Original Article

Prevalence of Various Kinds of Glumerulonephritis Based on the Electron Microscope Findings

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ABSTRACT

Background and Objective: **Glumerular diseases are among the most prevalent causes of renal chronic insufficiencies. This study aimed to analyze the prevalence of various kinds of glumerulonephritis based on the findings of electron microscope.**

Materials and Methods: **This study had a descriptive retrospective and cross sectional strategy. Slides of patients (124 cases) who had undergone kidney biopsy during a one-year period due to renal diseases were reviewed and compared. The required data were collected and analyzed using SPSS software.**

Results: **It was found out that 52.4% of the patients were female and 47.6% were male. The average age of the female patients was 28.26 and of the male ones was 29.8 years old. The most prevalent type of glumerulonephritis was membranous and the most prevalent stage was stage II. The prevalent fluorescence pattern of the IgG deposits in the basal membrane of glomerulus.**

Conclusion: **Regarding the variety in the prevalence of different kinds of glumerulonephritis fond within different ages and sex, all cases should be taken into consideration while dealing with the patients. It should also be noticed that immunofluorscence is a complementary diagnosis method and does not have much use without electron and light microscope. In those cases where several contradictory diagnoses have been suggested in light microscope or a particular change has not been observed or the sample has not been sufficient to be analyzed, electron microscope has a final and significant role.**

Key words: Glumerulonephritis, Electron microscope, Kidney biopsy

Introduction

Glumerular diseases are one of the major problems in nephrology and indeed chronic glumerulonephritis is one of the most prevalent causes of renal chronic insufficiencies in human beings. Kidney biopsy is a valuable method for the diagnosis of renal diseases (1). Through this method, it becomes possible to diagnose with great accuracy, achieve significant information about the progress and prognosis of the disease, and to handle the disease rationally and cure the renal diseases. Even in the progressed stages of renal damage, kidney biopsy can offer indications about the probability of the relapse of the disease after kidney transplantation. Accurate interpretation of kidney biopsy requires

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accurate information about the structure and natural functioning of the kidney as well as knowing the clinical, morphologic and histopathogenic aspects of renal diseases and the pathologist should compare the clinical and experimental data with immunofluorescence (IF) light microscope and electron microscope (EM) in order to analyze the kidney biopsy. Considering these facts, the significance of the findings of electron microscope in diagnosis, treatment, and determining the progress and prognosis of renal diseases becomes clear. Ultrastructural study of the samples of kidney biopsy by electron microscopy reveals many unnatural findings some of which have been quite helpful and fundamental in confirming the accuracy of diagnosis and a better understanding of the process of renal diseases (2,3). This study aims to determine the frequency of various kinds of glumerulonephritis based on the findings of electron microscopy and comparing the findings of immunofluorescence and light microscopy with the findings of electron microscopy, and to determine the frequency of various kinds of glumerulonephritis based on age and sex.

Materials and Methods

This study had a descriptive retrospective, and cross sectional strategy. Slides of patients (124 cases) who had undergone kidney biopsy in one of the most reputable university centers during a one-year period due to renal diseases and their biopsy samples had been analyzed by immunofluorscence and light microscope and electronic microscope were taken out from the archive and were reviewed and compared. The data related to patients with glumerulonephritis including age, sex, kind of disease, the pattern of IF deposits and microscope findings were extracted and analyzed by SPSS software.

Results

The total number of patients was 124. The prevalence of various kinds of glumerulonephritis according to the findings of electron microscope is described in Table 1. Among the 26 patients suffering from membranous glumerulonephritis, 3 were classified under stage I, 6 as stage II, 3 as stage III, 3 as stage IV, and 8 as no stage; among 9 patients suffering from diffuse proliferative glumerulonephritis lupus type 2 were classified under class III, 4 under class IV, and 2 under class V and one under class VI; among 12 patients suffering from proliferative membrane glumerulonephritis, 3 were classified under type I, 4 under type II, 3 under type III and 2 without any type.

