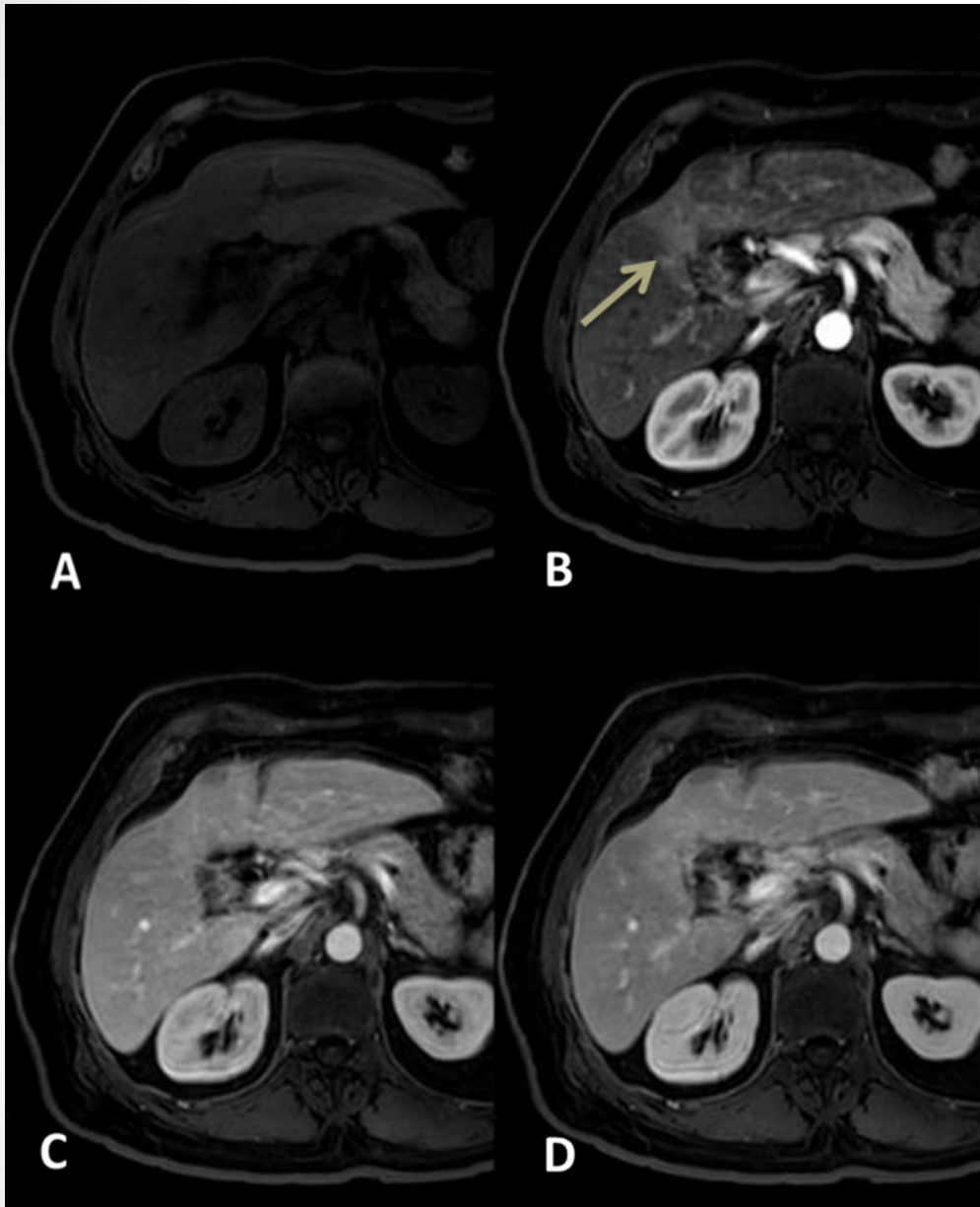


Figure 7: Dynamic contrast-enhanced fat-suppressed T1 axial, precontrast (A), arterial (B), portovenous (C) and delayed (D) images of a patient presenting with infectious cholangitis, showing a THID in the right liver lobe (arrows). THIDs are only visible on the arterial phase, and correspond to perfusion anomalies.

