Research Article

Albumin/Creatinine Ratio to Detect Renal Dysfunction in Rheumatoid Arthritis Patients

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ABSTRACT

Rheumatoid arthritis (RA) is an autoimmune disease characterized by chronic inflammation of the synovial joints. Renal disease in Rheumatoid arthritis however is usually asymptomatic and is detected only on laboratory investigations. It is often difficult to differentiate between damage due to disease activity and that due to drugs used to treat Rheumatoid arthritis. Various diagnostic parameters reveals about the severity of Rheumatoid arthritis and microalbuminuria is considered as one of the diagnostic marker. The aim of the present study is to investigate whether urinary albumin excretion is increased in Rheumatoid arthritis patients as compared to controls not having Rheumatoid arthritis. As urinary albumin excretion is frequently seen in diabetic patients we measured urinary albumin excretion in such patients and related the findings to Rheumatoid arthritis patients. We have taken 30 Diabetic patients without nephropathy as controls and 30 known Rheumatoid arthritis patients as cases. We have measured the urinary albumin and creatinine concentration for both the cases and controls and calculated the albumin creatinine ratio. Albumin creatinine ratio (ACR) calculated is expressed as Mean Value ± Std Deviation. For control it is 16.77 ± 4.08 and for Rheumatoid arthritis patients it is 50.44 ± 16.96. In our study, results showed that the ratio of the mg of albumin per gram of creatinine among Rheumatoid arthritis patients (cases) were significantly higher than Diabetic patients without nephropathy (controls). The study concludes that albumin creatinine ratio is a simple way to detect early renal dysfunction in rheumatoid arthritis patients.

Keywords: Micro albuminuria, rheumatoid arthritis, Diabetes mellitus.

INTRODUCTION

Rheumatoid arthritis (RA) is an autoimmune, symmetrical polyarticular disease that affects primarily the diarthrodial joints, which is characterized by chronic inflammation of the synovial joints.[1]The complication of this disease affects the kidney directly or by the action of drugs or both. Higher prevalence of renal impairment is observed in rheumatoid arthritis patients.[2-6] However, subclinical renal dysfunction is not uncommon in Rheumatoid arthritis and not detected by routine laboratory tests like urine total protein or albumin.[3-5]

Renal involvement may remain unnoticed for a long period in a reversible subclinical stage and should be detected as early as possible. The various diagnostic parameters gives idea about severity of Rheumatoid arthritis, the microalbuminuria is considered as one of the chemical diagnostic indicator. Patients at risk of developing renal dysfunction may be detected earlier by the appearance of microalbuminuria which may reflect not only glomerular disease, but also the inflammatory state and disease activity.[7]

The normal rate of albumin excretion is less than 30 mg/day and albuminuria is defined as excretion of ≥ 30 mg/day. Microalbuminuria is currently defined as urinary albumin excretion between 30 to 299 mg/day. Macroalbuminuria is defined as urinary albumin excretion of ≥ 300 mg/day. Albumin creatinine ratio (ACR) is the mg of albumin excreted per gram of creatinine or microgram of albumin excreted per milligram of creatinine.[8]

MATERIALS AND METHODS

We have taken 30 Diabetic patients without nephropathy as controls and 30 known Rheumatoid arthritis patients as cases. We have measured the urinary albumin and creatinine concentration for both the cases and controls and calculated the albumin creatinine ratio.

In our laboratory urinary albumin and creatinine concentration are measured as (mg/dl).

ACR is reported in (mg/g). Albumin concentration in spot urine sample is reported as UAC (mg/L).

Albumin creatinine ratio (ACR) is the ratio of urinary albumin to urinary creatinine. It is usually expressed as milligram of albumin excreted per gram of urinary creatinine.

Creatinine (g/dl) = 1000 x Creatinine (mg/dl)

ACR (mg/g) can be calculated by albumin (mg/dl) divided by creatinine (g/dl).

Urinary Albumin Concentration (UAC) is concentration of albumin present in one litre of urine or albumin excreted per litre of urine. It is expressed as (mg/L).

UAC (mg/L) = Albumin (mg/dl) x 10.