Table 1: The frequency distribution of kinds of glumerulonephritis in the kidney biopsies

Diagnosis	Frequency	Prevalence
MGN	26	21
FSGS	23	18.5
MCD	13	10.5
MPGN	12	9.7
DPGN	9	7.3
HGN	7	5.6
IgA-N	4	3.2
Int-N	4	3.2
Amyloidosis	2	1.6
Scl. GL	1	0.8
DM-GN	1	0.8
PSGN	1	0.8
ITG	1	0.8
No specific changes	2	1.6
No GLO	18	14.5
Total	124	100

No GLO: no glomerule in the specimen
MGN: membranous glomerulonephritis
FSGS: focal segmental glomerulosclerosis
ITG: immunotactoid glomerulopathy
MCD: minimal change disease
MPGN: membranoproliferative glomerulonephritis
DPGN: diffuse proliferative glomerulonephritis
HGN: hereditary glomerulonephritis
IgA N: IgA nephropathy
Int-N: interstitial nephropathy
Amylo:amyloidosis
Scl.GL: sclerosing glomerulopathy
DM GN: diabetic glomerulopathy
PSGN: post-streptococcal glomerulosclerosis

The minimum age of the patients was 1.5 and the maximum age was 67 years old. The average age of the female patients was 28.26 and of the male ones was 29.8 years old. The minimum age of female

patients was 1.5 and their maximum age was 65 years old. Among the male patients, the minimum age was 4 and the maximum age was 67 years old. The highest frequency of the disease was among the patients within 15-20 years old. The average age of the patients suffering from various kinds of glumerulonephritis and their minimum and maximum values is described in Table 2. Among 124 patients under study, 65 (52.4%) were female and 59 (47.6%) were male. In this respect, 14 cases of membranous glumerulonephritis patients were male and 12 were female. About focal segmental glumerulosclerosis (FSGS), this proportion was 9 and 14 respectively. In amyloidosis, diabetic glomerulopathy and post-streptococol glumerulonephritis (PSGN), all patients were male. In sclerosa glomerulopathy and immunotactiod glomerulopathy, all patients were female. Among 124 patients studied here, 70 patients had undergone immunofluorescence (IF) analysis simultaneously among whom 12 cases did not have glomerule and hence could not be examined. Among these 58 patients possessing IF samples, 15 cases had membranous glumerulonephritis, 14 cases as FSGS, 7 cases as minimal change disease (MCD), 7 cases as membranous proliferative glumerulonephritis (MPGN), 4 cases as diffuse membranous glumerulonephritis, 5 cases as hereditary glumerulonephritis, 3 cases as IgA nephropathy, one case as interstitial nephritis, one case as sclerosa glumerulonephritis and one case as non-specific. The pattern of IF in various kinds of glumerulonephritis was as follows: in membranous glumerulonephritis (MGM), in basal membrane of glomerule, IgG deposit was observed in 14 cases, IgA deposit in 12 cases, IgM deposit in 8 cases, C3C deposit in 12 cases, C4C in 6 cases, C1q deposit in 9 cases, fibrinogen deposit in 9 cases and albumin deposit in 2 cases. In mesangium, IgG deposit was observed in 7 cases, IgA deposit in 3 cases, IgM deposit in 3 cases, C3C deposit in 4 cases, C1q deposit in 4 cases, fibrinogen deposit in 2 cases, and albumin deposit in one case. Among 124 patients studied in this research, 96 patients had undergone light microscope analysis simultaneously, 14 cases of whom did not possess glomerule and hence could not be studied. Among other 82 patients, 17 cases showed a non-specific response. Through comparing light microscope samples with the related results of electron microscope, among 14 samples, which did not possess glomerule, 8 cases of the diagnosis of electron microscope were confirmed, and among 17 samples of non-specific responses, in 12 cases the diagnosis of electron microscope were confirmed; and among the other remaining cases of the results of light microscope (65 cases), in 13 cases, the result of light microscope were different from the results of electron microscope. Considering the higher precision and magnification of electron microscope, the diagnosis of electron microscope was considered as the final diagnosis.

