Educational Exhibit Intraductal Papillary Neoplasm of the Bile Duct- A Case Series

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Introduction

- Intraductal papillary neoplasm of the bile duct (IPNB) is an increasingly recognised pre-malignant biliary tumour, a precursor to cholangiocarcinoma.
- Characterised by intraluminal papillary or villous growth of biliary epithelium.
- Biliary counterpart to intraductal papillary mucinous neoplasm (IPMN) of the pancreas, demonstrating mucin hypersecretion in up to 40% of cases.
- Variability in location, morphology, histopathological subtype and growth pattern.
- IPNB demonstrates an adenoma-carcinoma relationship, progressing from low-high grade dysplasia to invasive adenocarcinoma. 40-80% are invasive at presentation.

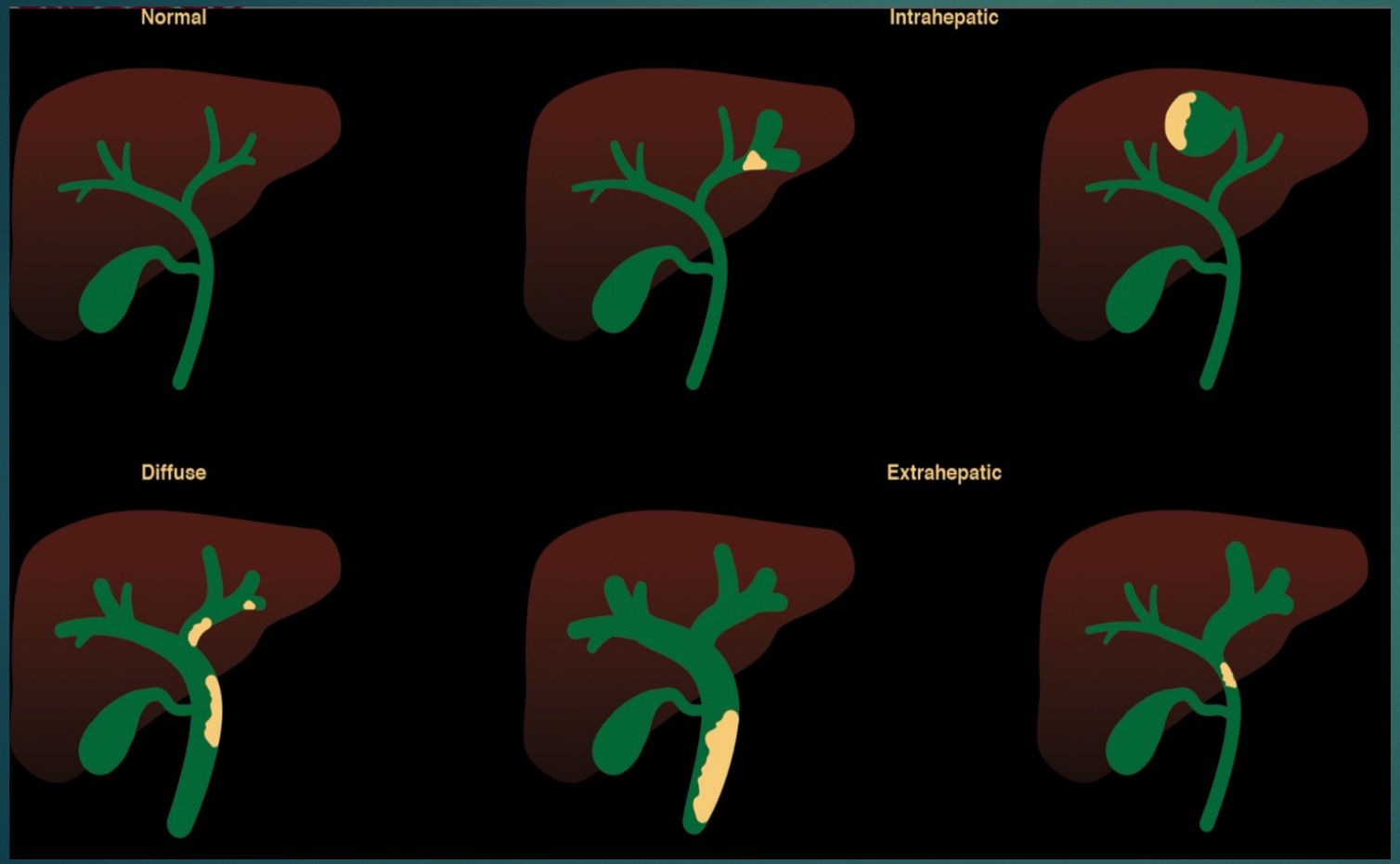
Aims

- Outline the demographics, clinical features and histopathology of IPNB.
- Illustration of the characteristic imaging features.
- Discuss differential diagnoses, management and prognosis.
- Presentation of a short case series of IPNB from our local institution.

Epidemiology and Clinical Features

- Most common in East Asia due to high incidence of hepatolithasis and clonorchiasis.
- Age range 50-70 years with a male predominance.
- Other risk factors include primary sclerosing cholangitis, parasitic infections, liver flukes, biliary tree malformations e.g. choledochal cysts, Gardner syndrome.
- Clinical features include recurrent abdominal pain, cholangitis or jaundice.
- Deranged LFTs +/- elevated CA19-9.