In our study urine albumin is expressed as (mg/L) and urine creatinine is expressed as (mg/dl). Here ACR is expressed as mg of albumin excreted per gram of creatinine. Hence we divided the urine albumin mg/L by urine creatinine mg/dl and multiplied by 100.

Table 1: Albumin Creatinine Ratio (ACR) for both cases and control

S.NO	Diabetic patients without nephropathy (control)			Rheumatoid arthritis patients (cases)		
	urine albumin(mg/L)	urine creatinine mg/dl	RATIO mg/G	urine albumin(mg/L)	urine creatinine mg/dl	RATIO mg/G
1	11.4	58	**19.66**	59	94.5	**62.43**
2	31	148	**20.95**	131.5	85.6	**153.62**
3	29.8	104	**28.65**	93.5	198.5	**47.10**
4	27.6	108.8	**25.37**	58.3	118.5	**49.20**
5	19	65	**29.23**	42.5	120.4	**35.30**
6	5	140	**3.57**	49.5	83.2	**59.50**
7	83.49	292.8	**28.51**	41.5	130.7	**31.75**
8	37.5	248	**15.12**	82.5	230	**35.87**
9	92.1	403	**22.85**	41	87.3	**46.96**
10	44.34	202.8	**21.86**	48	82	**58.54**
11	25.2	110.6	**22.78**	90.5	231.9	**39.03**
12	7	40	**17.50**	28.5	35.2	**80.97**
13	16.2	137	**11.82**	48	43.5	**110.34**
14	4.8	28.8	**16.67**	84	76.7	**109.52**
15	4.3	15.6	**27.56**	11.5	21.35	**53.86**
16	12	68.5	**17.52**	52.9	117.6	**44.98**
17	23	154	**14.94**	53	107.8	**49.17**
18	5	78	**6.41**	417	228.6	**182.41**
19	30	170	**17.65**	11.8	20.86	**56.57**
20	19.4	63.1	**30.74**	80	150.2	**53.26**
21	8	50	**16.00**	93.5	220.5	**42.40**
22	21	84	**25.00**	58.6	185.2	**31.64**
23	23.5	90	**26.11**	95.7	130.7	**73.22**
24	7.1	25.63	**27.70**	60.9	130.8	**46.56**
25	17.1	158.7	**10.78**	56.6	154.8	**36.56**
26	27	108	**25.00**	48.8	58.2	**83.85**
27	14	110	**12.73**	68.9	150.7	**45.72**
28	25	184	**13.59**	50	140.2	**35.66**
29	7	118	**5.93**	54.7	142.1	**38.49**
30	15	108	**13.89**	85.5	134.8	**63.43**
	Mean Value : 16.77 **Std Deviation : 4.08**			**Mean Value : 50.44** **Std Deviation : 16.96**		

DISCUSSION

Urinary albumin excretion is recognized as a predictor of overt kidney disease in patients with diabetes. It is associated with a generalised vascular damage in patients with diabetes mellitus and is a predictor of diabetic nephropathy.[7-12] Urinary albumin excretion is increased in patients with Rheumatoid Arthritis and is associated with arterial stiffness. There are several reasons for increased excretion of albumin noticed in patients with rheumatoid arthritis. Initially some studies attributed the presence of albuminuria to either side effects of medications or to glomerular or tubular nephropathies.[2,6] Renal

involvement may remain unnoticed for a long period in a reversible subclinical Condition and should be detected as early as possible. Various diagnostic parameters reveals about the severity of Rheumatoid arthritis, the microalbuminuria is considered as one of the chemical diagnostic indicator. Other diagnostic markers are costlier compared to the microalbuminuria which is relatively cheap. Microalbuminuria occurs due to leakage of small amounts of albumin into the urine, when there is an abnormal high permeability for albumin in the renal glomerulus of kidney.[11, 12] An albumin level above the upper limit values is called microalbuminuria.

To compensate for variations in urine concentration in spot-check samples, it is helpful to compare the amount of albumin in the sample against its concentration of creatinine. This is termed the albumin/creatinine ratio (ACR). It the mg of albumin excreted per gram of creatinine or microgram of albumin excreted per milligram of creatinine.

