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Comparison between Mycophenolate and Cyclophosphamide in Treatment of Lupus Nephritis

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ABSTRACT

Background*:* Systemic lupus erythematosus is a chronic inflammatory disease that can affect any organ, but very often injures the kidney. It is more prevalent in women than men across all age groups and populations; the female-to-male ratio is higher at reproductive age, ranging between 8:1 and 15:1, and is lowest in prepubertal children at about 4:3. **Aim of the Work:** To study the effect of intravenous cyclophosphamide versus oral mycophenolate (MMF) in the treatment of lupus nephritis (LN).

Subjects and Methods: This was a prospective, randomized, comparative study on the efficacy of I.V cyclophosphamide compared to oral MMF in the induction therapy of LN. In this study 40 patients of systemic lupus erythematosus with lupus nephritis, were included. All patients were divided randomly into two groups. The first group included 20 female patients who given Oral Corticosteroid 1mg /kg and intravenous cyclophosphamide 500mg once every two weeks for 6 months. The second group included 20 patients receiving oral corticosteroid 1mg /kg and oral mycophenolate 2-3g/day (1200 mg/m2) for 6 months.

Results*:* - As regard serum creatinine, alb/cr ratio, serum albumin, ESR, Anti DNA, c3, and eGFR there was a highly significant difference between before/after the treatment in each group, with no significant difference comparing the two group to each other.

Conclusion*:* In our study, both MMF and IVC show significant improvement in patients with lupus nephritis with no superiority of one of them to the other.

Keywords: Mycophenolate; Cyclophosphamide; Lupus Nephritis.

INTRODUCTION

Systemic lupus erythematosus characterizes by various manifestations, degrees of severity, and phases of remission and flares [1]. Patients may present with kidney disease, serositis, rashes, cytopenia's, arthritis, psychiatric, neurological, and other manifestations [2].

Clinically evident lupus nephritis occurs in 35–75 % of patients with (SLE). The prevalence of kidney involvement in patients presenting at around 50years of age is about 60%, whereas about 80 %of children have renal involvement during their illness. Lupus nephritis usually occurs within three years after the diagnosis of SLE [3-6].

It is the most severe manifestation of systemic lupus erythematosus. There was no specific treatment for severe lupus nephritis until 1950. Corticosteroids were used for LN, between the 1950s and 1970s [7].

Subsequently,intravenous cyclophosphamide became the standard of care in induction regimes; However, IV CPM was associated with complications such as infections, bladder toxicity, and gonadal problems. To decrease the toxicity, low-dose IV CPM. Intravenous CPM (using six biweekly fixed IV doses of 500 mg IV CPM) and showed equivalent efficacy and less side effects [8].

Mycophenolate mofetil (MMF) is widely used in solid organ transplantation and it reduces the rate of acute rejection following renal transplantation [9].

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MATERIALS AND METHODS

This was a prospective, randomized, comparative study conducted on 40 female patients with lupus nephritis.

Inclusion criteria

All patients with a history of systemic lupus erythematosus with lupus nephritis of all stages of lupus nephritis except stage (I, VI), females only with age range (15/50) years.

Exclusion criteria

Patients with an acute inflammatory process such as (rheumatoid arthritis or other rheumatological diseases), patients who are taking other immunosuppressive therapy, patients with malignancies, patients with HCV, HBV, or HIV infection, and patients who are diagnosed with Lupus nephritis sage(I, VI)

All lupus nephritis patients were divided randomly into two groups:

- The first group included 20 female patients with lupus nephritis. They were given Oral Corticosteroid 1mg /kg and intravenous cyclophosphamide 500mg once every two weeks for 6months

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- The second group included 20 patients with lupus nephritis who were giving oral corticosteroid 1mg /kg and oral mycophenolate 2-3g/day (1200 mg/m2) for 6 months.

Investigations: These investigations were done before starting the pharmacotherapy

- Renal biopsy
- HCV-AB, HbsAg,HIV ab,
- Renal function tests: Serum creatinine
- Serum albumin,
- Erythrocyte sedimentation rate
- Anti-DNA antibodies titer
- Complement 3 (C3) assay (by titer in serum)
- Alb/cr ratio
- eGFR

These follow-up investigations were done after 6 months of the treatment:

- Renal function tests: Serum creatinine
- Serum albumin,
- Erythrocyte sedimentation rate
- Anti-DNA antibodies titer
- Complement 3 (C3) assay (by titer in serum)
- Alb/cr ratio
- eGFR

Ethical approval:

The study protocol was approved by the Ethical Committee of Faculty of Medicine, Al-Azhar University, Assiut Branch.

