

Photo courtesy of Catherine Hagen, MD

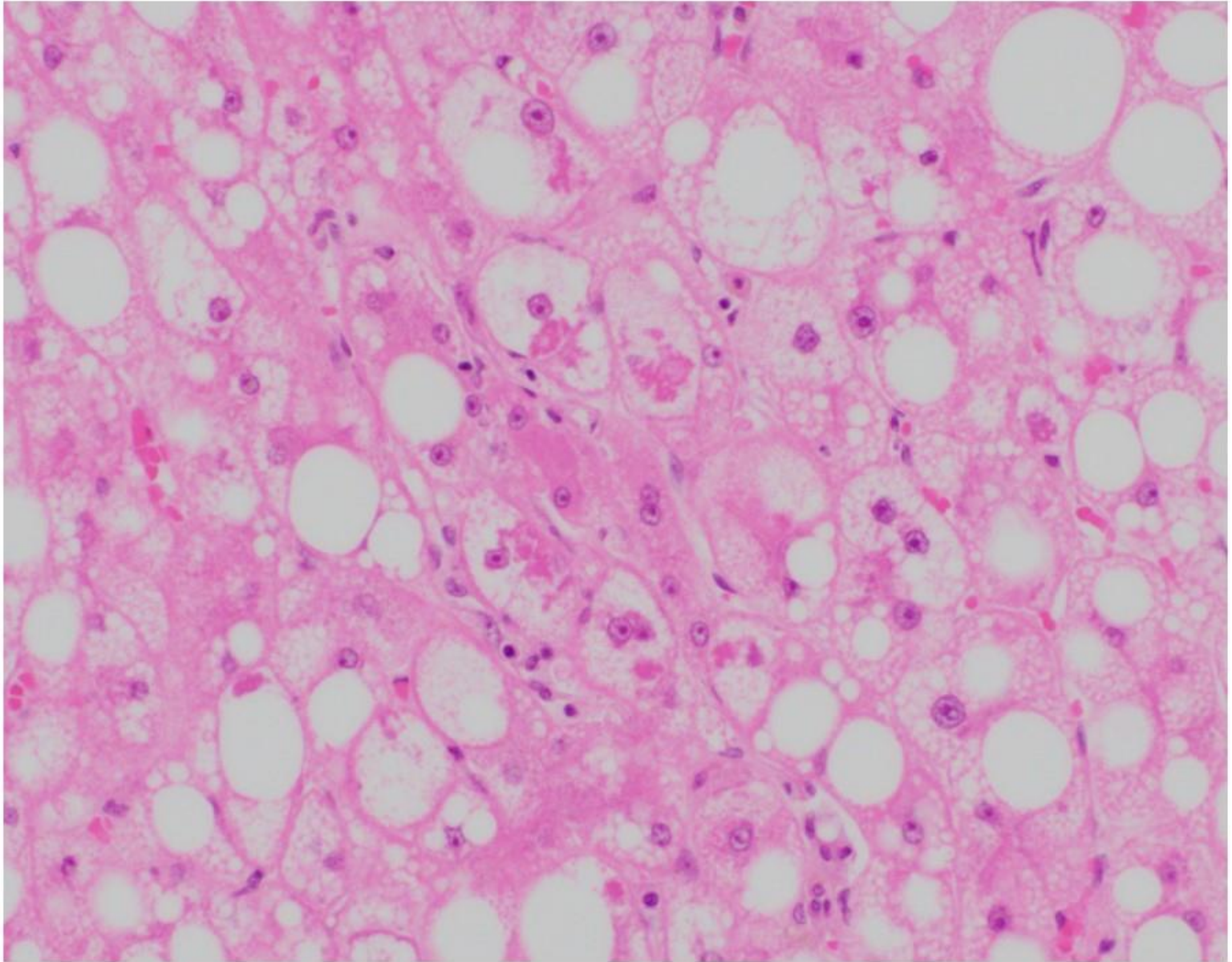
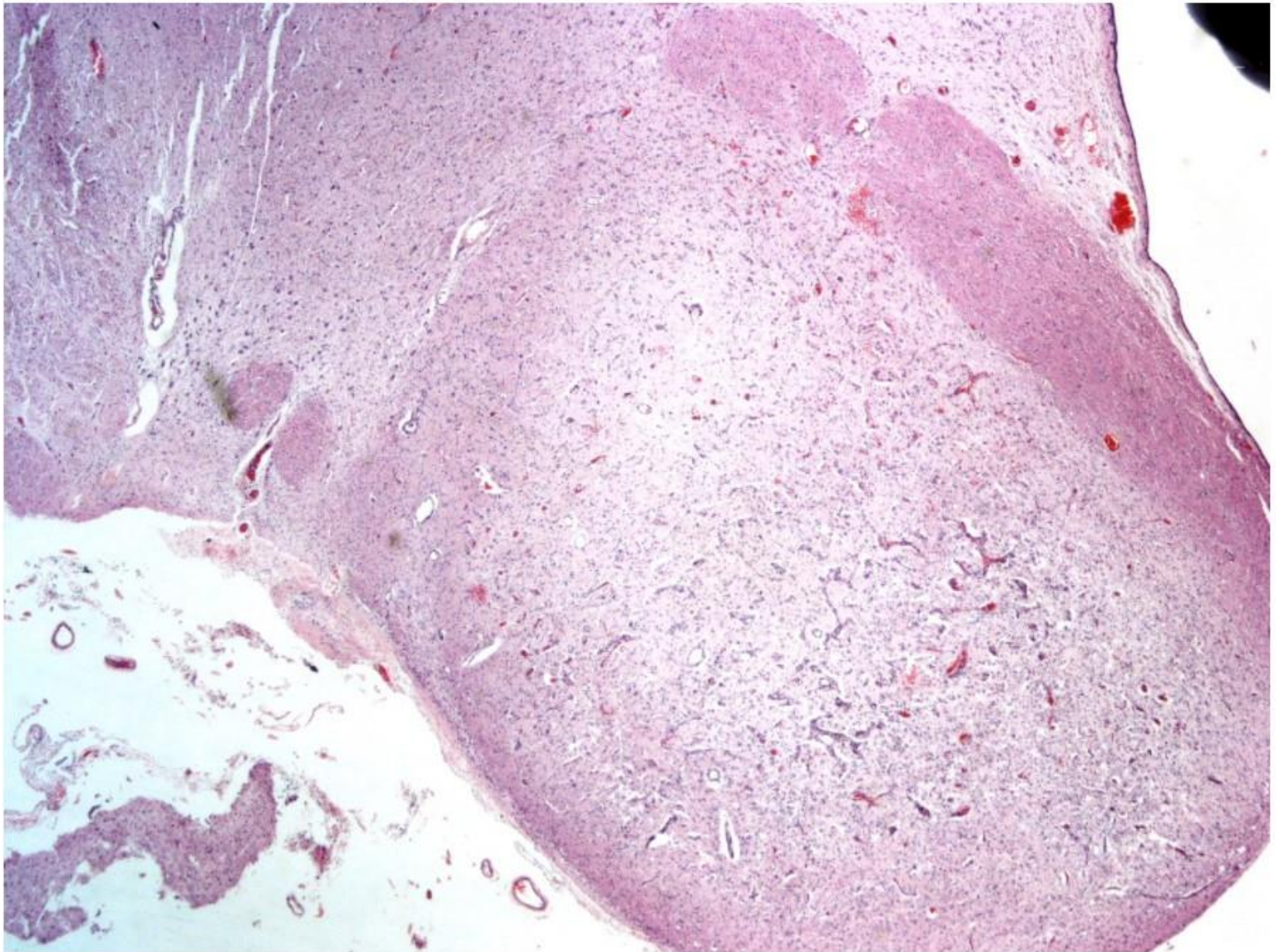