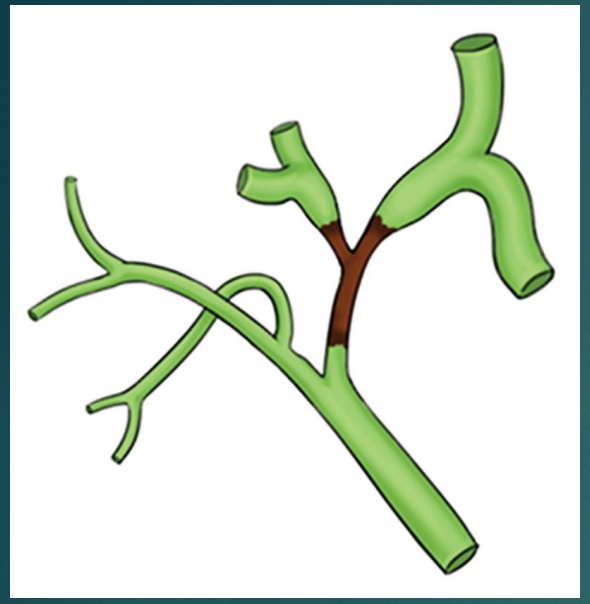
Jang and Kim's modified anatomic classification



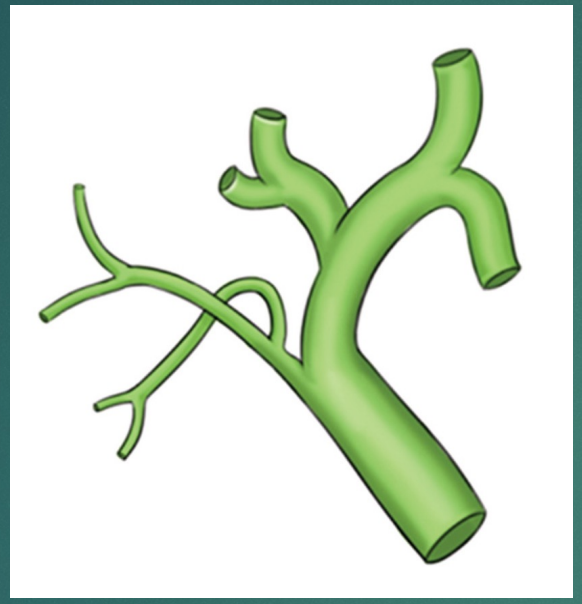
Kim JR et al. J Korean Med Sci. 2018 Sep 17;33(42

- IPNB can arise anywhere within the biliary tree.
- Intrahepatic most common in East Asia, usually within the left lobe.
- Extrahepatic most common in Western countries.
- Jang and Kim anatomic classification is based on primary tumour location and can aid surgical planning.