Ethical consideration

- The selection of subjects and the collection of specimens from the subjects were done after prior notice and written approval from all patients involved.
- The aim of the study and any possible risks were discussed with the patients included in the study.
- The privacy of the collected data was assured.

Data management and statistical analysis

Statistical Package for Social Science (IBM SPSS) version 20 was used. The data were presented as numbers and percentages for the qualitative data, mean, standard deviations, and ranges for the quantitative data with parametric distribution, and median with interquartile range (IQR) for the quantitative data with the non-parametric distribution.

Chi-square test was used in the comparison between two groups with qualitative data and ***Fisher exact test*** was used instead of the Chi-square test when the expected count in any cell found less than 5.

Independent t-test was used in the comparison between two groups with quantitative data and the parametric distribution and ***Mann-Whitney test*** was used in the comparison between two groups with quantitative data and non-parametric distribution. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

- $P > 0.05$: Non significant
- $P < 0.05$: Significant
- $P < 0.01$: Highly significant

RESULTS

For the IVC group, the mean age was 34.60 (± 6.16 SD) with range (20-44).

As for the MMF group, the mean age was 23.70 (± 4.23 SD) with a range of (17-33) (Table 1). There was a high statistically significant difference between the studied groups as regards age.

For the IVC group, the mean serum creatinine before the treatment was 2.16 (±0.87 SD) with range (1.2-4.4), and serum creatinine after the treatment was 1.46 (±0.58 SD) with range (0.9-3). There was a highly significant difference between before/after the treatment of serum creatinine for the IVC group. For the MMF group, the mean serum creatinine before the treatment was 1.84 (±0.54 SD) with range (0.8-3.2), and serum creatinine after the treatment was 1.33 (±0.6 SD) with range (0.7-3) (Table 2). There was a statistically significant difference between before/after the treatment of serum creatinine for the MMF group. There was no significant difference between the studied groups as regard serum creatinine compared to each other.

For the IVC group, the mean Alb/cr ratio before the treatment was 3526.25 (±1245.19SD) with a range (1600-5400) and Alb/cr ratio after the treatment was 917.10 (±1339.84SD) with a range (77-4700) (Table 3). There was a highly significant difference between before/after the treatment Alb/cr ratio for the IVC group.

In the MMF group, the mean Alb/cr ratio before the treatment was 3734.50 (±1812.22SD) with a range (1800-8720) and Alb/cr ratio after the treatment was 675.80 (±976.89SD) with a range (30-3400). There was a highly significant difference between before/after the treatment of Alb/cr ratio for the MMF group. There was no significant difference between the studied groups as regards the Alb/cr ratio compared to each other. The mean of serum albumin of IVC group before the treatment was 3.01 (±0.51SD) with range (2-3.9) and serum albumin after the treatment was 3.73 (±0.57 SD) with range (2.4-4.3) (Table 4). There was a highly significant difference between before/after the treatment in serum albumin for the IVC group. For the MMF group, the mean serum albumin before the treatment was 3.02 (±0.55 SD) with a range (1.9-4.1), and serum albumin after the treatment was 3.75 (±0.54 SD) with a range (2.5-4.6). There was a significant difference between before/after the treatments of serum albumin for the MMF group. There was no significant difference between the studied groups as regard serum albumin compared to each other.

For the IVC group, the mean ESR before the treatment was 89.90 (±17.63 SD) with range (60-125) and ESR after the treatment was 37.4 (±27.63 SD) with range (10-115).

There was a highly significant difference between before/after the treatment of ESR for the IVC group. (Table 5) shows that for the MMF group the mean ESR Before the treatment was 94.1 (±13.23 SD) with range (75-130) and ESR after the treatment was 46.4 (±24.88 SD) with range (12-90). There was a highly significant difference between before/after the treatment ESR for the MMF group. There was no significant difference between the studied groups as regard ESR compared to each other. The mean Anti-DNA before the treatment was 151.85 (±101.74 SD) with a range (50-350) and Anti-DNA after the treatment was 44.5 (±51.71 SD) with a range (7-200). There was a highly significant difference between before/after the treatment of Anti-DNA for the IVC group. As regards the MMF group the mean Anti-DNA before the treatment was 149.45 (±119.25 SD) with a range (35-460) and Anti-DNA after the treatment was 22.8 (±15.61 SD) with a range (5-70) (Table 6).

