Berkeley Public Health

THE FORUM For Collaborative Research℠

PSC Forum 9

Thursday, November 6, 2025

National Union Building
918 I Street NW, Washington, DC 20004

Novel Technologies in PSC Testing

Developments in Contrast-Enhanced MRI: Clinical Perspectives

Michael Trauner

Team of Ahmed Ba-Ssalamah & Sarah Poetter-Lang
GI/Liver Radiology, Dept. of Biomedical Imaging & Image Guided Therapy

MEDICAL UNIVERSITY OF VIENNA

Faculty Disclosure

I herewith declare the following paid or unpaid consultancies, business interests or sources of honoraria payments, and anything else which could potentially be viewed as a conflict of interest:

Advisor

Abbvie, Albireo, Agomab, Boehringer Ingelheim, Chemomab, Falk, Gilead, Genfit, Hightide, Intercept, Ipsen, Jannsen, Mirum, Novartis, Pliant, Rectify

Grants / research support

Alnylam, Cymabay, Falk, Genentech, Gilead, Intercept, UltraGenyx

Speakers bureau

Albireo, Falk Foundation, Gilead, Intercept, Ipsen, Madrigal

Travel grants

AbbVie, Falk Foundation, Gilead, Intercept, Jannsen

Property rights

Co-inventor (service invention) for patents on medical use of *nor*UDCA (filed by the Medical Universities of Graz and Vienna)

Agenda of my talk

- Visualization (& quantification) of hepatobiliary excretory function
  - Potential functional strictures (PFS) – prognosis & guiding endscopic interventions
  - Potential exploratory endpoint for clinical studies
- Correlation of multiparametric MRI with liver histology (pilot @ MUW)
  - Could this be the first step for early/earlier diagnosis of PSC

HEPATOLOGY
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Vol. 1, No. 2, p. 187, 1981
Printed in U.S.A.

Editorial

Cholestasis: The Future of a Past and Present Riddle

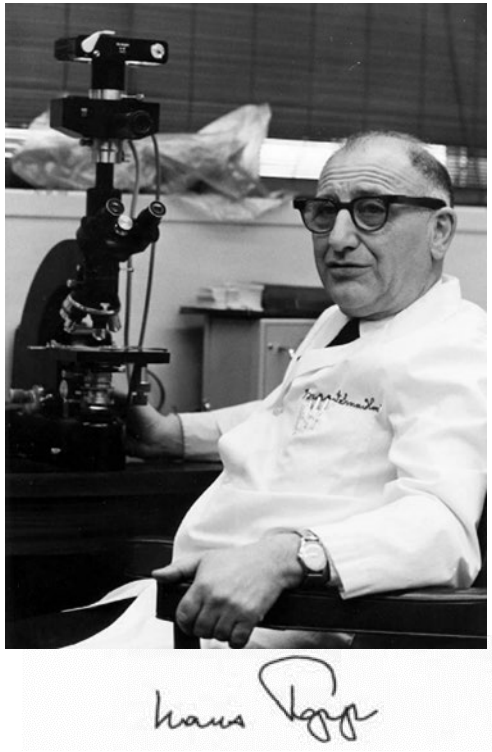
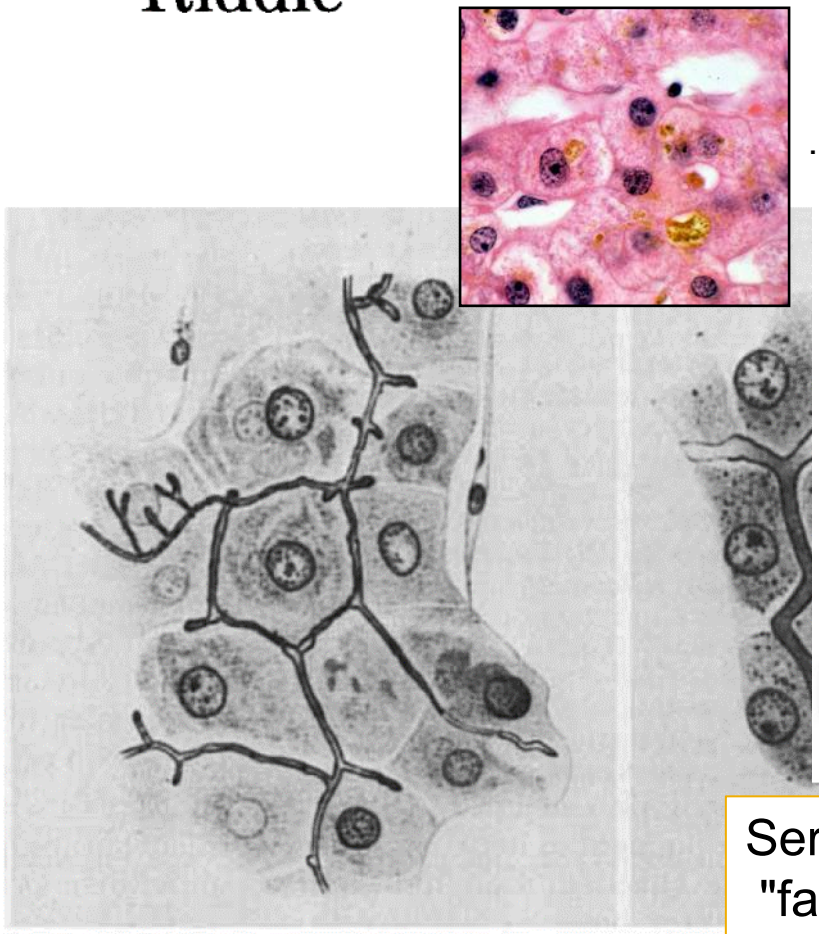
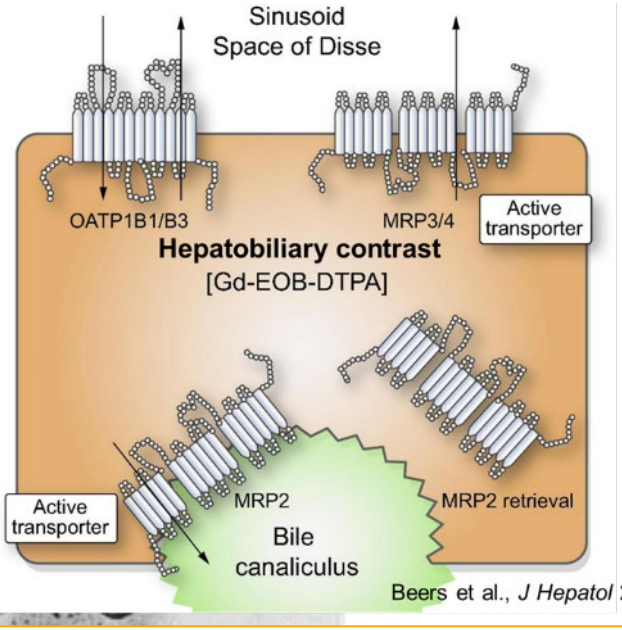


FIG. 1. Drawing of normal human bile canaliculi and dilated canaliculi showing rupture and communication with perisinusoidal space in cholestasis (from Eppinger, H., *Die Leberkrankheiten*, J. Springer, Wien, 1937).



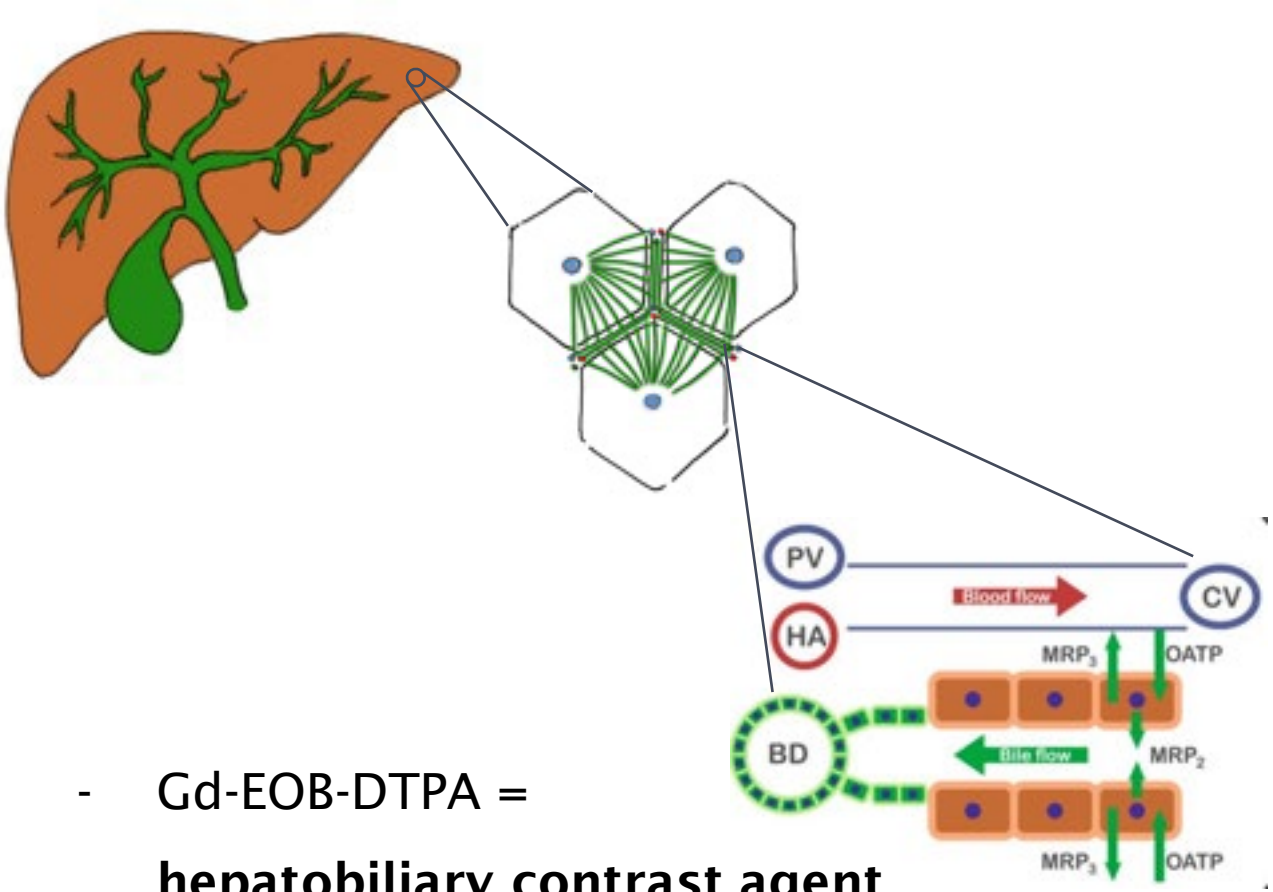
…(visible) stagnation of bile secretion…



