

Liver donor organ evaluation

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Protocols for histologic evaluation of potential donor livers for steatosis and other pathology vary by center. This assessment may be performed by frozen section at the time of organ evaluation, "back-table" or postreperfusion "time-zero" biopsies, or routine biopsy of potential living donors during evaluation for organ donation. Mild mononuclear portal inflammatory cell infiltrates (Fig. 3.1.1), bile ductular proliferation (Fig. 3.1.2), and cholestasis (Fig. 3.1.3) are nonspecific findings and do not preclude successful transplantation.

Hepatic steatosis is assessed as the percentage of the biopsy involved by macrovesicular or "large-droplet" steatosis. In macrovesicular steatosis, one or a few large fat droplets displace the nucleus to the edge of the hepatocyte (Fig. 3.1.4). Frozen section may be used to assess potential graft organs for steatosis because steatosis cannot be reliably assessed by gross evaluation, and moderate or severe steatosis has been associated with increased risk of poor or delayed graft function in some series. There is no uniformly acceptable amount of steatosis, and reported graft and patient outcomes for steatotic livers vary widely. Grafts with less than 30% steatosis are usually considered suitable for transplantation (Fig. 3.1.5), whereas those with greater than 30% (Fig. 3.1.6) or even greater than 60% (Fig. 3.1.7) are less desirable but have been used successfully in some circumstances. Special stains for fat (oil red O) may be used in steatosis assessment but are not required. "Small-droplet" steatosis refers to a single or few small lipid droplets that do not displace the nucleus (Fig. 3.1.8). This finding alone does not adversely impact graft function. Pure microvesicular steatosis is a rare finding that manifests as multiple tiny lipid droplets that surround the nucleus and impart a foamy or vesicular appearance to the hepatocyte cytoplasm (Fig. 3.1.9). Pure microvesicular steatosis likely represents an agonal or ischemic change that does not impact graft function.

Extended-criteria grafts do not meet standard donation criteria due to factors that increase the risk of early graft failure or predispose to inferior graft or patient survival. Examples include steatotic livers, livers harvested after cardiac death, and organs from hepatitis-C-positive donors (Fig. 3.1.10) or donors of advanced age. These organs are offered to patients who will not, or likely will not, receive a standard criteria graft due to advanced donor age, tumor burden, or low graft availability. Frozen sections may be performed to assess these organs for advanced scarring, vascular pathology, or other abnormalities. While precise staging of fibrosis requires a trichrome stain, advanced scarring is generally apparent and can be visualized more easily with use of polarized light. A host of other unusual and unexpected findings, including alpha-1 antitrypsin deficiency, amyloidosis, histoplasmosis, and varying degrees of iron overload (Fig. 3.1.11 and 3.1.12), have also been reported in living and cadaveric donor livers. While a few cases of "recurrent" iron overload have been reported with use of hemochromatotic donor livers, in other reports organs with iron and other pathologies such as alpha-1 antitrypsin deficiency have been used successfully.

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 5. Melin C, Miick R, Young NA, Ortiz J, Balasubramanian M. Approach to intraoperative consultation for donor liver biopsies. *Lab Med*. 2013;137:270-274.
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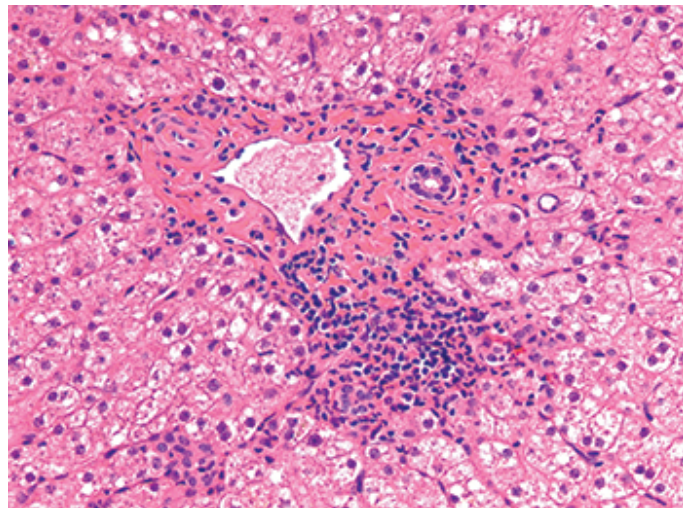


Fig. 3.1.1. Mild portal inflammation. Donor organs may exhibit mild portal inflammation with or without bile ductular proliferation. These changes are common and are not a contraindication to transplantation.

