ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 10, Issue, 05, pp.69576-69579, May, 2018

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

CORRELATION OF RENAL ARTERY VASCULAR RESISTIVE INDEX BY RENAL DOPPLER SONOGRAPHY WITH MICROALBUMINURIA AND ITS ROLE IN EARLY DETECTION OF DIABETIC NEPHROPATHY

***Niharika Ved, Rajesh Sharma and Anil K Gupta**

Acharya Shri College of Medical Sciences, Bye Pass Road, Sidhra, Jammu, Jammu and Kashmir 180017

ARTICLE INFO

Article History:
Received 05th February, 2018
Received in revised form
20th March, 2018
Accepted 24th April, 2018
Published online 30th May, 2018

Key words:
Microalbuminuria
Duplex ultrasonography
RI
Diabetic nephropathy.

****Corresponding author:***

ABSTRACT

Objective: Renal artery resistive index evaluation in patients with diabetes mellitus and control group along with its correlation with microalbuminuria.

Materials and Methods: This study comprised of 50 cases of diabetic mellitus (NIDDM) in age group of (40-60 years) and 50 cases of age match control of non-diabetic patients. Total 100 cases underwent duplex ultrasonography. Both groups of 50 cases each were tested for blood urea, serum creatinine, urine proteinuria and microalbuminuria.

Results: In our study 50 diabetics were further divided into two groups based on their RI values. Group 1 were the patients with RI value above 0.7 and group 2 with RI less than 0.7. 30% patients had RI value more than 0.7 and 20% patients had RI value less than 0.7. mean age of the patients in group 1 was 55.73 years and 54.05years in group 2.66% patients with diabetes were male and 34% female. 77% of group 1 patients and 20% in group 2 had overt proteinuria. 23% of group 1 and 60%of group 2 patients had microalbuminuria. There were 20% patients in group 2 which showed normal RI values and no overt or microalbuminuria. Patients with overt proteinuria had mean RI of 0.75. Microalbuminuric patients with mean RI of 0.69 and patients with no proteinuria had mean RI value of 0.64. Among diabetics, patients with RI more than 0.7 had mean blood urea of 34.5 mg/dl and 30.2 mg/dl in group 2. Among diabetics mean serum creatinine value in group 1 patients is 2.28 mg/dl and 0.99 mg/dl in group 2 patients. Mean RI of control group was 0.62 and 0.71 in diabetics.

Conclusion: High RI is significantly associated with micro and overt proteinuria. Thus, RI value can be used as an additional parameter for early detection of diabetic nephropathy similar to that with microalbuminuria. There is potential role of renal RI in identifying diabetic patients who are developing diabetic nephropathy.

Citation: Niharika Ved, Rajesh Sharma and Anil K Gupta. 2018. "Correlation of renal artery vascular resistive index by renal doppler sonography with microalbuminuria and its role in early detection of diabetic nephropathy", *International Journal of Current Research*, 10, (05), 69576-69579.

INTRODUCTION

Diabetes is fast gaining status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with this disease (Joshi SR *et al*., 2007). Diabetes and its complications pose an immense amount of social and economic burden on health infrastructure and resources throughout the globe. Diabetic nephropathy is the single most common cause of end stage renal disease and is also a leading cause of chronic kidney disease in India accounting for about 30% of all chronic kidney disease patients (Mk Mani *et al*., 1998). Diabetic nephropathy, also known as Kimmelstiel - Wilson syndrome or nodular diabetic glomerulosclerosis or intercapillary glomerulonephritis, is a clinical syndrome characterised by persistent albuminuria (>300mg/d or >200microg/min) that is confirmed on at least two occasions 3-6 months apart, progressive decline in the glomerular filtration rate and elevated Blood pressure. Serum creatinine level more than 1.3mg/dl is also considered as having diabetic nephropathy and patient having albumin in urine more than 300mg/dl is considered to have microalbuminuria. Several studies have established microalbuminuria as a predictive marker for progressive decline in renal function, however few researchers have challenged its significance especially after studies showed that many patients of diabetic nephropathy with advanced renal disease never developed albuminuria (MAGall *et al*., 1997) and 58%-68% with microalbuminuria regressed over a period of time to norm -albuminuria (HH Parving *et al*., 2002). Among parameters measured by Doppler USG, RI is the most frequently used index in clinical practice. It is hypothesized that RI demonstrates changes of renal vascular resistance in patients with impaired kidney function. Histopathological changes mainly affect vascular compartment in kidney of diabetic patients which results in elevation of renovascular resistance. Therefore, RI is valuable in detecting early diabetic

nephropathy. Renal Doppler is a non-invasive modality that can be used in association with biochemical parameters in follow up of patients with diabetic nephropathy .Thus intrarenal RI could prompt physician to a more tight control of blood sugar in group of diabetics, delaying progression to ESRD (CL Thukral *et al*., 2015).