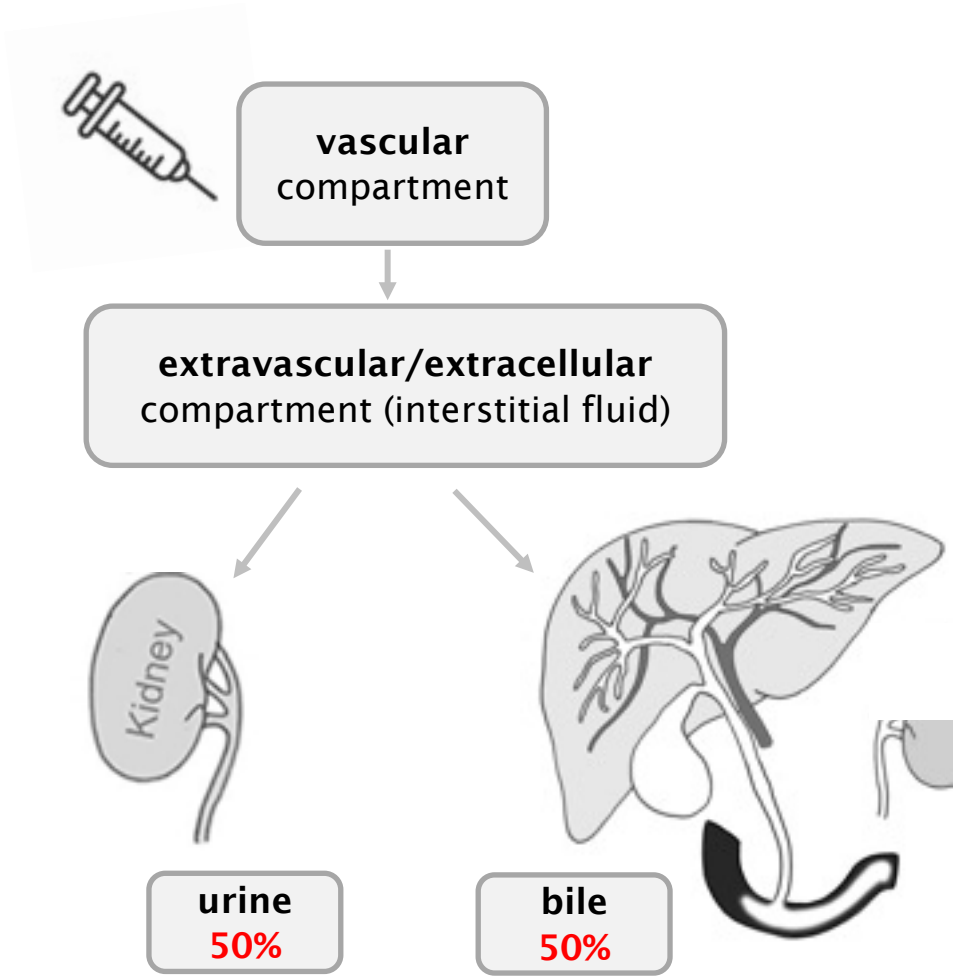
Serge Erlinger (Paris) :
"failure of bile to reach the duodenum in sufficient amount"

Popper, *Hepatology* 1981; 1: 187

Gd-EOB-DTPA – dual excretion



- Gd-EOB-DTPA = **hepatobiliary contrast agent**
- uptake in hepatocytes
- excretion via bile and kidneys



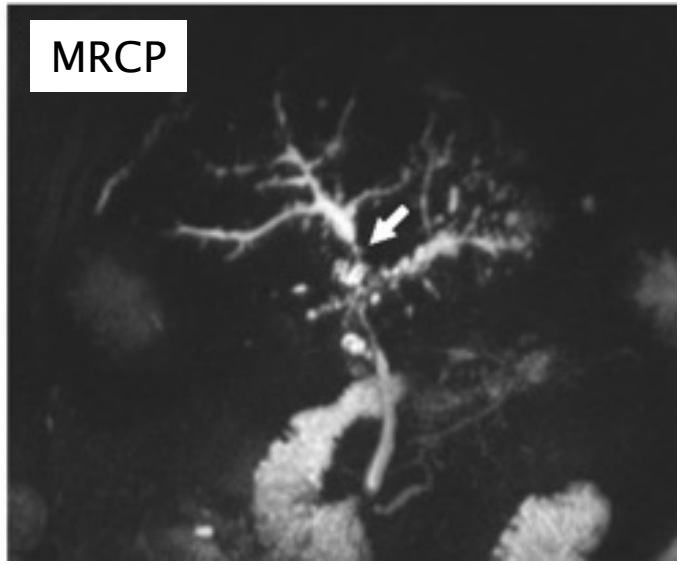
S. Erlinger, *J Hepatol* 1985, Hilscher et al. *Mayo Clinic Proc.* 2020

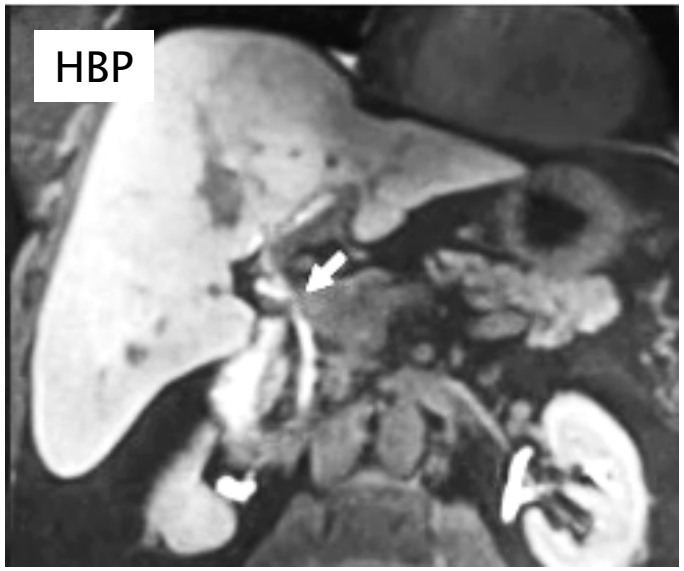
New definition – “simple, precise stricture diagnosis“

- Potential functional stricture (PFS) concept
- Describes functional rather than structural obstruction
- Three categories:
  - 1. No Functional Stricture (NFS): timely excretion
  - 2. Functional Stricture (FS): stop of contrast
  - 3. Hepatic dysfunction (HD): no uptake/excretion
- Fast, reproducible, clinically intuitive

Poetter-Lang et al., *Eur Radiol* 2023

New definition – "simple, precise stricture diagnosis"





European Radiology (2023) 33:9022–9037
https://doi.org/10.1007/s00330-023-09915-3

European Radiology
ESR EUROPEAN SOCIETY OF RADIOLOGY

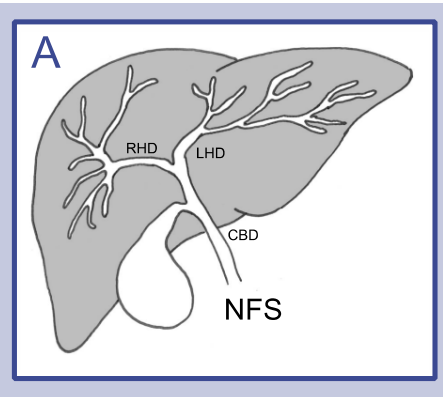
HEPATOBILIARY-PANCREAS

Check for updates

Diagnosis of functional strictures in patients with primary sclerosing cholangitis using hepatobiliary contrast-enhanced MRI: a proof-of-concept study

Sarah Poetter-Lang[1] · Alina Messner[1] · Nina Bastati[1] · Kristina I. Ringe[2] · Maxime Ronot[3] · Sudhakar K. Venkatesh[4] · Raphael Ambros[1] · Antonia Kristic[1] · Aida Korajac[1] · Gregor Dovjak[1] · Martin Zalaudek[1] · Jacqueline. C. Hodge[1] · Christoph Schramm[5] · Emina Halilbasic[6] · Michael Trauner[6] · Ahmed Ba-Ssalamah[1,7]