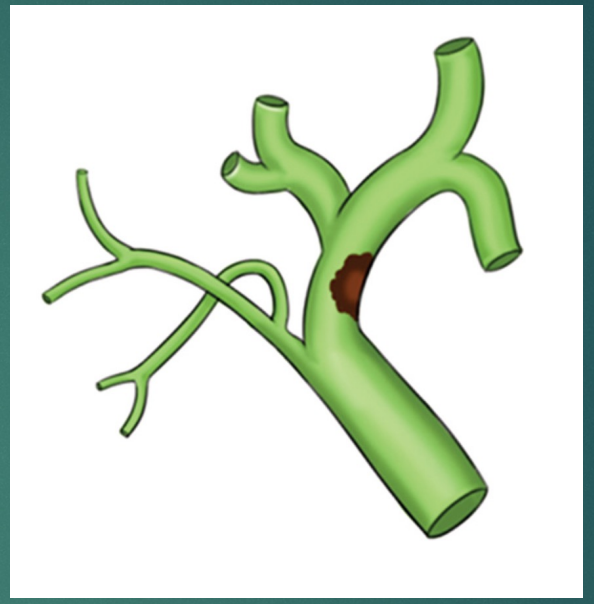
Radiological subtypes



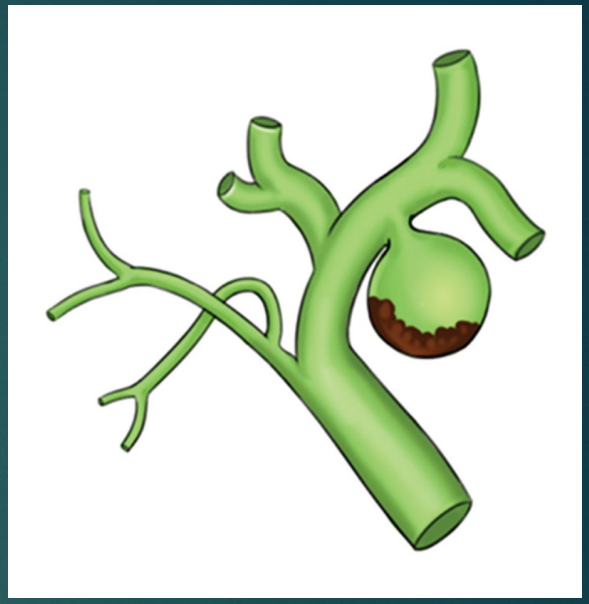
Mass with proximal ductal dilatation



Ductal dilatation without mass due to excess mucin secretion



Mass with proximal and distal ductal dilatation- **classic** appearance of IPNB

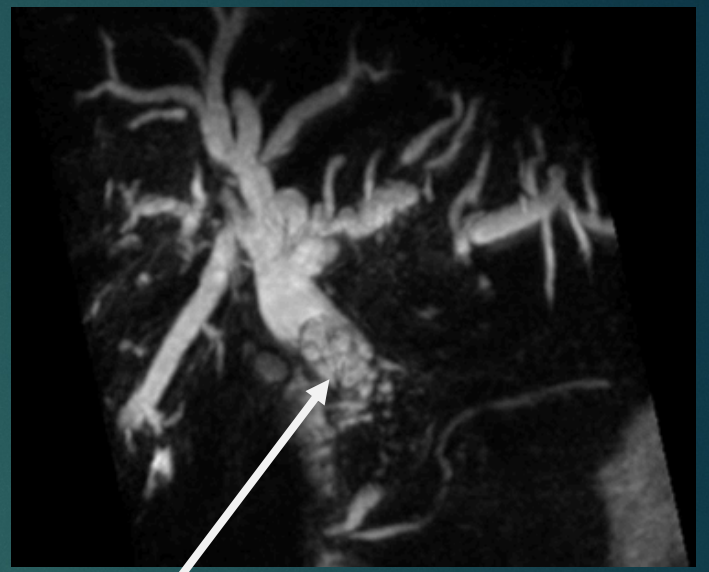


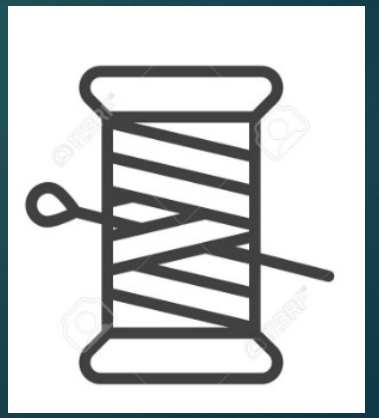
Cystic/aneurysmal dilatation due to mucin hypersecretion

Park HJ et al. AJR Am J Roentgenol. 2018 Jul;211(1):67-75

Imaging features

- Intra-ductal soft tissue mass
- Proximal +/- distal biliary ductal dilatation
- Cystic or aneurysmal ductal dilatation due to mucin hypersecretion
- Usually iso/hyperintense on late arterial phase with no enhancement on portal venous or delayed phase.
- Periductal oedema and inflammation
- Focal liver atrophy
- MRCP: T1 iso/hypointense and mildly T2 hyperintense relative to liver. Hypointense relative to bile on T2.
- Intraluminal curvilinear hypointense striae of mucin on T2 → **"Thread sign" (highly specific 99-100%)**
- DWI can increase lesion conspicuity. Restricted diffusion and low ADC signal can signify invasion.





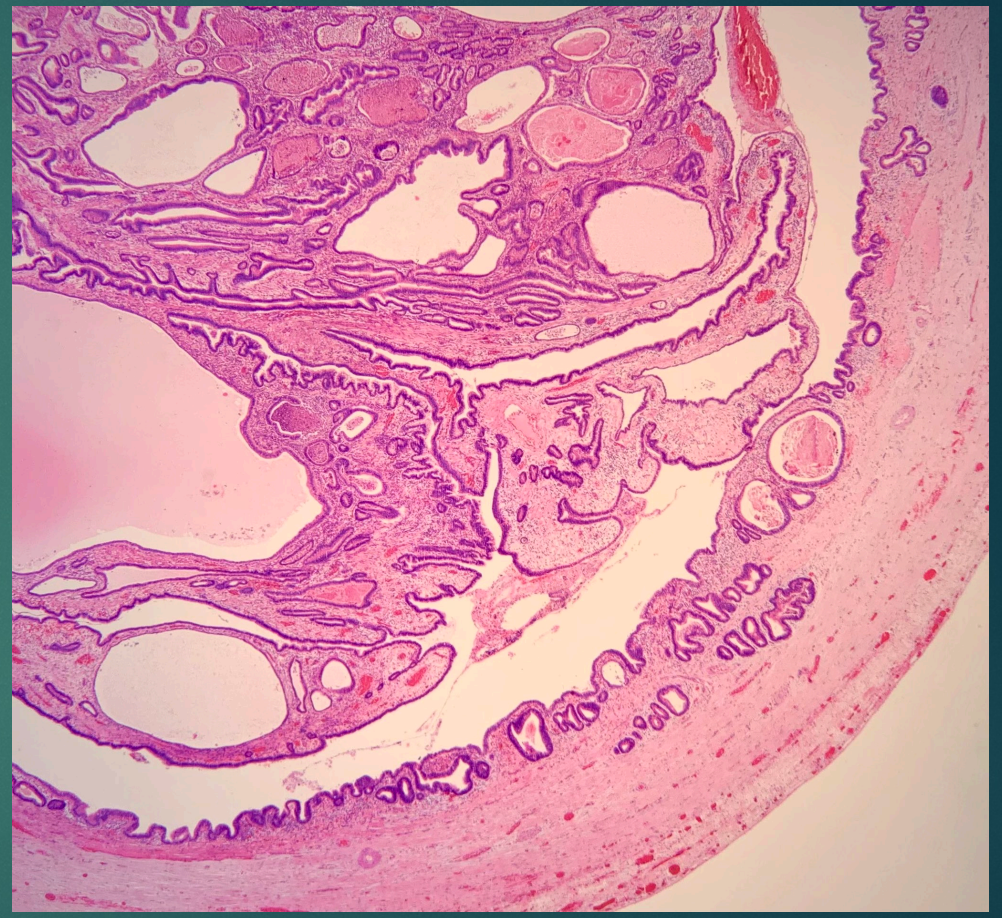
Histopathology

- Macroscopically → solitary or multiple friable papillary lesions within a dilated bile duct.