MATERIALS AND METHODS

This case-control study was conducted in the department of Radio diagnosis and imaging, Acharya Shri Chander College of Medical Sciences and Hospital, Sidhra, Jammu. There were 50 cases of diabetic mellitus (NIDDM) in age group of (40-60 years) and 50 cases of non-diabetic in age match control. Total 100 cases underwent duplex ultrasonography. Both groups of 50 cases each were tested for blood urea, serum creatinine, urine proteinuria and microalbuminuria.The ultrasound examination of the kidneys was performed in gray scale and color Doppler modes using, 3.5 MHz frequency, and curvilinear transducer of Logiq GE C5 Premium Ultrasound machine.

Patients of diabetic mellitus (NIDDM) in age group of 40-60, shall have inclusive criteria of selection

- Patients diagnosed with diabetes mellitus as per WHO criteria
- Random blood glucose > 11.1m-mole/L (200 mg/dl)
- Fasting plasma glucose more than 7m-mole/L (126 mg/dl)
- Age of patients between 40-60 years
- Both sexes included
- Control group
- Age of patients between 40-60 years
- Both sexes included

Exclusion Criteria

- Patients of renal artery stenosis
- Patients with glomerular or tubulointerstitial disease
- Patients with findings of obstructive uropathy
- Patients with cardiac failure
- Patients with hypertension
- Patients with unilateral or bilateral contracted kidneys of sonography
- Patients with urinary tract infection
- Patients with prior renal surgery
- Patients with hematuria.

Statistical Methods

The data was analyzed using multiple linear regression.

RESULTS

In one study diabetic patients between age group of 40-60 years and age match control group were taken.50 diabetics were further divided into two groups based on their RI values Group 1 were the patients with RI value above 0.7 and group 2 with RI less than 0.7. In our study 30 (30%) patients had RI value more than 0.7 and 20 (20%) patients had RI value less than 0.7. (Table 1). In our study, mean age of the patients in group 1 is 55.73 years with standard deviation of 0.82 and group 2 is 54.05years with standard deviation of 0.75. Maximum distribution is between 55-60 years of age group that is 57%of the patients in group 1 and 45% in group 2. In control group 35 patients were in the range of 55-60 years age group (Table 2). 66% patients with diabetes were male and 34% female. male: female ratio is 1.9:1. Male: female ration is 2.3:1 in control group. Among diabetics group 1 patients have sex ratio of 1.73:1and 2.3:1 in group 2patients. (Table 3).77% of group 1 patients have overt proteinuria and 20% in group 2. 23% of group 1 patients have microalbuminuria and 60% of group 2 patients have microalbuminuria. There were 20% patients in group 2 which showed normal RI values and no overt or microalbuminuria (table 4) (table 5). Patients having overt proteinuria have mean RI of 0.75. Microalbuminuric patients have mean RI of 0.69 and patients with no proteinuria have mean RI value of 0.64(table 6). On multiple regression analysis coefficient of RI with proteinuria. Coefficient of overt proteinuria is 0.106 with p value of 0.003 and microalbuminuria has coefficient of 0.047 and p value of 0.185.Hence according to our study, high RI value is significantly associated with proteinuria. RI value can be used a parameter for early detection of diabetic nephropathy similar to that with microalbuminuria. Mean serum urea in diabetic patients is 32.78 mg/dl and 25mg/dl in control group. Among diabetics patients with RI more than 0.7 have mean blood urea of 34.5 mg/dl and group 2 have blood urea of 30.2 mg/dl.Mean serum creatinine in diabetic patients is 1.77 mg/dl and 0.9 mg/dl in control patients. Among diabetics mean serum creatinine value in group 1 patients is 2.28 mg/dl and 0.99 mg/dl in group 2 patients (table 7). Mean RI of control group is 0.62 and mean RI in diabetics is 0.71.Mean RI of control group is 0.62 with standard deviation of 0.01 versus mean RI of diabetic group is 0.715,standard deviation 0.01. (table 8). Hence RI is higher in diabetic group in comparison with non-diabetic group. Among diabetics mean RI in group 1 patients is 0.76 and 0.65 in group 2 patients.