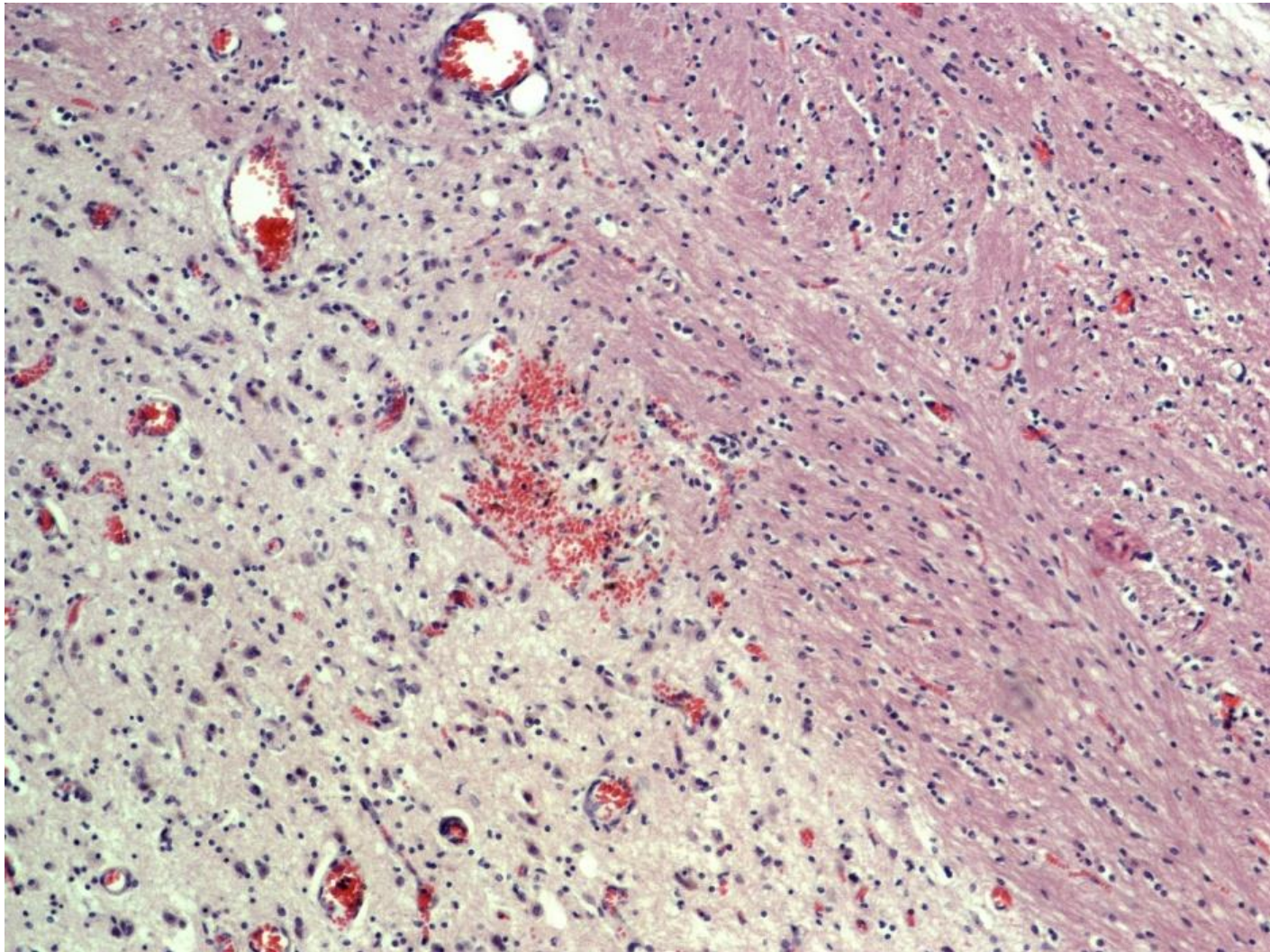