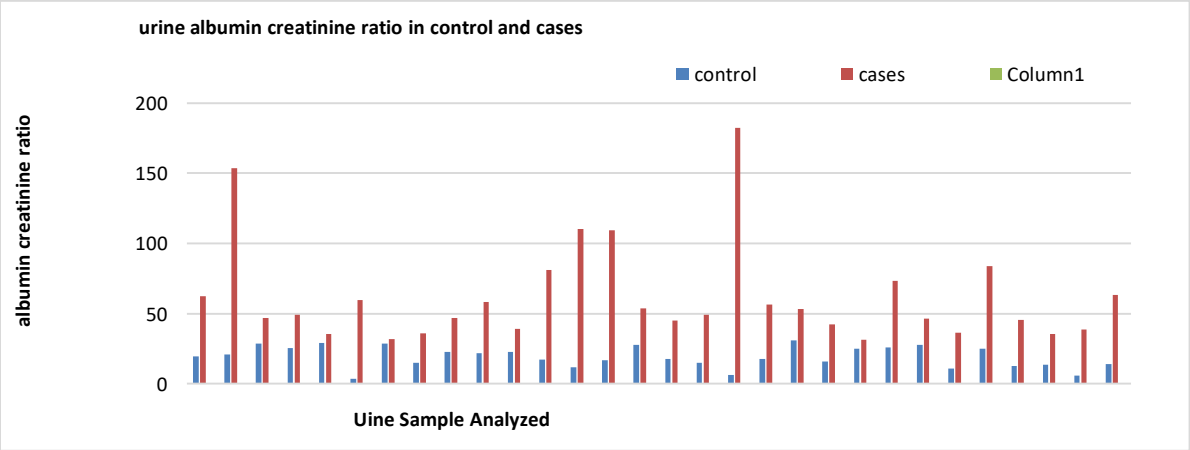

Figure 1: Urine Albumin Creatinine Ratio in Control and cases

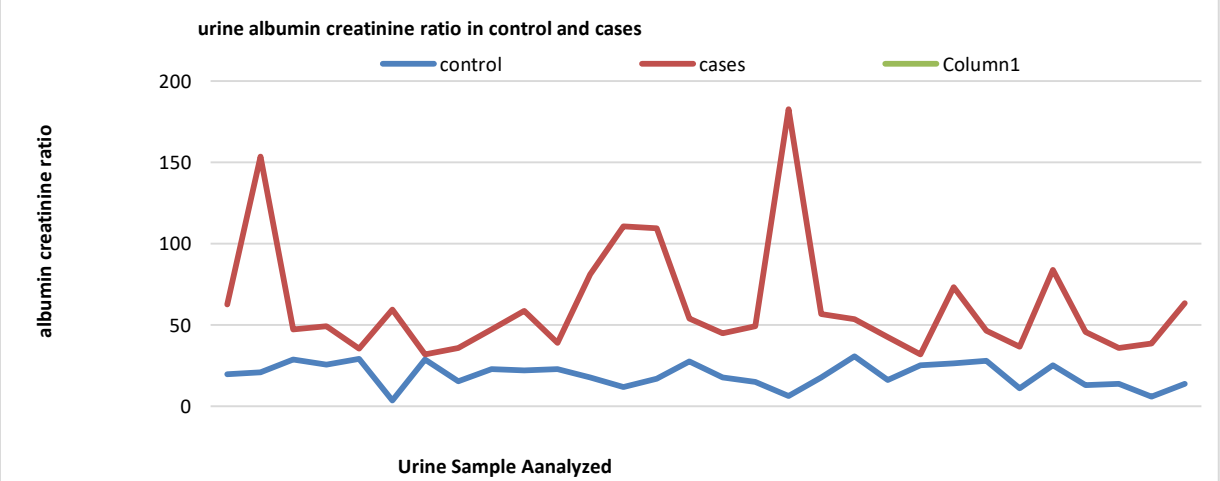

Figure 2: Urine Albumin Creatinine Ratio in Control and Cases

Method	Normal Value µg/mg or mg/G	Micro Albuminuria µg/mg or mg/G	Macro Albuminuria µg/mg or mg/G
Albumin creatinine Ratio µg /mg or mg/G	<30	30-300	>300