Table 1. Distribution of Patients According To RI

Group Name	Number of patients	% of total patients
Group 1	30	30%
Group 2	20	20%
Control	50	50%

Table 2. Distributionof Age of Patients in Diabetics

Age groups	Group 1	Group 2	Control
40 - 44	1	0	0
45 - 49	0	0	10
50 - 54	1	3	5
55 - 59	11	8	10
59 - 60	17	9	25

Table 3. Sex Ratio

Group name	Male	Female
Group 1	19	11
Group 2	14	6
Control	35	15

Table 4. Distributionof Patients with More Than 0.7 RI Value (Group 1) according to Proteinuria

Proteinuria	%	No. of patients
Overt proteinuria	77%	23
Micro Albuminuria	23%	7
No proteinuria	0%	0

Table 5. Distribution of Patients with less than 0.7 RI Value (Group 1) according to Proteinuria

Proteinuria	%	No. of patients
Overt proteinuria	20%	4
Micro Albuminuria	60%	12
No proteinuria	20%	4

Table 6. Renal Function Test and RI

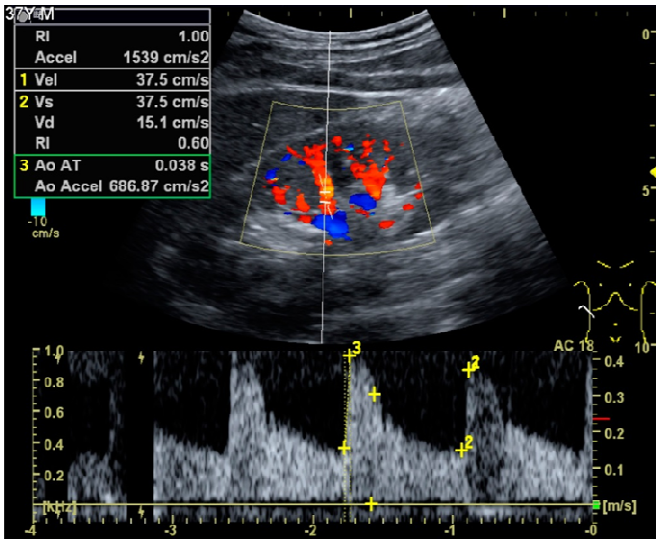
	Group 1	Group 2	Overall diabetics	Control
Mean urea | Serum	34.50	30.20	32.78	25.00
Mean creatinine | Serum	2.29	0.99	1.77	0.90

Table 7. Average RI according to Proteinuria

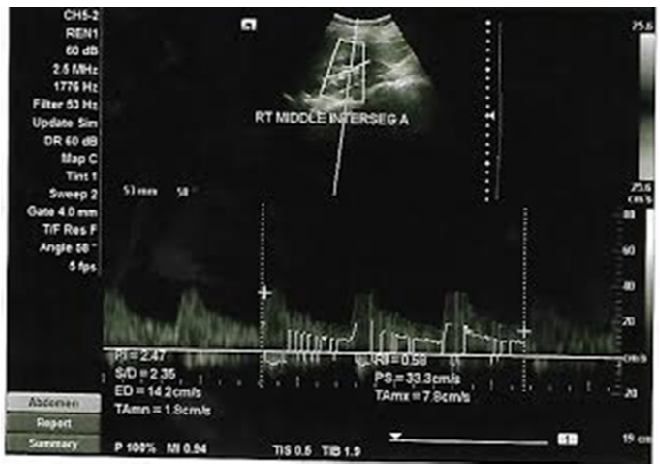
Proteinura	Average RI
No Proteinuria	0.64
Micro Albuminuria	0.69
Over Protienuria	0.75