Photo courtesy of Charles Cantanese, MD

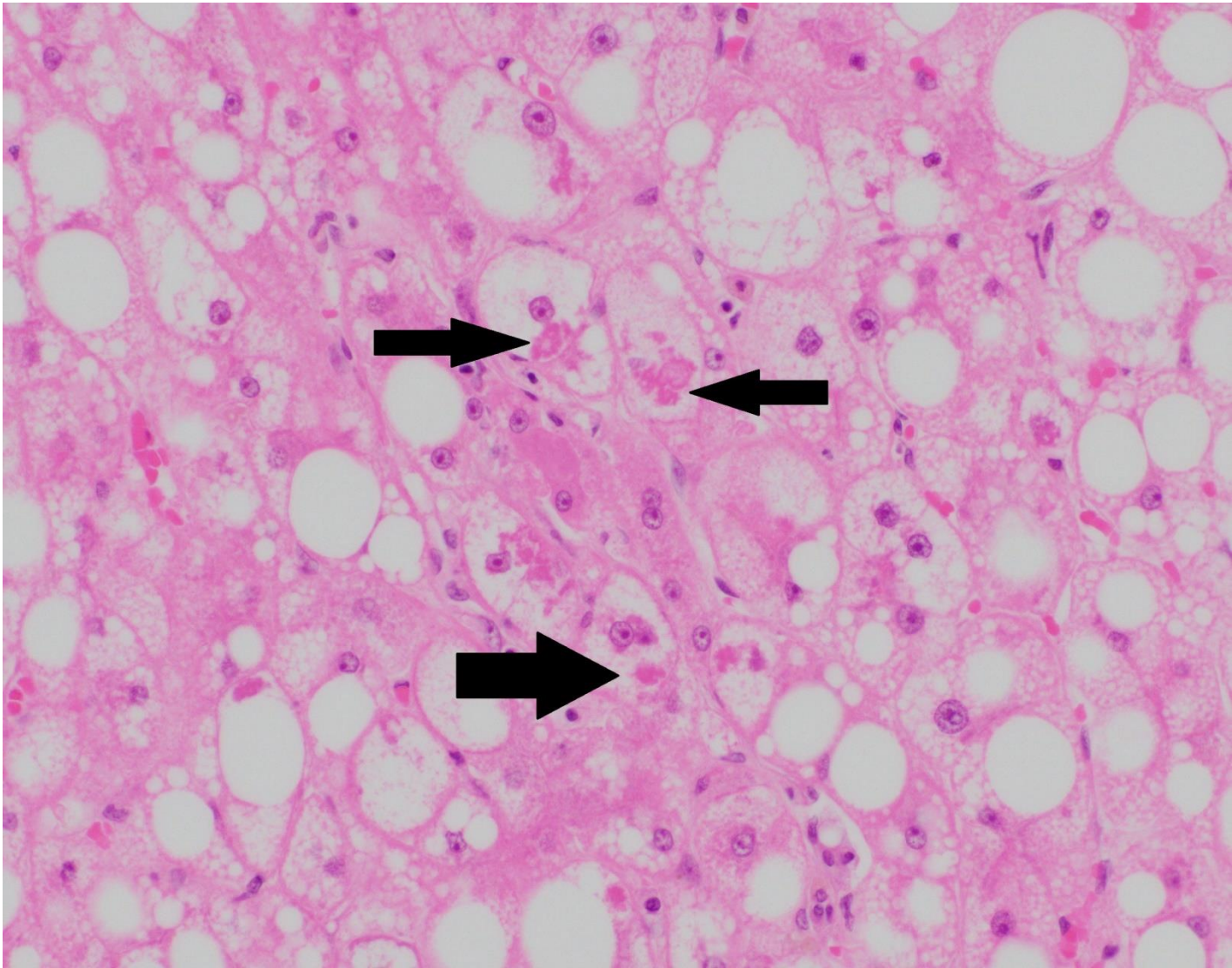


1. A 45 year-old male with no known medical history was found deceased in a hotel room after being described as "acting a bit crazy." The brain and liver findings are most consistent with:

- Morbid obesity
- Opioid use disorder
- Petrochemical insufflation ("huffing")
- Benzodiazepine use disorder
- Alcohol use disorder



Mamillary body with intraparenchymal hemorrhage



Mallory hyaline (arrows)

A. Morbid obesity (1.91% responses)

Excess adiposity can cause many metabolic and anatomic changes including the development of type 2 diabetes, hyperlipidemia, hypertension, non-alcoholic fatty liver disease, vasculopathy, and osteoarthritis. Morbid obesity alone is not associated with Wernicke encephalopathy nor Mallory hyaline formation.

B. Opioid use disorder (3.18% of responses)

Opioid use disorder can cause death due to arrhythmia, pulmonary edema, and multi-organ failure. Use of unclean needles can introduce HIV and staphylococcal/streptococcal infections, and lead to hepatitis and cirrhosis. Ischemic hepatitis (shock liver) characterized by softening, mottled appearance, congestion, hemorrhage, and necrosis may be observed. While Wernicke encephalopathy is not typically associated with opioid use disorder, Mallory hyaline formation may be observed less commonly with hepatitis.

C. Petrochemical insufflation ("huffing") (32.17% responses)

Huffing refers to inhaling different volatiles in products such glue, gas, paint, and solvents. Some of these substances such as toluene can metabolize into benzoic acid to cause acidosis and renal failure. Wernicke encephalopathy is not typically associated with huffing, and exposure to these substances rarely leads to Mallory hyaline formation.

D. Benzodiazepine use disorder (4.46% responses)

Benzodiazepine use disorder is not expected to cause liver damage unless through shock and multiorgan failure. Brain damage may occur with exceedingly high doses leading to hypoxic injury or from seizures due to benzodiazepine withdrawal. These events, however, are not associated with Wernicke encephalopathy nor Mallory hyaline formation.

E. Alcohol use disorder (Correct answer, 58.28% responses)

The brain shows classical anatomic findings of Wernicke encephalopathy with foci of extravasated blood (see new attached image) and necrosis in the mamillary bodies caused by thiamine deficiency, and clinically manifested by psychosis and ophthalmoplegia. Brain damage caused by lack of thiamine is common in people who have alcohol use disorder. The liver shows marked steatosis and Mallory hyaline (tangled, degraded skeins of intermediate filaments) within damaged hepatocytes often seen in alcohol use disorder. Some Mallory hyaline is marked with arrows on the second attached image.

References:

1. Margeta M, Perry A. The central nervous system. In: Kumar V, Abbas AK, Aster JC, Turner JR. Robbins and Cotran Pathologic Basis of Disease, 10th ed. Philadelphia, PA: Elsevier; 2021: 1291.
2. Gill RM, Kakar S. Liver and gallbladder. In: Kumar et al, 842-846.