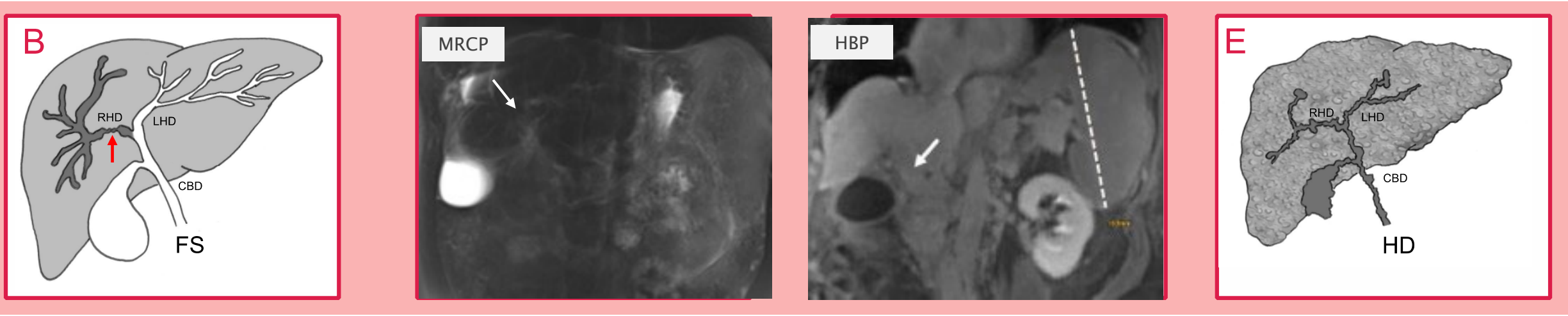
- Gd-EOB-DTPA => physiological bile flow
- Timely contrast agent excretion after 20 minutes (hepatobiliary phase = **HBP**) means "**no functional stricture (NFS)**"



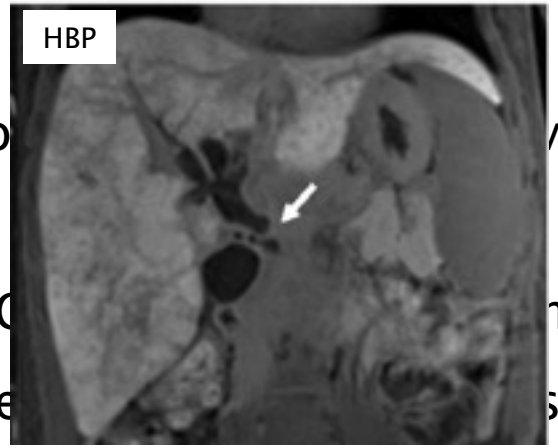
Poetter-Lang et al., *Eur Radiol* 2023

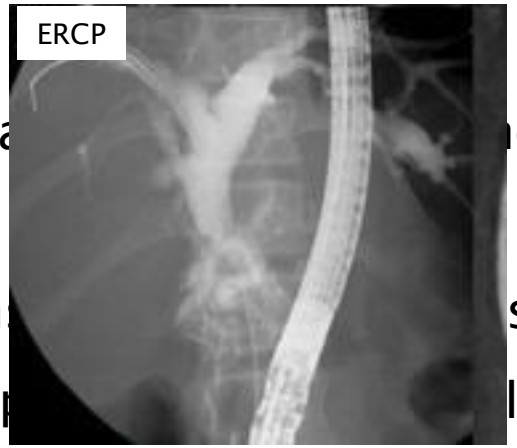
Definition of „Potential functional stricture (PFS)“

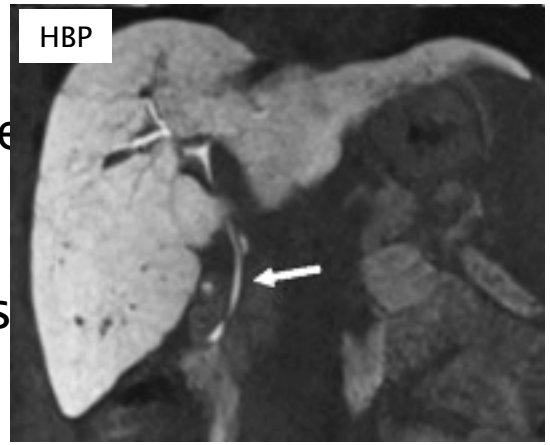
PFS



1. Impaired excretion, i.e., no contrast medium in the primary bile ducts, means “**functional stricture (FS)**”.
2. No contrast medium excretio
3. Comparison of the DS and HC
4. Correlation with laboratory re





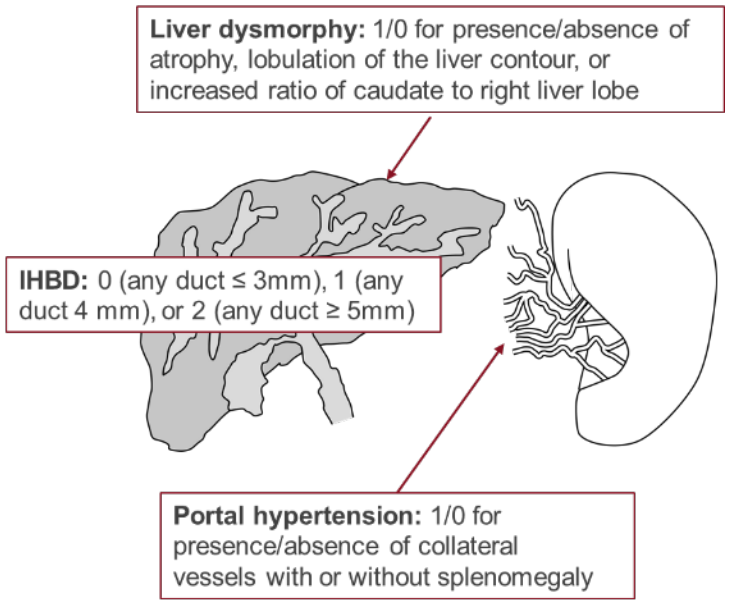


Poetter-Lang et al., *Eur Radiol* 2023

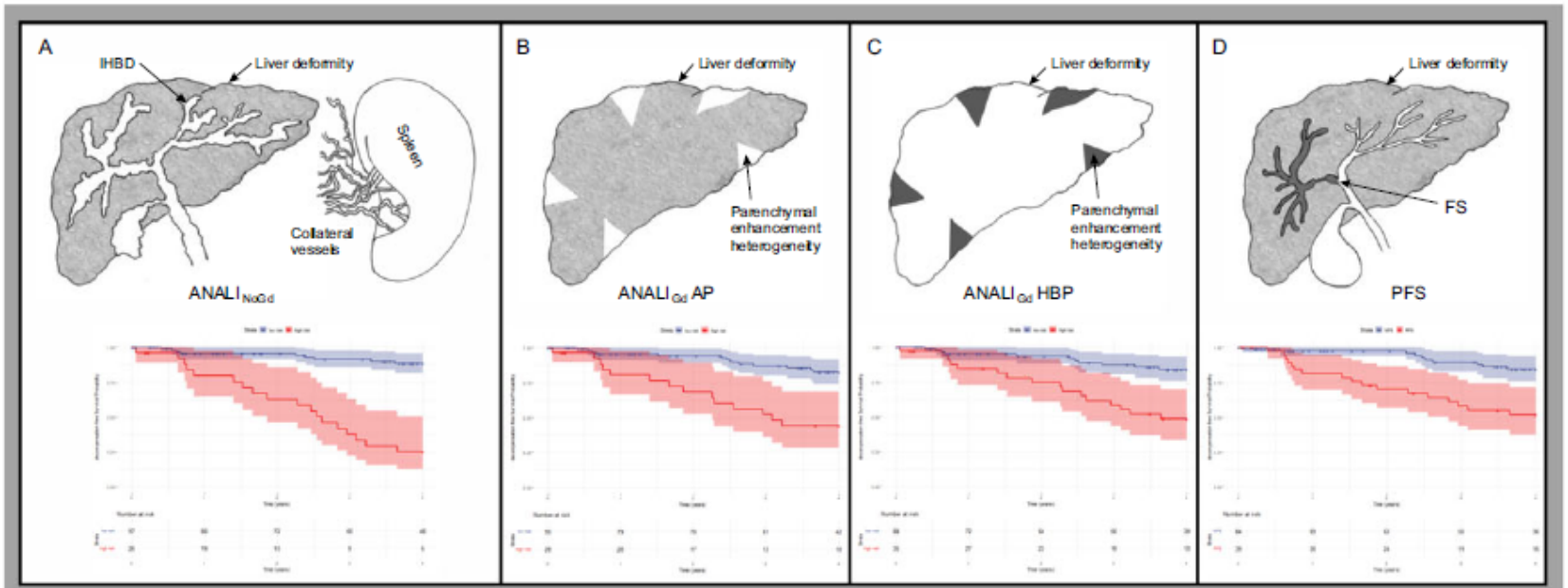
Simple Magnetic Resonance Scores Associate With Outcomes of Patients With Primary Sclerosing Cholangitis

Sara Lemoinne,[*,a] Nora Cazzagon,[*,‡,a] Sanaâ El Mouhadi,[§] Palak J. Trivedi,[‖,¶] Anthony Dohan,[#,**] Astrid Kemgang,[*] Karima Ben Belkacem,[*] Chantal Housset,[*] Yves Chretien,[*] Christophe Corpechot,[*] Gideon Hirschfield,[¶,‡‡] Annarosa Floreani,[‡] Raffaella Motta,[§§] Benoit Gallix,[#] Alan Barkun,[‖‖] Jeffrey Barkun,[¶¶] Olivier Chazouillères,[*] and Lionel Arrivé[§]