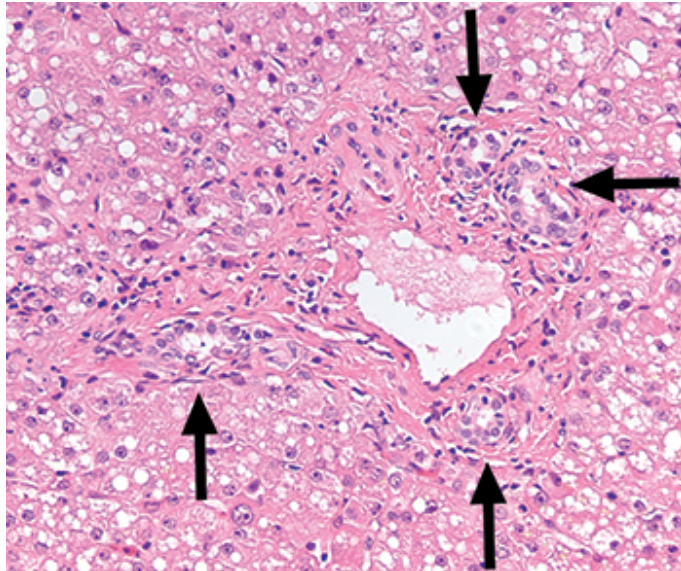


Fig. 3.1.2. Bile duct proliferation. This donor liver biopsy demonstrates several bile duct profiles (arrows) with only one hepatic arteriole. This finding is not a contraindication to using this liver for transplantation.

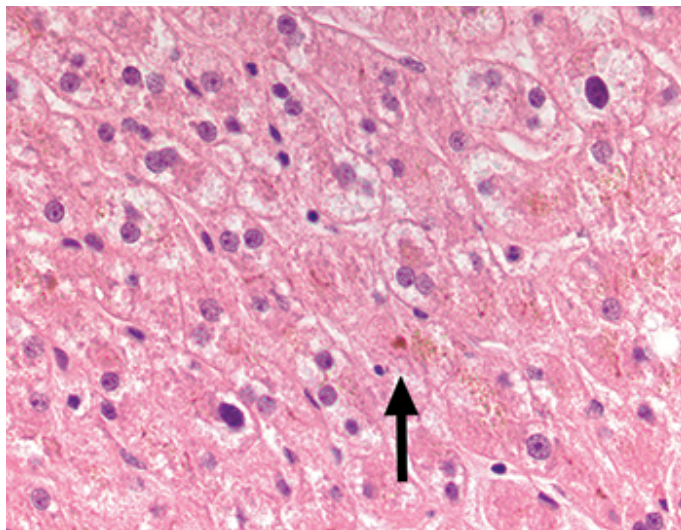


Fig. 3.1.3. Cholestasis. Mild hepatocellular and/or canalicular cholestasis may be seen in a cadaveric donor liver. These changes may be related to circumstances around the donor's demise and are not a contraindication to transplantation.

