# Liver changes in obese children

Gavino Faa

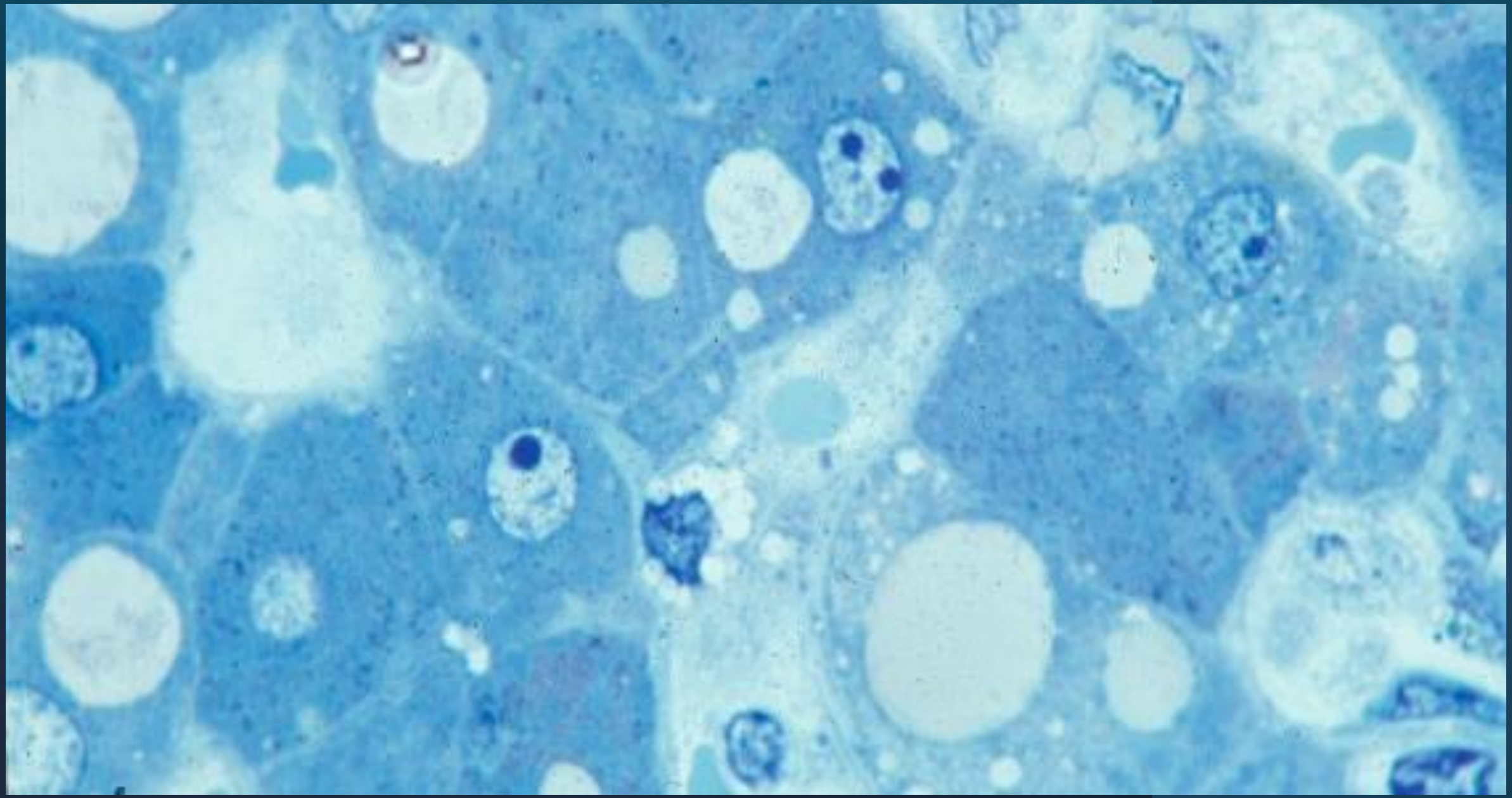
gavinofaa@gmail.com

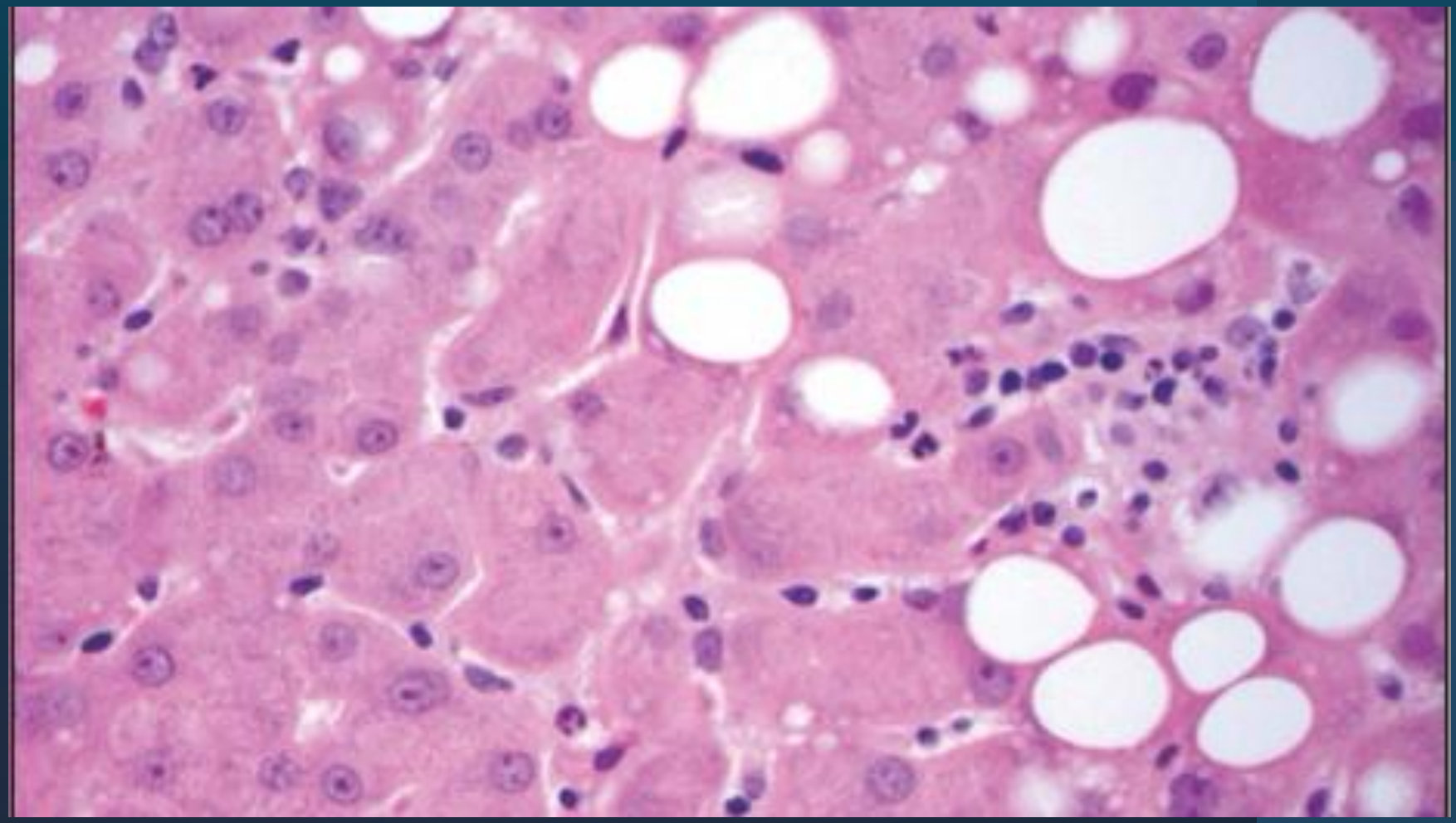
# Metabolic Dysfunction-Associated Liver Disease