Clinical Gastroenterology and Hepatology 2019;17:2785–2792



- Total score range: 0–5
- Patients with ANALI score > 2 have been shown to have a higher risk of PSC-related clinical events



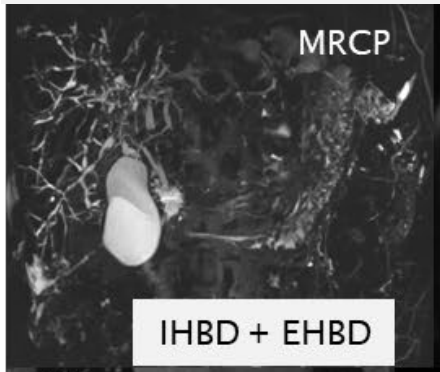
	ANALI NoGd	ANALI Gd AP	ANALI Gd HBP	PFS
Mean Interreader Agreement for the 5 readers	0.55 (0.49-6.0)	0.53 (0.48-0.59)	0.64 (0.59-0.69)	0.81 (0.75-0.86)
Hazard Ratio (HR)	6.42 (3.3-12.4)	3.8 (1.2-7.2)	3.7 (1.9-6.9)	3.2 (1.6-6.1)

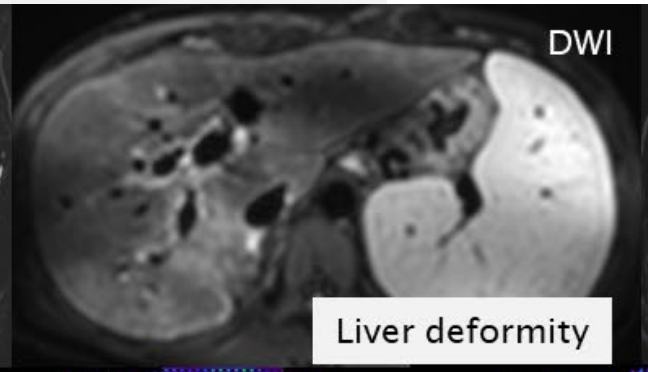
Radiology

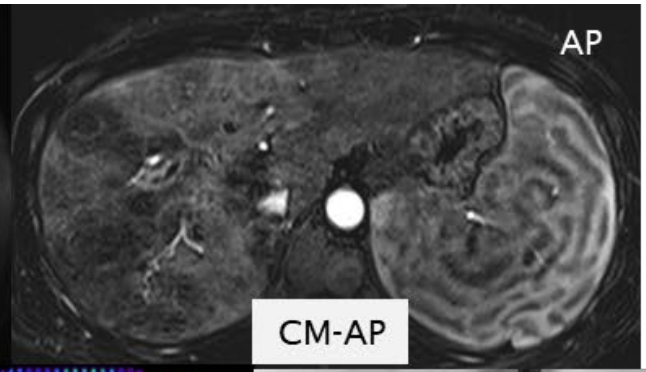
Poetter-Lang, Ba-Ssalamah, .. Trauner, *Eur Radiol* 2024

Overview MR-based Prognostic Tools

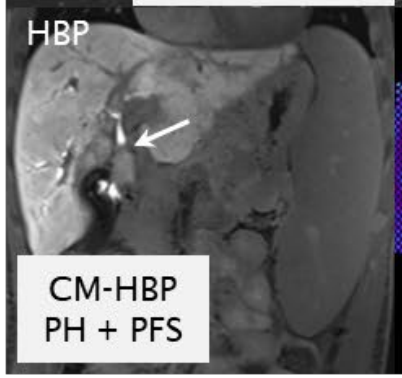
Prognostic Tool	Strengths	Limitations
Anali Scores	Integrates **cholangiographic and morphologic feature for risk stratification**, **strong negative predictive value**, supports non-contrast follow-up for low-risk patients	Relies on detailed radiologic assessment, subject to interreader variability

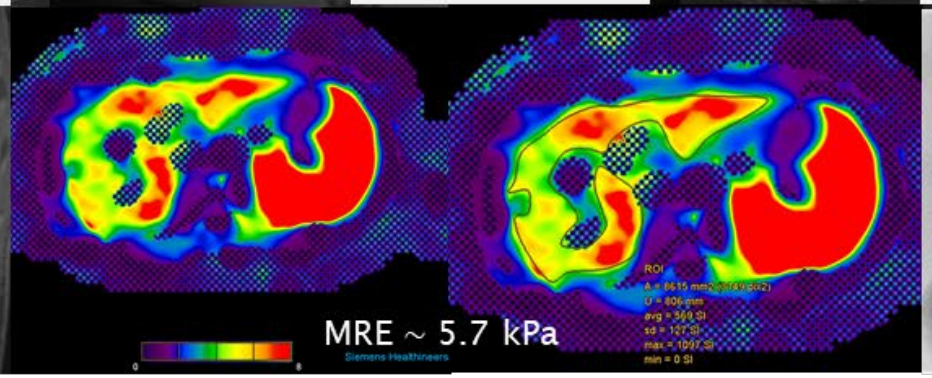


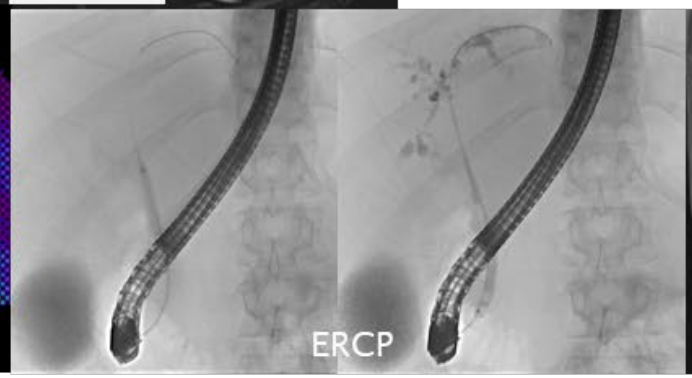




DiStrict	7 (severe)
$ANALI_{NoGd}$	4 (high risk)
$ANALI_{Gd}$	2 (high risk)
NFS/PFS	PFS
MRE	> 4. 32 kPa (high risk)







Slide courtesy Sarah Poetter-Lang, MUW Radiology

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Hepatology Communications. 2024;8:e0494.

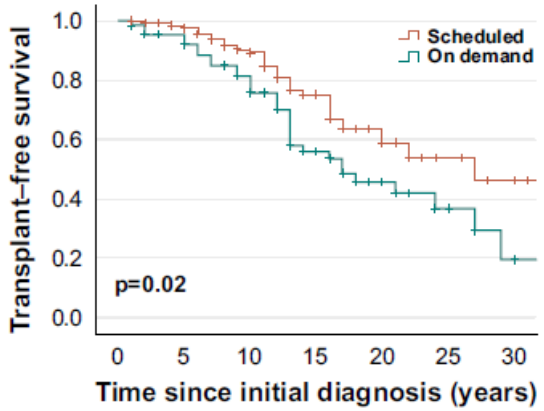
DOI: 10.1097/HC9.0000000000000494

ORIGINAL ARTICLE

OPEN

Long-term impact of scheduled regular endoscopic interventions for patients with primary sclerosing cholangitis

Burcin Özdirik[1,2] | Wilfried Veltzke-Schlieker[1] | Jule Marie Nicklaus[1] | Hilmar Berger[1] | Daniel Schmidt[1] | Silke Leonhardt[1] | Volker Penndorf[1] | Andreas Adler[1] | Tobias Müller[1] | Alexander Wree[1] | Frank Tacke[1] | Michael Sigal[1,3]



Endoscopy

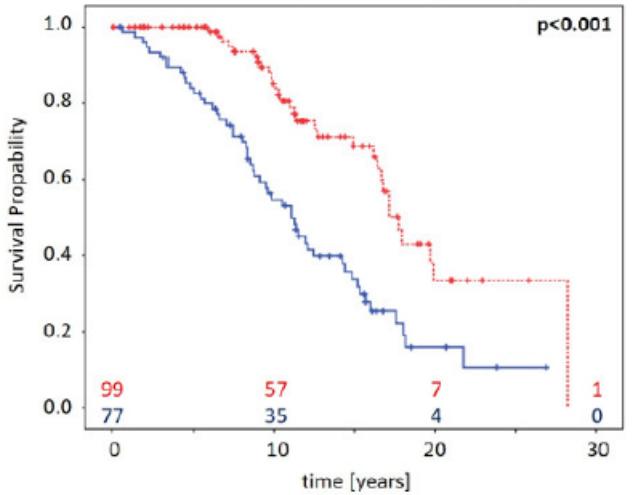
Rupp C, *et al*. *Gut* 2019;**68**:2170–2178. doi:10.1136/gutjnl-2018-316801

OPEN ACCESS

ORIGINAL ARTICLE

Effect of scheduled endoscopic dilatation of dominant strictures on outcome in patients with primary sclerosing cholangitis