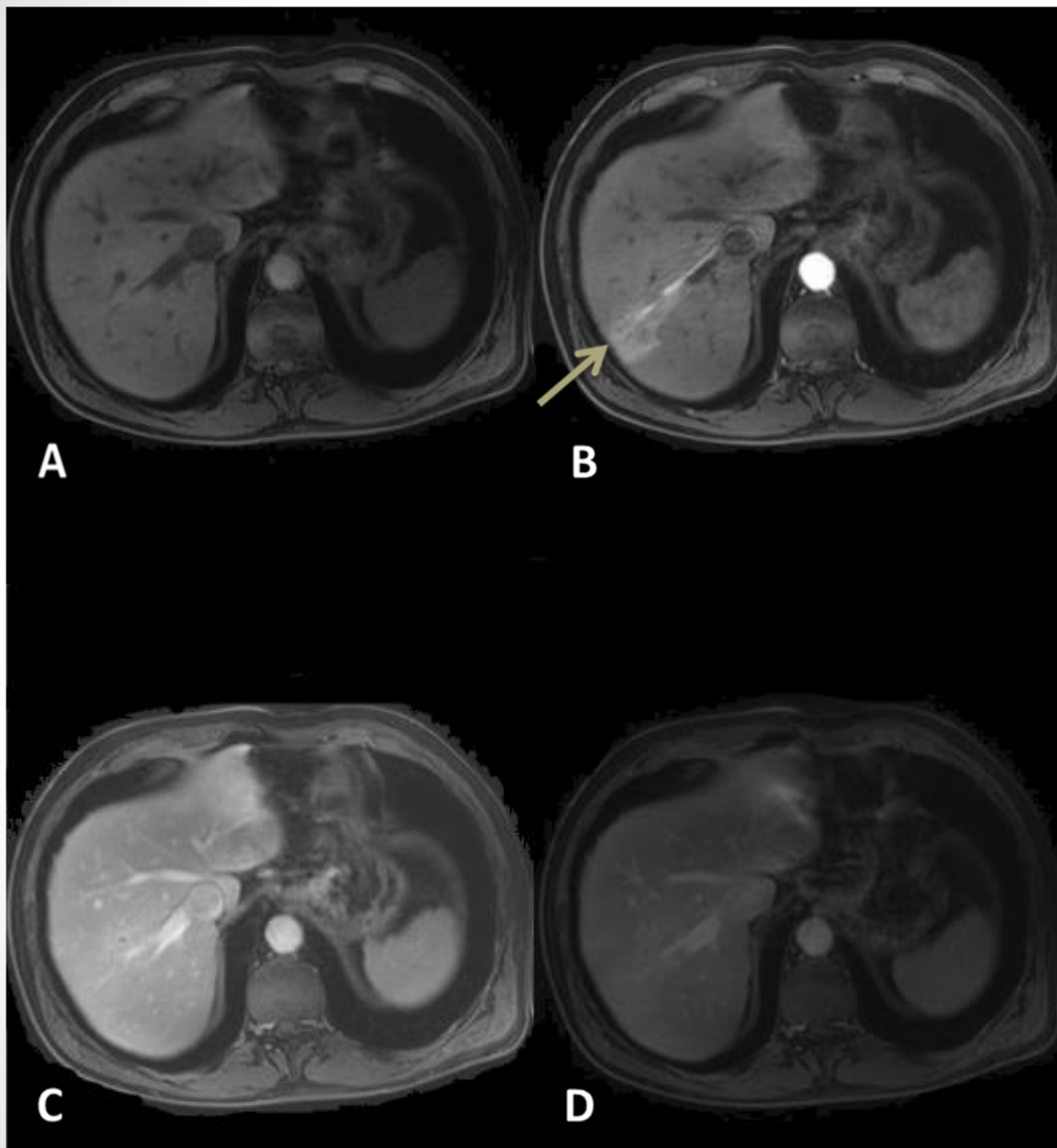


Figure 8: Dynamic contrast-enhanced fat-suppressed T1-weighted axial images (A-D) of a patient presenting with infectious cholangitis, with THID seen in the right liver lobe (arrows).

5% - Peribiliary hyperenhancement

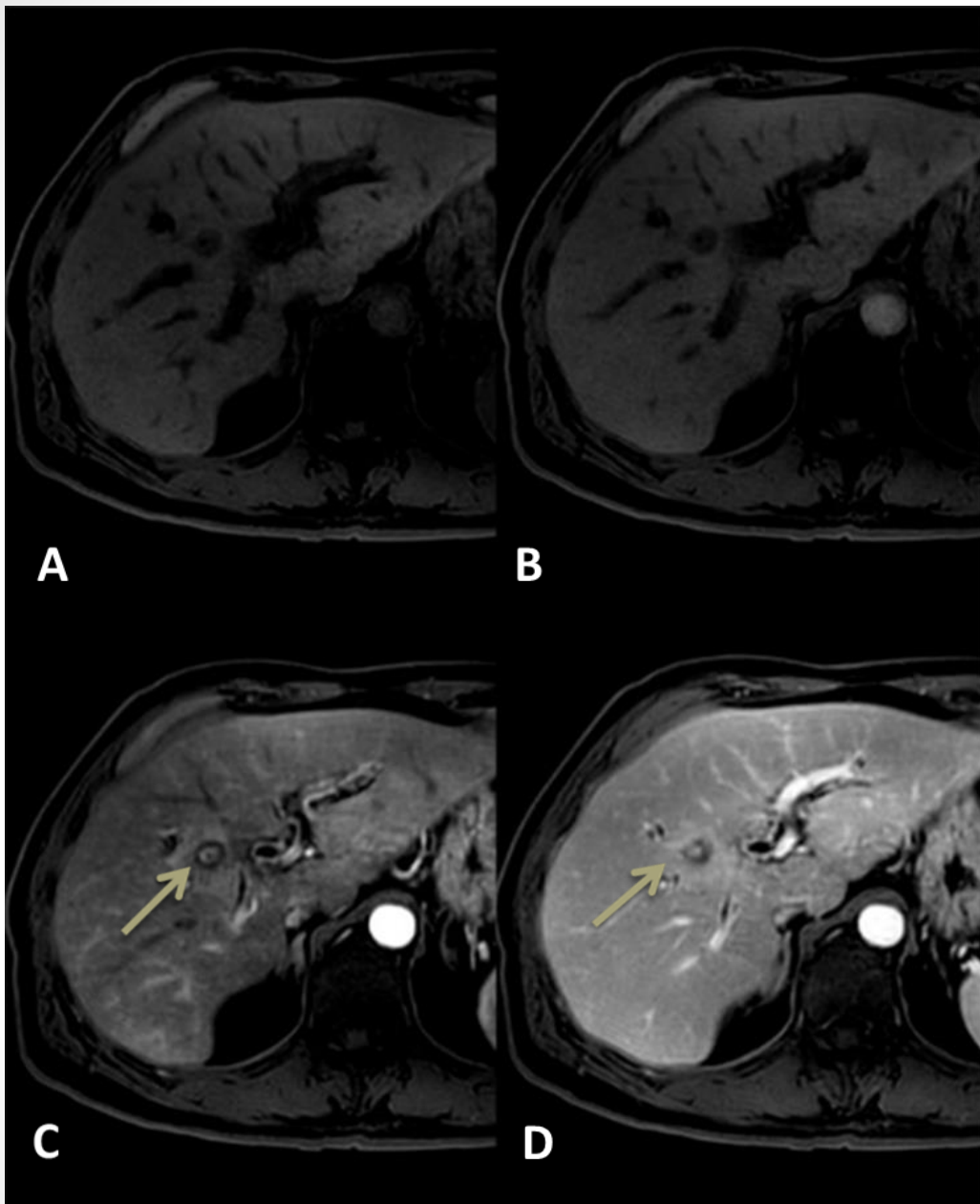


Figure 9: Dynamic contrast-enhanced fat-suppressed T1-weighted axial images (A-D) demonstrating hyperenhancing liver parenchyma surrounding a thickened bile duct in a patient with acute cholangitis.