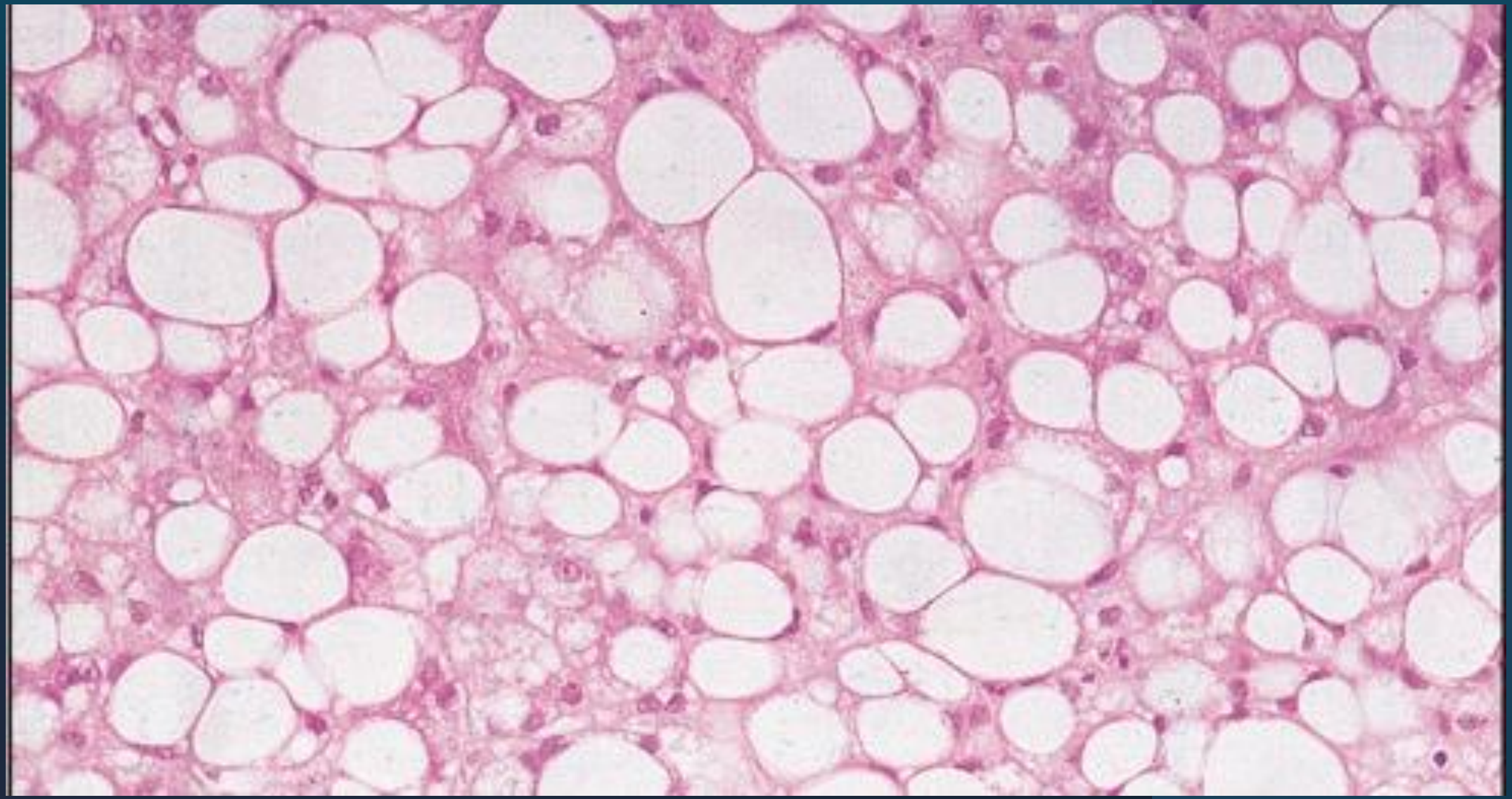
# MASLD

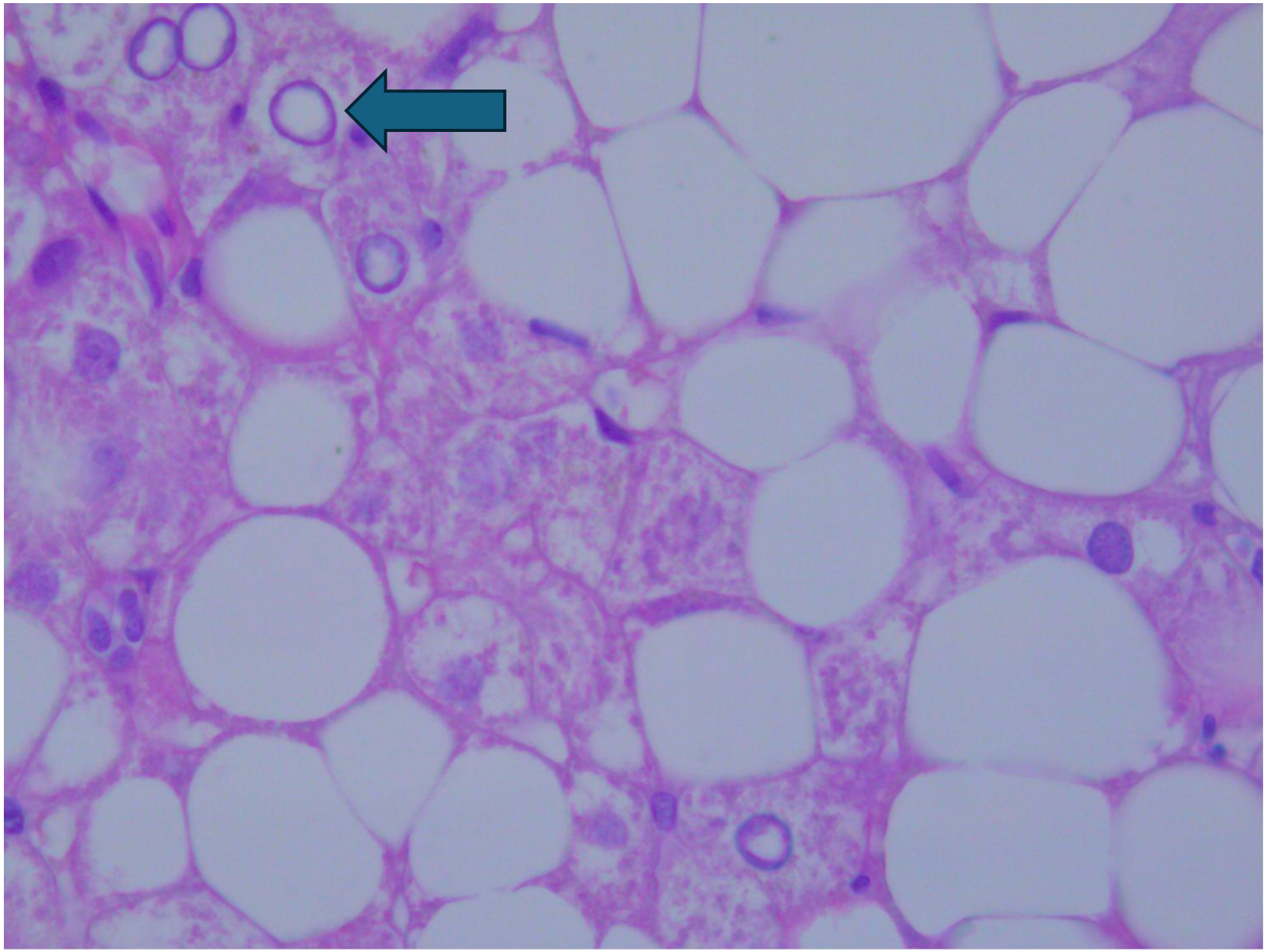
previously known as NAFLD

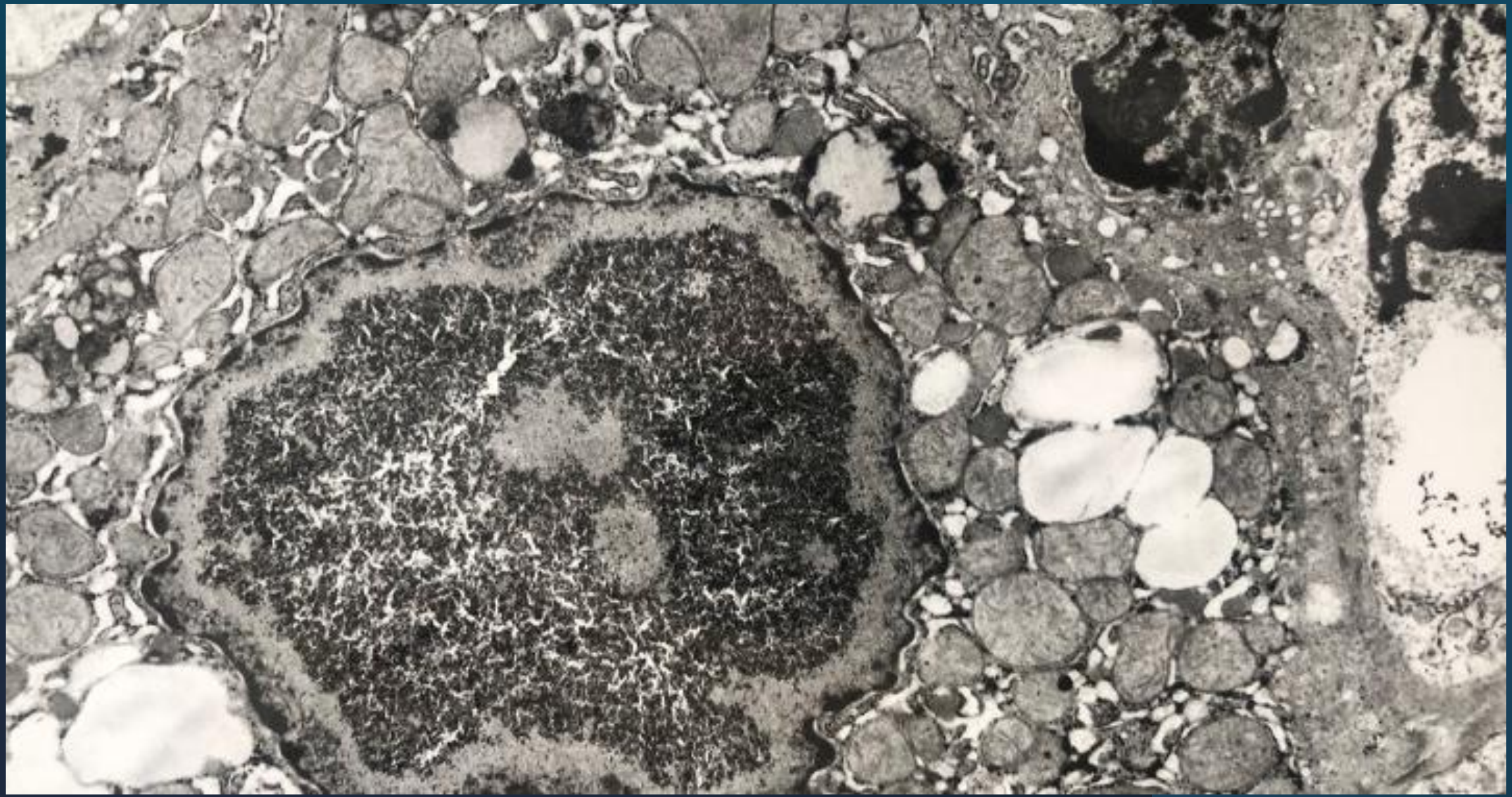
- The most common liver disease in children and adolescents
- Parallels the global increase in pediatric obesity
- Early diagnosis rimains challenging
- Limitations of current diagnostic non-invasive tools
- Liver biopsy the gold standard
- Histopathological evaluation complex
- High interobserver variability among pathologists

