Membrane Potential and Immune Stability Assessment in Prostate Cancer Patients

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ABSTRACT

Aim: This study was carried out to determine the status of membrane potential (MP) and immune stability of prostate cancer (PCA) using CD4 + T cell, CD8 + T cell counts, and the CD4/CD8 ratio. **Materials and Methods:** Eighty subjects were randomly recruited for the study and grouped into PCA subjects ($n = 40$) and control ($n = 40$). The level of MP was determine by Nernst equation, while the levels of CD4 + T cells (μl/count) and CD8 + T cells (μl/count) were determined using the flow cytometric method. The CD4/CD8 ratio was calculated from the CD4 + T cells and CD8 + T cells values. **Results:** The levels of MP, CD4+ T cells, and CD8+ T cells were significantly decrease in PCA patients compared to the control subjects ($P < 0.05$). **Conclusion:** The decreased MP, CD4 +, and CD8 + T cell counts in PCA patients could probably imply instability of MP and immune parameters in the cancer subjects.

Key words: Prostate cancer, membrane potential, immune stability

INTRODUCTION

Prostate cancer (PCA) is a disturbing health problem in men.[1] It is becoming a significant health concern for men in Nigeria and membrane potential (MP) as well as immune instability may be responsible.[2]

The development of PCA may be linked to alterations in the movement of ions in and outside the cells affecting MP and roles of immune cells in the peripheral circulation.[3] There is an antigen-specific immune effect due to complex dynamic interplay between antigen-presenting cells, ions, T lymphocytes, as well as target cells.[4] It has been observed that the progression of PCA is not singly dependent on the features of the tumor but also by the host response through the production of prostate-specific antigen (PSA). This PCA may induce the death of immune cells in the peripheral circulation.[5] Hence, affecting the immune parameters. This tends to elicit a response to CD8+ T cells and CD4+ T cells. The T cell repertoire in an adult is regulated by thymic selection where naive CD4+ and CD8+ T cells can then interrelate and be primed, with foreign antigen in the secondary lymphoid tissues.[6] CD4 T cells help in immune protection, which is done through the capacity to help B cells make antibodies.[7,8] Hence, inducing macrophages to form increased microbicidal activity. T-cells are a subset of white blood cells that are involved in the body's immune system. CD4 is a type of protein found on certain immune cells such as T-cells, macrophages, and monocytes.[9]

CD4 T-cells are called "helper" cells because they do not neutralize infections but rather trigger the body's response to infections.[10,11] While CD8 T-cells which is a type of protein on their surface which is involved in part as a "killer" cells by producing substances that help ward off viruses and other foreign invaders. Simply, the CD4 cells lead the fight against

infections. While Similarly, CD8 cells can kill cancer cells and other invaders.[12]

This research was aimed to determine the level of MP, the immune stability in PCA patients using CD4 + T cells, CD8 + T cell counts.

MATERIALS AND METHODS

A total of 40 confirmed PCA male subjects between the age of 60 and 80 years with PSA levels >4 ng/ml were used in this study, while 40 apparently healthy male subjects without PCA between the age of 60 and 80 years with PSA levels <4 ng/ml were used as control.

Blood Collection
In all subjects, 4 ml of fasting venous blood was collected. Two milliliters were discharged into disodium ethylenediaminetetraacetic acid for the estimation of CD4 + and CD8 + T cells, while the other 2 ml were discharged into plain tubes and serum was separated into a clean, dry Bijou bottle after centrifuging the whole blood in westerfuge (model 684) centrifuge at 5000 g for 10 min. Informed consent of the participants was obtained and was conducted in line with the ethical approval of the hospital.

Biochemical Assay
The MP was determined by calculation using the Nernst Equation.[13] The CD4 + and CD8 + T cells were determined within 2 h of collection using the flow cytometric method.[14]

Statistical Analysis
The mean and standard deviation were obtained for each parameter. The differences in the means for each parameter between the two groups were compared using Student's *t*-test.

RESULTS

The results are presented in the table. The results show that membrane potential, CD4 + T cells and CD8 + T cells in the prostate cancer subjects were significantly decreased (p<0.05) compare with the control subjects (Table 1). While

Table 1: The level of membrane potential and immune status in prostate cancer subjects and control

Parameters	Prostate cancer	Control	*P* value
Membrane Potential(J)	148.32±12.85	275.22±16.3	0.000*
CD4+ T cells (µl/count)	598± 84	991± 193	0.000*
CD8 +T cells (µl/count)	342± 50	705 ±76	0.000*

*Significant at *P*<0.05

the level of membrane potential was significantly decreased in prostate cancer when compared with control at p<0.05 as shown in Table 1.

DISCUSSION

In this study, the level of MP was significantly decreased in PCA when compared with control. This could probably be associated with a disruption of electron transport chains in PCA, affecting ion interactions of ions and flow.[15] This is in with the reports in diabetes.[16]

This decrease in MP in PCA may be linked to increased generation of free radicals that favors oxidative stress, Hence, affecting the ion balance negatively.[17]

Furthermore, the levels of CD4 + and CD8 + T cells in PCA subjects were significantly decreased when compared to control. This is in line with other reports in cancer.[18] The implication of the significant decrease of CD8 + T cells in PCA subjects is that it could result to decreased survival in PCA subjects. The CD8 + T cells were preferentially targeted for cell death compared to circulating CD4 + T cells. This indicates membrane and immune instability in the PCA.[19,20]

CONCLUSION

The levels of Membrane Potential, CD4 +, and CD8 + T cell counts in prostate cancer patients were significantly decreased. This could probably imply an instability of membrane potential and immune parameters in the prostate cancer subjects.

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