30 Diabetic patients without nephropathy as controls and 30 Rheumatoid arthritis patients as cases are taken for this current research study. Spot urine samples were collected and urinary albumin and creatinine concentrations were estimated. The albumin creatinine ratio (ACR) is calculated for both the controls and cases and it is shown in the table 1.The relation between urine albumin creatinine ratio for both the control and cases is shown in the figure 1 (column chart) and figure 2 (line graph). Mean Value ±Std Deviation is calculated for albumin creatinine ratio (ACR). For control it is 16.77 ± 4.08and for Rheumatoid arthritis patients it is 50.44 ± 16.96.In our study, results and analysis showed that the ratio of the mg of albumin per gram of creatinine among Rheumatoid arthritis patients (cases) were significantly higher than Diabetic patients without nephropathy (controls).

CONCLUSION

Microalbuminuria is frequently present in patients with rheumatoid arthritis and measuring the urinary albumin excretion is a simple way to detect early subclinical renal dysfunction. Microalbuminuria and subclinical renal damage are frequent in rheumatoid arthritis patients particularly for chronic cases. The study concludes that albumin creatinine ratio calculated may be used in rheumatoid arthritis patients to detect early renal dysfunction.

REFERENCES

1. Pedersen LM, Nordin H, Svensson B, Bliddal H. Microalbuminuria in patients with rheumatoid arthritis. Ann Rheum Dis 54, 1995, 189-92.
2. Daoussis D, Panoulas VF, John H, Toms TE, Antonopoulos I, Treharne G, et al. Microalbuminuria in rheumatoid arthritis in the post penicillamine/gold era: association with hypertension, but not therapy or inflammation. ClinRheumatol. 30(4), 2011, 477–84. [Pub Med: 20396921].
3. Niederstadt C, Happ T, Tatsis E, Schnabel A, Steinhoff J. Glomerular and tubular proteinuria as markers of nephropathy in rheumatoid arthritis. Rheumatology (Oxford). 38(1), 1999, 28–33. [Pub Med: 10334679].
4. Boers M. Renal disorders in rheumatoid arthritis. Semin Arthritis Rheum 20, 1990, 57-68.
5. Sesso R, Neto J T M, Ferraz M B, Pereira A B, Ajzen H. Frequent abnormalities of renal function in patients with rheumatoid arthritis. Nephron 59, 1991, 677-8.
6. Seideman P, Mullller-Suur R. Renal effects ofaspirin and low dose methotrexate in rheumatoid arthritis. Ann Rheum Dis 52, 1993, 613-5.
7. Silva AM, Schaan BD, Signori LU, Plentz RD, Moreno H Jr, Bertoluci MC, Irigoyen MC. Microalbuminuria is associated with impaired arterial and venous endothelium-dependent vasodilation in patients with Type 2 diabetes. J Endocrinol Invest, 33, 2010, 696-700.
8. MattixHj, Hsu Cy, Shaykevich S, Curhan G. Use Of The Albumin/Creatinine Ratio To Detect Microalbuminuria: Implications Of Sex And Race. J Am Soc Nephrol 13, 2002, 1034.
9. Caramori ML, Fioreto P, Mauer M. The need for early predictors of diabetic nephropathy risk: Is albumin excretion rate sufficient? Diabetes. 49, 2000, 1399–1408.
10. Ruggenenti P, Remuzzi G. Nephropathy of Type-2 Diabetes Mellitus. J Am Soc Nephrol 9, 1998, 2157.
11. Glassock RJ. Prevention of Microalbuminuria in Type 2 Diabetes: Millimeters or Milligrams. J Am Soc Nephrol. 17, 2006, 3276–3278.
12. Rossing K, Christensen Pk, Hovind P, Et Al. Progression of Nephropathy in Type 2 Diabetic Patients. Kidney Int 66, 2004, 1596.

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