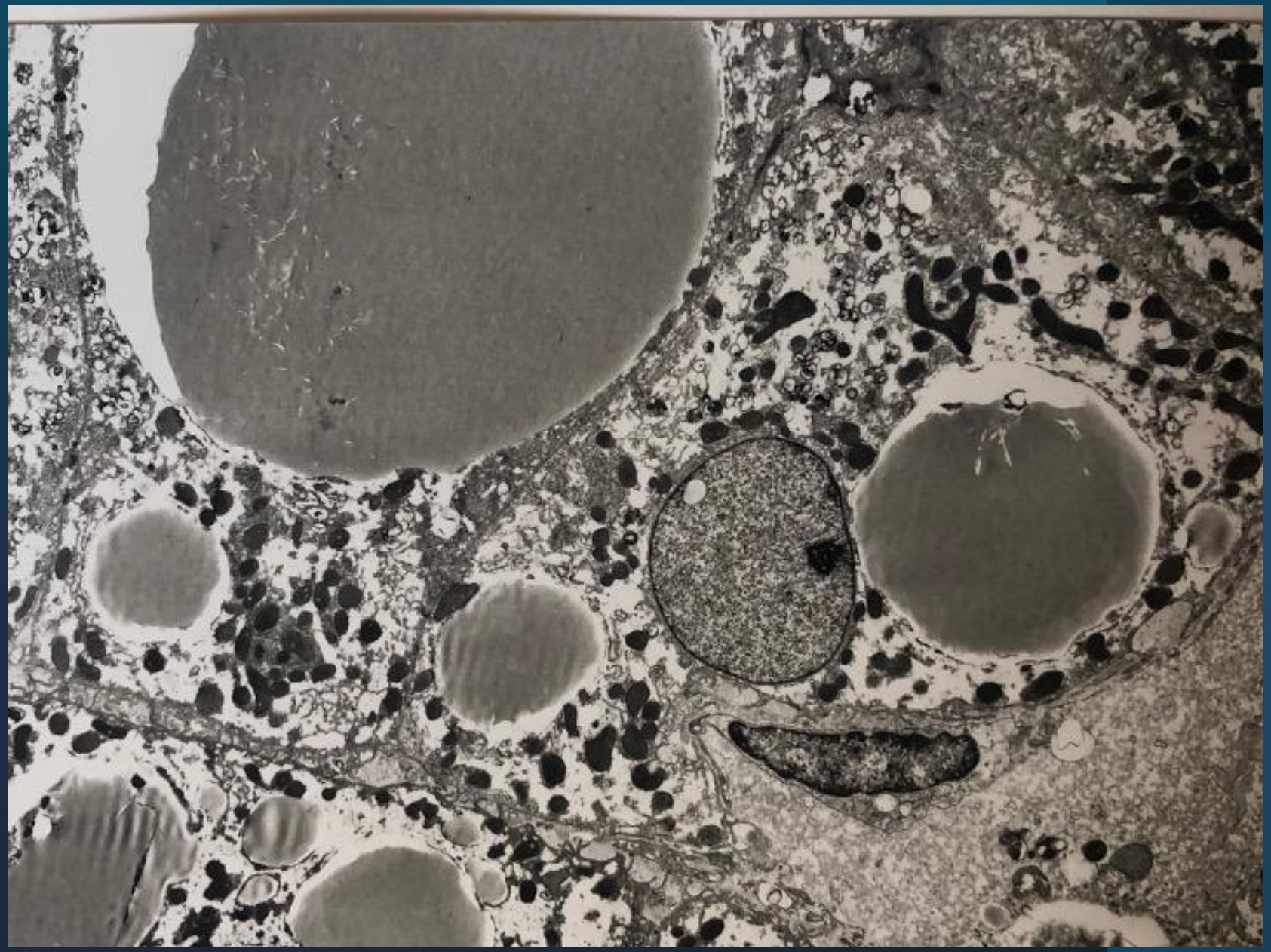


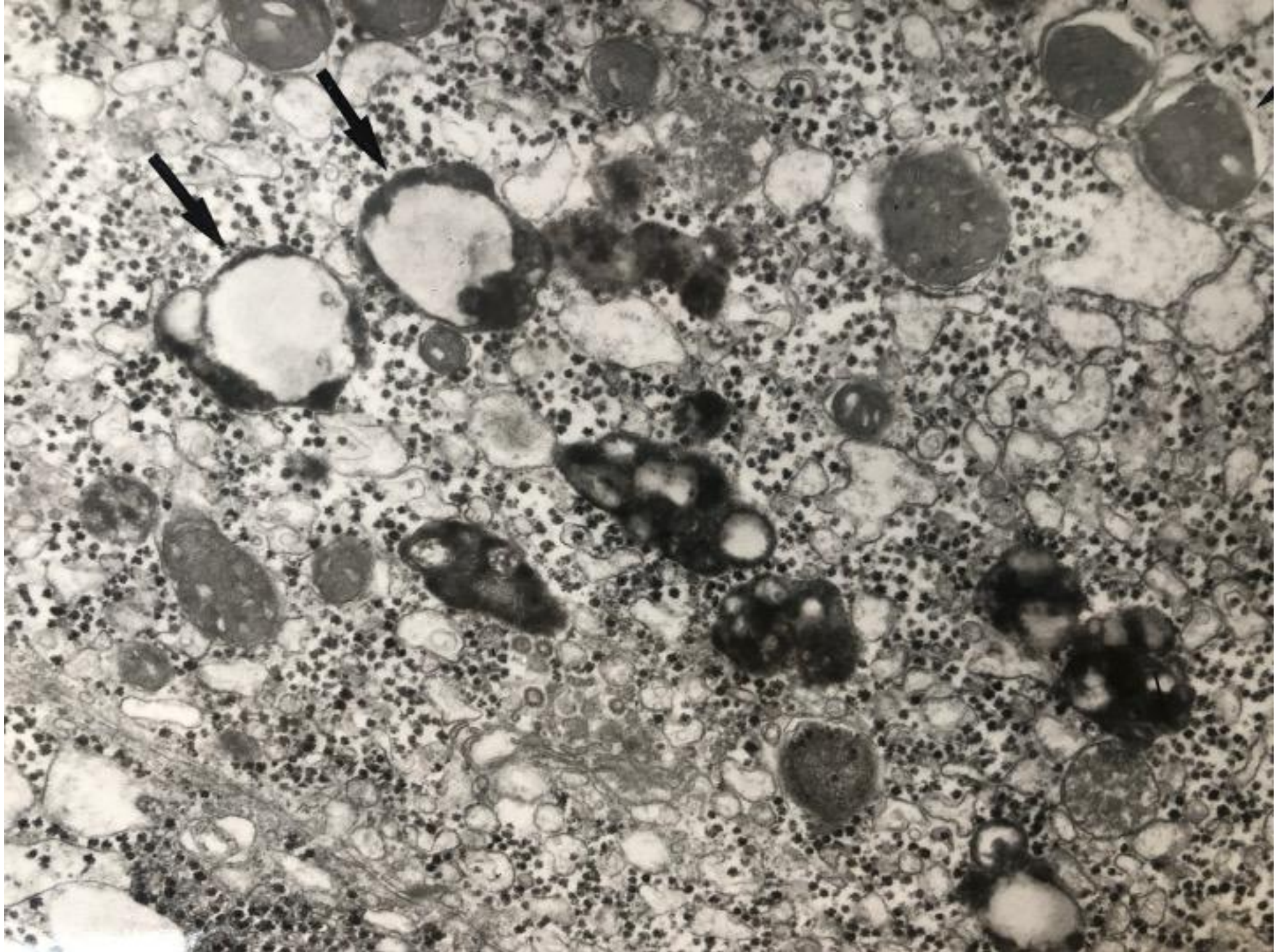


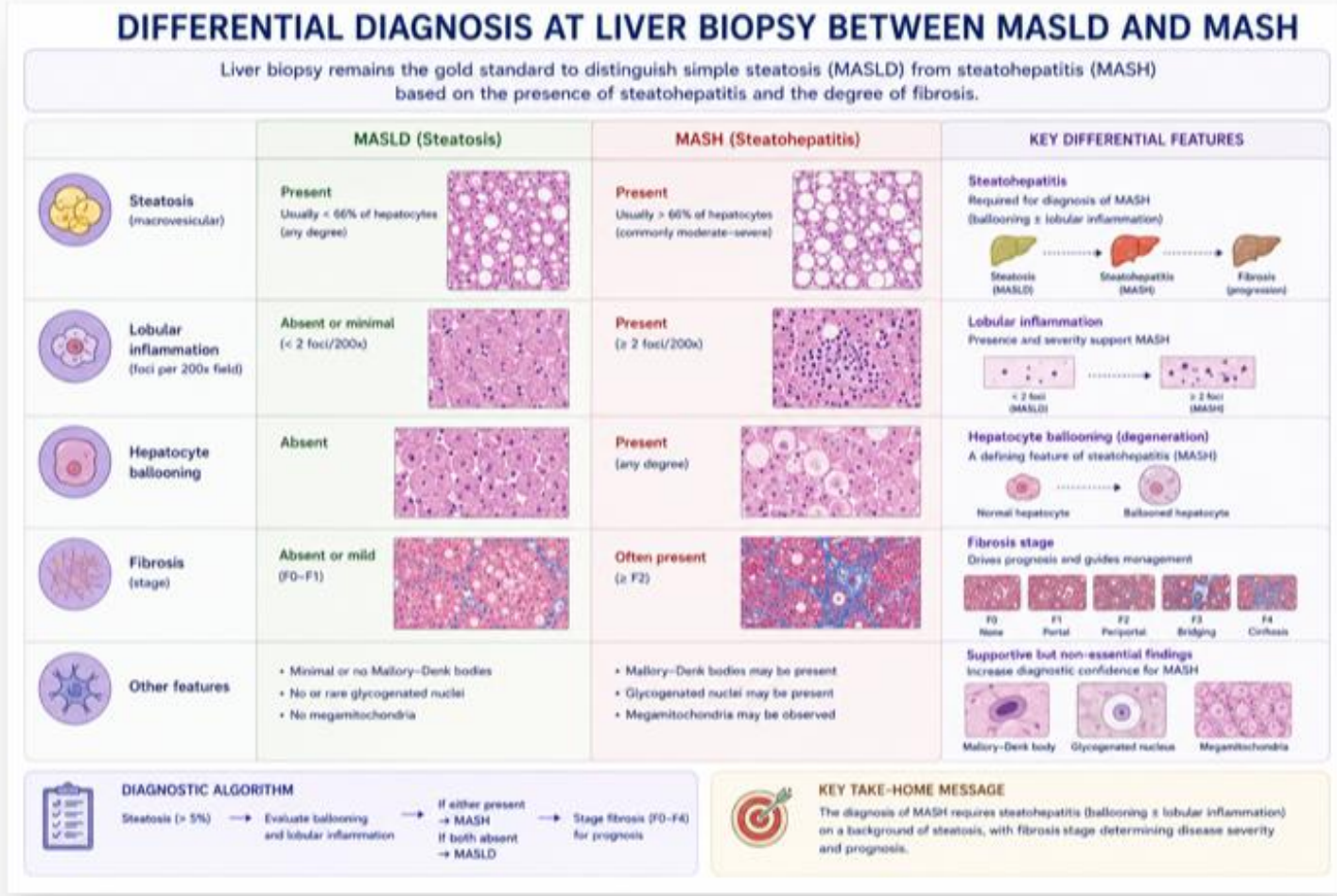




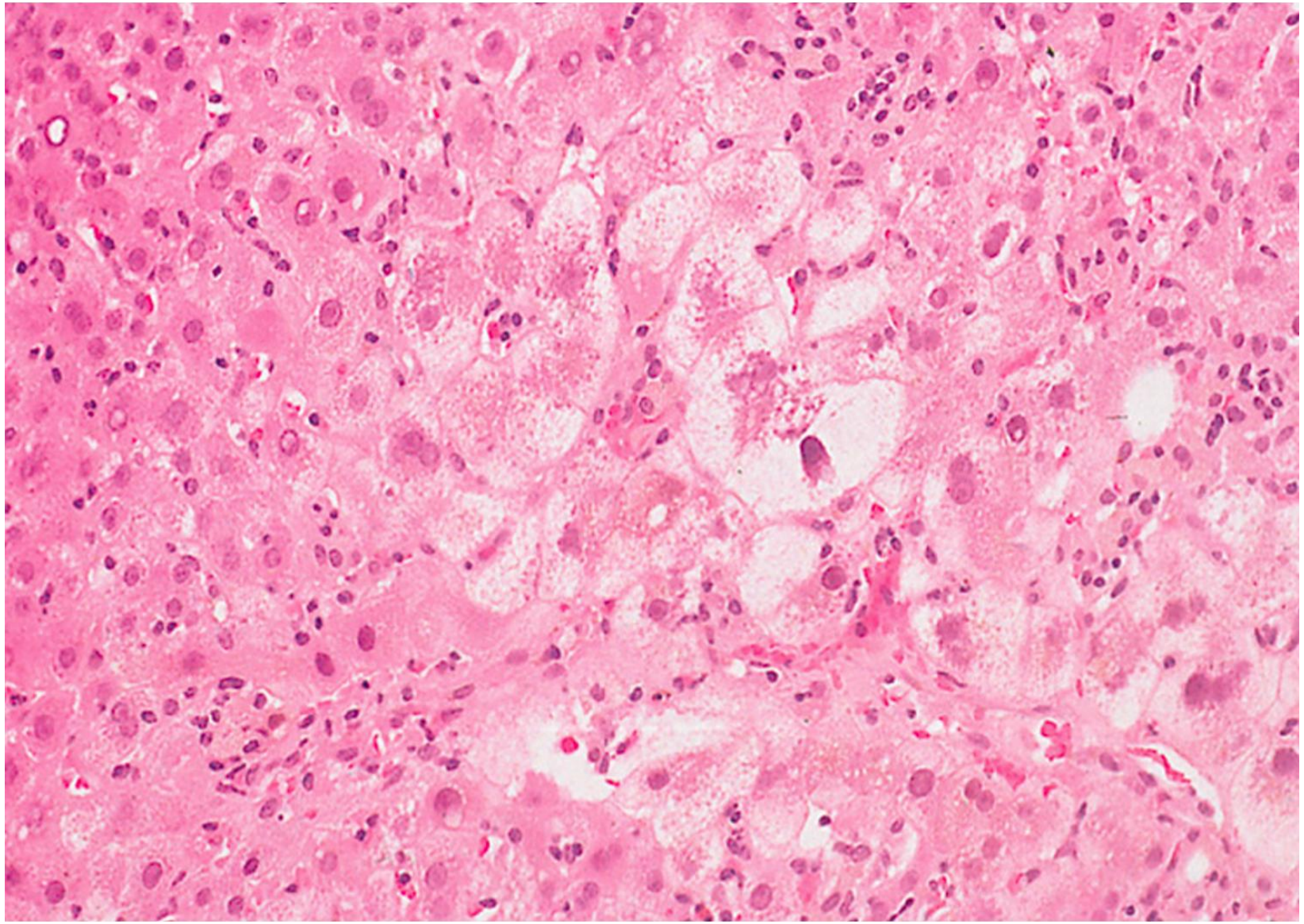




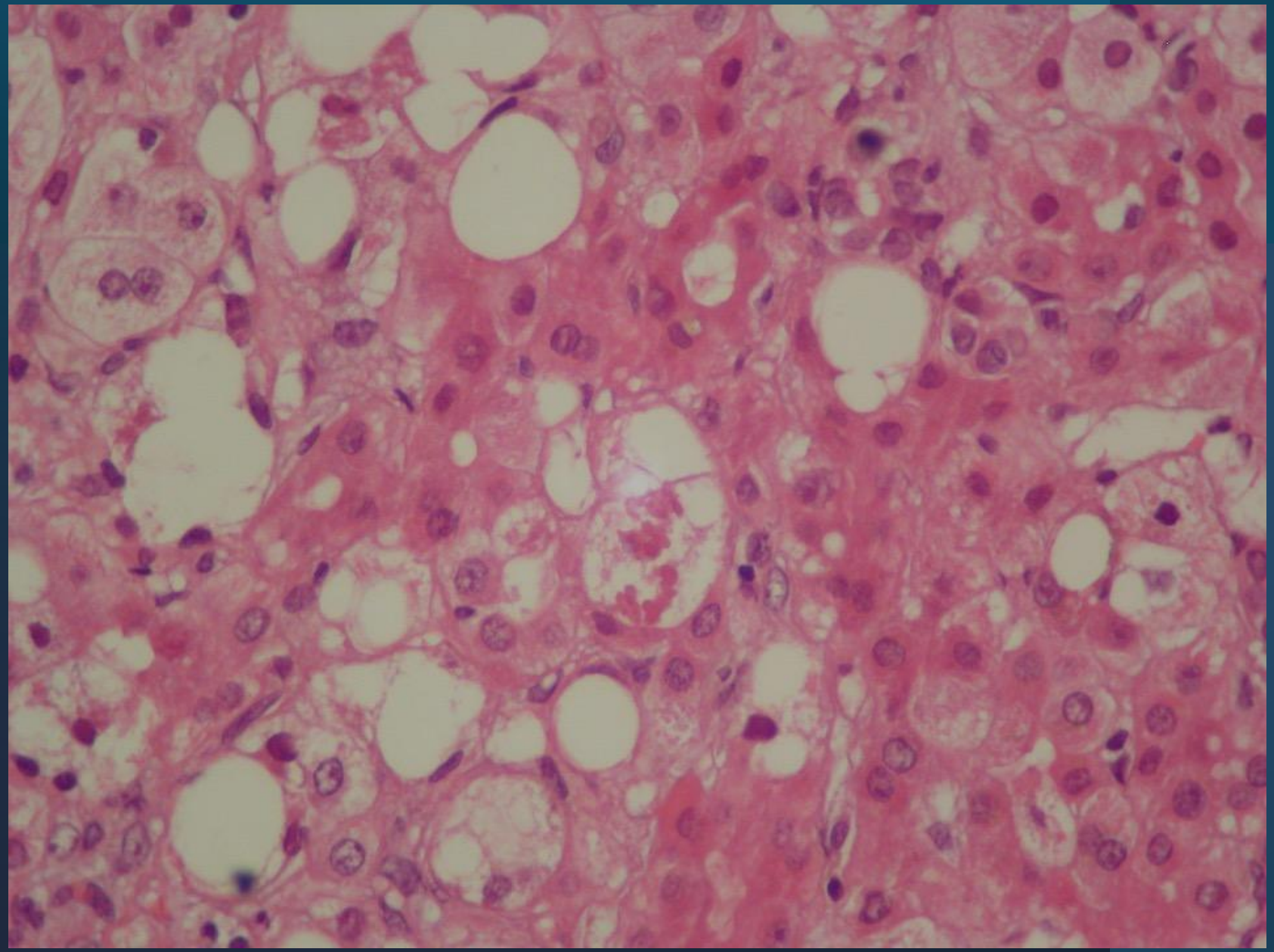