There was a highly significant difference between before/after the treatment of Anti-DNA for the MMF group. There was no significant difference between the studied groups as regard Anti-DNA compared to each other. For the IVC group, the mean C3 Before the treatment was 69.1 (±17.72 SD) with a range (45-95) and C3 after the treatment was 92.6 (±12.4 SD) with a range (77-120).

There was a highly significant difference between before/after the treatment C3 for the IVC group. For the MMF group, the mean C3 Before the treatment was 65.45 (±15.56 SD) with range (20-92) and C3 after the treatment was 89.8 (±13.38 SD) with range (66-120) (Table 7). There was a highly significant difference between before/after the treatment C3 for the MMF group. There was no significant difference between the studied groups as regard C3 compared to each other.

For the IVC group, the mean eGFR before treatment was 33.14 (±14.13 SD) with range (11.58-60.87), and eGFR after treatment was 50.36 (±17.75 SD) with range (18.02-78.14). There was a highly significant difference between before/ after treatment eGFR for the IVC group. For the MMF group, the mean eGFR before treatment was 41.68 (±21.24 SD) with a range (18.47-98.21), and eGFR after treatment was 62.17 (±23.26 SD) with a range (20.74-107.51).

There was a highly significant difference between before/ after treatment eGFR for the MMF group. There was no significant difference between the studied groups as regard eGFR compared to each other.

Table (1): Comparison between the two studied groups according to age

Age (years)	IVC (n = 20)	MMF (n = 20)	t	p
Min. – Max.	20.0 – 44.0	17.0 – 33.0	6.523*	<0.001*
Mean ± SD.	34.60 ± 6.16	23.70 ± 4.23		
Median (IQR)	35.50 (30.50 – 39.0)	22.0 (20.50 – 26.50)		

Table (2): Comparison between the two studied groups according to serum creatinine

	Serum creatinine	IVC (n = 20)	MMF (n = 20)	U	p
Before–treatment	**Mean ± SD.**	2.16 ± 0.87	1.84 ± 0.54	169	0.41
	Median (IQR)	2.0 (1.40 – 2.65)	1.90 (1.55 – 2.05)		
After 6 months of treatment	**Mean ± SD.**	1.46 ± 0.08	1.33 ± 0.06	155	0.22
	Median (IQR)	1.20 (1.05 – 1.75)	1.10 (1.0 – 1.40)		
	p_1	0.001*	0.006*		

U: Mann Whitney test

p: p-value for comparing between the studied groups

p_1: p-value for **Wilcoxon signed ranks test** for comparing between before and after the treatment in each group

*: Statistically significant at $p \leq 0.05$

Table (3): Comparison between the two studied groups according to alb/cr ratio

	Alb/cr ratio	IVC (n = 20)	MMF (n = 20)	U	p
Before–treatment	**Mean ± SD.**	3526.25 ± 245.19	3734.50 ± 812.22	199	0.99
	Median (IQR)	3450.0(2310.0–4550.0)	3244.0(2500.0–4275.0)		
After 6 months of treatment	**Mean ± SD.**	917.10 ± 39.84	675.80 ± 76.89	172	0.45
	Median (IQR)	240.0 (112.5 – 1160.0)	202.5 (104.5 – 1000.0)		
	p_1	<0.001*	<0.001*		

U: Mann Whitney test

p: p-value for comparing between the studied groups

p_1: p-value for **Wilcoxon signed ranks test** for comparing between before and after the treatment in each group

Statistically significant at $p \leq 0.05$

Table (4): Comparison between the two studied groups according to serum albumin

	Serum albumin	IVC (n = 20)	MMF (n = 20)	U	p
Before–treatment	**Mean ± SD.**	3.01 ± 0.51	3.02 ± 0.55	181	0.62
	Median (IQR)	3.05 (2.85 – 3.20)	3.0 (2.90 – 3.25)		
After 6 months of treatment	**Mean ± SD.**	3.73 ± 0.57	3.75 ± 0.54	185	0.68
	Median (IQR)	4.0 (3.40 – 4.05)	3.90 (3.45 – 4.05)		
	p_1	0.001*	0.002*		

