Original Research Article

Impaired protein tolerance test as a marker of early renal dysfunction in type 2 diabetes mellitus

Devabhaktuni Siva Sankar[1], Shaik Khaja Rassul[1*]

[1]Assistant Professor of Medicine, NRI Medical College and General Hospital, Chinakakani, Mangalagiri, Guntur, Andhra Pradesh, India
[*]Corresponding author email: **khajarassul@gmail.com**

International Archives of Integrated Medicine, Vol. 4, Issue 12, December, 2017.

Available online at http://iaimjournal.com/
ISSN: 2394-0026 (P) **ISSN: 2394-0034 (O)**
Received on: 30-11-2017 **Accepted on:** 07-12-2017
Source of support: Nil **Conflict of interest:** None declared.
How to cite this article: Devabhaktuni Siva Sankar, Shaik Khaja Rassul. Impaired protein tolerance test as a marker of early renal dysfunction in type 2 diabetes mellitus. IAIM, 2017; 4(12): 158-162.

Abstract

Background: Protein tolerance test measures renal functional reserve that augments during stressful conditions.

Aim: This was a clinical study on evaluation of protein tolerance test as marker for early renal dysfunction in Type 2 Diabetes mellitus. The study also compared progression of renal dysfunction with age and duration of Type 2 Diabetes mellitus.

Method: Total 104 cases - 54 study group, 50 control group were included. Patients with Type 2 diabetes mellitus were included in the study. Fifty healthy, age and sex matched controls without diabetes or its complications were also included in the study for comparison.

Observation: It was found that renal failure was more in patients over 60 years 86% as compared to 16% in the 51-60 years group and 8% in the 41-50 years group. It was found that normal functioning kidney would be able to reduce urine protein after protein tolerance, whereas in patients with renal dysfunction, 17% found to have renal risk and 21% have renal failure. It was demonstrated that normal functioning kidney responded to protein tolerance by increasing eGFR unlike in renal failure cases, eGFR declined after protein tolerance. After protein tolerance normal functioning kidney increased GFR unlike in renal failure cases, serum creatinine levels raised. Prolonged duration of Type II Diabetes mellitus increases risk of renal failure.

Conclusion: Patients with renal failure had more persistent elevation of serum creatinine and sustained decrease in GFR as compared to patients with normal renal function or those with mild renal dysfunction.

Key words

Impaired protein tolerance test, Marker, Renal dysfunction, Type 2 diabetes mellitus.

Introduction

Protein tolerance test: It's a test measures renal functional reserve that augments during stressful conditions. Patients were subjected to test protein meal and measured the renal functional parameters [1, 2]. Normal response would increase GFR without proteinuria and impaired tolerance test shows proteinuria which represents an early marker for renal dysfunction.

Materials and methods

Sample size: 104 cases - 54 study group, 50 control group.

Inclusion criteria

Patients with Type 2 diabetes mellitus were included in the study. Fifty healthy, age and sex matched controls without diabetes or its complications were also included in the study for comparison.

Exclusion criteria

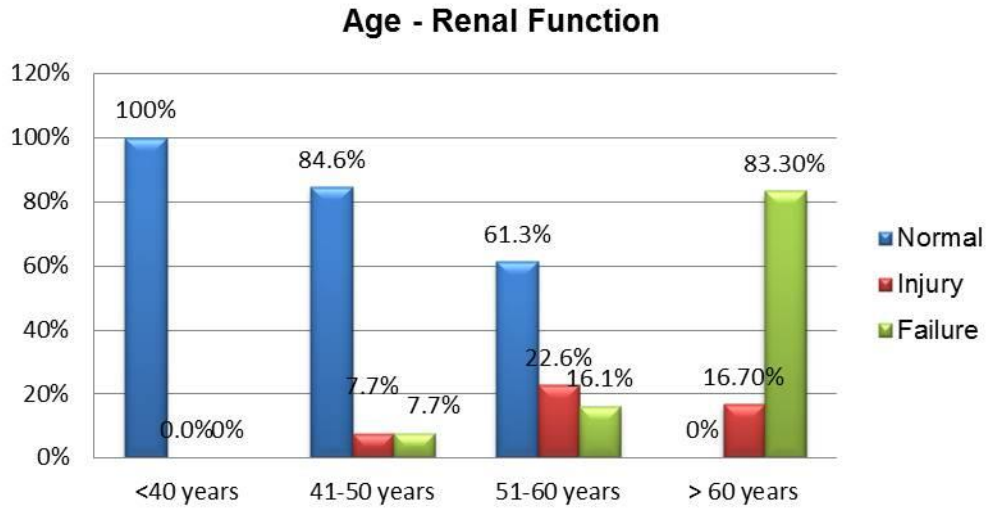
- Patients with Type 2 Diabetes mellitus with proteinuria
- Systemic hypertension
- Renal Failure

Results

The studied cases have been analyzed after protein tolerance test for renal functional parameters. The results of the study had been depicted in **Figure – 1 to Figure – 5**.