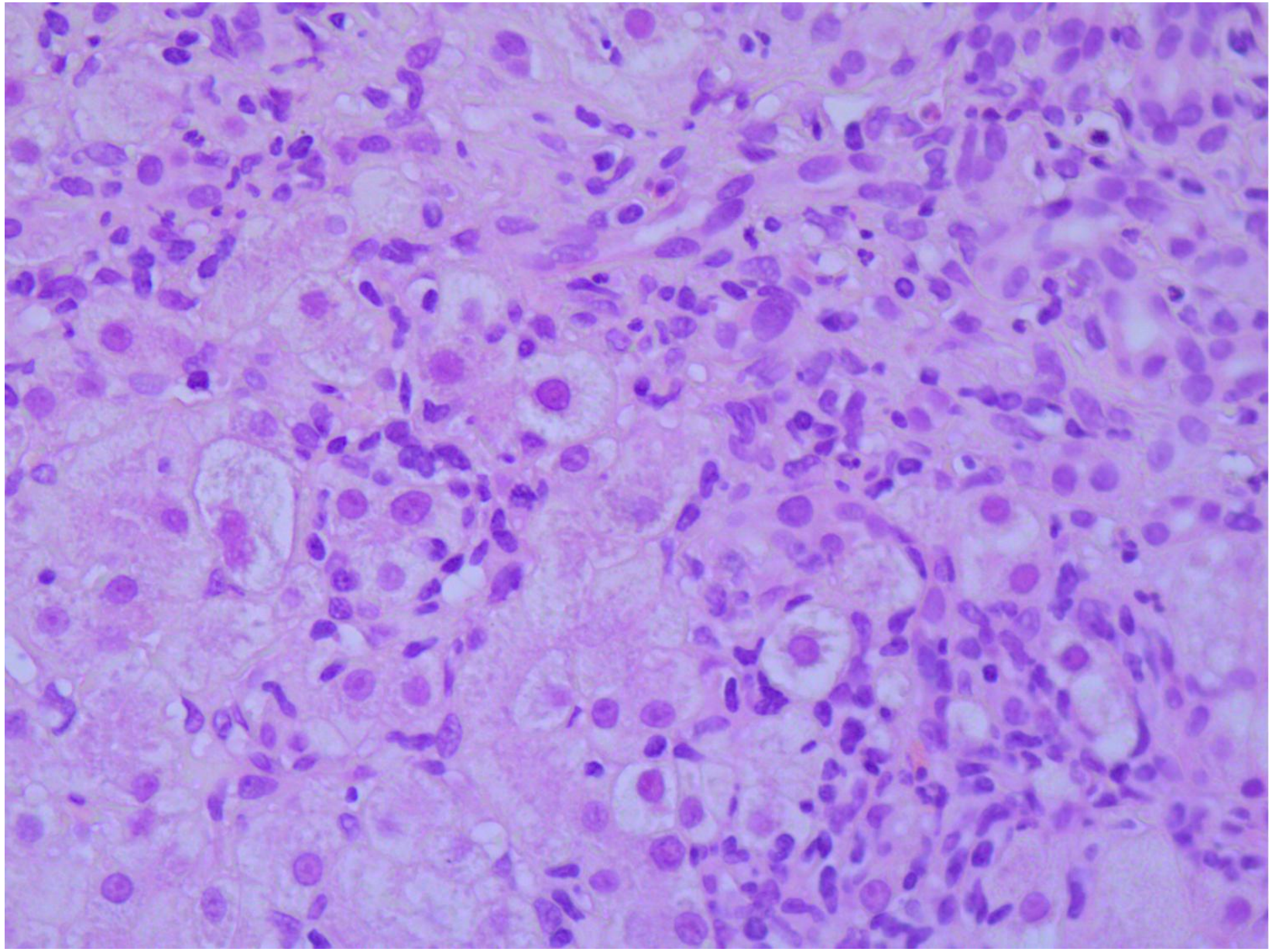



Crea immagini su ChatGPT



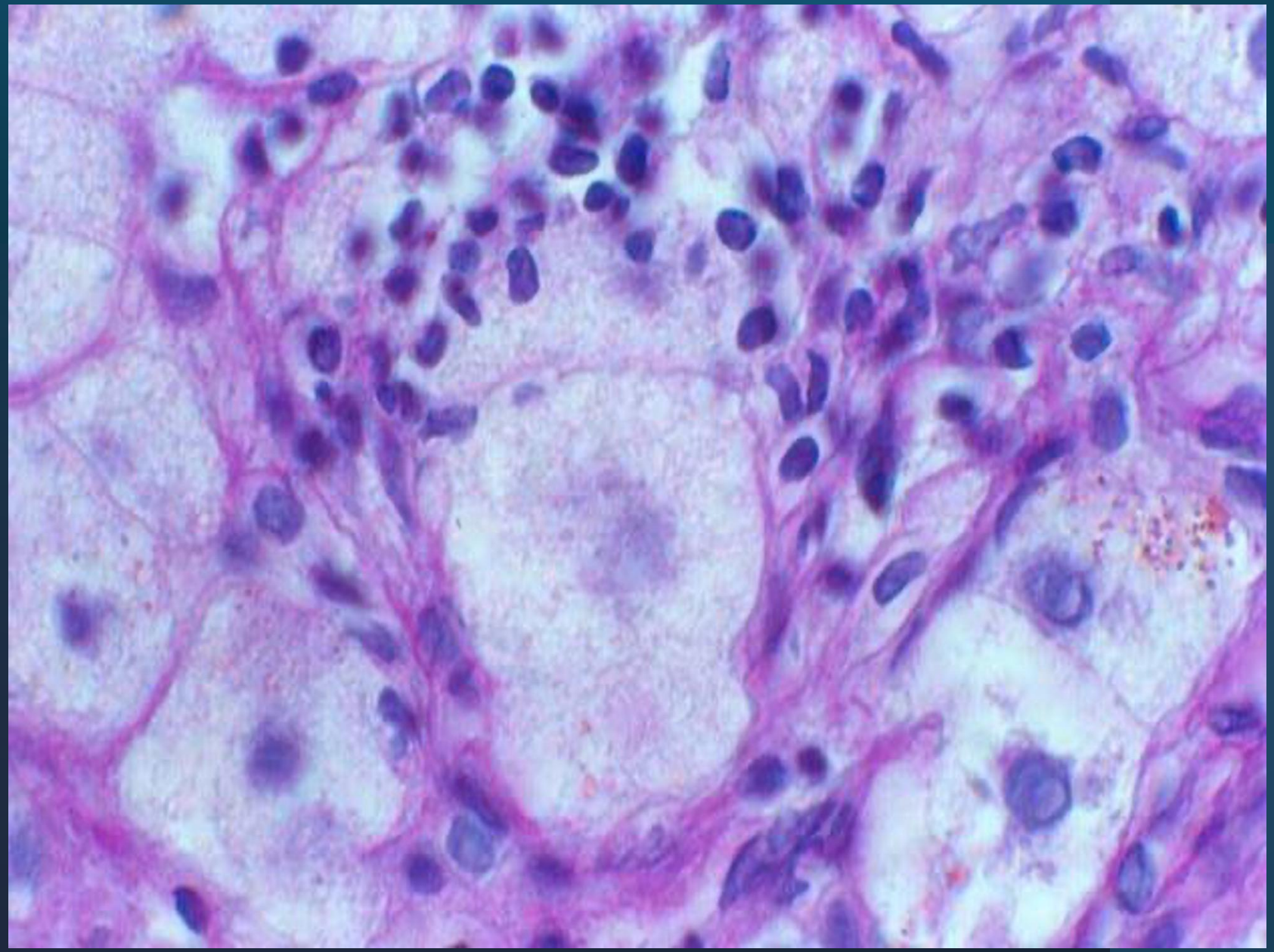
## Severe Ballooning

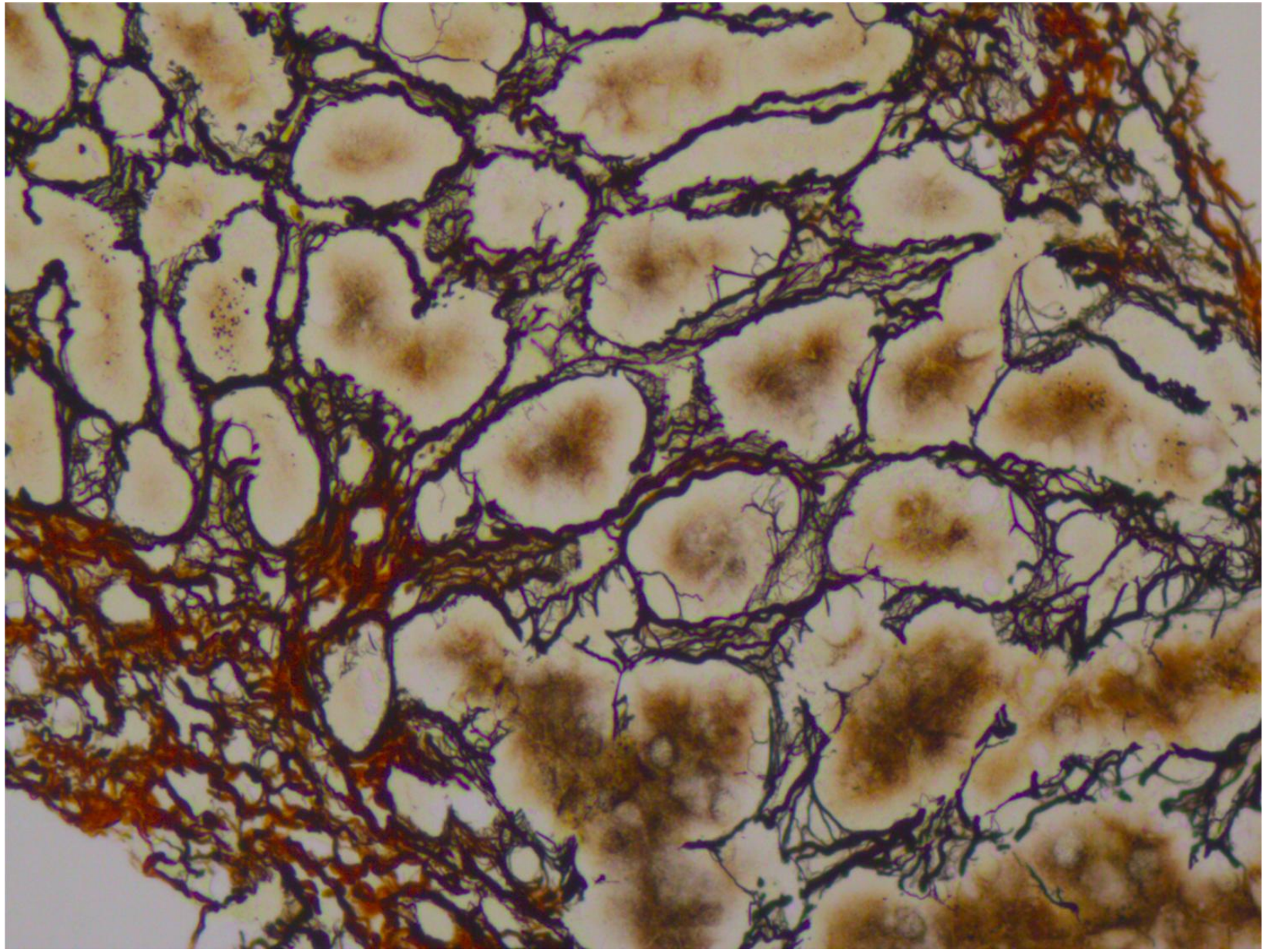