35% - Peribiliary T2-hyperintensity

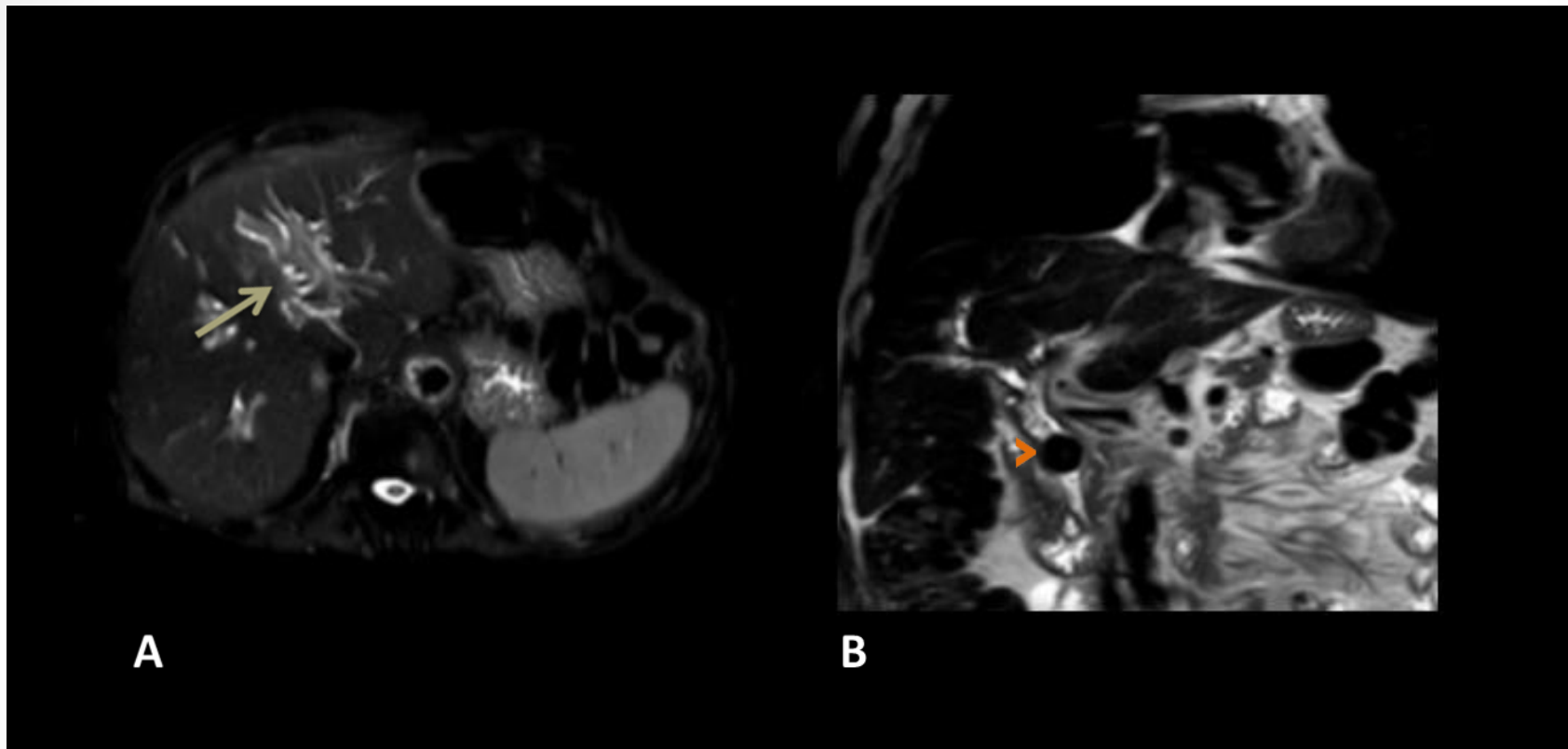


Figure 10: T2-weighted axial (A) and coronal (B) images of a patient with cholangitis secondary to choledocholithiasis (arrowhead), demonstrating peribiliary T2-hyperintensity (arrow).