Discussion

In comparing the prevalence of kinds of glumerulonephritis attained in this study with the statistical data presented in the references, the following discrepancies were noticed: 1) the frequency of mesangial glumerulonephritis in the references and essays was much less than the frequency achieved in this study (3,4) (3% vs. 7.3%), 2) The frequency of membranoproliferative glumerulonephritis (MPGN) in references was more than the frequency achieved in this study (5,6) (36.2% vs. 9.7%) (14.1% vs. 9.7%), 3) the frequency of IgA nephropathy in the references were much more than the frequency achieved in this study (7,8) (6.3% vs. 3.2%) and (10.2% vs. 3.2%), 4) the frequency of focal segmental glomerulosclerosis in the references was less than the frequency attained in this study (4) (8% vs. 18.5%), 5) the frequency of post-streptococal glomerulonephritis in the references was much more than the frequency achieved in this study (4) (11% vs. 0.8%), 6) the frequency of membranous glomeruloscholorosis in the existing articles was nearly the same as the frequency achieved in this study (9-11) (20.1% vs. 21% and 20.4% vs. 21%), 7) the most prevalent glomerulonephritis in the existing resources and articles were MPGN and FSGS while in the present study MGN was the most prevalent type (4,10,12), 8) the frequency of focal Segmental glomerulosclerosis in the existing articles was nearly the same as the frequency achieved in this study (10) (18.3% vs. 18.5%), and 9) the frequency of the MCD in the existing articles was less than the frequency achieved in this study (12) (5.3% vs. 10.5%).

Table 2: The distribution of the average age of kinds of glumenulonephritis

Diagnosis	Max. age	Min. age	Frequency	Average age
MGN	53	12	26	31.3
FSGS	65	4	23	28.78
MCD	51	1.5	13	21.88
MPGN	67	14	12	33.83
DPGN	6	6	9	6
HGN	52	6	7	23
IgA-N	40	21	4	31.25
Int-N	45	21	4	33.25
Amylo	66	14	2	53.5
Scl. GL	-	4	1	-
DMGN	-	55	1	-
PSGN	-	34	1	-
ITG	-	30	1	-
No specific changes	25	23	2	24
No GLO	58	7	18	29.16
Total			124	-

No GLO: no glomerule in the specimen
MGN: membranous glomerulonephritis
FSGS: focal segmental glomerulosclerosis
ITG: immunotactoid glomerulopathy
MCD: minimal change disease
MPGN: membranoproliferative glomerulonephritis
DPGN: diffuse proliferative glomerulonephritis
HGN: hereditary glomerulonephritis
IgA-N: IgA nephropathy
Int-N: interstitial nephropathy
Amylo: amyloidosis
Scl.GL: sclerosing glomerulopathy
DM GN: diabetic glomerulopathy
PSGN: post-streptococcal glomerulosclerosis

The average age of the membrahous glomerulonephritis in this study was 31.3 years old which was less than the statistical data referred to in the references (40 years old) and its frequency among the male patients was more than the female ones which is not different from the references (4). In the overall analyses, the frequency of the female patients was more than the male ones which is inconsistent with the articles (12). The highest age-based prevalence in the patients was less than 25 years old which is lower than the age mentioned in the articles (25 vs. 35) (12,13). The frequency of focal segmental glomerulosclerosis among the female patients is much more than the male patients. In the analyses made by electron microscope, a high percentage of the samples (14.5%) did not have any glomerule to be analyzed by microscope; considering the negative result of the report, much more care should be taken while taking the kidney biopsy. A comparison between the average ages of the incidence of any kind of glomerulonephritis in this study reveals that amyloidosis, MPGN and diabetic glomerulopathy occur in older ages as compared to other kinds of glomerulonephritis. Based on the findings of immunofluorscence in patients,