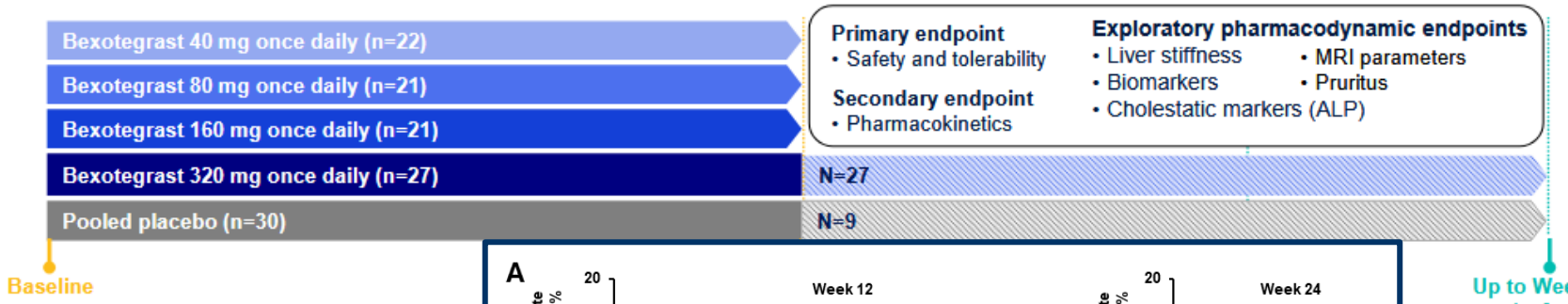
Christian Rupp [1,2] Theresa Hippchen,[1] Thomas Bruckner,[3] Petra Klöters-Plachky,[1] Anja Schaible,[4] Ronald Koschny,[1,2] Adolf Stiehl,[1] Daniel Nils Gotthardt,[1] Peter Sauer[1,2]



Monitoring of drug efficacy / MOA (explorative endpoint)

Bexotegrast experience

Phase II INTEGRIS-PSC trial of bexotegrast, an oral dual selective $\alpha_v\beta_6$ / $\alpha_v\beta_1$ integrin inhibitor, in primary sclerosing cholangitis

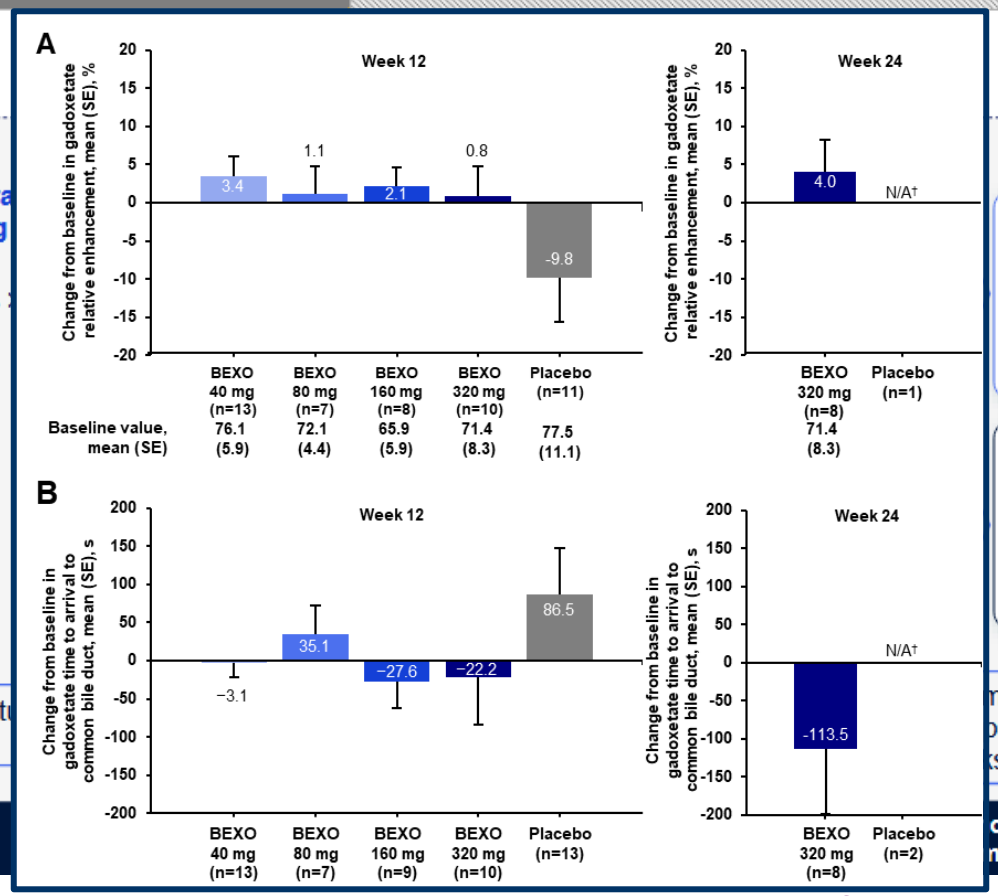


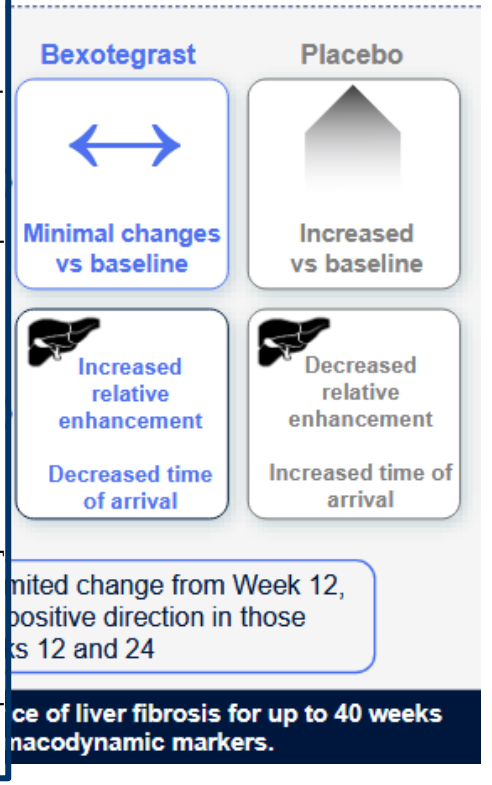
Safety Results

	Overall bexotegrast N=88	Placebo N=30	Bexotegra 320 mg N=27
	Week 12		Weeks
Any TEAEs	67.0%	66.7%	59.3%
Most common TEAEs			
Fatigue	13.2%	13.3%	0
Headache	8.8%	13.3%	3.7%
Pruritus	12.1%	20.0%	3.7%
Cholangitis	3.3%	13.3%	3.7%

No serious TEAEs related to st
or deaths occurred

MRI, magnetic resonance imaging; TEAE, treatment-emergent adverse event. *The longest treatment duration was 40 weeks.





mited change from Week 12,
positive direction in those
s 12 and 24

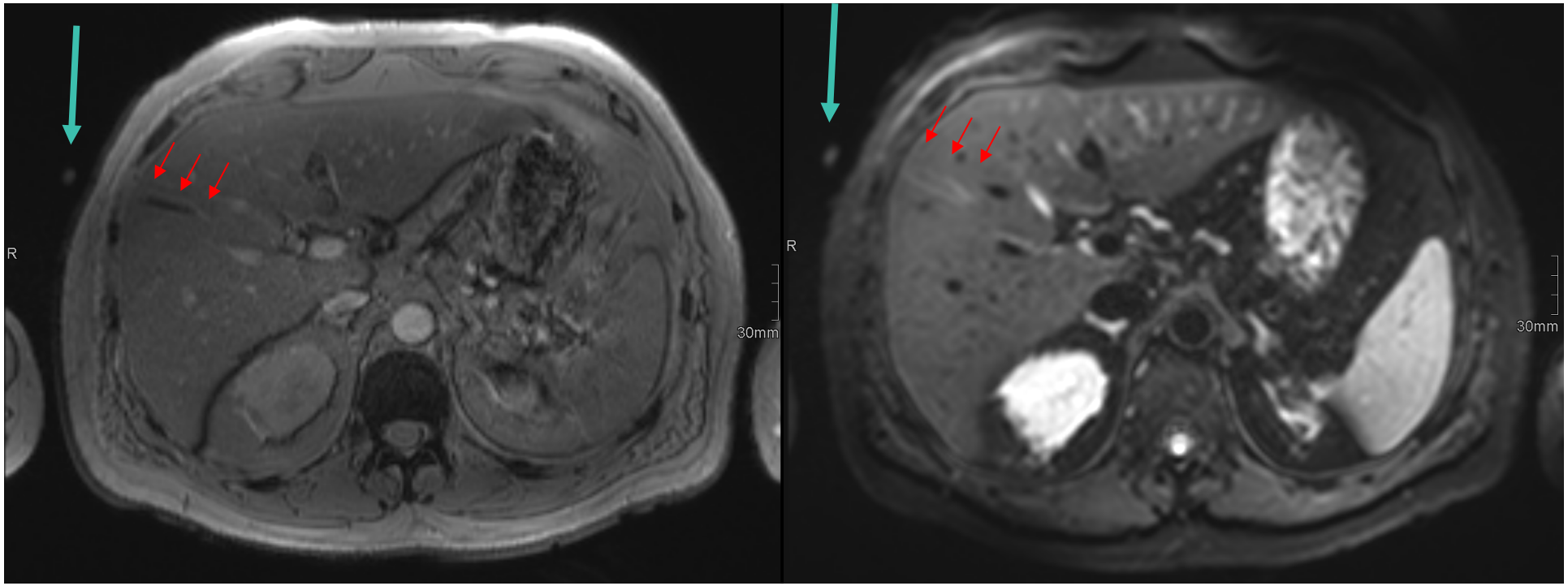
ce of liver fibrosis for up to 40 weeks
nacodynamic markers.