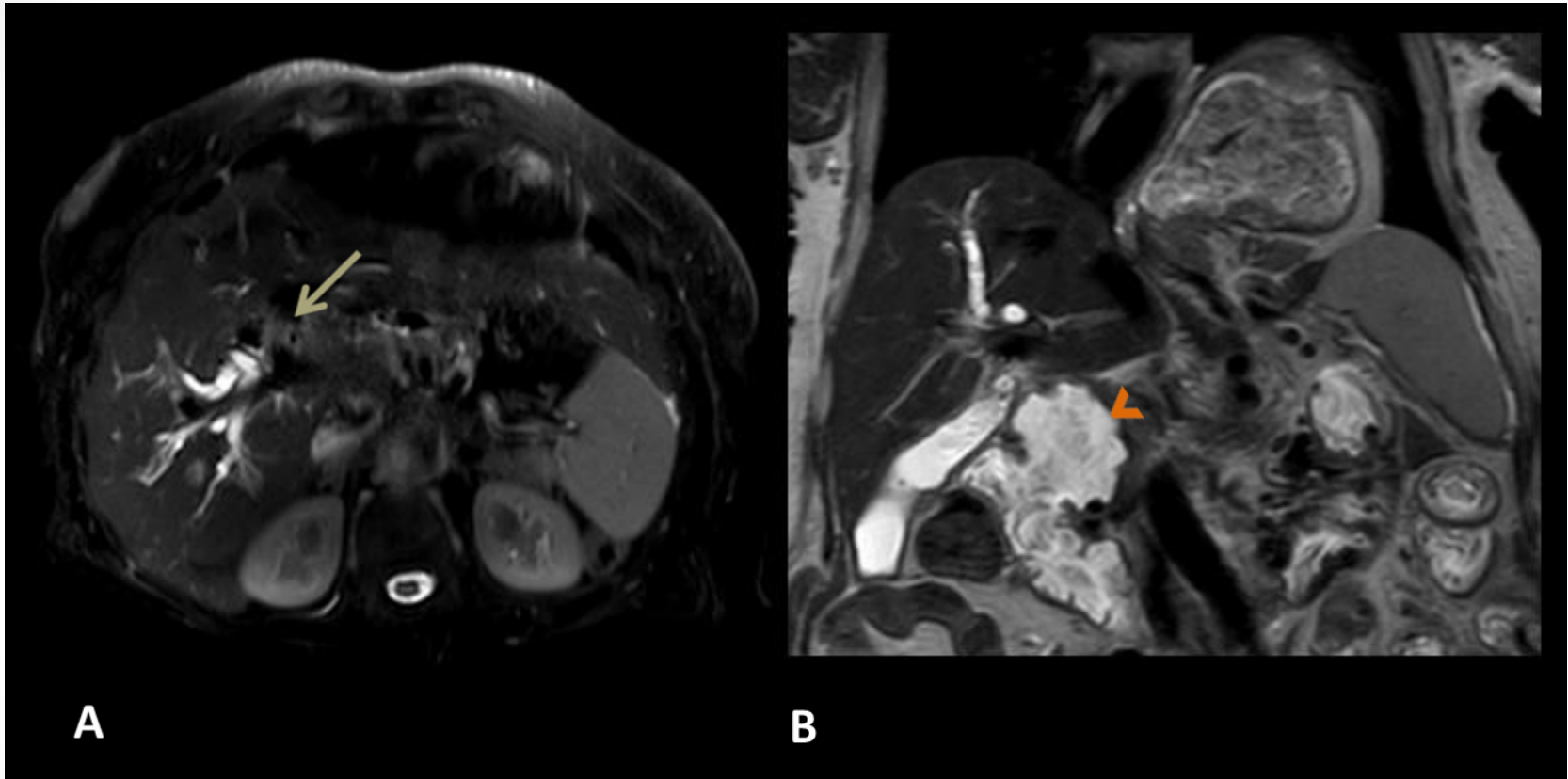


Figure 11: T2-weighted axial (A) and coronal (B) images in a patient with acute cholangitis. Peribiliary T2 hyperintensity is appreciated (arrow). A duodenal diverticulum (arrowhead) is noted as the likely cause of biliary obstruction.

10% - Portal vein thrombosis

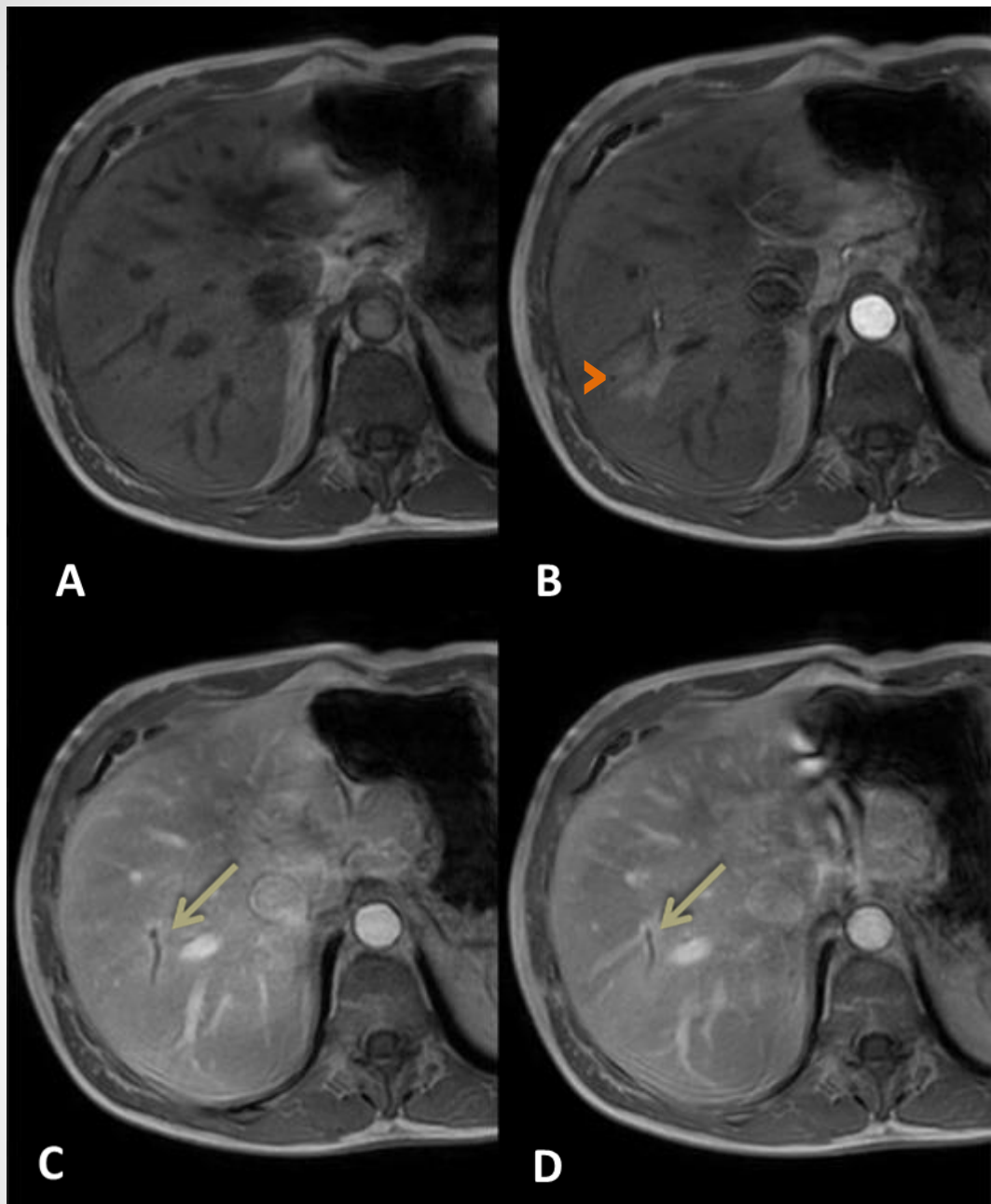


Figure 12: Dynamic contrast enhanced fat-suppressed T1-weighted axial images (A-D) demonstrating right portal vein thrombosis (arrow) in a patient with ascending cholangitis secondary to cholangiocarcinoma. A THID is seen around the thrombus on arterial phase imaging (B, arrowhead).