U: Mann Whitney test

p: p-value for comparing between the studied groups

p_1: p-value for **Wilcoxon signed ranks test** for comparing between before and after the treatment in each group

*: Statistically significant at $p \leq 0.05$

Table (5): Comparison between the two studied groups according to ESR

	ESR	IVC (n = 20)	MMF (n = 20)	U	p
Before–treatment	**Mean ± SD.**	89.90 ± 17.63	94.10 ± 13.23	168	0.4
	Median (IQR)	90.0 (80.0 – 100.0)	97.0 (80.0 – 100.0)		
After 6 months of treatment	**Mean ± SD.**	37.40 ± 7.63	46.40 ± 4.88	150	0.17
	Median (IQR)	27.50 (20.0 – 47.50)	44.50 (24.50 – 58.0)		
	p_1	<0.001*	<0.001*		

U: Mann Whitney test

p: p-value for comparing between the studied groups

p_1: p-value for **Wilcoxon signed ranks test** for comparing between before and after the treatment in each group

*: Statistically significant at $p \leq 0.05$

Table (6): Comparison between the two studied groups according to anti DNA

Anti DNA	IVC (n = 20)	MMF (n = 20)	U	p
Before–treatment				
Mean ± SD.	151.85 ± 11.74	149.45 ± 19.25	92.5	.841
Median (IQR)	99.50(73.50 – 245.0)	102.50(70.50 – 190.0)		
After 6 months of treatment				
Mean ± SD.	44.50 ± 5.71	22.80 ± 5.61	61.0	.301
Median (IQR)	19.0 (15.50 – 60.0)	16.0 (12.0 – 30.0)		
	<0.001*	<0.001*		

U: Mann Whitney test

p: p-value for comparing between the studied groups

p_1: p-value for **Wilcoxon signed ranks test** for comparing between before and after the treatment in each group

*: Statistically significant at $p \leq 0.05$

Table (7): Comparison between the two studied groups according to C3

	C3	IVC (n = 20)	MMF (n = 20)	U	p
Before–treatment	**Mean ± SD.**	69.10 ± 17.72	65.45 ± 15.56	192	0.82
	Median (IQR)	63.0 (55.0 – 85.0)	66.0 (60.0 – 73.50)		
After 6 months of treatment	**Mean ± SD.**	92.60 ± 12.40	89.80 ± 13.38	173	0.48
	Median (IQR)	90.0 (80.0 – 99.50)	89.0 (80.0 – 94.0)		
	p_1	<0.001*	<0.001*		

U: Mann Whitney test

p: p-value for comparing between the studied groups

p_1: p-value for **Wilcoxon signed ranks test** for comparing between before and after the treatment in each group

*: Statistically significant at $p \leq 0.05$

Table (8): Comparison between the two studied groups according to eGFR

eGFR	IVC (n = 20)	MMF (n = 20)	U	p
Before–treatment				
Mean ± SD.	33.14 ± 4.13	41.68 ± 2.24	145.5	0.142
Median (IQR)	30.29 (21.88 – 44.85)	33.61 (32.14 – 43.27)		
After 6 months of treatment				
Mean ± SD.	50.36 ± 7.75	62.17 ± 3.26	135.0	0.081
Median (IQR)	54.07 (35.43 – 63.59)	64.44 (49.45 – 74.76)		
	<0.001*	0.003*		

U: Mann Whitney test

p: p-value for comparing between the studied groups

p_1: p-value for **Wilcoxon signed ranks test** for comparing between pre and post-operative in each group

*: Statistically significant at $p \leq 0.05$

DISCUSSION

This was a prospective, randomized, comparative study of the efficacy of I.V. CyP compared to oral MMF in the induction therapy of LN. In this study 40 patients of systemic lupus erythematosus with lupus nephritis, were included. All patients were divided randomly into two groups. The first group included 20 female patients of lupus nephritis given Oral Corticosteroid 1mg /kg and intravenous cyclophosphamide 500mg once every two weeks for 6 months. The second group included 20 patients of lupus nephritis receiving oral corticosteroid 1mg /kg and oral mycophenolate 2-3g/day (1200 mg/m2) for 6 months.