Table 8. Mean RI invarious groups

Group name	Resistive Index
Group 1	0.76
Group 2	0.65
Overall diabetics	0.72
Control	0.62



Picture 1. RI of right middle intersegmental artery with RI value > 0.7



Picture 2. Right middle intersegmental artery RI with RI < 0.7

DISCUSSION

Diabetic nephropathy is the simple most common cause of end stage renal disease and leading cause of chronic kidney disease in India. Several studies reveal that only 40% of patients with diabetes have renal involvement. These set of patients that progress to frank diabetic nephropathy are labelled as progressors and other set do no progress despite poor glycemic control. There has been paradigm shift in understanding of factors responsible for this discrepancy in natural history of these two sets of patients with balance tilt towards hemodynamic factors rather than metabolic factors. Micro albuminuria is considered as a predictive marker for the progressive decline in renal function. However, few researchers have challenged its significance especially after studies showed that many patients of diabetic nephropathy with advanced renal disease never developed albuminuria and 58-68% with microalbumin regressed once a period of time to normal. In our study there are 50diabetic patients between age group 40-60 years and 50 age match control group.Diabetic patients were further divided into two groups based on their RI values. Group 1 patients have RI value above 0.7 and group 2 with RI less than 0.7. Among diabetics 30 patients have RI more than 0.7 and 20 patients have RI less than 0.7. Mean age of diabetics is 55.06 years.

Among diabetics mean age of group 1 patients with RI value more than 0.7 is 55.73 years and group 2 patients is 54.05 years. Maximum distribution is between 55-60 years of age group that is 57%of patients in group 1and 45%in group 2. In the control group 35 patients were in the range of 55-60 years .66%patients with diabetes were male and 34% female. Male:Female ratio is 1.9:1. Male : Female ratio is 2.3:1 in control group. Among diabetics group 1 patients have sex ratio of 1.73:1and 2.3:1 in group 2 .77%of group 1 patients have overt proteinuria and 20%in group 2.23% of group 1 patients have microalbuminuria and 60%of group 2 have microalbuminuria. Patients having overt proteinuria have mean RI of 0.75. microalbuminuria patients have mean RI of 0.69 and patients with no proteinuria have mean RI value of 0.64. Mean serum urea in diabetic patients is 32.78 mg/dl and 25mg/dl in control group. Among diabetics patients with RI more than 0.7 have mean blood urea of 34.5 md/dl and group 2 have blood urea of 30.2 mg/dl,mean creatinine in diabetic patients is 1.77 mg/dl and 0.9 mg/dl in control group. Among diabetics mean serum creatinine value in group 1 patients is 2.28 mg/dl and 0.99mg/dl in group 2 patients. Mean RI of control group is 0.62 and mean RI in diabetics is 0.71. among diabetics mean RI in group 1 patients is 0.76 and 0.65 in group 2 patients.

Conclusion

Renal doppler is a non-invasive modality that demonstrates changes of renal vascular resistive index in patients with impaired kidney function. Histopathological changes mainly affect vascular compartment which results in elevation of renovascular hypertension. High RI is significantly associated with proteinuria. Thus, RI value can be used as a parameter for early detection of diabetic nephropathy similar to that with microalbuminuria.There is role of renal RI in identifying diabetic patients who are developing diabetic nephropathy.

REFERENCES

Gall, M.A., Hougaard, P., Johnsen, K.B. *et al*. Risk factors for development of incipient and overt diabetic nephropathy in patients with non-insulin dependent diabetes mellitus. *British Medical Journal* 1997; 314:783-88.

Joshi, S.R., Parikh, R.M. 2007. India-diabetes capital of the world: now heading towards hypertension. *J Assoc Physicians India*, 2007; 55:323-40.

Mani, M.K. 1998. Patterns of renal disease in indigenous populations in India. *Nephrology*, 4:4-7.

Parving, H.H., Chaturvedi, N., Viberti, G.C. *et al*. 2002. Does microalbuminuria predict diabetic nephropathy. *Diabetes Care*, 25: 406-07.

Thukral, A., Mishra, M., Shrivastava, V. *et al*. 2011. Determinants of intravascular resistance in Indian diabetic nephropathy patients: A hospital-based study. *International Journal of Vascular Medicine,* 6(5):30-60.

****