

PROSTATE SPECIFIC ANTIGEN DENSITY CAN HELP AVOID UNNECESSARY PROSTATE BIOPSIES AT PROSTATE SPECIFIC ANTIGEN RANGE OF 4-10 ng/mL

Branimir Lodeta¹, Goran Benko¹, Siniša Car², Zoran Filipan¹, Damir Štajcar¹ and Tonći Dujmović¹

¹Department of Urology, ²Department of Medicine, Varaždin General Hospital, Varaždin, Croatia

SUMMARY – Elevated level of prostatic specific antigen (PSA) is an established parameter to help determine the need to perform prostate biopsy. The aim of the present study was to determine whether PSA density (PSAD) could better predict pathologic finding of 12-core prostate biopsy in men with PSA 4-10 ng/mL than PSA alone. Transrectal ultrasound guided biopsy was performed in 125 men with PSA within this range. The rate of cancer detection was 24%. Study results showed a significant difference in PSAD between the two patient groups with negative and positive biopsy findings ($P=0.002$), while difference in the measured PSA levels was not significant ($P=0.091$). Study results suggested that PSAD could serve as an additional parameter in predicting negative outcome of prostate biopsy, with a cut-off value of 0.15 ng/mL/mL within PSA range of 4-10 ng/mL (sensitivity 86.7% and negative predictive value 91.5%).

Key words: *Prostate specific antigen – blood; Prostatic neoplasms – blood; Prostatic neoplasms – pathology; Prostatic neoplasms – ultrasonography; Biopsy, needle*

Introduction

The discovery of prostatic specific antigen (PSA) and its clinical application have improved the diagnosis and treatment of prostate cancer. Unfortunately, PSA is organ-specific but not cancer-specific, and serum levels may also be elevated in the presence of benign prostatic enlargement (BPE), prostatitis and other non-malignant conditions. There is no universally accepted lower cut-off PSA value, although >4 ng/mL has been used in most studies. In PSA range of 4-10 ng/mL, prostate cancer detection rate is 11%-27%. Recent studies have shown that 2% of patients will go on to develop febrile urinary tract infection and require hospitalization, while rectal bleeding will occur in 2%-21%, hematuria in up to 63%, and vasovagal response in 1.4%-5.3% of patients after prostate biopsy. Attempts have been made to use PSA derivatives such as PSA density, PSA velocity and

age-adjusted values to improve the performance of PSA in order to avoid unnecessary prostate biopsies. The ratio of PSA to gland volume is termed PSA density (PSAD). PSAD has been proposed as a method to exclude men with PSA elevations related to BPE.

The aim of the present study was to determine whether PSAD could help on deciding whether or not to perform prostate biopsy in case of elevated PSA in a range between 4 and 10 ng/mL.

Patients and Methods

Between October 2005 and July 2007, we performed transrectal ultrasound (TRUS) guided biopsy in 125 men with PSA range 4-10 ng/mL. At our Department of Urology we perform systematic 12-core biopsy. All cores were obtained from lateral areas (2 from base, 2 from mid-lobe and 2 from apex on each side of prostate). Before each biopsy, prostate volume was measured by TRUS and PSAD was calculated. All analyses were performed with the use of MS Excel for Windows.

Correspondence to: *Branimir Lodeta, MD*, Stjepana Vukovića 8b, HR-42000 Varaždin, Croatia

E-mail: blodeta@hotmail.com

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All biopsies were performed on a Siemens Sonoline SL-1 ultrasound device with Siemens Endo-P Sonde Bi-plane, US biopsy 18G Biopsyneedle and Pro-Mag 2.2 Automatic Biopsy System.

Results

In the PSA range of 4-10 ng/mL, the rate of cancer detection was 24% (30 of 125 cases). The mean PSA and PSAD in patients with negative biopsy findings was 6.049 ng/mL (SD=1.898) and 0.176 ng/mL *per* mL (SD=0.101), respectively. In men diagnosed with prostate cancer, the mean PSA was 6.588 ng/mL (SD=1.98) and mean PSAD 0.233 ng/mL *per* mL (SD=0.096). The difference in PSAD between the two groups was statistically significant ($P=0.002$), whereas between-group difference in measured PSA did not reach statistical significance ($P=0.091$). We tested three different cut-off values for PSAD: 0.125, 0.15 and 0.175 ng/mL *per* mL, based on the calculated PSAD quartile.