The main results of this study were:

For the IVC group, the mean age was 34.60 (± 6.16 SD) with range (20-44). As for the MMF group, the mean age was 23.70 (± 4.23 SD) with a range of (17-33). There was a high statistically significant difference between the studied groups as regards age.

Our results are in agreement with the study of ***Radhakrishnan et al.*** [10] as they reported that there was a high statistically significant difference between the studied groups as regards age.

Furthermore, ***Sahay et al.*** [11] observed that there was a high statistically significant difference between the studied groups regarding age.

In contrary to our results, a study by ***Ong et al.*** [12] found that baseline characteristics of the patients were similar among both groups.

The present study shows that for the IVC group the mean serum creatinine before the treatment was 2.16 (±0.87 SD) with a range (1.2-4.4) and serum creatinine after the treatment was 1.46 (±0.58 SD) with a range (0.9-3). There was a highly significant difference between before/after the treatment of serum creatinine for the IVC group.

On the result, (Table 2) shows that for the MMF group the mean serum creatinine before the treatment was 1.84 (±0.54 SD) with a range (0.8-3.2), and serum creatinine after the treatment was 1.33 (±0.6 SD) with a range (0.7-3). There was a statistically significant difference between before/after the treatment of serum creatinine for the MMF group. There was no significant difference between the studied groups as regard serum creatinine.

Our results are in line with the study of ***Sahay et al.*** [11] as they found that there was no significant difference between the studied groups regarding the improvement in serum creatinine.

Sedhain et al. [13] revealed that mean serum creatinine was 1.47 ± 1.05 mg/dL, which was, statistically not significant, higher in CYC (1.73 ± 1.72)group than in MMF (1.22 ± 0.53).

The current study shows that for the IVC group the mean Alb/cr ratio before the treatment was 3526.25 (±1245.19SD) with a range (1600-5400) and Alb/cr ratio after the treatment was 917.10 (±1339.84SD) with a range (77-4700). There was a highly significant difference between before/after the treatment Alb/cr ratio for the IVC group. For the MMF group, the mean Alb/cr ratio before the treatment was 3734.50 (±1812.22SD) with a range (1800-8720) and Alb/cr ratio after the treatment was 675.80 (±976.89SD) with a range (30-3400). There was a highly significant difference between before/after the treatment Alb/cr ratio for the MMF group. There was no significant difference between the studied groups as regards Alb/cr ratio.

Our results are supported by the study of ***Mendonca et al.*** [14] as they reported that there was no significant difference between the studied groups regarding the Alb/cr ratio.

In the study in our hands, for the IVC group, the mean serum albumin before the treatment was 3.01 (±0.51SD) with a range (2-3.9) and s alb after the treatment was 3.73 (±0.57 SD) with a range (2.4-4.3). There was a highly significant difference between before/after the treatment of serum albumin for the IVC group. For the MMF group, the mean serum albumin before the treatment was 3.02 (±0.55 SD) with a range (1.9-4.1), and serum albumin after the treatment was

3.75 (±0.54 SD) with a range (2.5-4.6). There was a significant difference between before/after the treatment of serum albumin for the MMF group. There was no significant difference between the studied groups as regard serum albumin.

Our results are supported by the study of ***Moroni et al.*** [15] as they reported that there were no significant differences between the studied groups in the percentage of patients with albumin <3.5 g/dl.

Furthermore, ***Ong et al.*** [12] found that proteinuria decreased in both arms. Although the IVC group had a higher baseline proteinuria, the reduction in proteinuria overtime was parallel to the MMF group. Proteinuria decreased from 3.0±1.8g at baseline to 1.9±1.5g at 6 months in the IVC arm and from 1.8±1.2 g to 1.1 ± 0.6 g at baseline and at 6 months, respectively, in the MMF group. There was an improvement in proteinuria with an upward trend in serum albumin in both groups. The mean serum albumin increased from a baseline of 28 ± 6 g/L to 34.5 ± 6.3 g/L at 6 months in the IVC group and from 30.3 ± 7.9 g/L to 36.7 ± 4.3 g/L in the MMF group.

Regarding study conducted by ***Appel et al.*** [16]**,** using 50% reduction in proteinuria for partial remission (PR) and proteinuria of less than 500 mg/day for CR, ***Appel et al.*** [16] achieved a PR rate of 20.3% with IVC and 29.6% with MMF and a complete remission rate of 5.8% and 19.7%, respectively, over 24 weeks.