# Balloon Cells

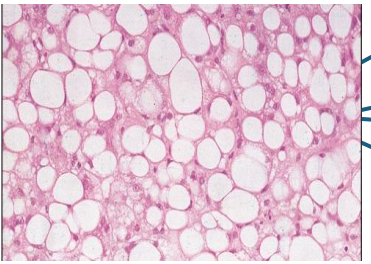
**Ballooning Associated With Lymphocytic Pericellular infiltrate**





**Pericellular fibrosis**

# The natural long-term history of pediatric MASLD remains incompletely defined



MASLD

MASH

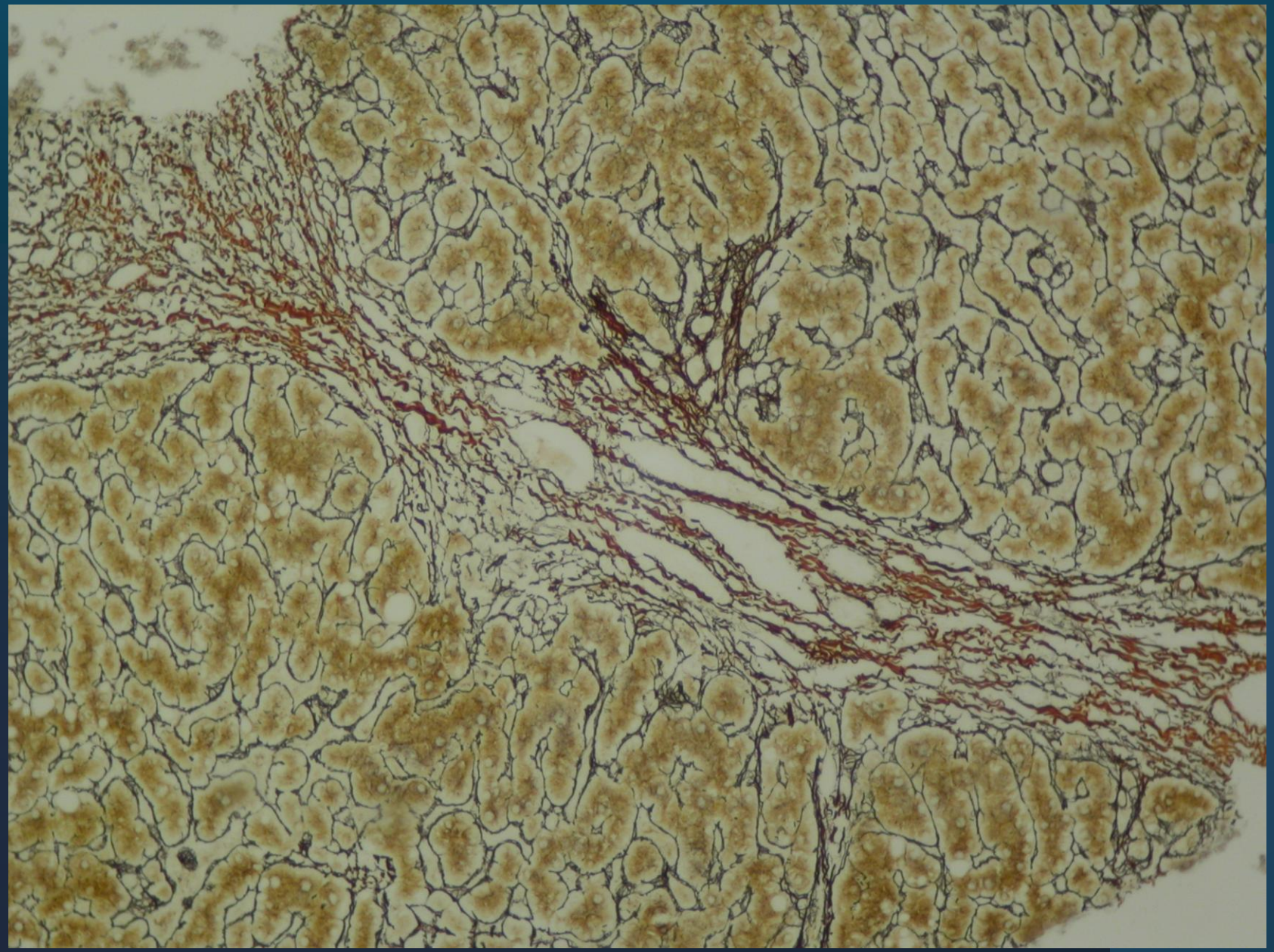
CIRRHOSIS

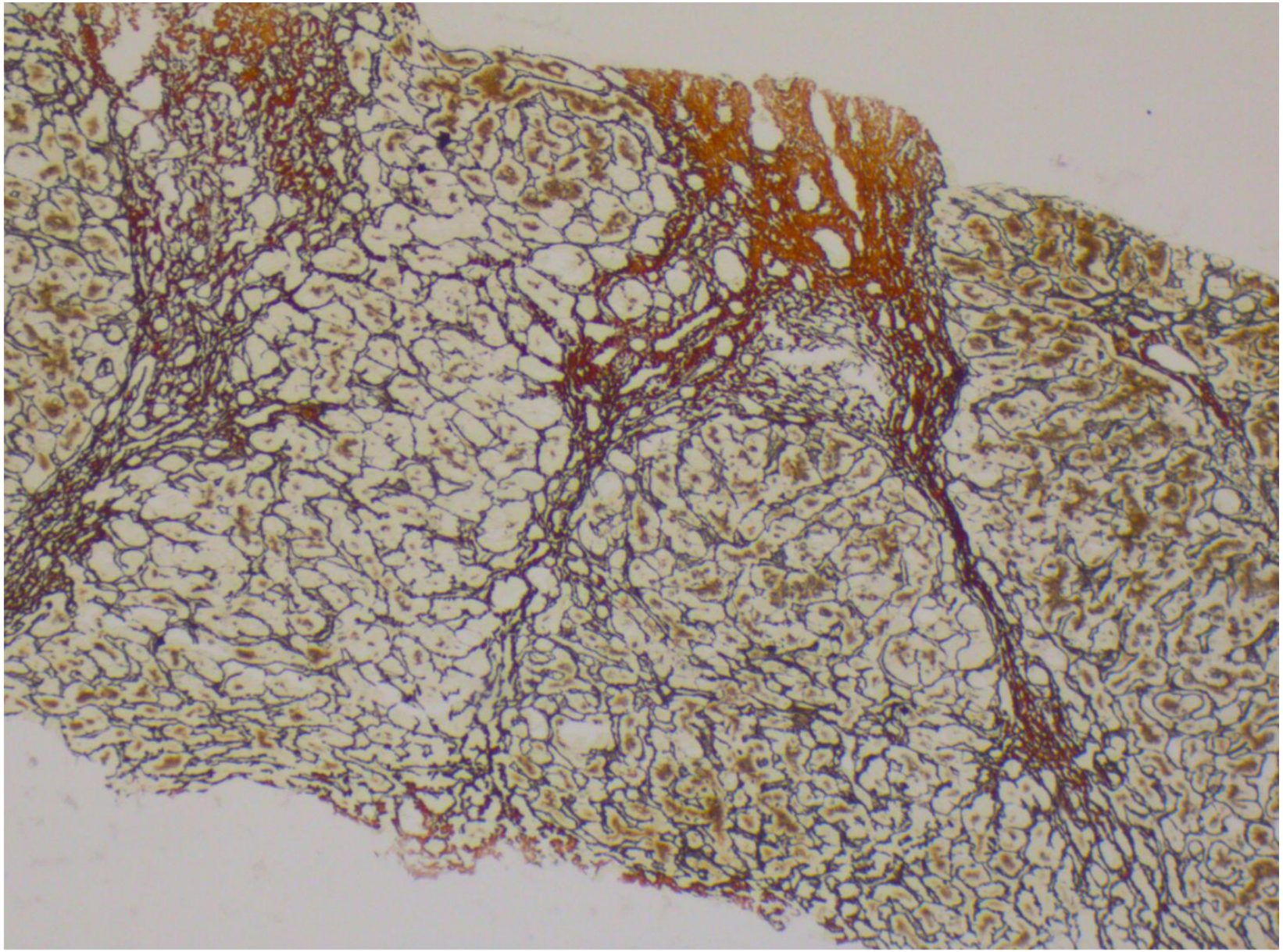
HEPATOCELLULAR CARCINOMA

Newton KP. HEPATOLOGY 2025, 82, 1198-1210
Karm M. Mol Oncol 2025, 19, 275-294.