The relation between age and renal function was analyzed. It was found that renal failure was more in patients over 60 years 86% as compared to 16% in the 51-60 years group and 8% in the 41-50 years group (**Figure – 1**).

Figure - 1: Progression of renal function with Age.



It was found that normal functioning kidney would be able to reduce urine protein after protein tolerance, whereas in patients with renal dysfunction, 17% found to have renal risk and 21% have renal failure (**Figure – 2**).

It was demonstrated that normal functioning kidney responded to protein tolerance by increasing eGFR unlike in renal failure cases, eGFR declined after protein tolerance (**Figure – 3**).

Figure - 2: Urine protein-creatinine ratio with renal function.

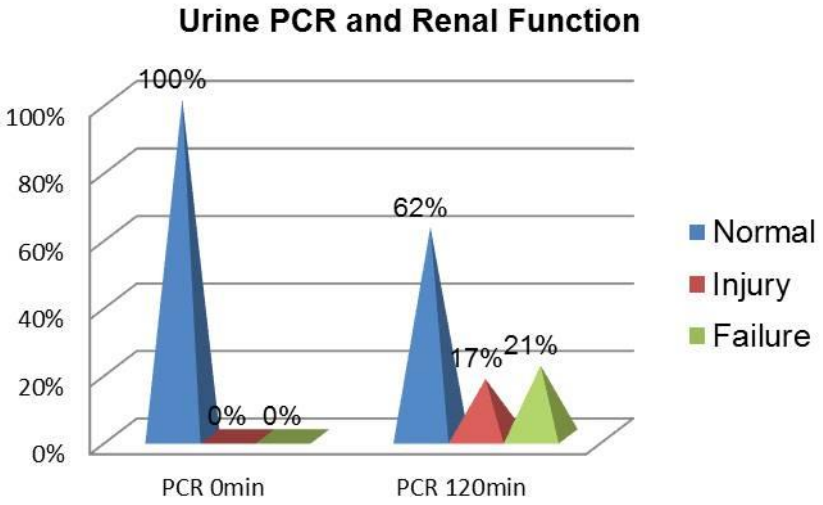


Figure - 3: eGFR and Protein tolerance.

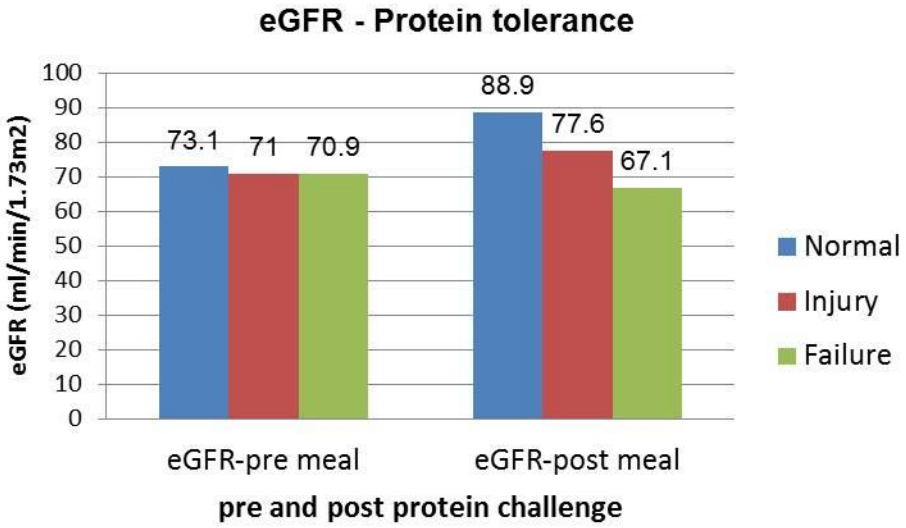


Figure – 4: Serum Creatinine and protein tolerance.