Hirschfield et al., *J Hepatol* 2025 ePub

Agenda of my talk

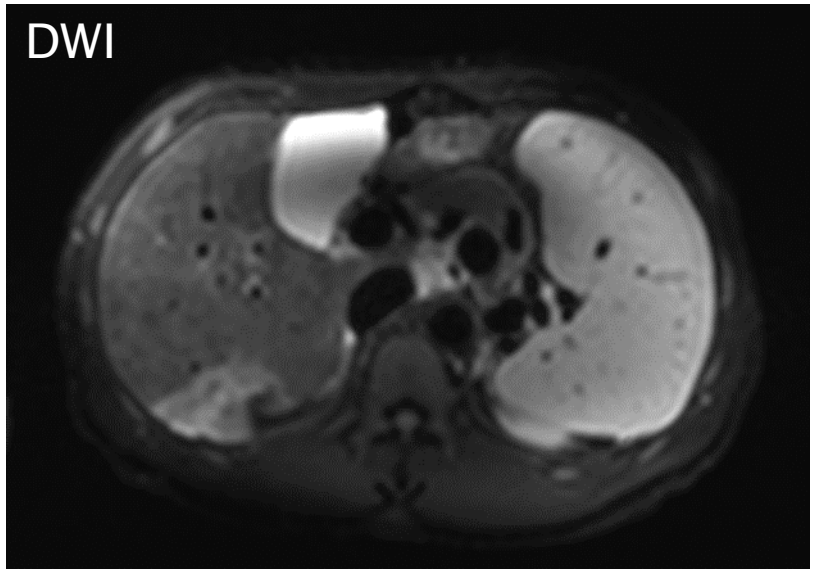
- Visualization (& quantification) of hepatobiliary excretory function
  - Potential functional strictures (PFS) – prognosis & guiding endscopic interventions
  - Potential exploratory endpoint for clinical studies
- Correlation of multiparametric MRI with liver histology (pilot @ MUW)
  - Could this be the first step for early/earlier diagnosis of PSC

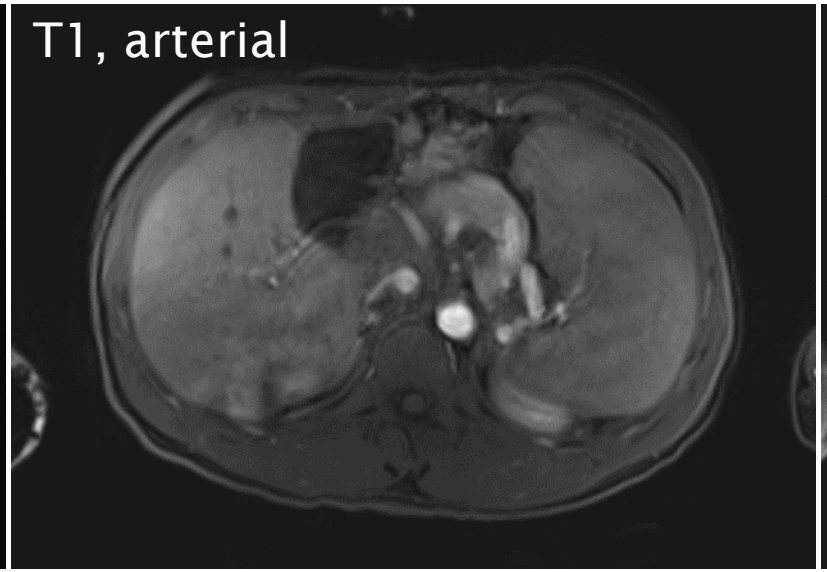
Needle track after liver biopsy with extracorporal mark

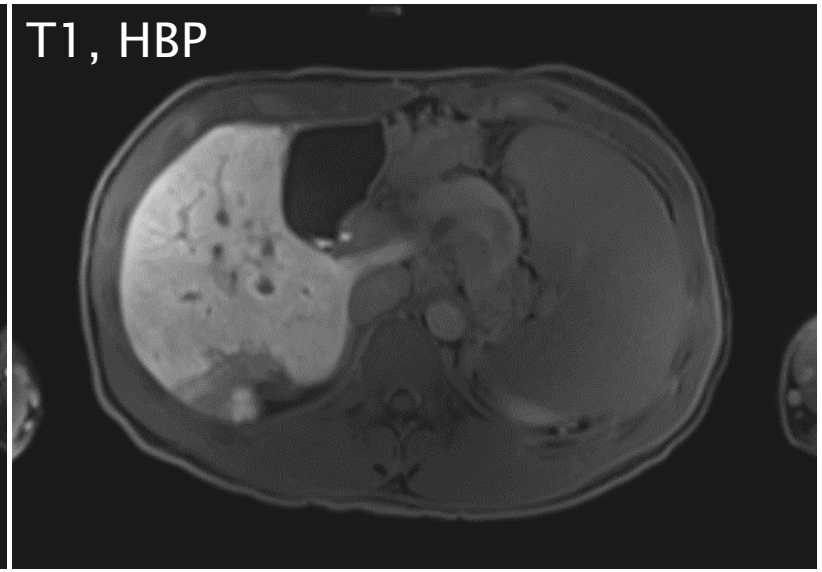


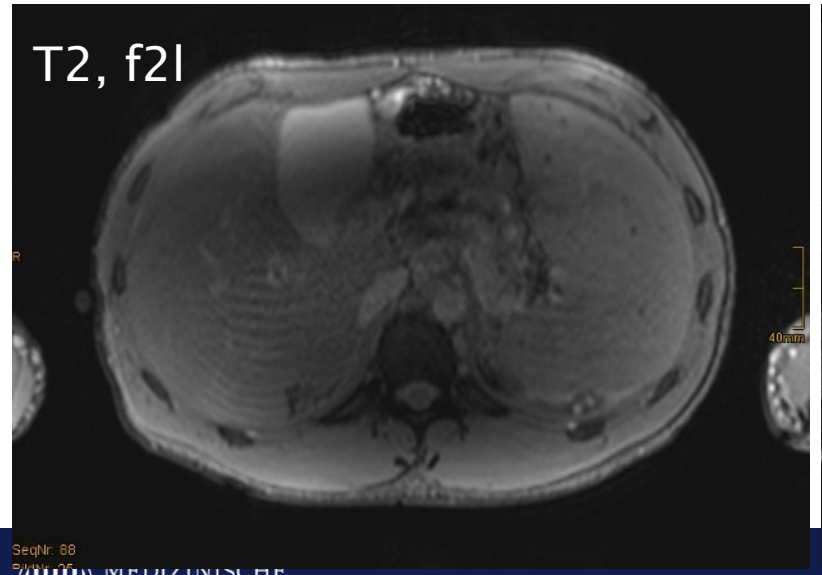
T2* axial, slice thickness 3mm ***Diffusion weighted***