- Microscopically → Papillary proliferation of atypical biliary epithelial cells with central fibrovascular cores and mucinous cells.

- 4 histological subtypes;

1. Pancreaticobiliary (most common in Western countries)
2. Intestinal
3. Gastric
4. Oncocytic.



Pathology specimen demonstrating intraluminal polypoid lesion with features of IPNB within the common bile duct (CBD).

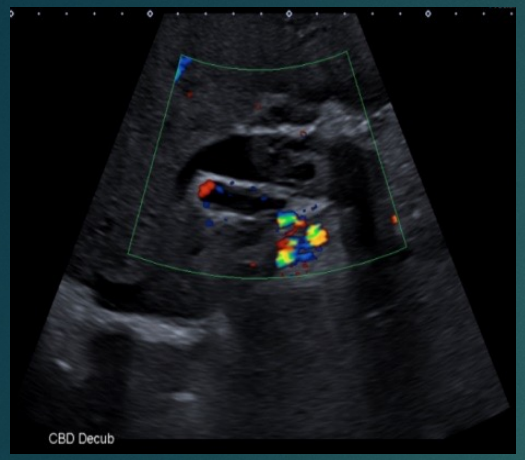
Differential Diagnoses

IPNB radiological subtype	Differential diagnosis	Key differentiating features
1) Mass with proximal ductal dilatation	Hepatolithiasis	Non enhancing, dense on unenhanced CT
	Hepatocellular carcinoma (HCC) with biliary invasion	Parenchymal mass with arterial enhancement, rapid washout
	Intraductal metastases	Parenchymal mass, history of malignancy
2) Ductal dilatation without mass	Choledochal cyst	Cystic/fusiform dilatation of biliary tree, associated anomalous pancreaticobiliary ductal junction
	Recurrent pyogenic cholangitis	Multiple strictures, intraductal pigmented calculi
3) Mass with proximal and distal ductal dilatation	Appearance unique to IPNB	
4) Cystic lesion	Mucinous cystic neoplasm	Common in females, small mural nodule, no ductal dilatation
	Simple hepatic cyst	No ductal dilatation

Management and Prognosis

- Management is surgical resection with tumour-free resection margins.
- Bile duct resection +/- hepatectomy. If extensive or positive resection margin, liver transplant + pancreaticoduodenectomy.
- 5 year survival rate ranges 47-84%.
- Recurrence rate 20-60% depending on level of invasion.
- Prognostic factors include resection margin status and tumour multiplicity
- MRCP surveillance recommended.

Case 1



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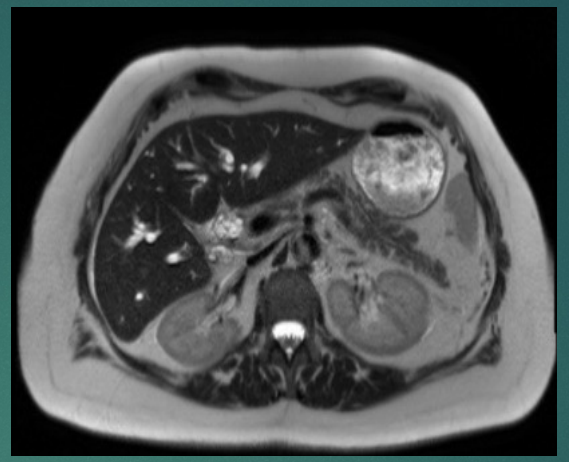
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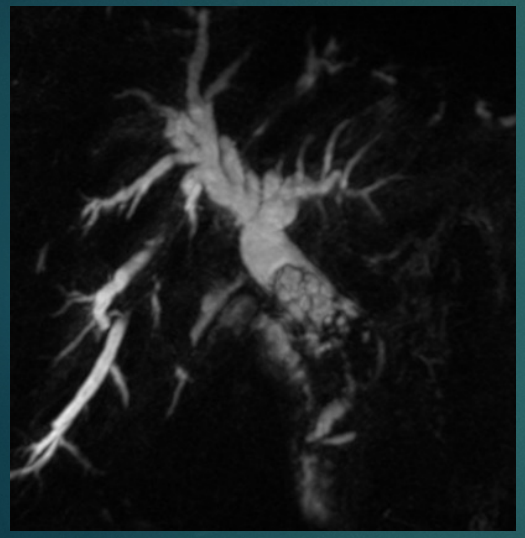
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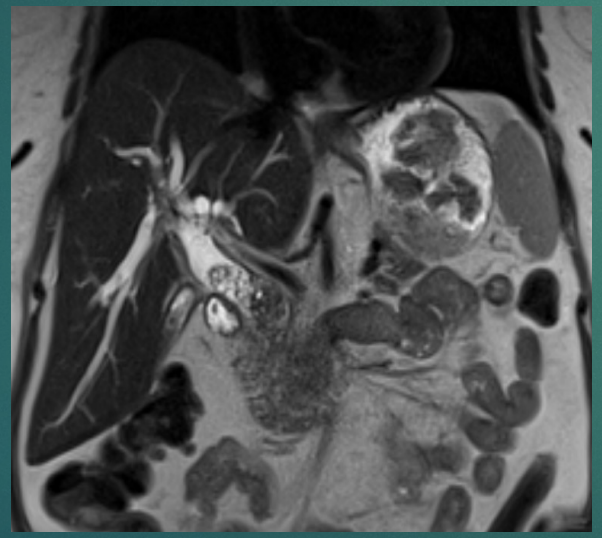
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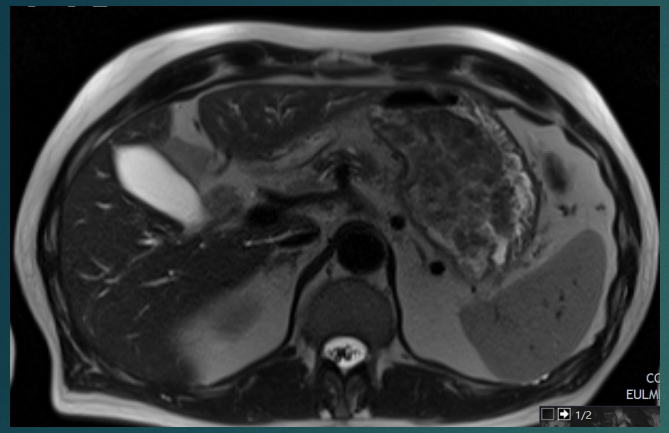
(a) Colour doppler ultrasound (b) Axial T1FS (c) Axial T2 HASTE
(d) MIP 3D MRCP (e) Coronal T2 HASTE (f) Axial T1 VIBE post contrast

