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Urinary Beta Glucuronidase Enzyme Activity in Nephrotic Syndrome*

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Serum enzyme determinations have been used in the diagnosis and prognosis of some diseases for a long time. More recently studies have focused on the use of urinary enzyme activity as an index of cellular injury at a specific site of the renal parenchyma.[1] β glucuronidase enzyme is a hydrolytic enzyme known to be present in human urine.[2-4] Acute inflamatory and toxic renal lesions, such as kidney tuberculosis, renal lupus erythematosus, acute tubular necrosis, and pyelonephritis are all accompanied by an increased β glucuronidase activity. In chronic kidney diseases such as chronic inactive pyelonephritis and chronic glomerulonephritis, β glucuronidase activity of urine is normal.[5]

The present study decribes the urinary β glucuronidase activity in patients with amyloidosis and idiopathic nephrotic syndrome.

Materials and Methods

The 37 patients, aged from 2 to 18 years, included in this study were selected from Hacettepe Children's Hospital; of these 9 patients had amyloid nephrosis, 13 had idiopathic nephrotic syndrome in relapse and 15 had idiopathic nephrotic syndrome in complete remission. Eleven normal children, ranging in age from 9 to 10 were used as controls.

The diagnosis was established by history, physical examination, laboratory findings and needle biopsy of the kidney. Nephrotic syndrome was defined to be in relapse when the patient had hypoalbuminemia

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(serum albumin < 3g/dl) edema, and heavy proteinuria (urinary protein > 2g/24hr/m^2).

Urine samples from all patients were obtained by single midstream voided specimens in which urinary cultures were done. Those patients in whom urine cultures revealed bacteria were excluded from this study. Urinary β glucuronidase activity was measured by a modified method of Talalay Fishman and Huggins.[6] Urinary creatinine concentration was measured by the standard picric acid method.[7] One enzyme unit equals 1 mcg phenolphthalein liberated per milliter of urine per 22 hours incubation (at 37 degrees). Urinary β glucuronidase concentration was factored by the creatinine concentration to provide an approximate correction for differences in urine flow[8].

$$\frac{\text{mcg.Phenolphthalein/ml urine}}{\text{mg, CREATİNİNE/ml urine}}$$

Urinary enzyme creatinine ratio values in control subjects: Ranged from 33 to 129.2 with a mean of 63.82 ∓ 9.89. Urinary enzyme creatinine ratio in patients with amyloid nephrosis: Ranged from 191.8 to 1536.2 with a mean value 646.34 ∓ 147.42. Urinary enzyme creatinine ratio in patients with nephrotic syndrome in relapse: Ranged from 188.4

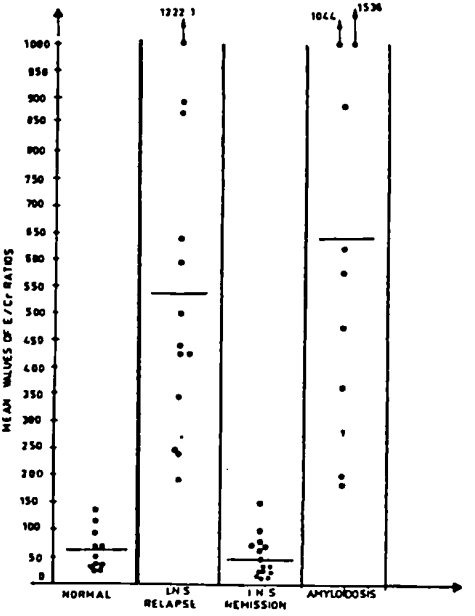

Figure 1
Mean Values of Enzyme/Creatinine Ratio in Groups

to 1222.1 with a mean of 540.015 ∓ 84.35. In patients with idiopathic nephrotic syndrome in complete remission: the values ranged from 9.2 to 143.7 with a mean of 45.47 ∓ 9.38. (Figure 1).

