Autopsy Renal Pathology

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KEYWORDS

• Gross examination • Glomeruli • Tubules • Interstitium • Light microscopy
• Immunofluorescence microscopy • Electron microscopy • Congenital abnormalities

ABSTRACT

We provide an overview of assessment of the kidneys at autopsy, with special considerations for pediatric versus adult kidneys. We describe the approach to gross examination, tissue allocation when needed for additional studies of potential medical renal disease, the spectrum of congenital abnormalities of the kidneys and urinary tract, and approach to cystic diseases of the kidney. We also discuss common lesions seen at autopsy, including acute tubular injury, ischemic versus toxic contributions to this injury, interstitial nephritis, and common vascular diseases. Infections commonly involve the kidney at autopsy, and the key features and differential diagnoses are also discussed.

APPROACH TO GROSS DISSECTION

TISSUE ALLOCATION

In any patient with renal functional abnormalities premortem, or with clinical suspicion of medical renal disease, tissue should be saved and allocated for potential immunofluorescence and electron microscopy (EM) studies. Tissue for immunofluorescence should be taken from the cortex. Pieces should be 2 to 3 mm thick, and approximately 5 × 2 to 3 mm and either directly snap-frozen or placed in Michel transport media. This tissue can then be stored for several days, before freezing for potential immunofluorescence studies. Immunofluorescence microscopy is much less sensitive on tissue that has already been fixed, and therefore it is imperative that fresh tissue is preserved for these studies. In contrast, EM can be done from tissue that has been fixed in any non–mercury-based fixative. For ease of maintaining optimal tissue allocation, we recommend that small rectangular pieces of tissue 2 to 3 mm × 2 to 3 mm be quickly place in glutaraldehyde. It is important that this tissue is cut with a fresh sharp blade on a clean surface, to avoid crushing and contamination of the tissue. The tissue allocated for these EM studies should come from the cortex. In cases in which regional abnormalities are present, the nonscarred and non-necrotic areas should be designated for immunofluorescence and EM studies.

In special circumstances, molecular studies may be indicated. Although DNA mutation analysis is better done from peripheral blood leukocytes or fibroblast-rich tissue sources, additional stains or assessment of specific markers may occasionally be necessary to reach a specific diagnosis. Allocation of tissue depends on the specific test needed, and a specialized reference laboratory should be consulted.

POSTMORTEM ALTERATIONS

The autopsy kidney will always show variable postmortem changes of autolysis. These changes may be minimal in infants, or patients with low body mass with a short postmortem interval, or when the body was quickly cooled. In contrast, even with a relatively short postmortem interval, patients with a high body mass may have kidneys that show extensive postmortem autolysis, due to maintenance of a higher inner core temperature for a longer period of time, as the body does not cool as quickly in this setting. The changes of autolysis consist of pyknosis of tubular epithelial nuclei, retraction and loss of continuity between the tubular epithelium and basement membrane, and degeneration of the tubular epithelium (**Fig. 1**). Although these findings overlap somewhat with those of acute tubular injury (ATI) (see later in this

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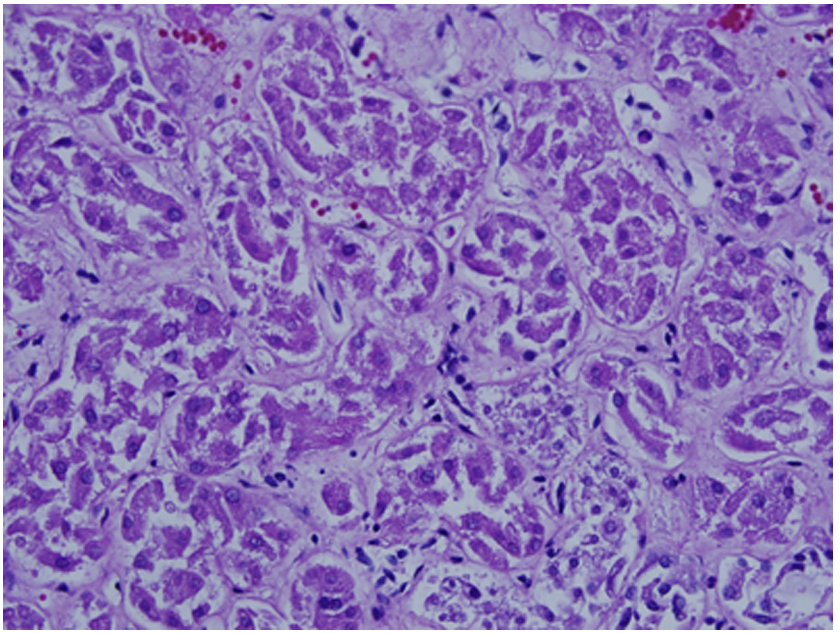

Fig. 1. Autolysis. There is pyknosis of tubular epithelial nuclei, retraction and loss of continuity between the tubular epithelial basement membranes and cells and degeneration of the tubular epithelium (H&E stain, original magnification ×200).

article), they may be distinguished from ATI by the uniform extent of these findings and the similar appearance of pyknotic changes of nuclei in other anatomic compartments of the kidney. Thus, in ATI, the proximal tubules are preferentially affected, whereas in postmortem injury, all of the nuclei have a similar pyknotic appearance and all of the tubules show similar degenerative changes. Regenerating changes of flattened epithelium (**Fig. 2**) and mitotic figures also distinguish ATI from autolysis.

MEDICAL RENAL DISEASES

A variety of medical renal diseases may be present in the autopsy kidney, most often clinically known before death. Comparison with any renal biopsies done antemortem is useful in determining

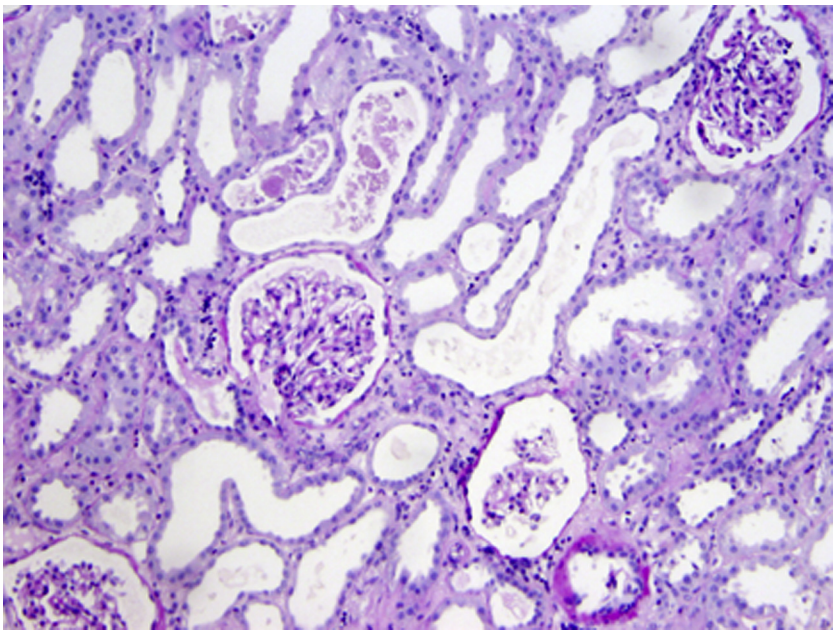

Fig. 2. Regenerative acute tubular injury. The proximal tubules are preferentially affected. Regenerating changes of flattened epithelium also distinguish ATI from autolysis (PAS stain, original magnification ×200).