**40% - Diffusion weighted imaging
(DWI) anomalies**

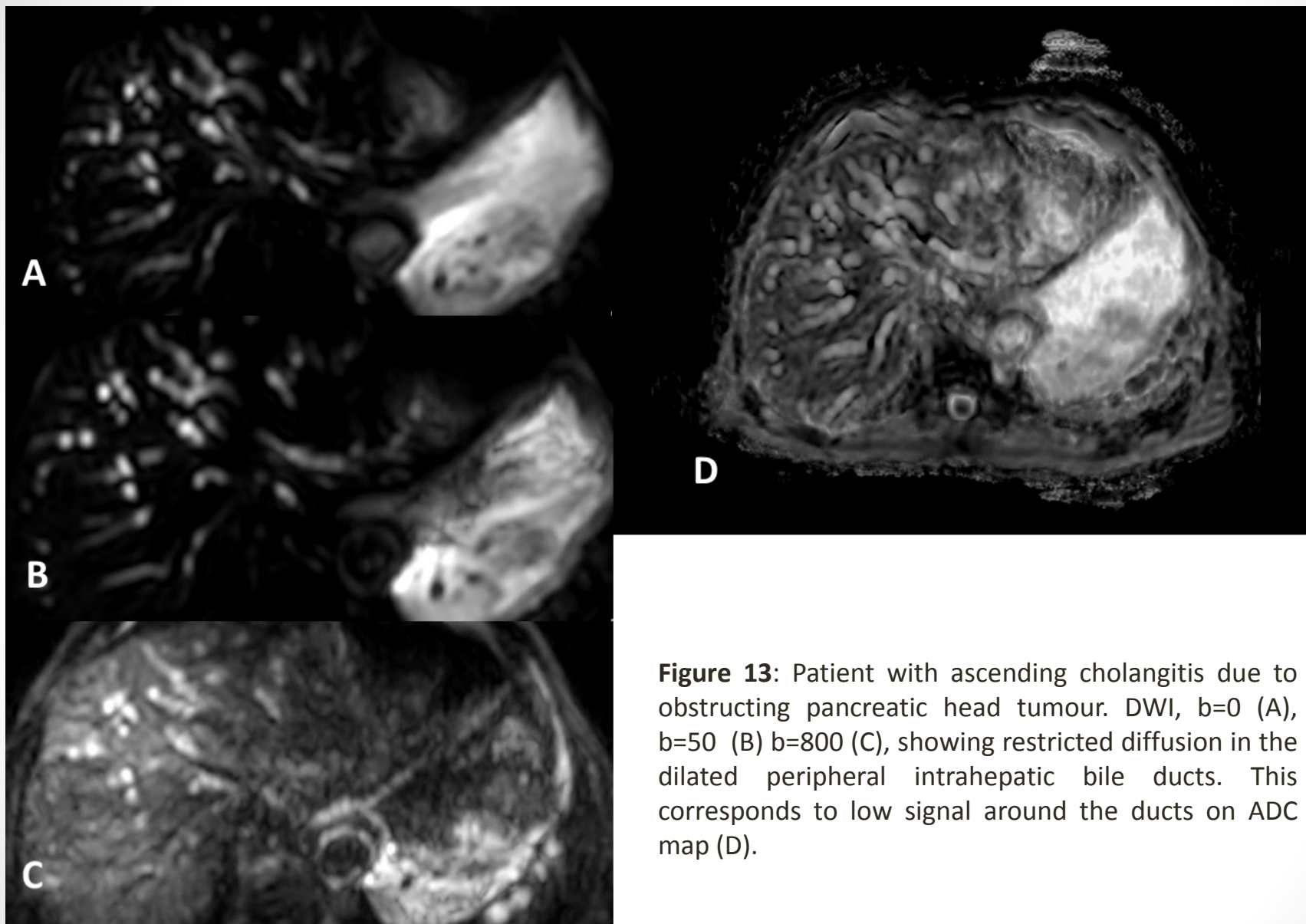


Figure 13: Patient with ascending cholangitis due to obstructing pancreatic head tumour. DWI, $b=0$ (A), $b=50$ (B) $b=800$ (C), showing restricted diffusion in the dilated peripheral intrahepatic bile ducts. This corresponds to low signal around the ducts on ADC map (D).