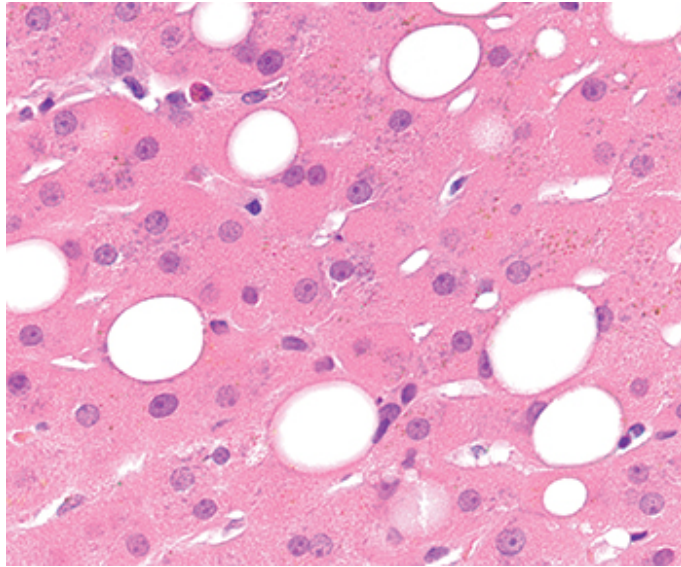


Fig. 3.1.4. Macrovesicular steatosis. In macrovesicular steatosis, one or a few round fat droplets displace the hepatocyte nucleus to the edge of the cell.

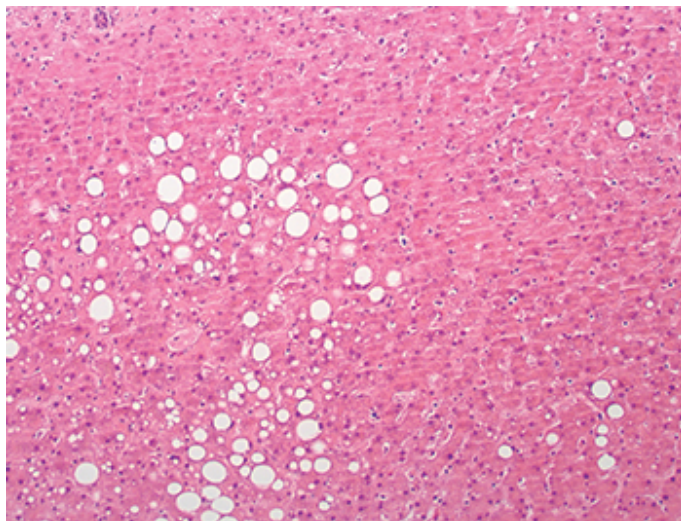


Fig. 3.1.5. Mild macrovesicular steatosis (<30%; frozen section). Cadaveric livers with mild steatosis are widely considered suitable for transplantation.

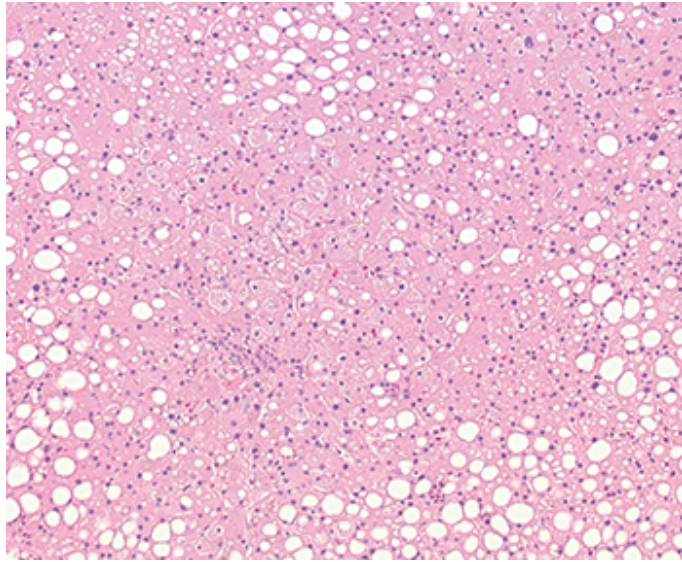


Fig. 3.1.6. Moderate macrovesicular steatosis (30%-60%). Although this liver contains greater than mild steatosis, it may be considered acceptable for use in selected settings.