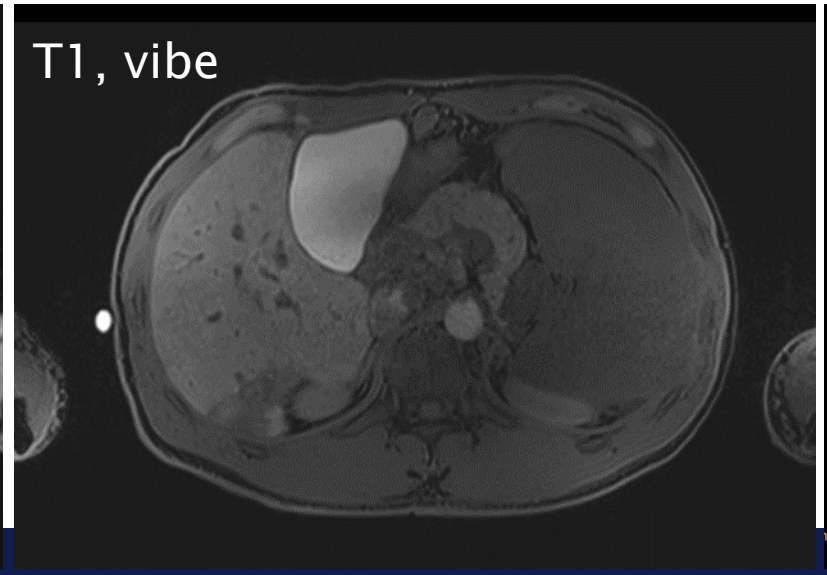
PSC pat., 29y, male, UC

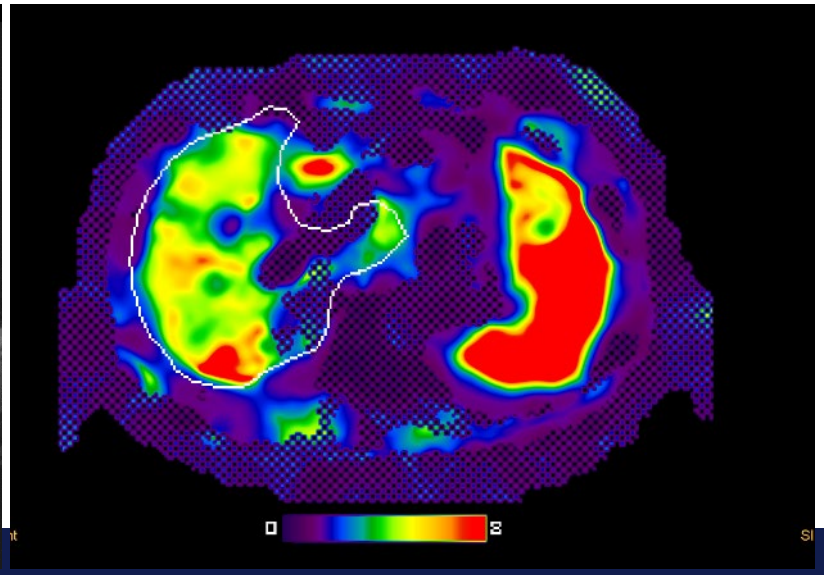




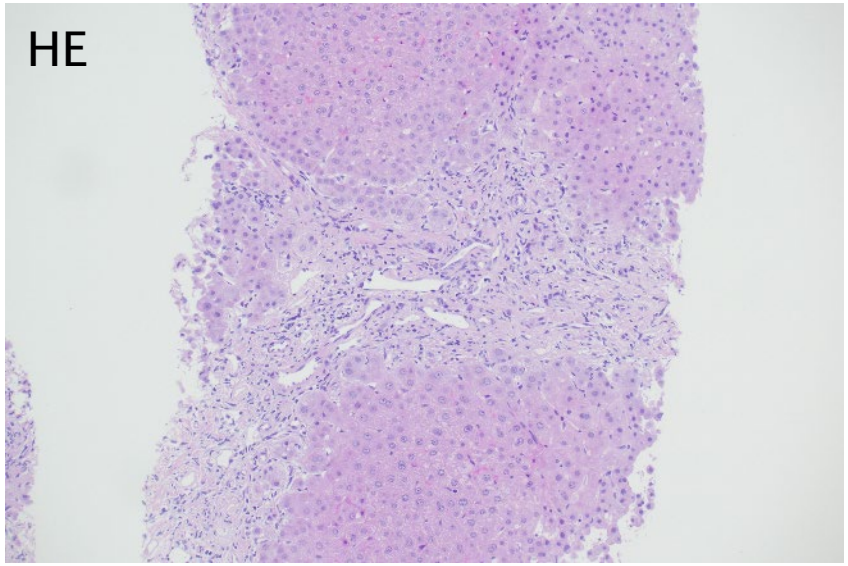


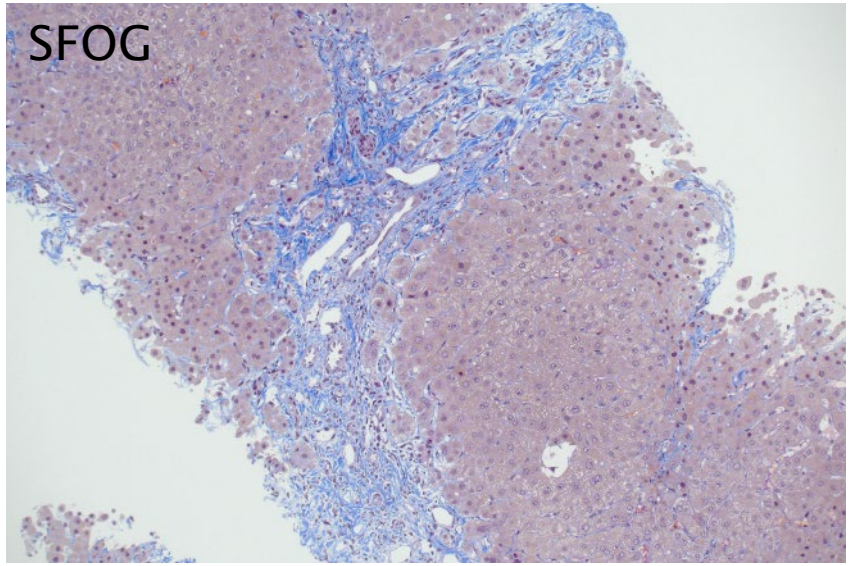






PSC pat., 29y, male, UC



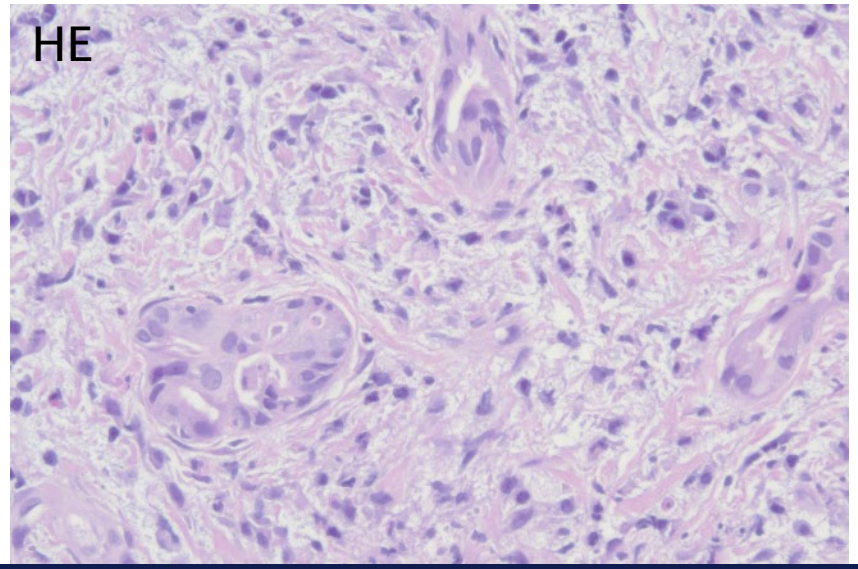


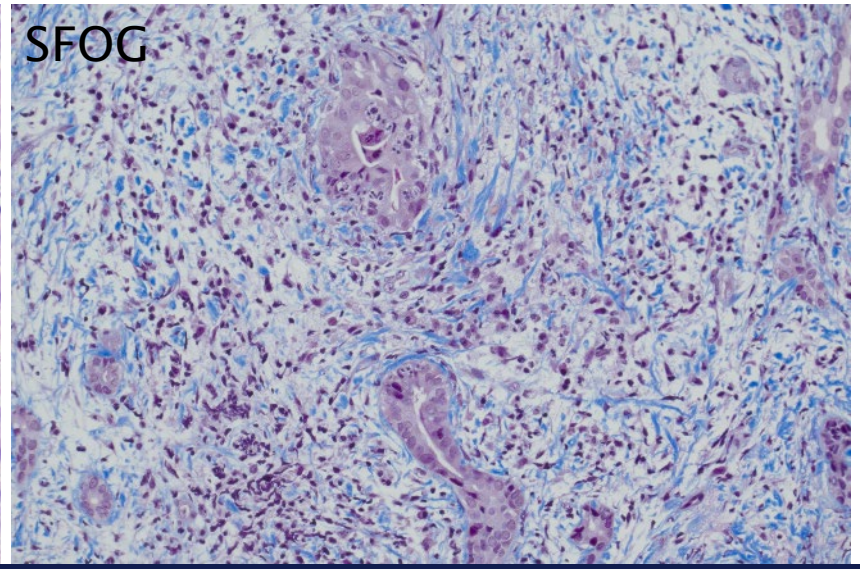
Portal inflammation

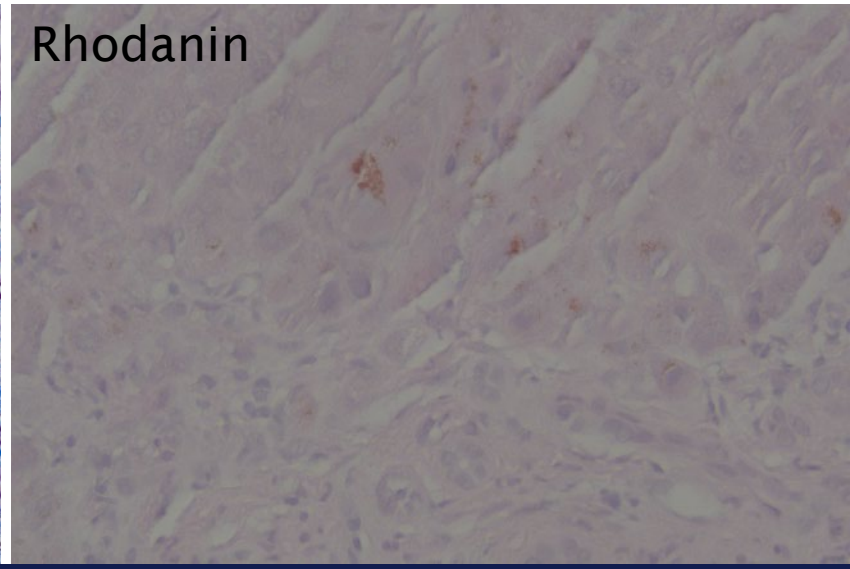
Portal fibrosis with beginning of cirrhosis

Pronounced ductular reaction

No signs of bile duct loss
Periportal cooper accumulation (cholatestasis)





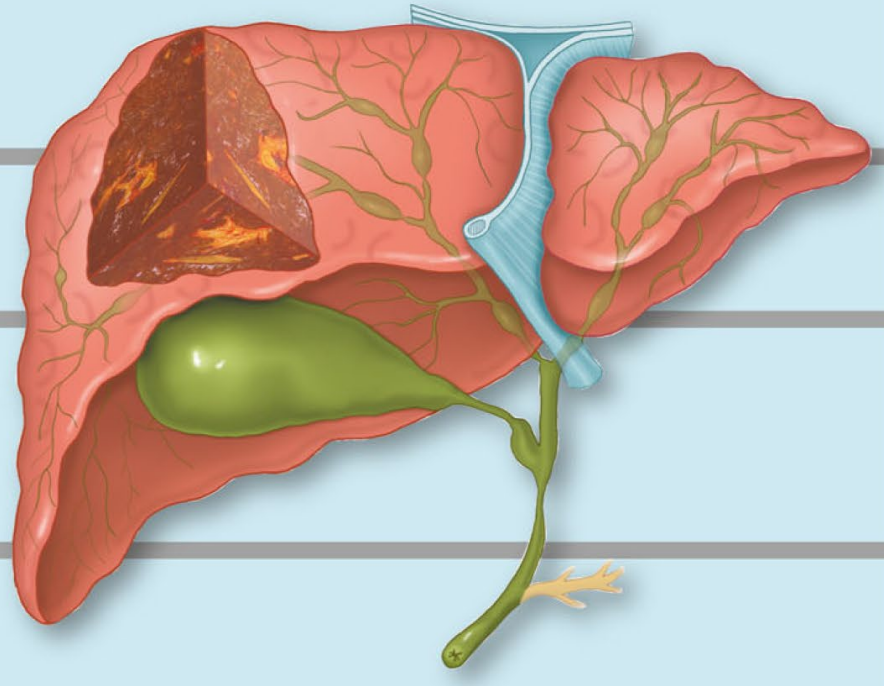


Early Diagnosis of PSC?

