

Acid Phosphatase Activity As A Potential Prognostic Marker In Patients With Benign Prostate Hyperplasia (BPH)

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Citation

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Abstract

Introduction: We assayed for the serum activity of acid phosphatase (Orthophosphoric monoester phosphohydrolase (Acid optimum), E.C. 3.1.3.2), alanine aminotransferase (L-alanine: 2-oxoglutarate aminotransferase, EC. 2.6.1.2), aspartate aminotransferase (L-aspartate: 2-oxoglutarate aminotransferase, EC. 2.6.1.1) in patients presenting with benign prostate hyperplasia.

Methods: Blood samples were collected 24 hours before surgery and 24 hours after surgery from each of adult 7 patients involved in the study and a control group of 10 healthy adult males.

Results: The results show that both pre- and post-surgical acid phosphatase activity (2.34 ± 0.44 IU and 2.29 ± 0.34 IU) were elevated by about 40% relative to the activity of the same enzyme in the control group (1.63 ± 0.21), $p < 0.05$. Alanine and aspartate aminotransferase activities were relatively stable in both pre- and post-operative BPH patients when compared to the control values.

Conclusion: Acid phosphatase therefore has the dual potential of being used to differentiate prostate enlargement due to BPH or prostate carcinoma and as a prognostic marker of benign prostate hypertrophy.

INTRODUCTION

Benign, nodular, paraurethral hyperplasia of the prostate (BPH) is one of the most common neoplastic diseases affecting the elderly male population. Eighty percent of all men above the age of 40 years suffer from urodynamic consequences of BPH¹. This condition is characterized by progressive enlargement of the prostate gland, which results in obstruction of the flow of the urine from the bladder. The associated symptoms of the resulting urinary dysfunction include urgency, hesitancy, weak urinary stream, intermittency, dribbling and feeling of incomplete emptying. Furthermore, men with BPH may also have a higher level of botherness and more interference in selected daily living activities caused by urinary dysfunction, together with embarrassment about urinary dysfunction and worry or concern over progression to prostate cancer¹. Based on newer anatomical divisions of the prostate, prostatic hyperplasia develops in the transition zone located mediolateral of the urethra, which is characterized by narrow glands and a very tight stroma². A proliferation of the mesenchymal-stromal or the glandular-epithelial portion of

the gland has been reported to initiate BPH³. The usual therapy in advanced stages with obstructive voiding symptoms is surgical treatment, most commonly the transurethral resection of the prostate⁴. Although much has been reported on the elevation in serum acid phosphatase activity in the more severe cancer of the prostate⁵, little is known about the enzymology of BPH. In this work we report about the changes in serum activities of acid phosphatase, alanine and aspartate aminotransferases in patients with BPH.

METHODS

Patients. The subjects involved in this study were made up of 7 adult males presenting at the Bauchi State Specialist Hospital with BPH.

Serum. Blood sample (5 ml) was collected from each patient 24 hours before surgery (pre-surgical samples) and 24 hours after surgery (post-surgical sample) using sterile needle and syringe. Serum was prepared by transferring the blood sample into a clean, sterile centrifuge tube. The sample was

centrifuged at 3000g for 5 minutes and the supernatant serum sample removed by aspiration using a Pastuer pipette. The sample was then transferred into a clean, sterile container and stored at -4°C until analyzed. The control serum was prepared by collecting blood samples from 10 healthy male donors using the procedure described above.

Enzyme assays. Total serum acid phosphatase, alanine and aspartate aminotransferase activities were assayed according to the method described in Bergemeyer ⁶.

Ethics. Approval for this work was obtained from the management of the Bauchi state Specialist Hospital. In addition, we conformed strictly to the World Medical Association's ethical declaration on the rights of the patients in medical research. ⁷.

Statistics. Data was analyzed using Minitab – 10 Statistical Software. The non-parametric test of Kruskal-Wallis was used to assess the differences between means for pre-surgical, post-surgical and control enzyme activities. $p < 0.05$ were considered significant.

RESULTS

The results obtained for variations in serum activities of acid phosphatase (ACP), alanine aminotransferase (ALT) and aspartate aminotransferase (AST) are shown in tables 1 – 2.

Figure 1

Table 1: Total serum acid phosphatase activity in patients with BPH.

Subjects	Enzyme activity (mean \pm SEM) IU
Pre-surgical	2.43 \pm 0.44
Post-surgical	2.29 \pm 0.34
Control	1.63 \pm 0.21

Figure 2

Table 2: Serum alanine and aspartate aminotransferase activity in patients with BPH.

Enzyme		Enzyme activity (mean \pm SEM) IU
Alanine aminotransferase (ALT)	Pre-surgical	20.29 \pm 2.49
	Post-surgical	22.21 \pm 1.18
	Control	20.10 \pm 1.39
Aspartate aminotransferase (AST)	Pre-surgical	21.50 \pm 0.92
	Post-surgical	21.43 \pm 1.79
	Control	20.95 \pm 1.34

Acid phosphatase activity before surgical intervention was 2.43 ± 0.44 IU. It dropped to 2.29 ± 0.34 IU after 24 hours. These values are all relatively higher than the control ACP activity of 1.63 ± 0.21 IU, $p < 0.05$, table 1. Table two shows the variation in both serum alanine and aspartate

aminotransferase activities in pre- and post-surgical BPH patients. The pre-surgical serum ALT activity was 20.29 ± 1.44 IU and it increased slightly to 22.21 ± 1.18 IU 24 hours after surgery. Relative to the control ALT activity of 20.10 IU, these values are slightly higher, $p > 0.05$. The serum activity of AST was slightly elevated in both pre- and post-surgical patients relative to the control values. Pre-surgical and post-surgical serum AST activities were 21.50 ± 0.92 IU and 21.43 ± 1.79 IU respectively. These values were not significantly different from the control AST activity of 20.95 ± 1.34 IU, $P > 0.05$.

DISCUSSION

Not much work has been done on the effect of surgery on the enzymology of BPH. The major factor known to be responsible for changes in serum levels of intracellular enzymes is injury to organs or tissues rich in such enzymes ⁸. The result obtained indicates that both ALT and AST activities are relatively stable both during and after surgery. This can be accounted for by the fact that the prostate is not among the tissues reported to contain significant, measurable amounts of ALT and AST ⁵. However, the high acid phosphatase observed in pre-operative patients relative to the control value may arise due to enlargement of the prostate gland, leading to increased synthesis or expression of this enzyme. A reduction in serum acid phosphatase activity was observed after surgery, suggesting that surgery has a beneficial effect on the pathogenesis of BPH. These changes are however lower than that observed on the more serious relative of BPH, that is, prostatic carcinoma. Acid phosphatase activity in carcinoma of the prostate is three times above normal. When the magnitude of the increase is taken into consideration, changes in serum acid phosphatase activity can be used potentially to differentiate between BPH and carcinoma of the prostate. Furthermore, monitoring of serum acid phosphatase levels can also be of prognostic value during the post-surgical assessment of the outcome of prostatectomy. However, this finding should not preclude further research aimed at studying and correlating the urinary and serum activities of acid phosphatase, alanine aminotransferase and aspartate aminotransferase in patients with BPH.

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