# Histological signs of MASLD progression in children

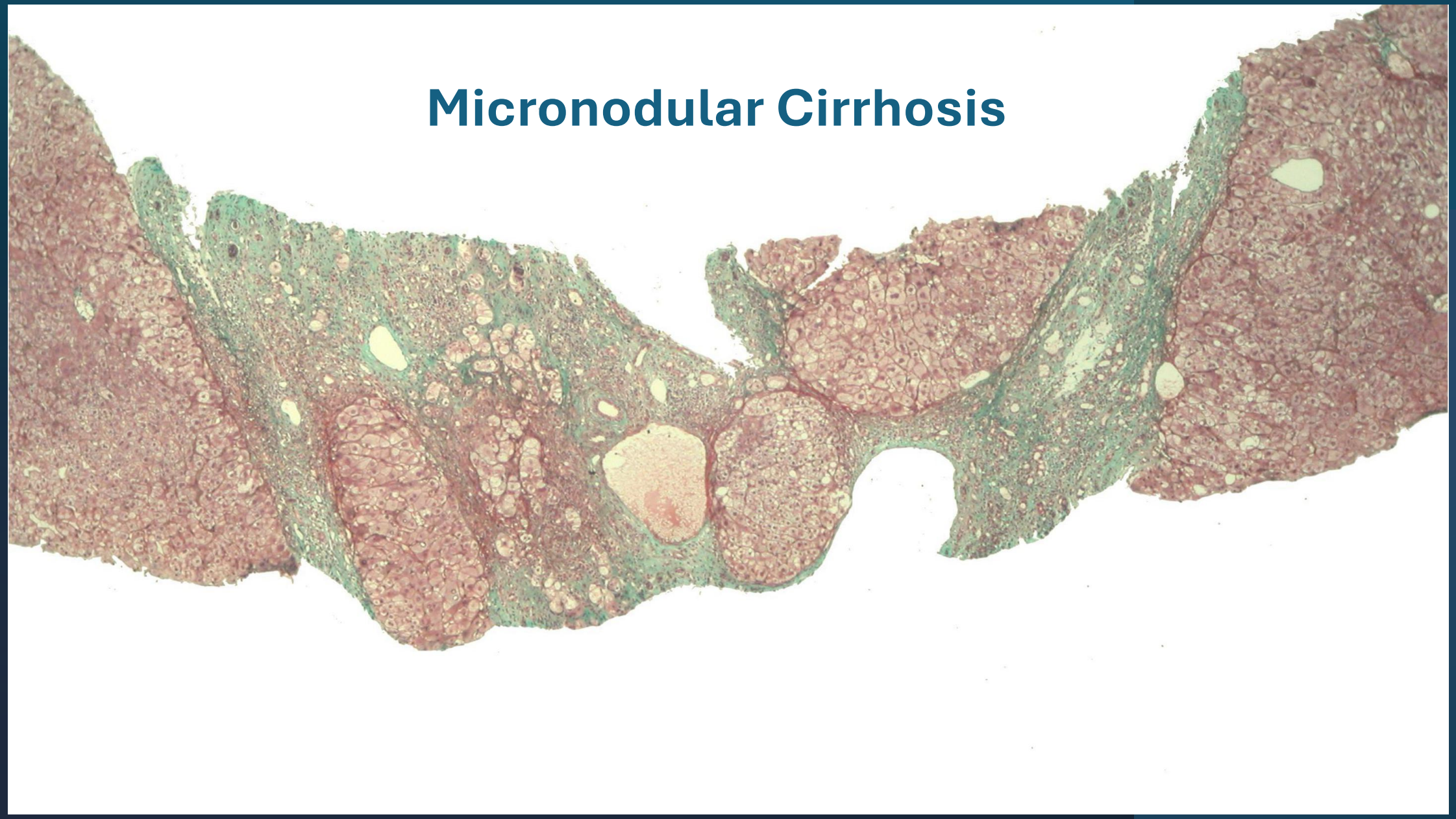
- 1. prevalent periportal steatosis
- 2. presence of portal/periportal inflammation
- 3. presence of periportal fibrosis
- Scoring systems for pediatric MASLD/MASH should be different from those utilized in adults
- Xanthakos SA. Gastroenterology 2020, 159, 1731-1751





# Bridging. Fibrosis

# Micronodular Cirrhosis



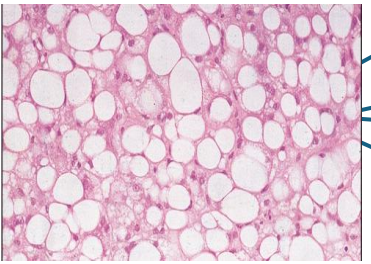
# HCC from MASLD/MASH peculiar features

- With the epidemic of obesity, MASLD is estimated to become the most prevalent etiology of HCC

- NAFLD-HCC has distinct features
- 1. 50% occur in the absence of cirrhosis
- 2. in associated with loss of CD4+ lymphocytes (the cells utilized for immune
- 3. Diminished response to immunotherapy (immune checkpoint inhibitors)
- 4. Fat storage in tumor cells
- 5. Ballooned tumor cells
- Mallory-Denk bodies in peritumoral hepatocytes

- Fijiwara N. Cancer Science 2023, 114, 3825-3833

# The natural long-term history of pediatric MASLD remains incompletely defined



MASLD

MASH

CIRRHOSIS

HEPATOCELLULAR CARCINOMA

Who will progress to NASH?

Who will progress to Cirrhosis?

Who will develop HCC?

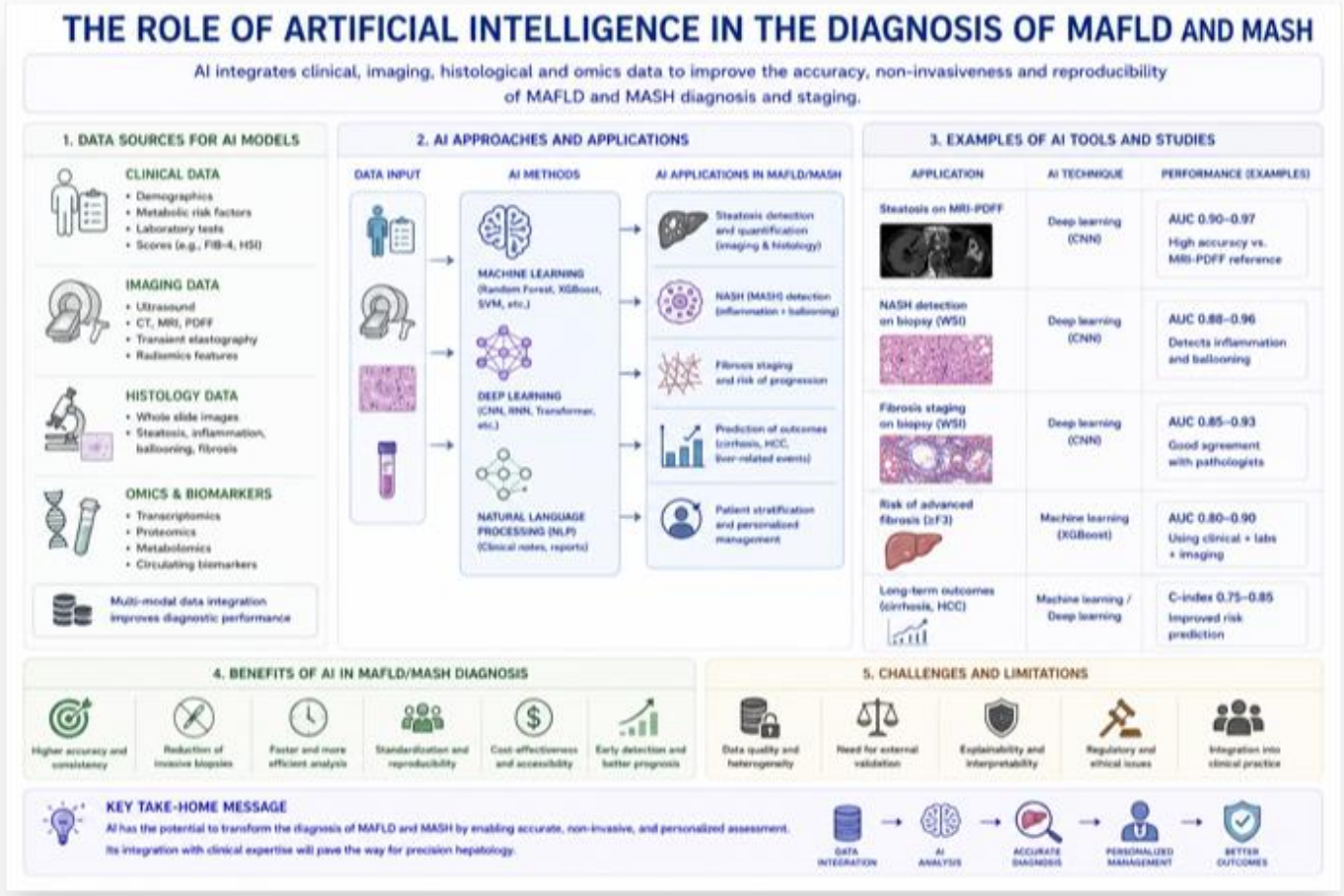
Who will remain stable With liver steatosis?

Newton KP. HEPATOLOGY 2025, 82, 1198-1210
Karm M. Mol Oncol 2025, 19, 275-294.

