



How do lupus glomerulonephritis and its treatment affect the renal reserve?

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Editor,

Lupus nephritis (LN) is one of the most severe complications of systemic lupus erythematosus, which has variable manifestation from urinalysis alterations to nephrotic or nephritic syndrome with rapidly progressive renal failure and evolution to end-stage renal disease [1, 2].

Renal reserve (RR) is the kidney's ability to increase its basal glomerular filtration rate (GFR) by at least 20% after a protein overload [3, 4].

However, as far as we know, there is no report in the literature regarding how acute lupus glomerulonephritis and its successful treatment affect RR. Therefore, we evaluated the RR in three young women suffering from a recently diagnosed lupus glomerulonephritis, and then we reevaluated their RR after they were treated with immunosuppressant drugs (Table 1).

Regarding the RR test technique used, it consisted of obtaining two consecutive fast minuted-CCs (basal GFR) after an adequate patient's oral hydration (15 cc/kg of tap water). Then, a high-protein meal based on dairy products (1.2 g/kg of protein) was delivered, and 70 min later, three successive minuted-CCs were measured [5]. Finally, the difference between the higher post-prandial CC (pick value) and the average between the two pre-prandial CCs (basal value) was obtained. Both RR tests were performed with the patient not being on any renin–angiotensin–aldosterone system blockers.

We documented that RR was abolished (RR:0%) in the LN patients without treatment, while it was totally (positive

RR: $\geq 20\%$), partially (borderline RR: $\geq 5\%$), or not recovered (negative RR: $< 5\%$), depending on their prescribed treatment: patients 1 and 2 were treated with double immunosuppressant treatment during 12 and 6 months, respectively; while patient 3 was treated only with methylprednisolone during 6 months.

Even though, a different degree of RR recovery was documented associated with different immunosuppressant therapeutic schedules (months of treatment and sort of immunosuppressant drugs), basal hyperfiltration was significantly reduced in all the treated patients (Table 1).

It is worth pointing out that, our patients had basal high CC (hyperfiltration) despite the documented glomerular damage (mesangioendothelial proliferation in 90% of glomeruli) since their kidney biopsy showed neither crescents nor significant tubule-interstitial damage, thus the patients had enough preserved renal parenchyma in order to be able to achieve hyperfiltration due to a complete RR activation (RR: 0%). Even though, all the treated patients showed a significant reduction in their hyperfiltration, only those who were treated with double immunosuppressant therapeutic schedule recovered their RR (Table 1).

In conclusion, it seems that acute lupus glomerulonephritis abolished the patient's RR, which can be recovered by prescribing double immunosuppressant therapy.

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Table 1 Minuted-creatinine clearance (CC) before and after acute glomerulonephritis treatments

	CC	
	Before treatment (ml/min/1.73 m ²)	After treatment (ml/min/1.73 m ²)
Patient 1 (39 years old)	–	–
Treatment		
Initial: methylprednisolone—cyclophosphamide		
Maintenance: methylprednisolone—mycophenolate		
Basal value	114.4	93.1
Pick value (30 min)	99.5	114.8
Delta (pick – basal) value	– 14.9	21.7
Renal Reserve	Negative (0%)	Positive (23%)
Patient 2 (25 years old)	–	–
Treatment		
Initial: methylprednisolone—cyclophosphamide		
Maintenance. methylprednisolone—mycophenolate		
Basal value	174.3	122.8
Pick value (60 min)	145.8	142.2
Delta (pick – basal) value	– 28.5	19.4
Renal Reserve	Negative (0%)	Borderline (16%)
Patient 3 (37 years old)	–	–
Treatment		
Initial: methylprednisolone		
Maintenance. methylprednisolone		
Basal value	167.8	102.9
Pick value (60 min)	172.4	105.9
Delta (pick – basal) value	4.6	3.1
Renal Reserve	Negative (2.7%)	Negative (3.1%)

Compliance with ethical standards

Conflict of interest All the authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from the patient.

References

- Weening JJ, D'Agati VD, Schwartz MM, Seshan SV, Alpers CE, Appel GB, Balow JE, Bruijn JA, Cook T, Ferrario F, Fogo AB, Ginzler EM, Hebert L, Hill G, Hill P, Jennette JC, Kong NC, Lesavre P, Lockshin M, Looi LM, Makino H, Moura LA, Nagata M (2004) The classification of glomerulonephritis in systemic lupus erythematosus revisited. *J Am Soc Nephrol* 15(2):241–250 (Erratum in: *J Am Soc Nephrol* (2004) 3:835–836)
- Weening JJ, D'Agati VD, Schwartz MM, Seshan SV, Alpers CE, Appel GB, Balow JE, Bruijn JA, Cook T, Ferrario F, Fogo AB, Ginzler EM, Hebert L, Hill G, Hill P, Jennette JC, Kong NC, Lesavre P, Lockshin M, Looi LM, Makino H, Moura LA, Nagata M, International Society of Nephrology Working Group on the Classification of Lupus Nephritis; Renal Pathology Society Working Group on the Classification of Lupus Nephritis (2004) The classification of glomerulonephritis in systemic lupus erythematosus revisited. *Kidney Int* 65(2):521–530 (Erratum in: *Kidney Int* (2004) 3:1132)
- Musso CG, Reynaldi J, Martinez B, Pierángelo A, Vilas M, Algranati L (2011) Renal reserve in the oldest old. *Int Urol Nephrol* 43(1):253–256. <https://doi.org/10.1007/s11255-010-9769-9>
- Musso CG (2011) Renal reserve test: its methodology and significance. *Saudi J Kidney Dis Transpl* 22(5):990–993
- Hellerstein S, Berenbom M, Erwin P, Wilson N, DiMaggio S (2004) Measurement of renal functional reserve in children. *Pediatr Nephrol* 19:1132–1136