- 69 year old female
- 2 month history of **painless jaundice**
- Ultrasound→ intraluminal soft tissue mass within CBD with doppler flow, intra and extra hepatic ductal dilatation.
- MRCP→ Ductal dilatation, part cystic part solid CBD mass lesion with extension into cystic duct. **Septal enhancement** of solid component.
- ERCP→ polypoid lesion within CBD. Histology- **IPNB, no malignancy.**
- Surgical→ Underwent **Whipple's procedure.**
- Histology→ Branching fibrovascular cores lined by biliary, intestinal and glandular epithelium. **Low and high grade dysplasia.**

Case 2



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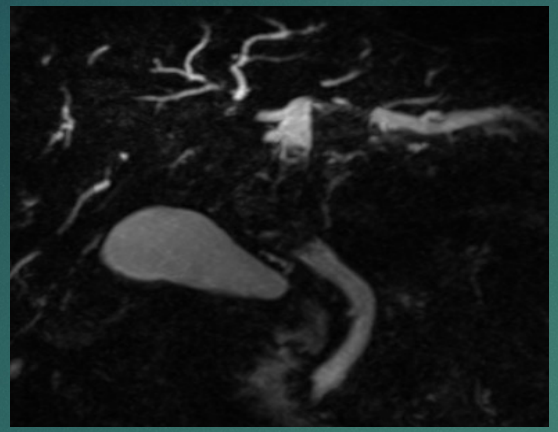

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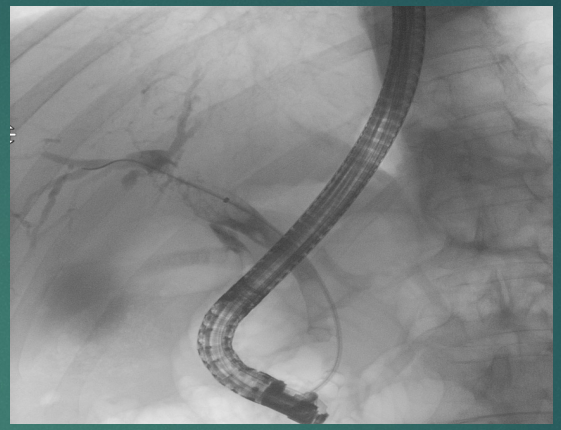

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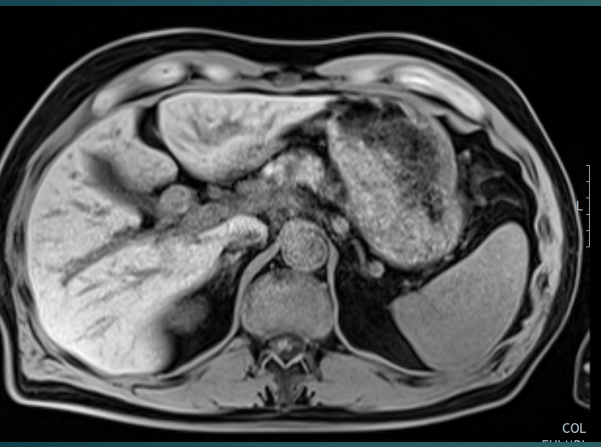

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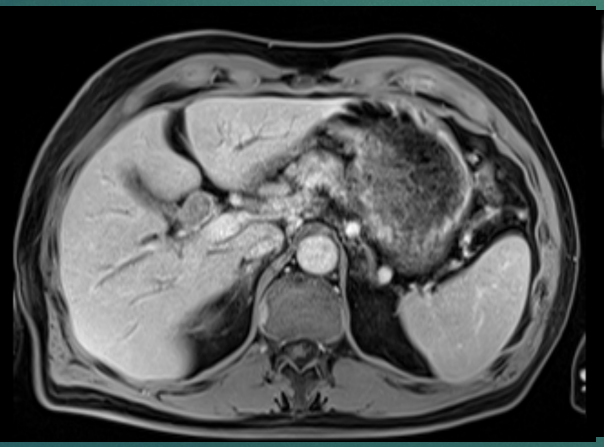

