



Validation and Utility of Telepathology for Immediate Intraoperative Consultation of Donor Kidney



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Introduction:

The immediate intraoperative or bedside evaluation of donor kidneys is a critical step in the procurement of organs for donation. Review by a qualified transplant pathologist poses issues for most medical centers. Telepathology systems enable the electronic transmission of whole slide images for review by a transplant pathologist located at a remote site. We evaluated and validated the use of telepathology for assessment of donor kidneys.

Design:

We retrospectively reviewed 25 donor kidney cases with 40 total biopsies. Briefly, intraoperative frozen sections of donor kidneys were prepared and stained with H&E and scanned at 20x using an Aperio CS2 ScanScope®. Scanned whole slide images were interpreted by a transplant pathologist at a remote site. Biopsies were evaluated for: 1) glomerulosclerosis, 2) tubulo-interstitial disease (atrophy, inflammation, and fibrosis), and 3) vascular disease (intimal hyperplasia and arteriolar hyalinosis). The same 40 biopsies were then evaluated by the same pathologist using conventional light microscopy. The results from the telepathology and light microscopic interpretations were compared.

Numerical values were assigned using a recognized scoring system (Remuzzi et al, 1999). The number of globally sclerosed glomeruli were expressed as a percentage. A difference of 5% was interpreted as clinical significant. Vascular disease was graded as absent, mild, moderate, or severe and was assigned a score of 0-3, respectively. Similarly, the degree of tubular atrophy and interstitial fibrosis was assessed as absent, <20%, 20-50%, or >50% and subsequently scored from 0-3, respectively.

Statistical analysis was performed using a McNemar's chi-squared test.

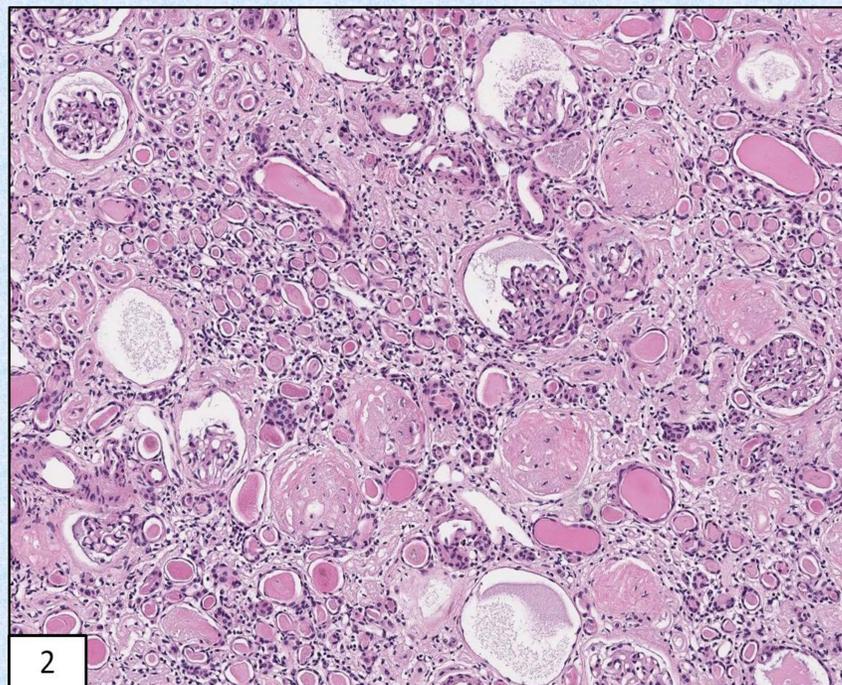
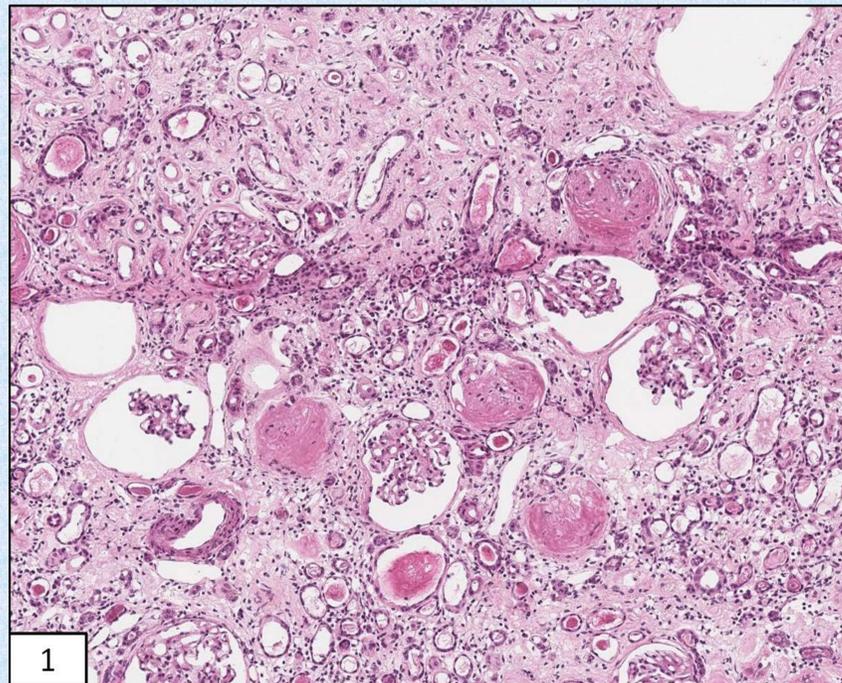


Figure 1, light microscopy; **Figure 2**, scanned image using Aperio CS2 ScanScope® of the same biopsy. (H&E, 10X)

Results:

We observed significant correlation between light microscopy and telepathology. Fifteen percent (6/40 cases) showed a discrepancy in the percentage of glomerulosclerosis (> 5%) identified by telepathology versus light microscopic interpretation. Of these, two cases showed a greater percentage of sclerosed glomeruli examined by light microscopy and four cases showed a greater percentage of sclerosed glomeruli by telepathology. Twenty five percent of cases (10/40) showed a discrepancy in the degree of vascular disease, with light microscopy showing greater disease in five cases and telepathology showing greater disease in five cases. Only one percent (4/40) of cases showed a difference in tubulo-interstitial disease, with three cases showing greater disease as assessed by light microscopy and one case showing greater disease as assessed by telepathology. The corresponding p-values showed no statistically significant difference (Table 1).

Glomerulosclerosis	Scanner (+)	Scanner (-)	Total
Light microscopy (+)	34	2	36
Light microscopy (-)	4	0	4
Total	38	2	40
			P value: 0.68
Vascular disease	Scanner (+)	Scanner (-)	Total
Light microscopy (+)	30	5	35
Light microscopy (-)	5	0	5
Total	40	5	40
			P value: 0.72
Tubulo-interstitial disease	Scanner (+)	Scanner (-)	Total
Light microscopy (+)	36	3	39
Light microscopy (-)	1	0	1
	37	3	40
			P value: 0.21

Table 1. Abbreviations: LM = light microscopy (gold standard); Scanner =telepathology; TID = tubulo-interstitial disease; GS = glomerulosclerosis; VD = vascular disease. +/+ = LM and scanner show no difference ; LM +/-Scanner = LM shows greater disease than scanner; LM -/Scanner + = scanner shows greater disease than LM

Conclusions:

No statistically significant difference was identified when comparing the degree of glomerular, tubulo-interstitial and vascular disease using conventional light microscopy versus telepathology. This study provides evidence that telepathology is as accurate as light microscopy in evaluating donor kidneys. And, it provides relatively easy access to qualified transplant pathologists.