ABSTRACT

Objective: This study aimed to compare PSMA expression in both prostate cancer and benign prostate disease.

Material & Methods: PSMA antigen expression was examined using polymerase chain reaction (PCR), twenty samples from each prostate cancer and benign prostate group were examined at the Department of Pathology Anatomy, Sardjito General Hospital. The data was analyzed using version 21 of SPSS.

Results: The mean PSMA gene expression in benign groups was 13.49 [95% CI: 11.27 – 15.72] and the mean PSMA gene expression in the malignant group was: 25.14 [95% CI: 20.95-29.33], the p-value was <0.01. Using an independent T-test analysis, we found that the increase in PSMA gene expression in the prostate cancer group was statistically significant.

Conclusion: The expression of the PSMA gene was correlated with prostate cancer. Increased PSMA gene expression in prostate tissue could be used as a biomarker to diagnose prostate cancer.

Keywords: PSMA, prostate cancer, PCR, gene expression.

INTRODUCTION

Prostate cancer is the second most common malignancy among men in the world.\(^1\) When detected at an early stage, prostate cancer has nearly 100 percent of the 5-year survival rate. Prostate-specific antigen (PSA) is currently the main marker used in screening settings. PSA has high sensitivity and low specificity, resulting in a high false-positive rate.\(^2\) In order to reduce the mortality rate due to prostate cancer, another diagnostic tool with better specificity in screening setting is needed.

Prostate-specific membrane antigen (PSMA), a type II membrane protein, is produced by all prostate cells in any stage of prostate malignancy.\(^3\) PSMA, characterized by the presence of murine monoclonal antibody (mAb) 7E11 - C5, has an internalization signal that allows the protein to be internalized on the cell surface to the endosomal compartment. PSMA is expressed in all forms of prostate tissues, including carcinoma. This recently recognized attribute may prove useful in future diagnosis and therapy of prostate cancer.\(^4\) This study assessed PSMA gene expression in prostate tissue in two different groups: prostate cancer and benign prostate disease.
OBJECTIVE

This study aimed to compare PSMA expression in both prostate cancer and benign prostate disease.

MATERIAL & METHODS

This study is a non-experimental retrospective study to evaluate PSMA expression between prostate cancer tissue samples and benign prostate disease patients at Sardjito General Hospital, Yogyakarta. This research included 40 tissue samples, of which 20 tissue samples were collected from patients with prostate cancer, and 20 other tissue samples were collected from patients with prostate cancer who had met the inclusion and exclusion criteria. Results were documented and analyzed for differences in prostate-specific membrane antigen in prostate cancer and benign prostate hyperplasia. Statistical measurement was performed using an independent T-test analysis with SPSS 21.

RESULTS

Forty tissue samples were obtained from two groups; the prostate cancer group and the benign prostate disease group. The mean prostate-specific membrane antigen values for both prostate cancer and benign prostate disease were shown in Table 1.

An independent T-test was obtained with a 2-way significance value of 0.00 in both groups with a p-value of 0.01. There was a significant difference in PSA level between prostate cancer and benign prostate hyperplasia groups (table 2). In the prostate cancer group, PSMA had a higher value than in the benign prostatic hyperplasia group and was statistically significant.

DISCUSSION

In addition to the histopathologic examination, some studies suggest that PSMA can be used as a serum-based marker option for prostate cancer using RT-PCR, but this has not been thoroughly verified.

The monoclonal antibody (mAb) 7E11 is an anti-PSMA antibody used to assess the PMSA expression in serum. Increased PSMA expression was found in prostate adenocarcinoma and prostate intraepithelial neoplasia compared to benign prostatic hyperplasia. Therefore, PSMA expression can be used as a diagnostic tool and also as a criterion for a patient undergoing prostate cancer therapy.

In comparison to that study, a previous study looked at the expression of prostate-specific membrane antigen with anti-PSMA antibodies. In this study, immunoreactivity was shown to have a higher percentage of cancer cells than benign epithelial cells.

Wright et al. compare the expression of PSMA in normal prostate tissue, benign prostatic hyperplasia (BPH), prostate intraepithelial neoplasia (PIN) tissue, and prostate cancer tissue. In that study, out of 27 tissue samples of BPH, 22 (81%) of the samples had positive PSMA result, with 29% mean positive cells, while in PIN, 100% of the tissue samples had positive PSMA result with 59% mean positive cells. The expression of PSMA had varying stain patterns, ranging from low-level diffuse cytoplasmic staining in the epithelium of normal prostate to very intense cytoplasmic and focal membrane staining in high-grade carcinomas.

---

**Table 1. Sample Characteristics.**

<table>
<thead>
<tr>
<th>Prostate-Specific Membrane Antigen (PSMA)</th>
<th>N</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate Cancer</td>
<td>20</td>
<td>25.14</td>
</tr>
<tr>
<td>Benign prostate hyperplasia</td>
<td>20</td>
<td>13.49</td>
</tr>
</tbody>
</table>

**Table 2. Independent T-Test PSMA in prostate cancer group and BPH group.**

<table>
<thead>
<tr>
<th>Prostate-Specific Membrane Antigen (PSMA)</th>
<th>Sig. (2-tailed)</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate Cancer</td>
<td>0.000</td>
<td>20.95</td>
</tr>
<tr>
<td>Benign prostate hyperplasia</td>
<td>0.000</td>
<td>11.27</td>
</tr>
</tbody>
</table>

---
and metastatic tissue. Another study found PSMA expression in prostate cancer tissue, with 157 out of 165 (95%) samples had positive PSMA result, with 53% mean positive cells.

Several studies have suggested that although PSMA expression can be found in BPH tissue, the values were not as high as PSMA in prostate cancer tissue. A number of cells with a positive result against PSMA-antigen have also been shown to be higher in prostate cancer tissue compared to BPH tissue samples.

CONCLUSION

The expression of the PSMA gene was correlated with prostate cancer. Increased PSMA gene expression in prostate tissue could be used as a biomarker to diagnose prostate cancer at early stage, and also as a criterion for a patient undergoing prostate cancer therapy to avoid over-treatment due to false-positive results from other diagnostic test.

REFERENCES