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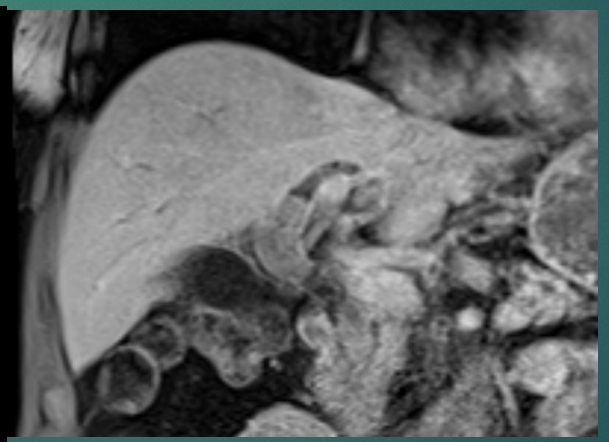

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(a) Axial T2 HASTE (b) MRCP 3D MIP (c) ERCP filling defect within CHD
(d) Pre contrast Axial T1FS VIBE (e) 5 min post contrast Axial T1FS VIBE (f) 20 min post contrast Axial T1FS

- 78 year old male
- **Jaundice, epigastric pain and weight loss**
- MRCP→ Bilateral intrahepatic ductal dilatation. Filling defect at bifurcation of CHD extending into right and left hepatic ducts. Low T1, low-intermediate T2, mild contrast enhancement, no diffusion restriction.
- ERCP → Cytological atypia.
- Surgical→ Left hepatectomy, bile duct resection and hepatico-jejunostomy.
- Histology→ **focal adenocarcinoma arising from IPNB.**

Case 2

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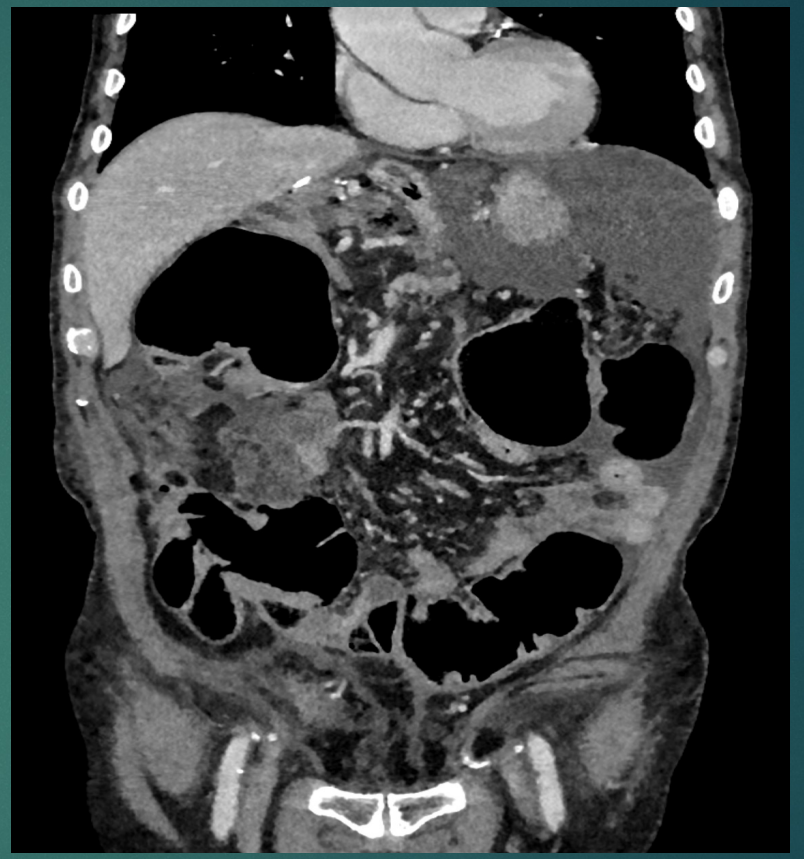

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Despite early surgical resection, the patient developed a recurrence of adenocarcinoma with extensive peritoneal metastatic disease and ascites.

a) Axial PV CTAP
b) Coronal PV CTAP

Case 3

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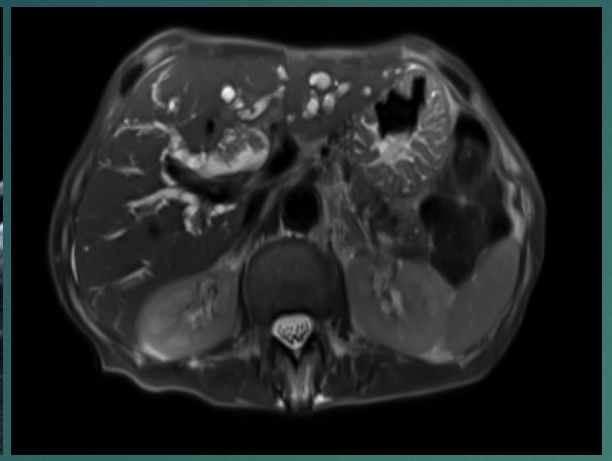

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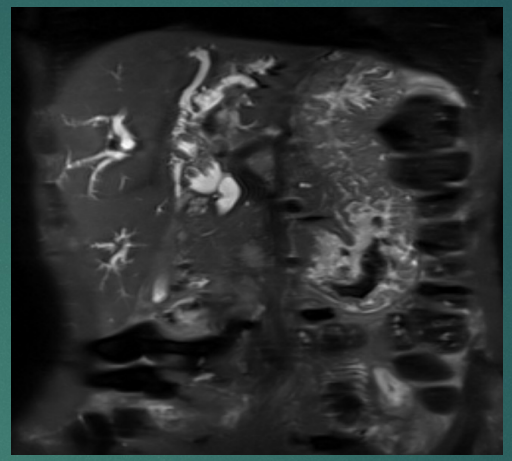