Discussion

Prostate carcinoma accounted for 14% of new male cancers in Croatia in 2006. Serum PSA is the most useful first-line test to assess the risk of prostate cancer. Serum PSA levels may be elevated in the presence of prostate cancer as well as in the presence of BPE, prostatitis, prostate injury, urinary retention, etc. In the PSA range of 4-10 ng/mL, also called gray zone of PSA range, the rate of prostate cancer detection is 11%-27%. Taking into account potential complications and cost of each biopsy, additional parameters are needed to decide to perform or not to perform prostate biopsy. In our study, we tried to determine whether PSAD could help avoid unnecessary biopsies in this PSA range. In some studies, PSA density of 0.15 ng/mL/cm³ or greater has been proposed as a threshold for recommending prostate biopsy in men with PSA levels of 4-10 ng/mL. Some other

Table 1. Significance of prostate specific antigen (PSA) level and PSA density (PSAD) in patient groups with positive and negative biopsy finding

	Negative biopsy	Positive biopsy	P value
PSA (ng/mL)	6.049	6.588	0.091
PSAD (ng/mL/mL)	0.176	0.233	0.002

studies challenged these results. We performed 12-core laterally directed biopsies in an attempt to detect even smaller tumors because the vast majority of adenocarcinomas arise in the posterolateral peripheral zone. Our cancer detection rate was 24%. According to our data, by using PSAD cut-off value of 0.15 ng/mL/cm³ we could avoid up to 33% of unnecessary biopsies, while missing only 7% of prostate cancers. All patients should undergo periodical follow up and treatment depending on PSA dynamics.

Table 2. Results obtained for the proposed prostate specific antigen density cut-off value of 0.15 ng/mL/mL

Sensitivity	86.7%
Specificity	45.3%
Positive predictive value	33.3%
Negative predictive value	91.5%

Conclusion

PSAD can provide an additional tool in predicting negative pathologic findings of prostate biopsy at a cut-off value of 0.15 ng/mL *per* cm³ in the PSA range of 4-10 ng/mL. Using this cut-off value, one can exclude up to 33% of unnecessary biopsies done because of PSA elevation.

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Sažetak

GUSTOĆA ANTIGENA SPECIFIČNOG ZA PROSTATU MOŽE POMOĆI U IZBJEGAVANJU NEPOTREBNE BIOPSIJE PROSTATE KOD RAZINE ANTIGENA SPECIFIČNOG ZA PROSTATU OD 4-10 ng/mL

B. Lodeta, G. Benko, S. Car, Z. Filipan, D. Štajcar i T. Dujmović

Povišene vrijednosti antigena specifičnog za prostatu (PSA) su potvrđeni parametar u donošenju odluke o provođenju biopsije prostate. Cilj ove studije bio je pokazati može li određivanje gustoće PSA predvidjeti ishod biopsije prostate bolje od samog PSA kod muškaraca s vrijednostima PSA od 4-10 ng/mL. U studiju je bilo uključeno 125 muškaraca kojima je učinjena biopsija prostate zbog sumnje na karcinom prostate, s vrijednostima PSA u navedenom rasponu. Unutar toga raspona PSA otkriveno je 24% karcinoma. Rezultati studije su pokazali značajnu razliku u gustoći PSA između dviju skupina bolesnika s negativnim i pozitivnim nalazom biopsije ($P=0,002$), dok razlika u razini PSA nije bila značajna ($P=0,091$). Pokazalo se da gustoća PSA može biti pomoćni parametar u predviđanju negativnog ishoda biopsije prostate uz graničnu vrijednost od 0,15 ng/mL/mL kod raspona PSA od 4 do 10 ng/mL (osjetljivost 86,7%, negativna prediktivna vrijednost 91,5%).

Ključne riječi: Antigen specifičan za prostatu – krv; Novotvorine prostate – krv; Novotvorine prostate – patologija; Novotvorine prostate – ultrazvuk; Biopsija, igla

