The Growing Challenge of Inadequate Kidney Biopsies: Quantifying the Problem and Impact to Nephropathology Practice

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Background

A kidney biopsy is critical for the diagnosis and management of medical renal disease, yet biopsy adequacy has become a significant problem. The number of biopsies <10 glomeruli by light microscopy has markedly risen, with a frequency of 1% in 2005, 13% in 2018, and had continued to increase. An adequate biopsy is standard of care with sufficient tissue for an accurate diagnosis, treatment and prognostic information, and ancillary studies. Here, we characterize biopsy adequacy from a consecutive cohort of 82,919 cases.

Methods

Kidney biopsy data (including glomerular counts, percent cortex, and ancillary studies) from cases received from 2020-2024 were evaluated from a biopsy database at Arkana Laboratories (n=82,919, comprising 69,808 native and 13,111 transplant cases). There are no established criteria for adequacy for native kidney biopsies, however, multiple pathologic scoring systems require approximately 10 glomeruli for assessment. Therefore, we define an adequate biopsy as having ≥10 glomeruli by light microscopy and ≥5 glomeruli for immunofluorescence (IF). We evaluated the frequency of inadequate biopsies by type, demographics, utilization of ancillary studies, and residence in health professional shortage areas (HPSAs). Chi-Square analysis was used to compare differences.

Results

Of 82,919 biopsies, 34,562 were inadequate (41.7%). There was a similar rate of inadequacy within native and transplant cases (41.8 vs. 41.3%, p=0.87). There was a slight increase in inadequate biopsies in males (42.3 vs. 41.0%, p<0.0001), and lower rates of inadequate biopsies among children than adults (34.0% vs. 42.0 %, p=0.0029). There was no impact of residence in HPSA zip codes (68.4% vs. 68.4%, p=1.0).

Inadequate biopsies were more often deep with <50% cortex (40.5 vs. 7.5%, p<0.0001), within both native and transplant cases. There was a significant increase in utilization of salvage studies, including deeper tissue sections (18.2% vs. 6.4%, p<0.0001) or paraffin IF (23.6% vs. 9.8%, p<0.0001). There were significantly more inadequate cases without electron microscopy (16.1% vs. 5.9%, p<0.0001).

Conclusion

Inadequate kidney biopsies are increasingly common in both the native and transplant setting, resulting in limitations in diagnosis and increased healthcare costs.

Category: Pathology and Laboratory Medicine (1800)

Keywords: Kidney biopsy, biopsy adequacy

Funding Sources: None