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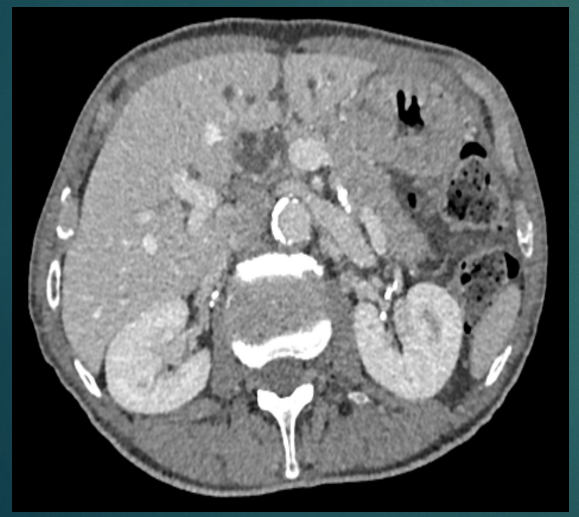

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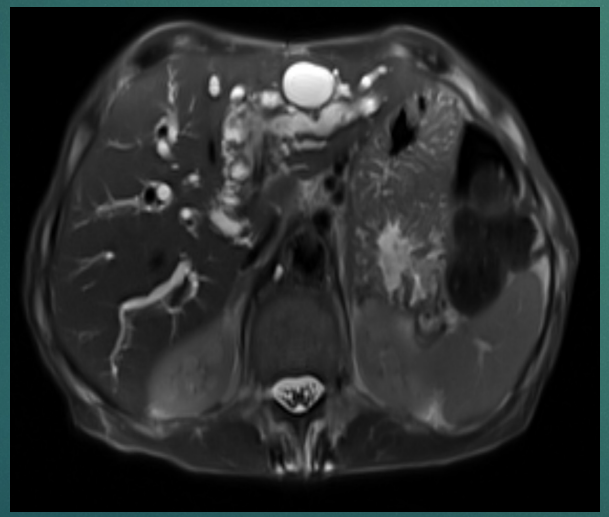

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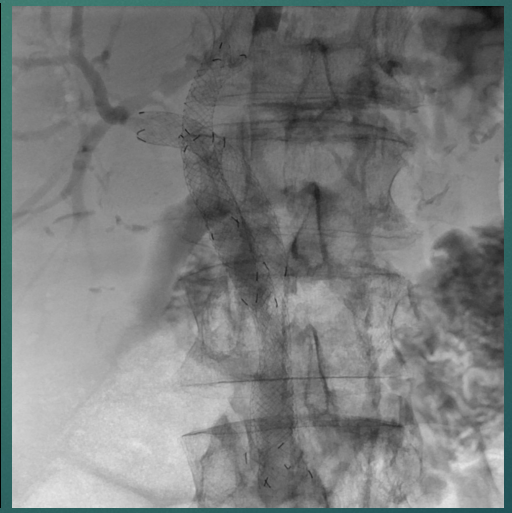

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(a) Ultrasound left liver (b) Axial T2 HASTE (c) Coronal T2 HASTE
(d) PV CTAP (e) Axial T2 HASTE (f) Percutaneous transhepatic cholangiogram and biliary stent

- 79 year old male
- **Obstructive jaundice**
- Ultrasound→ left lobar intrahepatic ductal dilatation.
- Portal venous CTAP→ CHD soft tissue mass, ductal dilatation.
- MRI Liver → stricture of left and CHD. Periductal diffusion restriction with arterial enhancement. Left intra-hepatic cystic ductal dilatation.
- ERCP→ villiform tissue. No definite malignant features.
- PTC→ bilateral internal external biliary drains inserted.
- Histology superficial villiform glandular epithelium. **Low and high grade dysplasia.**

Case 4

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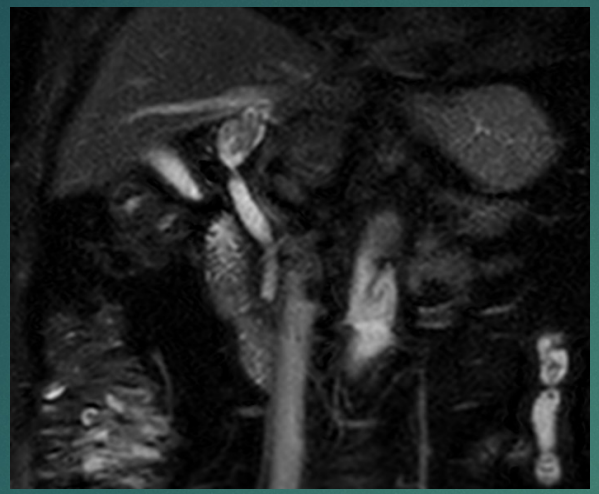

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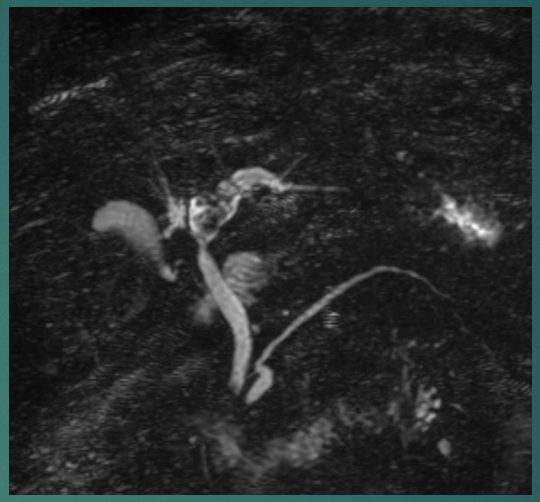