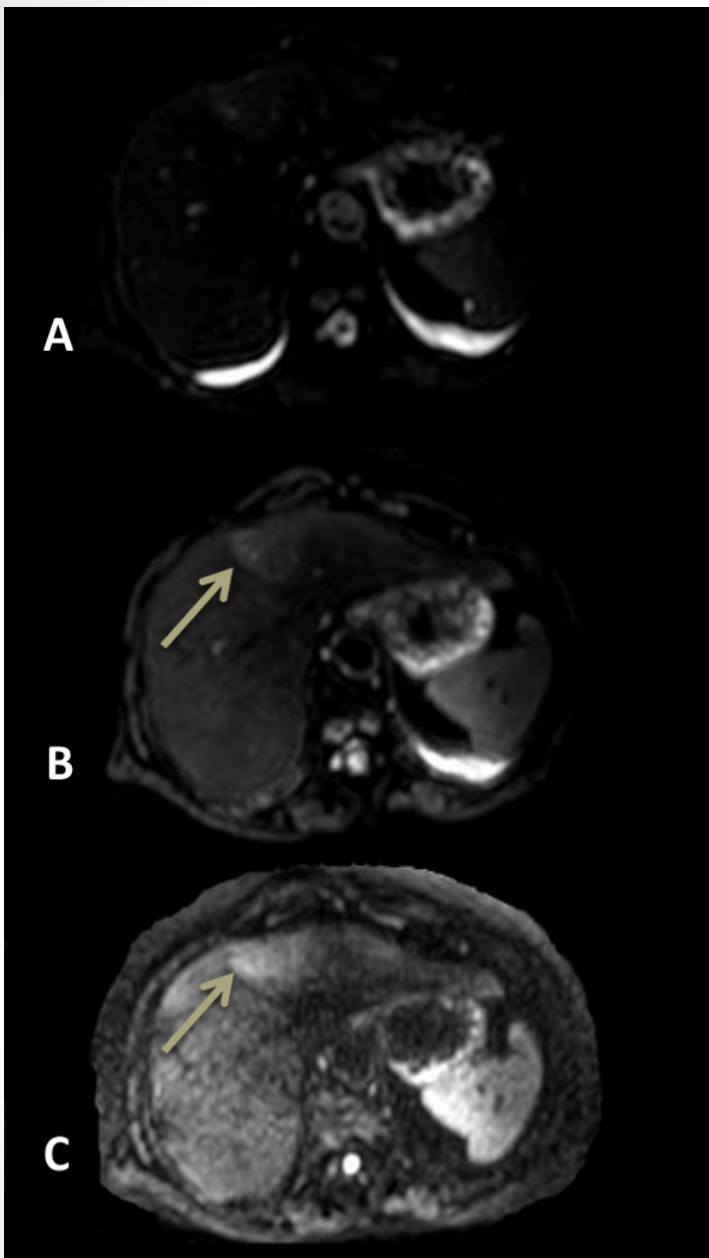


Figure 14: DWI, b=0 (A), b=50 (B) b=800 (C) demonstrates restricted diffusion of entire segment IV (arrows) in a patient who presented with acute cholangitis secondary to choledocholithiasis.



Figure 15: DWI, b=0 (A), b=50 (B) b=800 (C) in a patient with acute cholangitis demonstrating restricted diffusion (arrows). Coronal T2-weighted image (D) demonstrates small abscesses in the right liver lobe (arrowheads).

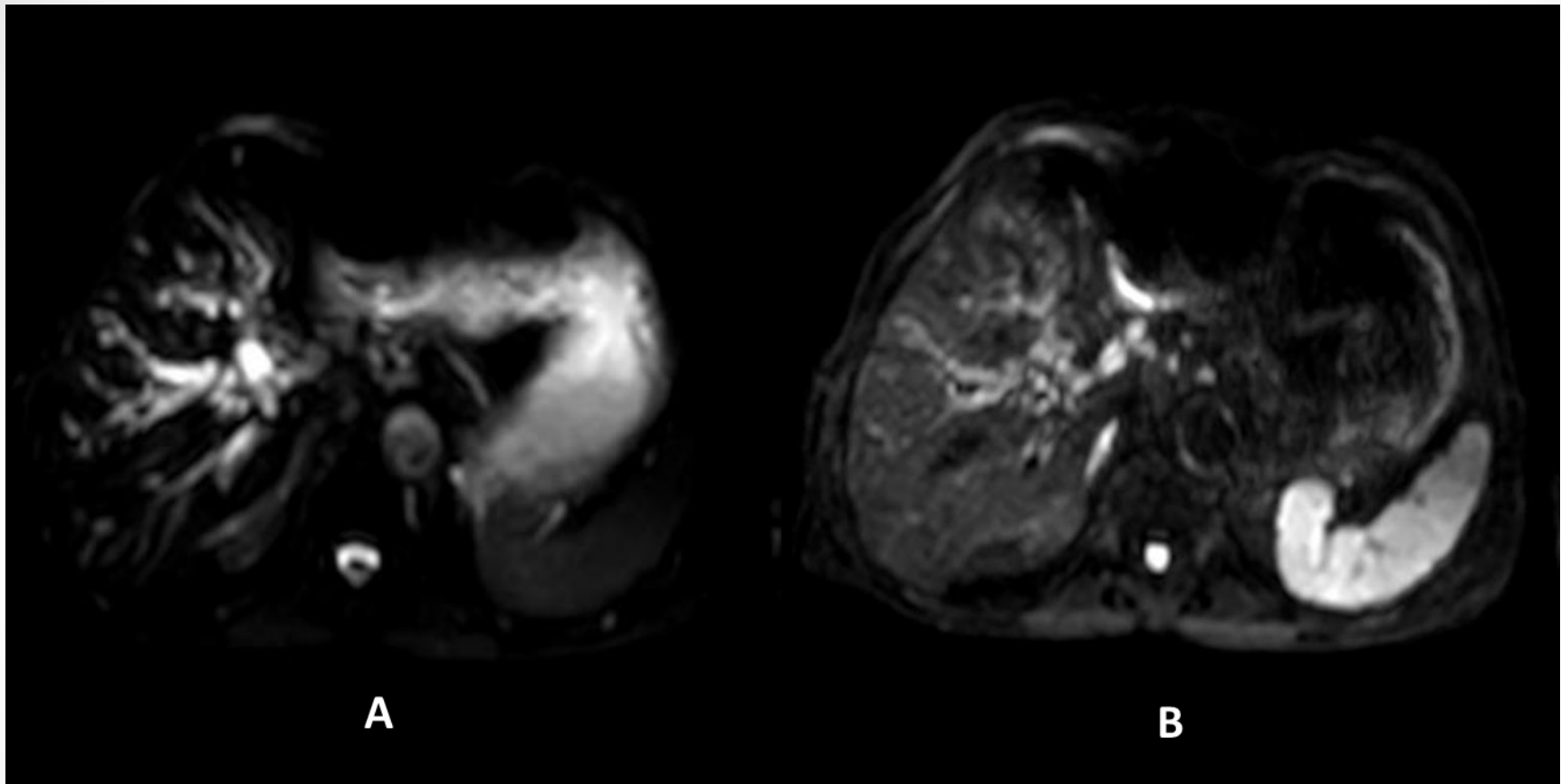


Figure 16: DWI b=50 (A) and b=800 (B) demonstrating peribiliary/biliary T2-shine through