Discussion

In recent years several enzymes have been measured in the urine of patients with diseases of the urinary tract.[9, 10] Normal urine has measurable β glucuronidase activity. The value of the urinary enzyme creatinine ratio was 63.82 ∓ 9.89 in our normal control children. This value differs from those of other published reports. This may be due to differences in methods applied.[11]

In both our amyloid nephrosis and idiopathic nephrotic syndrome cases in relapse a significant increase in urinary β glucuronidase enzyme creatinine ratio was observed compared to the control group value ($p < 0.001$). Therefore β glucuronidase enzyme activity cannot be used as a differential index in diagnosis between these two renal diseases. However, in idiopathic nephrotic syndrome in remission the value of urinary β glucuronidase enzyme creatinine ratio was observed to be within the normal range ($p > 0.05$) (Figure 1). For this reason this enzyme creatinine ratio would be a useful in the interpretation of the course of patients with idiopathic nephrotic syndrome. Since nephrotic syndrome is characterized by increased protein in the glomerular filtrate, it could allow plasma enzyme to leak in to the urine; but we were unable to correlate the degree of proteinuria and endogenous creatinine clearence with urinary β glucuronidase enzyme creatinine ratio. β glucuronidase enzyme is found in greatest concentration in the lysosomes of the proximal tubules, and it is present in diminishing concentration, in the loop of Henle, in the epithelial cells of the prostate and of the bladder.[12] These observations suggest that injured tubules could be the principal source of the increased urinary enzyme activity in patients with amyloid nephrosis and with idiopathic nephrotic syndrome.

We arrived at the conclusion that in idiopathic nephrotic syndrome and in amyloid nephrosis there may be tubular injury in addition to the glomerular disorder. It was not possible to differentiate amyloidosis from idiopathic nephrotic syndrome by the determination of urinary β glucuronidase enzyme activity. But it could be used to follow the course of the patients with idiopathic nephrotic syndrome.

Summary

Urinary β glucuronidase enzyme activity was investigated in urine samples from the patients with amyloidosis and idiopathic nephrotic

syndrome in relapse and idiopathic nephrotic syndrome in complete remission. Urinary enzyme activity was found to be increased in patients with amyloidosis and nephrotic syndrome in relapse. In the patients with idiopathic nephrotic syndrome a significant reduction in the urinary β glucuronidase activity occured during the remission. The results were discussed.

REFERENCES

1. Wacher, W. E. C., Dorfman, L. E.: Urinary lactic dehydrogenase activity 1. Screening method for detection of cancer of kidney and bladder. JAMA 181: 972, 1962.
2. Amodor, E., Zimmerman, T. S., Wacker, W. E. C.: Urinary alkaline phosphatase activity. 1. Elevated urinary LDH and alkaline phosphatase activities for the diagnosis of renal adenocarcinomas. JAMA. 185: 789, 1963.
3. Amodor, E., Dorfaman, L. E., Wacker, W. E. C.: Urinary alkaline phosphatase and lactic dehydrogenase activity in the differential diagnosis of renal diseases. Ann. Intern Med. 62: 30, 1965.
4. Riggins, R. S., Kiser, W. S. : A study of lactic dehydrogenase in urine and serum of patients with urinary tract diseasese. J, Urol. 90: 594, 1963.
5. Gonick, H. C., Kramer, H. J. and Schapiro, A. E.: Urinary β glucuronidase activity in renal disease. Arch. Intern. Med. 132: 63, 1973.
6. Talalay, P., Fishman, W. N., and Huggins, C.: Chromogenic substrates. II Phenolphthalein glucuronic acid as substrate for assay of glucuronidase activity. J. Biol. Chem. 166: 757, 1946.
7. Joseph, H. R.: Clinical chemistry, Principles and technic. New York Hoeben-C. 1964.
8. Leonard, C. D.: Urinary βeta glucuronidase in man. Relation to urinary spesific gravity and creatinine concentration. Clin. Neph. 2: 41, 1974.
9. Goldberg, W. M., Chakrabartis, S. and Filipick, R.: Urinary lactic dehydrogenase, alkaline, phosphatase and lysozyme studies in renal disease. Can. Med. Assoc. J. 94: 1264, 1966.
10. Haysleft, J. P., Periuie, P. E., and Finch, S. C.: Urinary muramidase and renal disease correlation with renal histology and implication for the mechanism of enzymuria. N. Eng. J. Med. 279: 506, 1968.
11. Kallet, H. A., Lapco, L.: Urine βeta glucuronidase activity in urinary tract disease. J. Urol. 97: 352, 1967.
12. Schapiro, A., Paul, W., and Gonich, H.: Urinary βeta glucuronidase in urologic disease of the kidney, J. Urol. 100: 146, 1968.