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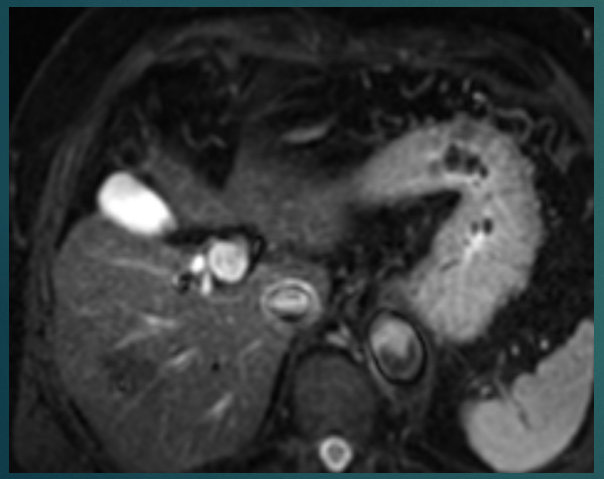

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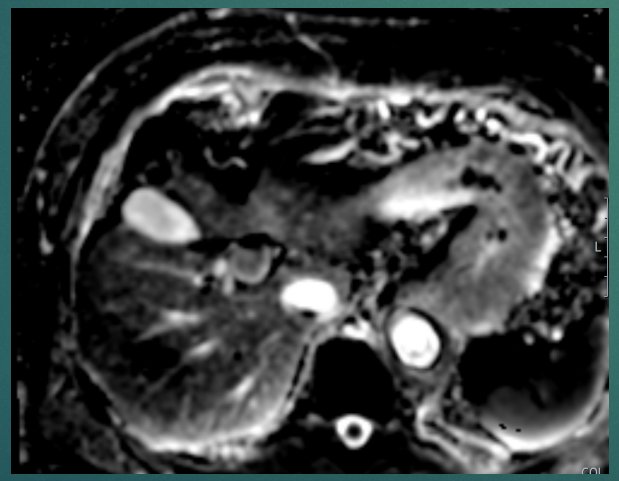

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(a) Axial T2 HASTE (b) Coronal T2 HASTE (c) MRCP 3D MIP
(d) DWI (e) ADC map (f) PV CTAP demonstrating left hepatectomy

75 year old
Deranged LTFS and epigastric pain

- Ultrasound → Normal.
- MRCP→ Dilated left intrahepatic duct with intraluminal low signal material.
- MRI liver→ left and common hepatic ductal filling defect. Diffusion restriction with some delayed enhancement.
- ERCP not successful.
- Surgery→ cholecystectomy, left hepatectomy and bile duct excision.
- Histology→ IPNB with l**ow and high grade dysplasia.**

Key Learning points

- IPNB is a pre-malignant biliary tumour, a precursor to cholangiocarcinoma.
- Biliary counterpart to IPMN of the pancreas.
- Most common in East Asia, predominately in 50-70 year old males.
- Clinical presentation includes abdominal pain, jaundice and cholangitis
- Classical imaging appearance is a cauliflower-like papillary intraductal mass with associated proximal and distal ductal dilatation due to mucin hypersecretion.
- MRCP is the imaging modality of choice. Linear hypointense mucinous striae on T2 (thread sign) is highly specific for IPNB.
- Early surgical resection with negative resection margins is the cornerstone of management.
- Prognosis is variable with recurrence in 20-60% despite surgical intervention as demonstrated in case 2.

References

- Park HJ, Kim SY, Kim HJ, Lee SS, Hong GS, Byun JH, Hong SM, Lee MG. Intraductal Papillary Neoplasm of the Bile Duct: Clinical, Imaging, and Pathologic Features. AJR Am J Roentgenol. 2018 Jul;211(1):67-75. doi: 10.2214/AJR.17.19261. Epub 2018 Apr 9. PMID: 29629808.

- Kim JR, Lee KB, Kwon W, Kim E, Kim SW, Jang JY. Comparison of the Clinicopathologic Characteristics of Intraductal Papillary Neoplasm of the Bile Duct according to Morphological and Anatomical Classifications. J Korean Med Sci. 2018 Sep 17;33(42):e266. doi: 10.3346/jkms.2018.33.e266. PMID: 30310366; PMCID: PMC6179985.

- Lee MH, Katabathina VS, Lubner MG, Shah HU, Prasad SR, Matkowskyj KA, Pickhardt PJ. Mucin-producing Cystic Hepatobiliary Neoplasms: Updated Nomenclature and Clinical, Pathologic, and Imaging Features. Radiographics. 2021 Oct;41(6):1592-1610. doi: 10.1148/rg.2021210011. PMID: 34597230; PMCID: PMC8493652.

- Wei PK, Gupta M, Tsai LL, Lee KS, Jaramillo AM, Smith MP, LeGout JD, Shenoy-Bhangle AS. Spectrum of MRI Features of Mucin-producing Neoplasms in the Abdomen and Pelvis. Radiographics. 2022 Mar-Apr;42(2):469-486. doi: 10.1148/rg.210055. Epub 2022 Jan 21. PMID: 35061517.

Thank you