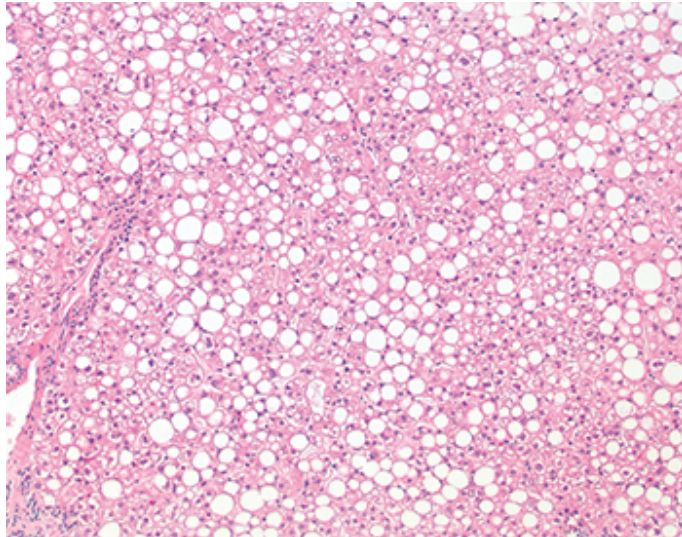


Fig. 3.1.7. Severe macrovesicular steatosis (>60%). This graft was found to be severely steatotic (80% steatosis overall) on routine time-zero biopsy; no frozen section was performed prior to implantation. Although in this case the organ functioned well and the recipient experienced a normal posttransplant recovery, severely steatotic livers would not be used in most settings if detected prior to implantation.

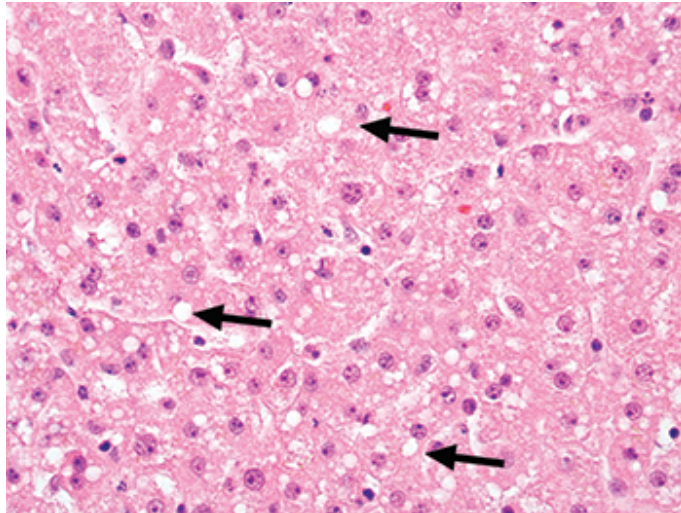


Fig. 3.1.8. Small droplet steatosis. This previously frozen biopsy demonstrates scattered small fat droplets (arrows) that neither fill the cell nor displace the nucleus. These droplets resolve after implantation of the liver and do not impact graft function.

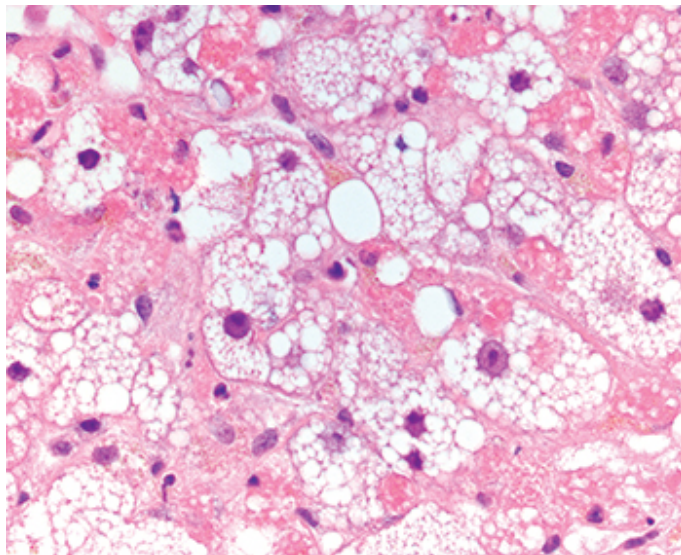


Fig. 3.1.9. Microvesicular steatosis. Numerous tiny fat droplets surrounding the hepatocyte nucleus impart a foamy or finely vesicular appearance to the hepatocyte. This change is rare in livers being evaluated for potential transplantation.