the following points can be mentioned:1) in the immunoreactant deposit patterns in various kinds of glumerulonephritis, there was no specific finding, 2) among 15 cases of membranous glumerulonephritis, there was IgG deposit in 14 cases which is in conformity with the references (4). On the other hand, there was a clear discrepancy in the deposit IgG between MGN and other kinds of glumerulonephritis, 3) IgA deposit was positive in 12 cases of 15 membranous glumerulonephritis, the frequency of which is more than what has been presented in the references (4) (46% vs. 25%), 4) C3C deposit was positive in 12 cases of 15 membranous glumerulonephritis, which considering the fact that in the same number IgA deposit was also observed, it may propound lupus membranous GN (4), 5) IgM deposit was positive among 4 cases of 7 membranoproliferative glumerulonephritis, and considering the references, this is mostly observed in type II (4), 6) C3C deposit was positive in 3 cases out of 7 MPGN patients, and based on the references is mostly observed in type I (4), 7) C3C was observed within 5 cases out of7 membranoproliferative glumerulonephritis patients which, considering the references books, is mostly related to type I (4), 8) C1q deposit was observed among 5 cases out of 7 and C4C deposit among 4 cases out of 7 membranoproliferative glumerulonephritis patients, which, considering the references and articles, confirms the role of classic role in the activation of complement system (4), 9) IgM deposit was observed in 3 cases out of 7 patients who suffered from MCD, which, based on the references is one of the most prevalent deposits (4), 10) In most cases of MCD, IF results have been negative that is in conformity with the references (4), 11) IgM deposits has been positive in 5 cases out of 14 patients suffering from FSGS, and C3C deposit was positive within 4 cases; this frequency of IgM and C3Cb deposit is consistent with the references (4), 12) in one of the patients suffering from PSGN, no immunoreactant deposit was observed which is inconsistent with the references which increases the IgG and C3 deposits (4), 13) among 7 patients who suffered from hereditary nephritis, IgM and C3C was positive in GBM of 2 cases; which is consistent with the references, but IgM deposit did not exist in mesangium which is inconsistent with the references (1), and 13) in one of the patients suffering from immunotactoid glomerulopathy, no immunoreactant deposit was observed, while in the references IgG and C3 deposits have been reported (7).

Considering the average age and the sex-based frequency of kinds of glumerulonephritis, there are some inconsistencies with the references and articles which are as follows (1,4,7,14): 1) In this study, the average age of the incidence of MCD is the second decade of life, while in the references, it is within the first decade of life; and in the present study, the frequency among female patients is higher than the male ones (in the references: M>F), 2) in the present study, the average age of the occurrence of FSGS was in the second decade of the life which is consistent with the references; however its frequency in female patients is higher than the male ones (4) (In the references F<M), 3) in the present study, the average age of the occurrence of IgA nephropathy is in the third decade of life which is in consistency with the references; the proportion of frequency of male patients to female ones is 3 to 1 which is the same as the references (4), 4) in this study, the average age of the occurrence of lupus and diffused proliferative glomerulonephritis is 6 years old which is not consistent with the references (16-50 years old); however, its sex-based distribution is the same as the references (M<F), 5) The only case of PSGN in this study was a 34 years old man, while the prevalence of PSGN in the references is in the first decade of life (4), 6) in this study, the distribution of the frequency of hereditary nephritis among female patients is higher than the male ones which is inconsistent with the references (M>F), 7) The only immunotactoid glomerulopathy in this study was a 30-year-old woman, while in the references the fifth decade of life is mentioned as time of prevalence of ITG (7,14,15).

From 124 patients studied here, seventy patients had simultaneously undergone IF analyses, among whom 12 cases of samples did not possess any glomerule and hence could not be analyzed. Meanwhile, 96 other cases had been analyzed by light microscopy among which 14 samples did not have any glomerule and hence could not be analyzed. From the remaining 82 patients who had a light microscope report, 17 cases had a non-specific response. Through comparison of the results of light microscope with those of electron microscope, from 14 cases which did not include any glomerule in the light microscope, 8 cases were confirmed by EM, and from 17 cases of non-specific reports, 12 cases were confirmed by EM. Among the remaining cases of light microscope reports (65

cases), in 13 cases the result of light microscope was different from those of electron microscope, which considering the higher precision and magnification of electron microscope, the diagnosis of EM was considered as the final diagnosis.

Conclusion

Based on the implemented studies it was revealed that immunofluorscence is a complementary diagnosis method and does not have much application without electron and light microscope. However, in those cases where light microscope can not offer a definite finding as the final diagnosis result or in those cases where light microscope findings include certain discrepancies, this method can be helpful. Also, considering the results of electron microscope and the completion of the diagnosis of IF and light microscope by EM, we can discuss the high efficiency of electron microscope especially in those cases where in light microscopy there are several discrepant diagnoses or specific changes can not be observed, or one light microscope sample is not sufficient for the analysis and hence EM can be used for an accurate and final diagnosis.

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