Kidney Ultrastructure by Atomic Force Microscopy Imaging Directly From Formalin Fixed-Paraffin Embedded Biopsy: Is This a Dream Come True?

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The golden years of transmission electron microscopy in basic sciences and daily diagnostics were from 1950 to 1980. A plethora of new information about the structure of cells was coupled to and followed by biochemical, clinical, and functional studies. Immunohistochemistry, immunofluorescence, and other modern techniques in diagnostic pathology are growing; however, electron microscopy and ultrastructural studies remain pivotal in kidney pathology. Atomic force microscopy (AFM) is a powerful tool able to evaluate the structural and the mechanical properties of biological samples from the microscale to the nanoscale.1 We consider this technique as a real possibility for fast, easy, and low-cost complementary histological diagnosis on normal or pathological renal biopsies, and it can be applied directly to uncovered/unstained small formalin fixed-paraffin embedded samples.2 Additionally, topography AFM imaging measurements can be used for 2D/3D structural analysis or to characterize physical parameters such as roughness, linearity, depth, and so on. Figure 1 shows one normal renal corpuscle on an uncovered/unstained fixed sample. Figure 2 shows the topography AFM imaging (512 points per line, scanning rate = 0.10

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lines/s in air environment and in contact mode) of the scanning area selected in Figure 1.

Further studies are required to elucidate the diagnostic capabilities and advantages of the AFM in a clinical setting, but this technique may represent a promising and useful chapter in kidney pathology.

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References