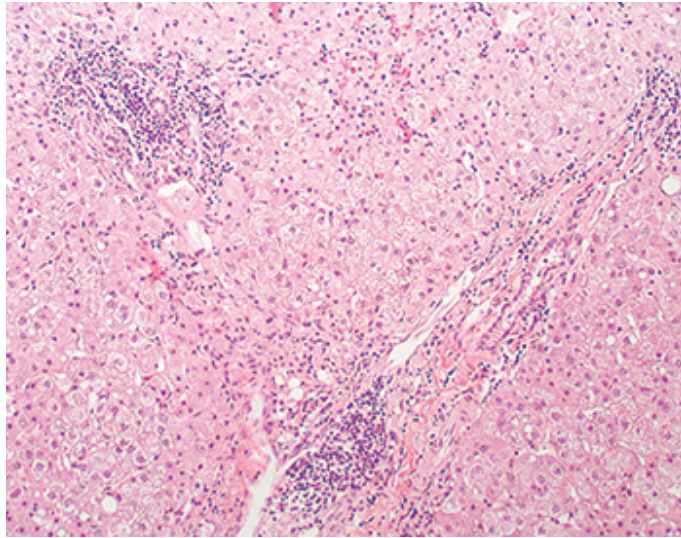


Fig. 3.1.10. Chronic hepatitis. Portal inflammation is seen in this hepatitis-C-positive “extended-criteria” donor. This finding is expected and is not a contraindication to use of this organ in selected clinical settings.

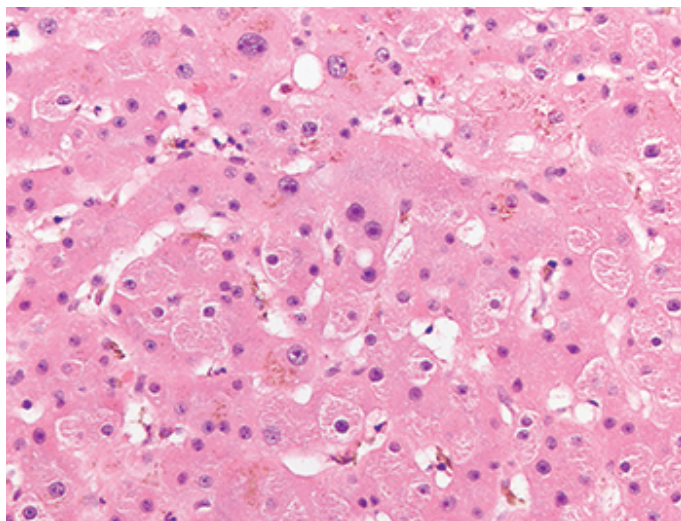


Fig. 3.1.11. Iron overload in donor liver. Hepatocellular and sinusoidal iron pigment is evident on the hematoxylin-eosin (H&E)-stained slide in this donor liver biopsy.

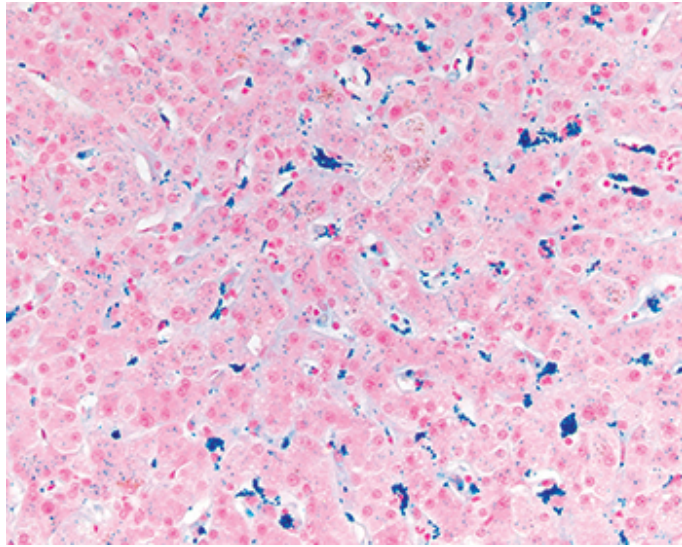


Fig. 3.1.12. Iron overload in donor liver, Prussian blue stain. A Prussian blue stain performed on the biopsy illustrated in Figure 3.1.11 confirms mild iron accumulation in hepatocytes and Kupffer cells.