M, 25 y/o, IBD, elevated LFTs, PSC?

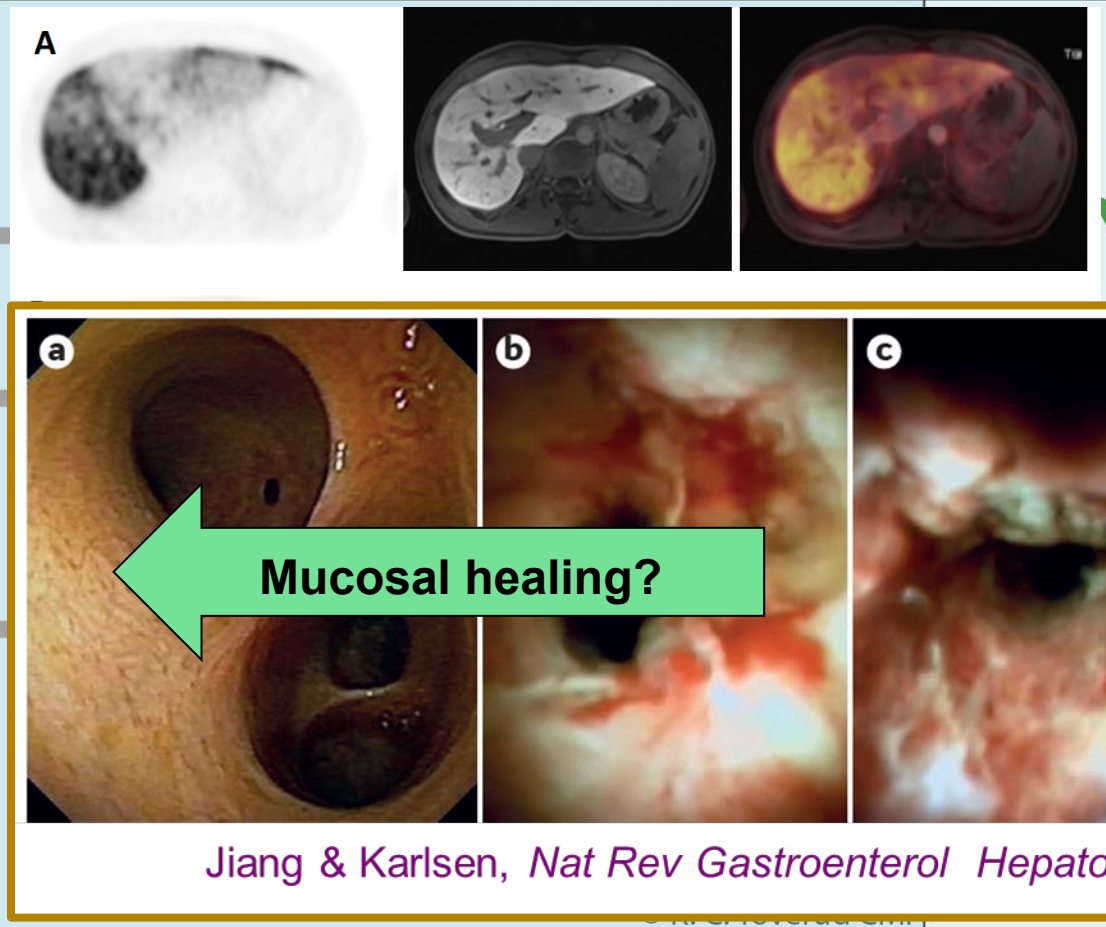
Poetter-Lang S, Bastati N, Attenberger U, Halilbasic E, Trauner M, Ba-Ssalamah A. Can a comprehensive gadoxetic acid-enhanced MRI with MRCP be used for early diagnosis, monitoring, and outcome prediction of PSC? *Eur Radiol.* 2024;34:7647-7649

Emerging Treatment Options for PSC - Overview
Candidates for Recent & Ongoing Clinical Trials

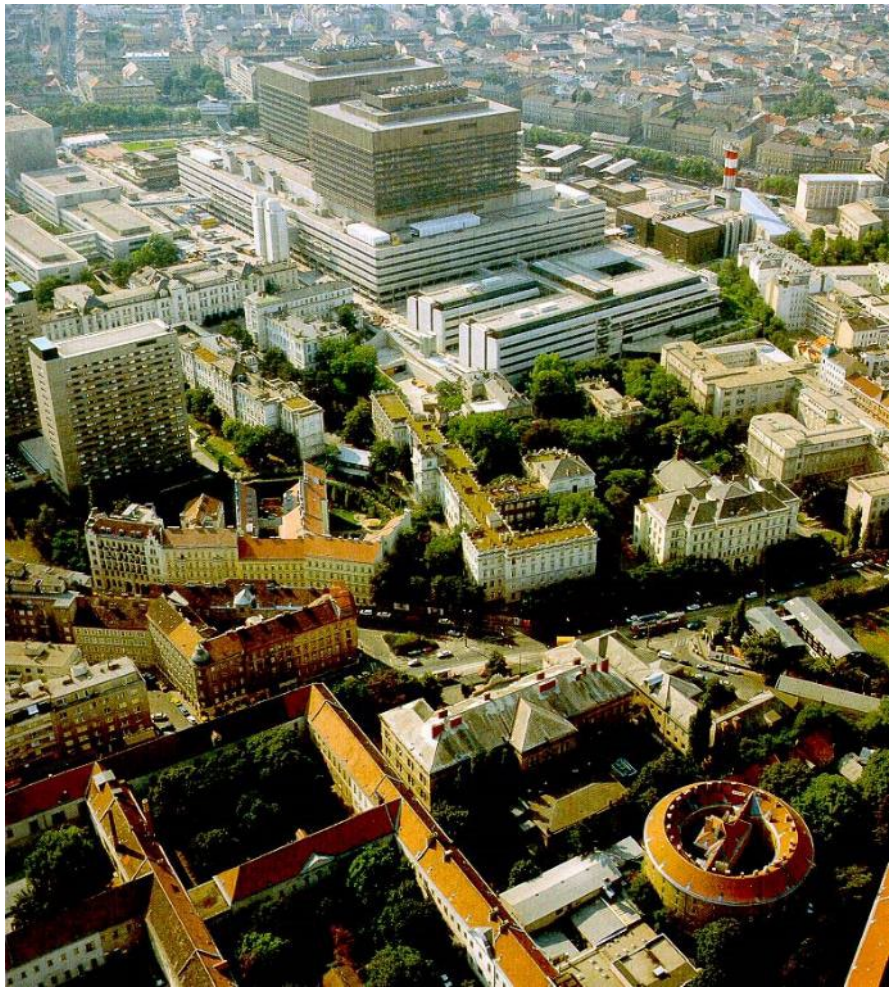
Treatment	Biliary strictures and cholestasis	ALP signal
Bile-acid based therapy and PPARs • UDCA • *nor*UDCA • FXR and FGF19 analogues • Bezafibrate and fenofibrate, elafibranor • IBAT inhibitors (no ALP signal)		✓
Microbiota-based therapy • Antibiotics (e.g. vancomycin) • Fecal transplantation, bacteriophages		✓
Immune-modulation therapy • Glucocorticoids and azathioprine • Calcineurin-inhibitors and MMF • Anti-TNFα • Vedolizumab • Simtuzumab (i.e. anti-fibrotic) Cenicriviroc, Tofa?		✗

Modified after: Vesterhus & Karlsen, *J Gastroenterol* 2020; 55: 588–614

Emerging Therapeutic Strategies for PSC - Overview Candidates for Recent & Ongoing Clinical Trials

Treatment	Biliary strictures and cholestasis	ALP signal
Bile-acid based therapy and PPARs • UDCA • *nor*UDCA (renamed as NCA) • FXR and FGF19 analogues • Bezafibrate and fenofibrate, elafibranor • IBAT inhibitors (no ALP signal) **Microbiota-based therapy** • Antibiotics (e.g. vancomycin) • Fecal transplantation, bacteriophages **Immune-modulation therapy** • Glucocorticoids and azathioprine • Calcineurin-inhibitors and MMF • Anti-TNFα • Vedolizumab • Simtuzumab (i.e. anti-fibrotic) Cenicriviroc, Tofa?		

Modified after: Vesterhus & Karlsen, *J Gastroenterol* 2020; 55: 588–614



Thank you for your attention!

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