15% - Focal cholangitis or abscess formation

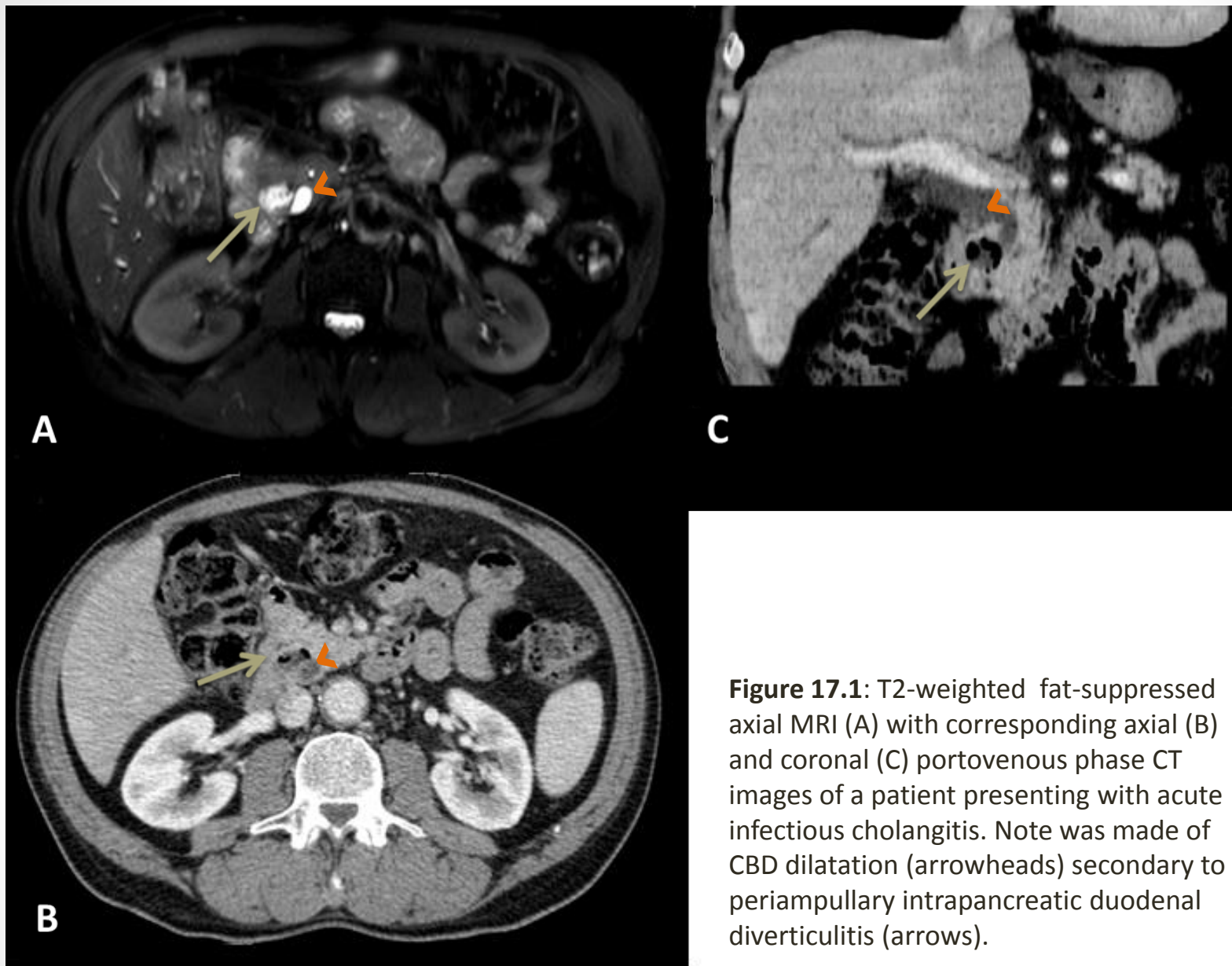


Figure 17.1: T2-weighted fat-suppressed axial MRI (A) with corresponding axial (B) and coronal (C) portovenous phase CT images of a patient presenting with acute infectious cholangitis. Note was made of CBD dilatation (arrowheads) secondary to a periampullary intrapancreatic duodenal diverticulitis (arrows).