The present study shows that for the IVC group the mean ESR Before the treatment was 89.90 (±17.63 SD) with range (60-125) and ESR after the treatment was 37.4 (±27.63 SD) with range (10-115). There was a highly significant difference between before/after the treatment ESR for the IVC group. for the MMF group, the mean ESR before the treatment was 94.1 (±13.23 SD) with a range (75-130), and ESR after the treatment was 46.4 (±24.88 SD) with a range (12-90). There was a highly significant difference between before/after the treatment ESR for the MMF group. There was no significant difference between the studied groups as regards ESR.

For the IVC group, the mean Anti-DNA before the treatment was 151.85 (±101.74 SD) with a range (50-350) and Anti-DNA after the treatment was 44.5 (±51.71 SD) with a range (7-200). There was a highly significant difference between before/after the treatment Anti-DNA for the IVC group. For the MMF group, the mean Anti-DNA before the treatment was 149.45 (±119.25 SD) with range (35-460) and Anti-DNA after the treatment was 22.8 (±15.61 SD) with a range (5-70). There was a highly significant difference between before/after the treatment of Anti-DNA for the MMF group. There was no significant difference between the studied groups as regard to Anti-DNA.

Our results are in agreement with the study of ***Rathi et al.*** [17] as they reported that there was no significant difference between the studied groups as regard Anti-DNA. This study revealed that the response to I.V CyP was comparable to MMF despite low doses of I.V. CyP were used, which are only for European patients as per the EUROLUPUS study. The study also demonstrated that the use of I.V CyP may be beneficial in Indian patients taking into consideration different financial, educational, and socioeconomic factors of India compared to the areas and populations of the previous studies.

Furthermore, ***Moroni et al.*** [15] found that there was no significant difference between the studied groups as regard Anti-DNA.

Mendonca et al. [14] demonstrated that there was no significant difference between the studied groups as regard Anti-DNA.

The present study shows that for the IVC group the mean C3 Before the treatment was 69.1 (±17.72 SD) with range (45-95) and C3 after the treatment was 92.6 (±12.4 SD) with range (77-120). There was a highly significant difference between before/after the treatmentC3 for the IVC group. For the MMF group, the mean C3 Before the treatment was 65.45 (±15.56 SD) with a range (20-92) and C3 after the treatment was 89.8 (±13.38 SD) with a range (66-120). There was a highly significant difference between before/after the treatmentC3 for the MMF group. There was no significant difference between the studied groups as regard C3.

Our results are in line with the study of ***Mendonca et al.*** [14] as they reported that there was no significant difference between the studied groups as regard C3.

Furthermore, ***Moroni et al.*** [15] found that there was no significant difference between the studied groups as regard C3.

Ong et al. [12] reported that there was an improvement in other indices of SLE and lupus nephritis activity. These included the erythrocyte sedimentation rate (ESR), urinary RBC serum C3 and C4 concentration, SLEDAI score, and urinary casts. There were no significant differences in these parameters between the two groups.

The present study show For the IVC group the mean eGFR before the treatment was 33.14 (±14.13 SD) with range (11.58-60.87) and eGFR after treatment was 50.36 (±17.75 SD) with range (18.02-78.14). There was a highly significant difference between before/after the treatment eGFR for the IVC group. For the MMF group, the mean eGFR before the treatment was 41.68 (±21.24 SD) with a range (18.47-98.21), and eGFR C3 after treatment was 62.17 (±23.26 SD) with a range (20.74-107.51). There was a highly significant difference before/after eGFR for the MMF group. There was no significant difference between the studied groups as regard eGFR.

Our results are in agreement with the study of ***Rathi et al.*** [17] as they reported that there was no significant difference between the studied groups as regard eGFR.

Regarding ***Mendonca et al***. (2017) [14], complete remission was achieved in 52% of the MMF group and 47% of the I.V. CyP group.

Small retrospective studies conducted by **Tang *et al.*** (2008) [18] have shown that MMF may be beneficial in aggressive forms of lupus nephritis and extrarenal. In crescentic LN, a randomized trial revealed that MMF was equivalent to I.V CyP in inducing remission of the disease at a year of follow-up, but MMF reached complete remission at a higher rate (54% vs. 27%).

CONCLUSION

In our study, MMF and IVC both show significant improvement in patients with lupus nephritis with no superiority of one of them to the other.

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