ISSN: 2469-5742

Mercantepe. Int Arch Urol Complic 2018, 4:051
DOI: 10.23937/2469-5742/1510051
Volume 4 | Issue 2
Open Access

International Archives of
Urology and Complications

SHORT COMMENTARY

A Brief Look at the Examination of Kidney Biopsies under Transmission Electron Microscope

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Ultrastructural examination using the transmission electron microscope (TEM) has been used for diagnostic purposes in the evaluation of renal pathologies for more than 40 years [1,2]. Previous studies have reported that electron microscopic ultrastructural examination makes a contribution of at least 25% in the diagnosis of renal pathologies, particularly including glomerulopathies such as nephrotic syndrome and minimal change disease [3,4]. Several new glomerulopathies such as human immunodeficiency virus (HIV), fibrillary glomerulonephritis, membranoproliferative glomerulonephritis, and C1q have been discovered in the last 25 years, and ultrastructural findings are reported to contribute to diagnosis in 85% of all renal pathologies [5] (Table 1). In a prospective study from 2011, Mokthar, et al. reported differing success rates in the diagnosis of 25 separate renal pathologies [2]. There exist various technical problems in raising this success rate in the evaluation and diagnosis of renal pathology using electron microscopic ultrastructural examination [6,7]. The most important of these problems derives from insufficient kidney biopsy dimensions [5-7]. The needle gauges used in the collection of renal biopsies are particularly important since these will determine the number of glomeruli in the tissue [6]. Glomerular number is of vital importance in diagnosis with renal biopsies: For example, while a single glomerulus is sufficient for diagnosis of membranous glomerulonephritis, at least seven glomeruli need to be examined for transplant diagnoses. In addition, despite the variety of diagnosis in the evaluation of renal pathology, the diagnostic success rate in renal biopsies containing 25 glomeruli is as high as 95% [2,3,5-8]. However, 18- and 19-gauge needles are incapable of providing this amount of glomeruli [6,9]. Moreover, in addition to glomerulus numbers, different types of glomerulus, such as subcapsular and juxtaglomerular glomeruli are also important in diagnosis [1,4-6,9]. Subcapsular cortical glomeruli play a role in the diagnosis of hypertension and global sclerosis, while juxtamedullary glomeruli are reported to have an important function in the diagnosis of focal segmental glomerulosclerosis (FSGS) [3,6,9]. However, due to the

Table 1: Contribution of electron microscopy to diagnostic renal pathology categories.

Acute tubular necrosis
Alports syndrome
Amyloid nephropathy
Class II-VI lupus nephritis
Combined class VI + V lupus nephritis
Crescentic glomerulonephritis
C1q nephropathy
Diabetic nephropathy
End-stage renal disease
Fibrillary glomerulonephritis
Focal and segmental glomerulosclerosis (FSGS)
Hypertensive nephropathy
IgA nephropathy and Henoch-Schonlein purpura
IgM nephropathy
Interstitial nephritis and pyelonephritis
Membranous nephropathy Minimal
Membranoproliferative types I and II
Minimal change disease
Post-infectious glomerulonephritis
Thin-basement membrane
Thrombotic mico-angiopathy

Citation: Mercantepe T (2018) A Brief Look at the Examination of Kidney Biopsies under Transmission Electron Microscope. Int Arch Urol Complic 4:051. doi.org/10.23937/2469-5742/1510051

Accepted: December 22, 2018: **Published:** December 24, 2018

harmful impact on human health and the adverse effect of the fixation process, it appears unlikely that the size of biopsy specimens can be increased in the near future. For that reason, accurate identification of glomerular diseases at diagnostic renal pathology assessment requires a holistic approach involving pathological evaluation of renal biopsy with clinical data, serological tests, electron microscopy, light microscopy, and immunofluorescence (IF) [2]. Serological, immunofluorescent and light microscopic findings must be analyzed together in order to increase the success rates of diagnosing renal pathologies using the TEM. In addition, the presence of accompanying previous or correlated renal pathologies in the biopsy donor may give rise to misleading results in the diagnosis of pathologies. It is therefore important that renal pathology scales be designed by eminent and experienced pediatric and other nephrologists and histopathologists with ultrastructural experience. This will permit faster and more accurate diagnosis of renal pathologies. The design of an ergonomic multidisciplinary renal pathology diagnosis scale will increase the success of diagnosis of renal pathologies. It will also lead to new therapeutic horizons by shedding light on the damage mechanisms of diagnosed renal pathologies.

Conflicts of Interest

We declare no conflict of interest.

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