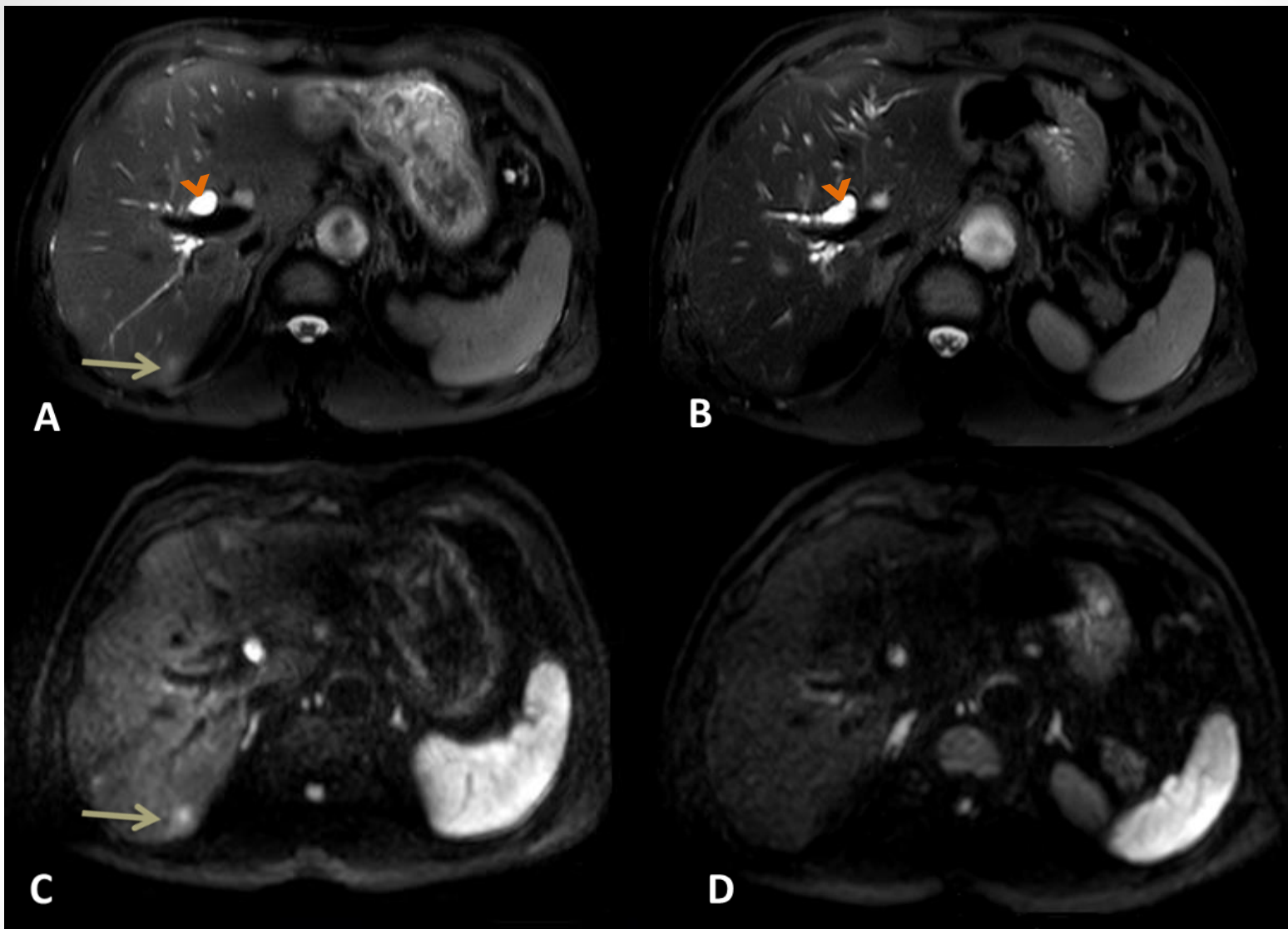


Figure 17.2: T2 weighted MRI (A&B) and corresponding DWI (C&D) of same patient in previous (b=800) demonstrating biliary dilatation (arrowheads) and poorly defined areas of moderate T2-hyperintensity corresponding to areas of T2 shine-through (arrows; more evident on image C). This corresponds to areas of focal cholangitis/early abscess formation.

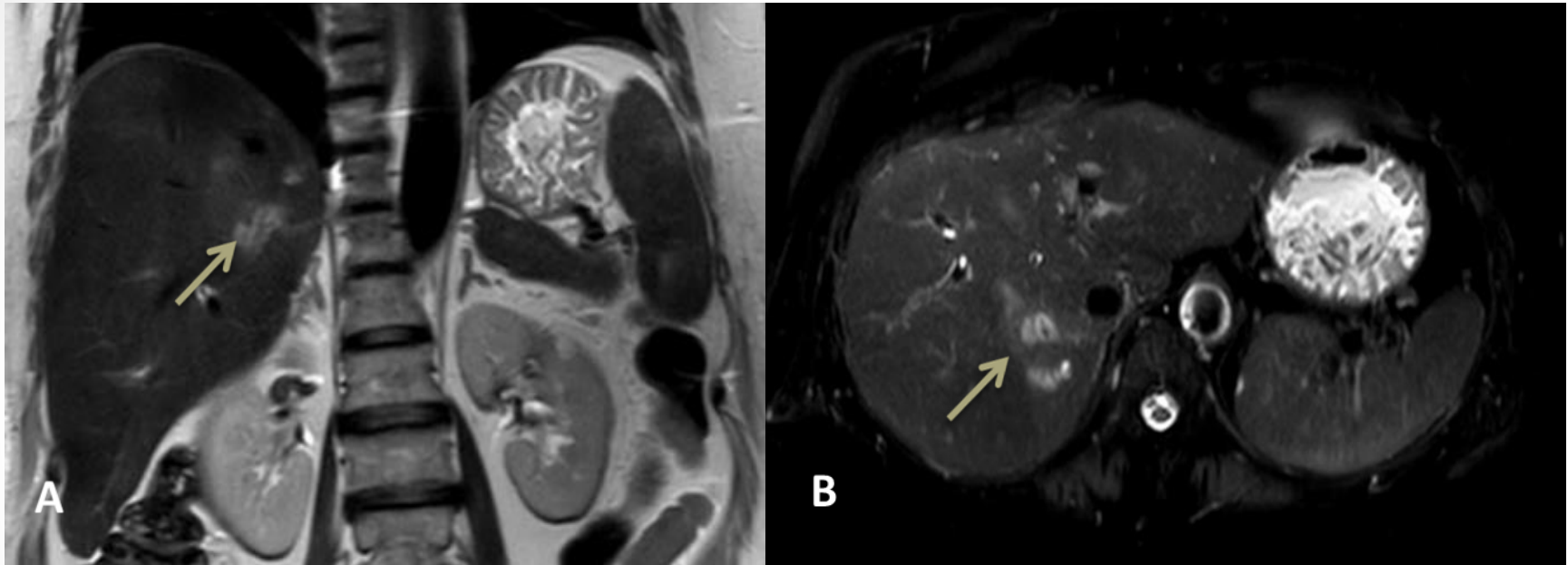


Figure 18: Coronal (A) and axial fat-suppressed (B) T2-weighted images demonstrating abscess formation in segment VII (arrows) in a middle aged female presenting with acute cholangitis.

Conclusion

- MRI and MRCP represent the current gold standard in non-invasive evaluation of biliary tree disease.
- A combination of certain MRI findings might suggest the presence of acute infectious cholangitis, with resultant clinical implications.
- Findings suggestive of acute cholangitis on MRI include:
 - Bile duct dilation
 - Bile duct wall thickening with enhancement
 - Transient hepatic intensity differences
 - Patchy or wedge-shaped areas of peribiliary T2-hyperintensity
 - Inhomogeneous peribiliary enhancement in arterial phase imaging
 - Early abscess formation or areas of focal cholangitis

Conclusion

- The role of DWI in such cases is not clearly established.
- In view of its ability to highlight different tissue compositions depending on diffusion of protons, DWI might provide additional information in the interpretation of various biliary disorders.
- In acute cholangitis, increased parenchymal signal intensity may be more evident on black-blood DWI ($b=50$) than on T2 weighted imaging.

Conclusion

- Additionally DWI may allow differentiation between isolated cholangitis and abscess formation.
- In acute cholangitis low b value hyperintense parenchyma returns to isointense or high b values (T2 shine through), whilst in the case of abscesses, hyperintensity persists on high b values with low ADC values (restricted diffusion).

Conclusion

- In the correct clinical context, a combination of distinctive MRI imaging findings can be used to confirm acute infectious cholangitis as being the source of patient sepsis.
- In cases of sepsis limited to one lobe or segment, MRI features can guide endoscopic or percutaneous interventional drainage by highlighting target segment to be drained.
- Altered peribiliary/biliary signal on DWI is a relatively common imaging finding in these patients, seen in 40% of our small patient cohort.

References

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