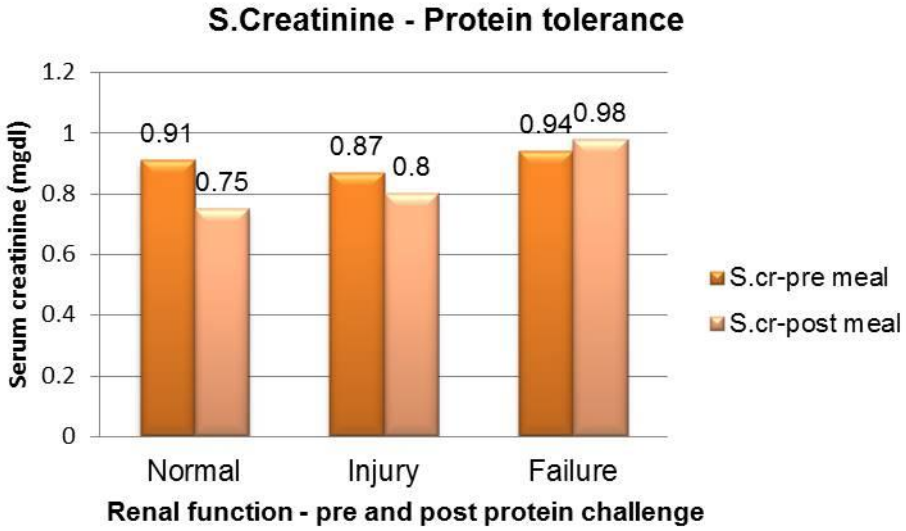
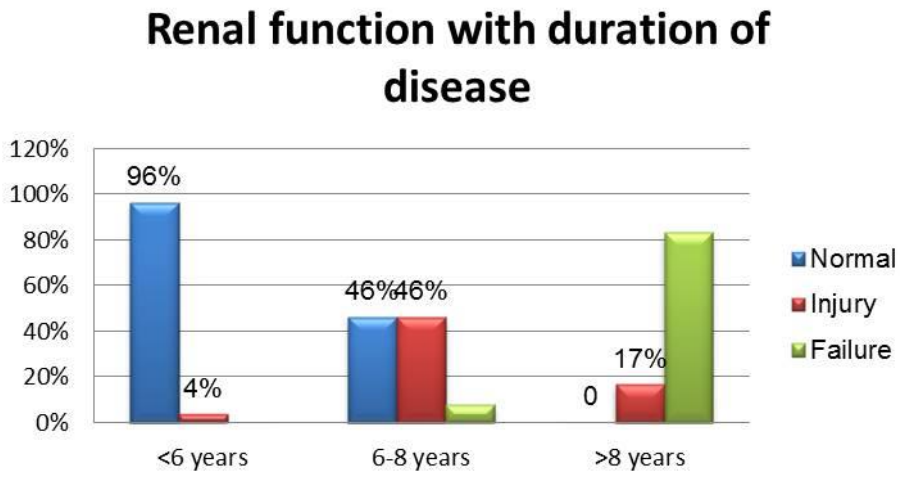


Figure – 5: Renal function with duration of disease.



After protein tolerance normal functioning kidney increased GFR unlike in renal failure cases, serum creatinine levels raised (**Figure – 4**).

Prolonged duration of Type II Diabetes mellitus increases risk of renal failure (**Figure – 5**).

Discussion

Renal function was analyzed in the two groups. Normal renal function was observed in 96% patients in the control group compared to 61% in the test group. Renal injury was observed in 4% patients in the control group compared to 17% in the test group. Renal failure was observed in none of the patients in the control group compared to 21% in the test group**.** There was an age related decline in GFR similar to that seen in most studies [3]. Around 86% of patients in this study above 60 years had renal failure compared to only 24% in age group <60 years. It was found that normal functioning kidney would be able to reduce urine protein after protein tolerance, whereas patients with renal dysfunction, 17% found to have renal risk and 21% have renal failure. In this study it was seen that post protein challenge mean creatinine remained persistently elevated in patients with renal injury and renal failure cases compared to patients with normal renal function. The decline in post protein challenge eGFR-2 was also statistically significant 67ml/kg/1.73m^2 in renal failure versus 88 ml/kg/1.73m^2 in normal renal function implying that this could be a useful marker of renal reserve. The study revealed increase in duration of diabetes was strongly related to renal failure [4]. This is well in concurrence with the study done by Gall M, et al. [4] where it was seen that increasing age and duration of diabetes were associated with renal failure in Type 2 and Type 1 diabetes [5]. In Type 2 diabetes duration of diabetes was a more important risk factor than age [6-9]. In the same study, both Type 1 and Type 2 diabetic retinopathy and proteinuria were strongly associated with renal failure. This was also seen in our study where 38% of patients with abnormal urine protein creatinine ratio had renal dysfunction.

Conclusion

Patients with renal failure had more persistent elevation of serum creatinine and sustained decrease in GFR as compared to patients with normal renal function or those with mild renal dysfunction. There was also an age related decline in renal function. Proteinuria was found to be an independent risk factor for renal failure. It was found that patients with long duration of diabetes and poor glycemic control have more chance of early renal injury and dysfunction than those with short duration of diabetes and good glycemic control. Protein tolerance test can be useful to detect incipient renal failure in patients with normal GFR and normal serum creatinine. It

enables to initiate early aggressive intervention. Protein Tolerance Test may be useful in high risk patients like diabetes, hypertension, solitary kidney, polycystic kidney disease, post renal transplants.

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