# DeepLiverNet

# BiLSTM

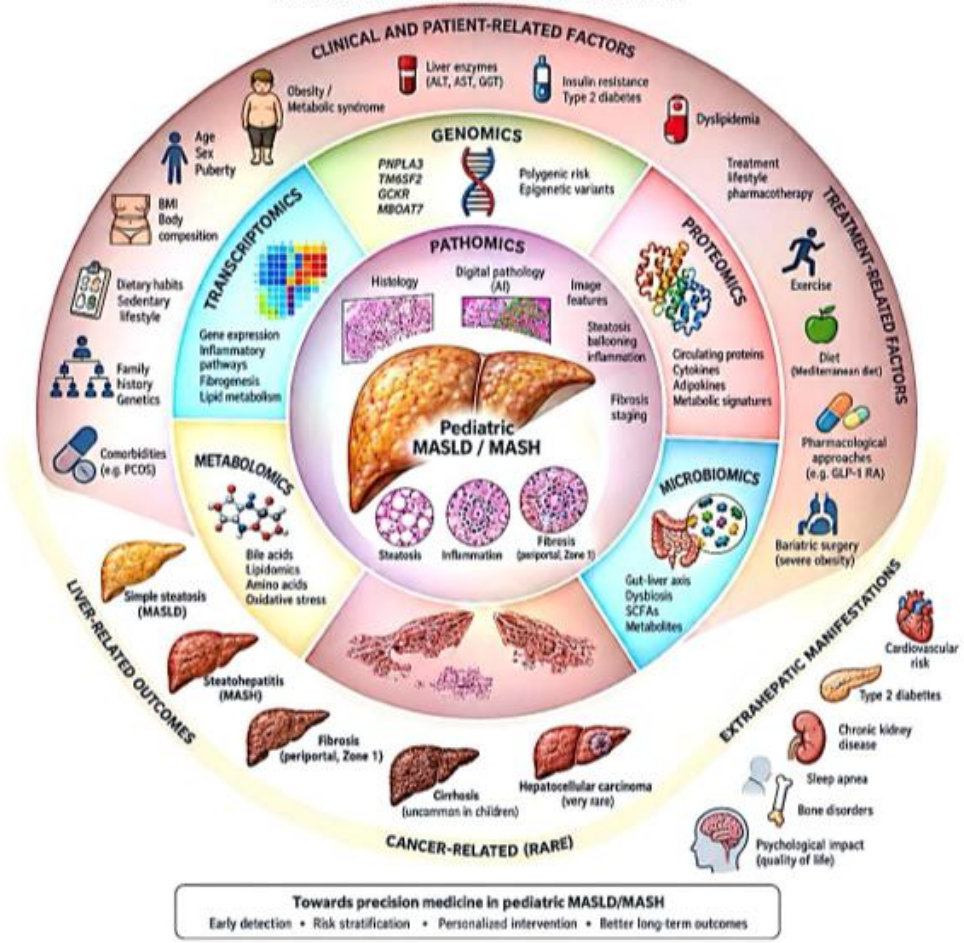
Immagine




Crea immagini su ChatGPT

# Pediatric MASLD and MASH

## A multi-omics and clinical overview

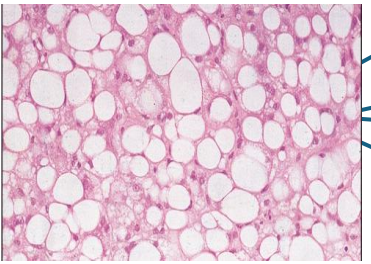



**Towards precision medicine in pediatric MASLD/MASH**

Early detection • Risk stratification • Personalized intervention • Better long-term outcomes

Scanned with CamScanner

# The natural long-term history of pediatric MASLD remains incompletely defined



MASLD

MASH

CIRRHOSIS

HEPATOCELLULAR CARCINOMA

**AI models can stratify Patients with simple steatosis**

Sarkar S. Gastro Hep Adv 2024,3, 498-505.

# AIM-MASH Algorithm  24.04.2025

- First to be approved by the European Medicines Agency (EMA) for liver biopsy analisys **in clinical trials**
- A promising useful tool to assist pathologists in the accurate, quantitative assessment of key histopathological features in MASLD/MASH
    - Steatosis
    - Bellooning
    - Lobular inflammation
    - Periportal inflammation
    - Portal/periportal fibrosis
    - Bridging fibrosis

Pulaski H. Nature medicine 2025, 31, 315-322

# Major challenges halting the integration of AI-driven models into clinical practice

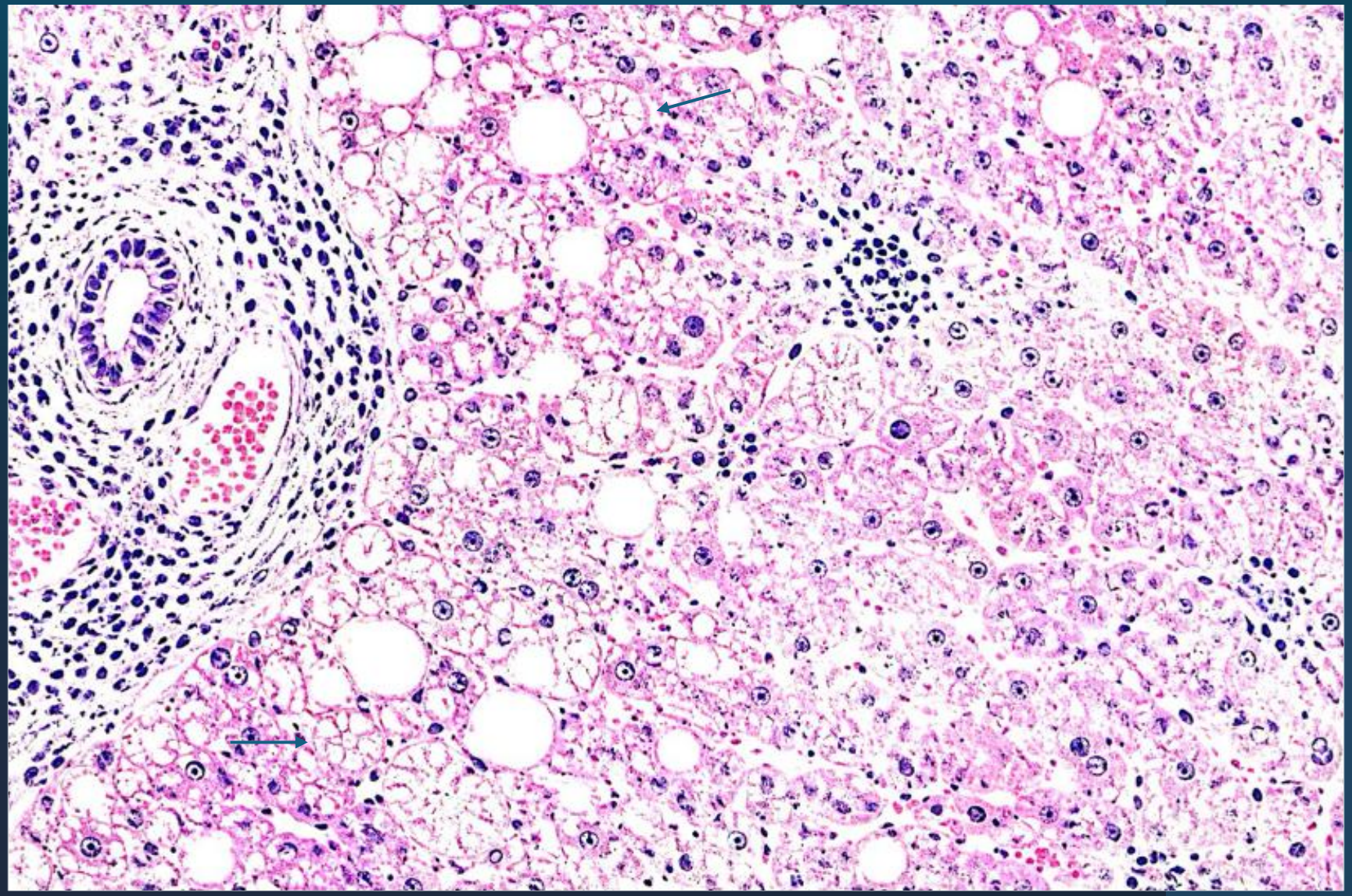
- 1. Black-box nature of algorithms
- 2. algorithmic biases
- 3. the risk of errors in prediction
- 4. the risk of misclassification
- 5. Hallucinations
- 6. Issues related to data management and privacy




- Pugliese N. How AI is shaping the future of liver care
- Cancers 2025, 17, article number 722

**Prompt:**

**MASLD Histology Image**



Scanned with CamScanner

# HALLUCINATION

# Conclusions

| | |
|---|---|
| Algorithms should be: | Well developed with MASLD experts involved<br>Well-trained<br>Well validated |
| AI models may represent a major advantage | in the interpretation of liver biopsy specimens, ultrasound images and MRI images<br>In the stratification of high-risk and low-risk children for developing severe liver diseases in pediatric obese patients |

# Conclusions

- The application of AI models in pediatric MASLD/MASH remains largely investigational.
- Most AI models have been developed and validated in adult populations
- Studies on multicenter large pediatric datasets are needed
- **The involvement of MASLD experts, including pediatricians, pathologists and radiologists, is mandatory for a better training of AI-driven models**


- Faa G, Fanos V. Pediatric obesity-associated MASLD: which role to AI?
- Gastroenterology Insights 2026 (August) 17, article number 53.

gastroenterology insights

MDPI

*Review*

# Pediatric Obesity-Associated Liver Disease: What Role Does Artificial Intelligence Play in Metabolic Dysfunction-Associated Steatotic Liver Disease?

Gavino Faa [1,2], Matteo Fraschini [3], Andrea Faa [1], Monica Piras [1,*], Mara Lastretti [4], Marco Piludu [5], Angelica Dessì [6] and Vassilios Fanos [6]

